



XenApp 7.6 and XenDesktop 7.6

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XenApp 7.6 and XenDesktop 7.6

Welcome to Citrix eDocs for XenApp 7.6 and XenDesktop 7.6.

XenApp and XenDesktop are application and desktop virtualization solutions built on a unified architecture so they're simple to manage and flexible enough to meet the needs of all your organization's users. XenApp and XenDesktop have a common set of management tools that simplify and automate IT tasks. You use the same architecture and management tools to manage public, private, and hybrid cloud deployments as you do for on-premises deployments.

XenApp delivers:

- XenApp published apps, also known as server-based hosted applications. These are applications hosted from Windows servers to any type of device, including Windows PCs, Macs, smartphones, and tablets. Some XenApp editions include technologies that further optimize the experience of using Windows applications on a mobile device by automatically translating native mobile-device display, navigation, and controls to Windows applications; enhancing performance over mobile networks; and enabling developers to optimize any custom Windows application for any mobile environment.
- XenApp published desktops, also known as server-hosted desktops. These are inexpensive, locked-down Windows virtual desktops hosted from Windows server operating systems. They are ideal for users, such as call center employees, who perform a standard set of tasks.
- VM-hosted apps. These are applications hosted from machines running Windows desktop operating systems for applications that can't be hosted in a server environment.
- Windows applications delivered with Microsoft App-V using the same management tools you use for the rest of your XenApp deployment.

XenDesktop delivers:

- VDI desktops. These virtual desktops each run a Windows desktop operating system rather than running in a shared, server-based environment. They can provide users with their own desktop that they can fully personalize.
- Hosted physical desktop. This solution is ideal for providing secure access powerful physical machines, such as blade servers, from within your data center.
- Remote PC access. This solution allows users to log in to their physical Windows PC from anywhere over a secure XenDesktop connection.
- Server VDI. This solution is designed to provide hosted desktops in multitenant, cloud environments.
- Capabilities that allow users to continue to use their virtual desktops while not connected to your network.

Some XenDesktop editions include the features available in XenApp.

Key features in this release

This version of XenApp and XenDesktop includes new features that make it easier for users to access applications and desktops and for Citrix administrator to manage applications:

- The session prelaunch and session linger features help users quickly access server-based hosted applications by starting sessions before they are requested (session prelaunch) and keeping application sessions active after a user closes all applications (session linger).
- Support for unauthenticated (anonymous) users means users can access server-based hosted applications and server-hosted desktops without presenting credentials to StoreFront or Citrix Receiver.
- Connection leasing makes recently used applications and desktops available even when the Site database is unavailable.
- Application folders in Studio make it easier to administer large numbers of applications.

Other new features in this release allow you to improve performance by specifying the number of actions that can occur on a Site's host connection, display enhanced data when you manage and monitor your Site, and anonymously and automatically contribute data that Citrix can use to improve product quality, reliability, and performance.

For information on all key features new in this release, see [New in this release](#).

Related content

System requirements	StoreFront
Known issues	Provisioning Services
Issues Fixed in This Release: Controller VDA for Windows Server VDA for Windows Workstation	Citrix Connector 7.5 for System Center Configuration Manager 2012
New in this release	AppDNA
New deployments	Profile management
Upgrades and migration	Personal vDisk
	Citrix Receiver

New in this release

This product release includes the following new and enhanced features.

Session prelaunch and session linger

The session prelaunch and session linger features help users quickly access applications by starting sessions before they are requested (*session prelaunch*) and keeping application sessions active after a user closes all applications (*session linger*). These features are supported for Server OS machines only.

By default, session prelaunch and session linger are not used. A session starts (launches) when a user starts an application and remains active until the last open application in the session closes. You can enable the features for all users in a Delivery Group or only for specified users.

There are several ways to specify how long an unused session remains active if the user does not start an application: a configured timeout and two server load thresholds. You can configure all of them; the event that occurs first will cause the unused session to end.

For more information, see [Configure session prelaunch and session linger](#).

Support for unauthenticated (anonymous) users

When creating or editing Delivery Groups containing Server OS machines, you can now allow users to access applications and desktops without presenting credentials to StoreFront or Citrix Receiver. For example, when users access applications through kiosks, the application may require credentials, but the Citrix access portal and tools do not.

When you configure the Delivery Group, you can grant access to authenticated users, unauthenticated users, or both. When you grant access to unauthenticated (anonymous) users, you must provide an unauthenticated StoreFront store.

For more information, see [Users](#).

Connection leasing

To ensure that the Site database is always available, Citrix recommends starting with a fault-tolerant SQL Server deployment by following high availability best practices from Microsoft. However, network issues and interruptions may prevent Delivery Controllers from accessing the database, resulting in users not being able to connect to their applications or desktop.

The connection leasing feature supplements the SQL Server high availability best practices by enabling users to connect and reconnect to their most recently used applications and desktops, even when the Site database is not available.

Although users may have a large number of published resources available, they often use only a few of them regularly. When you enable connection leasing, each Controller caches user connections to those recently used applications and desktops during normal operations (when the database is available). If the database becomes unavailable, the Controller enters leased connection mode and “replays” the cached operations when a user attempts to connect or reconnect to a recently used application or desktop from StoreFront.

For more information, see [Connection leasing](#).

Application folders

You can organize applications in folders, which makes it easier to administer large numbers of applications in Studio.

By default, applications in a Delivery Group appear in a single folder. From the Delivery Group display in Studio, you can create additional folders and move applications into them. Moving, nesting, and renaming folders are easy drag-and-drop operations; you can also use Actions menu items. Additionally, you can specify folder destinations and create new folders when you add applications to a Delivery Group.

For more information, see [Manage application folders](#).

XenApp 6.5 migration

The XenApp 6.5 migration process helps you more efficiently and quickly transition from a XenApp 6.5 farm to a Site running XenApp 7.6 (or a later supported release). This is helpful in deployments that contain large numbers of applications and Citrix group policies, lowering the risk of inadvertently introducing errors when manually moving applications and Citrix group policies to the new XenApp Site.

After you install the XenApp 7.6 core components and create a Site, the migration process follows this sequence:

- Run the XenApp 7.6 installer on each XenApp 6.5 worker, which automatically upgrades it to a new Virtual Delivery Agent for Windows Server OS for use in the new Site.
- Run PowerShell export cmdlets on a XenApp 6.5 controller, which export application and Citrix policy settings to XML files.
- Edit the XML files, if desired, to refine what you want to import to the new Site. By tailoring the files, you can import policy and application settings into your XenApp 7.6 Site in stages: some now and others later.
- Run PowerShell import cmdlets on the new XenApp 7.6 Controller, which import settings from the XML files to the new XenApp Site.
- Reconfigure the new Site as needed, and then test it.

For more information, see [Migrate XenApp 6.x](#).

Citrix Customer Experience Improvement Program

The Citrix Customer Experience Improvement Program (CEIP) gives you the opportunity to contribute to the design and development of Citrix products. When you enroll in the program, Citrix collects anonymous information about your deployment, which is used to improve product quality, reliability, and performance.

It's easy to enroll in the program after you create or upgrade a Site. You can also opt in or out of the program at any time by selecting Configuration in the Studio navigation pane and following the instructions.

For more information, see [About the Citrix Customer Experience Improvement Program](#).

Enhanced connection throttling settings

To improve performance, you can now specify the maximum number of simultaneous actions, simultaneous Personal Storage inventory updates, and actions per minute that can occur on a host connection.

For more information, see [Edit a connection](#).

Enhanced reporting in Studio

Studio displays more detailed status and error reporting when updating PvD images, and displays comprehensive licensing alerts when you are in the licensing node.

SSL/TLS

You can enable Secure Sockets Layer (SSL/TLS) connections between users and VDAs by configuring SSL/TLS on the machines where the VDAs are installed and in the Delivery Groups that contain the VDAs.

For more information, see [SSL](#).

Virtual IP and virtual loopback

For published applications, you can enable and use the Microsoft virtual IP feature in machines running Windows Server 2008 R2 and Windows Server 2012 R2. Additionally, you can add new Citrix policy settings to manage virtual loopback. A preferred loopback option is also available.

For more information, see [Virtual IP and virtual loopback](#).

Remote PC Access

You can now prevent a local user from disconnecting a remote session without the permission of the remote user.

When disconnecting a remote session, moving the mouse or pressing a keyboard key wakes the local monitor. (In previous releases, pressing CTRL+ALT+DEL twice presented the logon screen.)

Icon locations are now preserved when connecting from a lower resolution device and then returning to a larger resolution device.

Generic USB Redirection

This release provides support for Generic USB Redirection for specialty USB devices for which there is no optimized virtual channel. This functionality redirects arbitrary USB devices from client machines to XenDesktop virtual desktops; with this new feature, end users have the ability to interact with a wide selection of generic USB devices in the XenDesktop session as if the devices were physically attached. With Generic USB Redirection:

- users do not need to install device drivers on the user device.
- USB client drivers are installed on the host.

This feature requires Windows Server 2012 R2, and functions with existing Windows Receiver versions for published desktop sessions hosted on RDS hosts in single-hop scenarios. Using this feature, USB client drivers are installed on the host, so these drivers must be compatible with RDSH for Windows 2012 R2 platforms.

Citrix Director 7.6.100

Director 7.6.100 includes the following new and enhanced features. For download, installation, and upgrade information, see <http://support.citrix.com/article/CTX200330>.

- **Virtual machine usage** — provides administrators with the real-time view of their VM usage so they can quickly assess their site's capacity needs. VM usage is categorized by Desktop OS availability and Server OS availability.
 - **Desktop OS availability** — displays the current state of Desktop OS machines (VDIs) by availability for the entire site or specific Delivery Group.
 - **Server OS availability** — displays the current state of Server OS machines by availability for the entire site or specific Delivery Group.
- **Export improvements** — enhanced to provide the option of exporting the trends reports in CSV, PDF, and Excel formats.
- **Zoom-in drilldown enhancements** — Drilldown capabilities were added to Director 7.6. This enhanced feature lets administrators navigate through trend charts by zooming in on a time period (clicking on a data point in the graph) and drilling down to see the details associated with the trend. The administrators can now better understand the details of who or what has been affected by the trends being displayed.

New features in Director 7.6

Licensing alerts making you aware of issues that may impact user connections. Director also displays a recommended action to correct the condition. Some of the conditions displayed in Director are:

- All licenses have expired.
- Licenses are about to expire.
- Citrix license grace period has expired.
- The Supplemental Grace Period is active, and all installed licenses are currently in use.

View hosted applications usage. You can select the Delivery Group and time period to view a graph displaying peak concurrent usage and a table displaying application-based usage. From the Application Based Usage table, you can choose a specific application to see details and a list of users who are using or have used the application.

Monitor hotfixes. You can view the hotfixes installed on a specific machine VDA (physical or VM) using the User Details or Machine Details view.

The filtering feature has been expanded. Filter data is clickable and leads to User Details, Machine Details, Endpoint Details, and Anonymous Sessions.

Director is compatible with XenApp 6.5. You can use Director to monitor your XenApp 6.5 deployments.

For information, see [Director](#).

AppDNA 7.6

Citrix AppDNA accelerates the migration and transformation of desktop and web applications for new environments through rapid analysis, automated application remediation and packaging, and daily application management. AppDNA 7.6 includes a new Build Assessment solution that tests whether applications will work on additional builds of the same OS family. AppDNA 7.6 analysis enhancements now indicate whether required applications, application frameworks, and files are present, whether enabled GPOs will cause issues, and whether web applications are compatible with Citrix WorxWeb.

For information, see [AppDNA 7.6](#).

Citrix StoreFront 2.6

Simplified store configuration in the administration console. The updated StoreFront console simplifies the StoreFront configuration for the following features:

- User subscriptions
- Set session timeout for Receiver for Web
- Show domains list in logon page

Receiver for Web My Apps Folder View. This new view displays the applications in a folder hierarchy and includes a breadcrumb path for unauthenticated and mandatory stores. This folder view can help your users move from Web Interface to Receiver for Web.

Kerberos constrained delegation for XenApp 6.5. StoreFront with Kerberos constrained delegation enables pass-through authentication, eliminating the need for the client and device to run Windows with Receiver.

Single Fully Qualified Domain Name (FQDN) access. With this feature, you can provide access to resources internally and externally using a single FQDN.

XenApp Services Support smart card authentication. The StoreFront server authenticates using smart cards to XenApp Services Support sites and does not require specific versions of Receiver and operating systems.

Receiver for Android, iOS, and Linux smart card authentication. New versions of Receiver support local and remote use of smart cards for accessing apps and desktops.

Extensible authentication. Support for extensible authentication provides a single customization point for extension of StoreFront's form-based authentication. Worx Home and Receiver for Web use it to authenticate with XenMobile and XenApp and XenDesktop for both internal (direct) and external (using NetScaler Gateway) access scenarios.

For information, see [StoreFront 2.6](#).

Support for Citrix Connector 7.5

Citrix Connector 7.5 provides a bridge between Microsoft System Center Configuration Manager and XenApp or XenDesktop, enabling you to extend the use of Configuration Manager to your Citrix environments. Citrix Connector 7.5 support now includes the Platinum editions of XenApp 7.6 and XenDesktop 7.6.

For information, see [Citrix Connector 7.5 for System Center Configuration Manager 2012](#).

Support for Receiver for Chrome 1.4 and Receiver for HTML5 1.4

Receiver for Chrome enables users to access virtual desktops and hosted applications from devices running the Google Chrome operating system. Users access these resources through Receiver for Chrome, and their desktops and applications are displayed in a single window

Receiver for HTML5 is hosted on StoreFront servers and enables users to access virtual desktops and hosted applications from a web browser. Users can access desktops and applications within their web browsers without needing to install Citrix Receiver locally on their devices.

In this release, both these Receivers include the ability to convert documents to PDF from hosted applications or applications running on virtual desktops and view them on a local device or print to a locally attached printer; enhanced clipboard operations; end-user experience metrics; and the ability to track licence usage for hosted applications.

For information, see [Receiver for Chrome 1.4](#) and [Receiver for HTML5 1.4](#).

Support for HDX Real-Time Optimization Pack 1.5 for Microsoft Lync

HDX Real-Time Optimization Pack 1.5 for Microsoft Lync supports Lync-certified USB phones, mixed Lync 2010 client and Lync Server 2013 configuration, and asynchronous upgrades.

For information, see [HDX Real-Time Optimization Pack 1.5 for Microsoft Lync](#).

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Kerberos constrained delegation for XenApp 6.5. StoreFront with Kerberos constrained delegation enables pass-through authentication, eliminating the need for the client and device to run Windows with Receiver.

Single Fully Qualified Domain Name (FQDN) access. With this feature, you can provide access to resources internally and externally using a single FQDN.

XenApp Services Support smart card authentication. The StoreFront server authenticates using smart cards to XenApp Services Support sites and does not require specific versions of Receiver and operating systems.

Receiver for Android, iOS, and Linux smart card authentication. New versions of Receiver support local and remote use of smart cards for accessing apps and desktops.

Extensible authentication. Support for extensible authentication provides a single customization point for extension of StoreFront's form-based authentication. Worx Home and Receiver for Web use it to authenticate with XenMobile and XenApp and XenDesktop for both internal (direct) and external (using NetScaler Gateway) access scenarios.

For information, see [StoreFront 2.6](#).

Support for Citrix Connector 7.5

Citrix Connector 7.5 provides a bridge between Microsoft System Center Configuration Manager and XenApp or XenDesktop, enabling you to extend the use of Configuration Manager to your Citrix environments. Citrix Connector 7.5 support now includes the Platinum editions of XenApp 7.6 and XenDesktop 7.6.

For information, see [Citrix Connector 7.5 for System Center Configuration Manager 2012](#).

Support for Receiver for Chrome 1.4 and Receiver for HTML5 1.4

Receiver for Chrome enables users to access virtual desktops and hosted applications from devices running the Google Chrome operating system. Users access these resources through Receiver for Chrome, and their desktops and applications are displayed in a single window

Receiver for HTML5 is hosted on StoreFront servers and enables users to access virtual desktops and hosted applications from a web browser. Users can access desktops and applications within their web browsers without needing to install Citrix Receiver locally on their devices.

In this release, both these Receivers include the ability to convert documents to PDF from hosted applications or applications running on virtual desktops and view them on a local device or print to a locally attached printer; enhanced clipboard operations; end-user experience metrics; and the ability to track licence usage for hosted applications.

For information, see [Receiver for Chrome 1.4](#) and [Receiver for HTML5 1.4](#).

Support for HDX Real-Time Optimization Pack 1.5 for Microsoft Lync

HDX Real-Time Optimization Pack 1.5 for Microsoft Lync supports Lync-certified USB phones, mixed Lync 2010 client and Lync Server 2013 configuration, and asynchronous upgrades.

For information, see [HDX Real-Time Optimization Pack 1.5 for Microsoft Lync](#).

Known issues

General issues

The following note applies to any workaround that suggests changing a registry entry:

Caution: Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

- On Server OS machines, the CreateAnonymousUsersApp tool may not delete all anonymous user accounts from the local machine; all anonymous users are local users, not Active Directory users. Because the tool deletes passwords and profiles, any anonymous-user account names that are not deleted are no longer useable. To delete unwanted anonymous-user account names locally on the server, use Manage User Accounts or Computer Manager. [#4999679]
- To configure a nonstandard HTTP/SOAP port for the Universal Print Server web service, use PowerShell cmdlets to change the session printer policy. For information about configuring Group Policy settings, see the Group Policy SDK usage section in the *About the SDK* topic. To set the policy value, use:

Set-ItemProperty

LocalGpo:\Computer\Unfiltered\Settings\ICA\Printing\UniversalPrintServer\UpsHttpPort
-name Value -Value <portnumber>. [#268593]

- After a Hyper-V host is unpaused, Microsoft System Center Virtual Machine Manager (VMM) might not update the overall host state immediately. This can affect the use of Machine Creation Services (MCS). If one Hyper-V host reports a paused state, that host will not be used to provision Virtual Machines (VMs); if all hosts report a paused state, catalog creation will fail.

As a workaround, manually refresh the parent cluster node or Hyper-V host node. Also, running environment tests on the host will identify hosts reporting a paused state. [#285696]

- Brokering hosted applications on Desktop OS machines is not supported using the Remote Desktop Protocol (RDP). [#377108]
- This release does not support mounting an .iso file when Client Drive Mapping (CDM) is configured for Windows 8 sessions. [#333111]
- If the Citrix Universal Print Server fails because of bad drivers, try running those drivers under printer driver isolation. For information about how to configure printer driver isolation, see MSDN:
[http://msdn.microsoft.com/en-us/library/windows/hardware/ff560836\(v=vs.85\).aspx](http://msdn.microsoft.com/en-us/library/windows/hardware/ff560836(v=vs.85).aspx).
[#381460]
- The Enhanced Desktop Experience policy setting does not affect pre-existing user or administrator profiles. As a workaround, delete all pre-existing profiles before

enabling/disabling the setting, and delete the profile used for VDA installation (after installing the VDA). If the built-in administrator's account was used for (Virtual Delivery Agent (VDA) installation, you cannot delete the profile. In that case, the user can choose the Citrix Enhanced Desktop Theme when logged on. [#363736]

- If monitor resolution is affected because the VDA desktop session resolution exceeds the client monitor resolution, change the resolution setting on the VDA desktop to the highest supported value for the attached monitor. Alternatively, you can detach the monitor cables from the VDA graphics card. [#365877]
- Screen savers and the power-save option are disabled in sessions. Edit the registry and create the following DWORD value:

HKLM\Software\Citrix\Graphics\SetDisplayRequiredMode = 0

This change does not prevent the remote machine screen saver or power save mode from coming on. If the power save mode comes on, the remote session is not updated until the user provides input (mouse/keyboard), but the screen will not be blanked. [#380550]

- Attempting to use a PowerShell SDK New-ProvScheme command or any MCS command from a remote machine before setting the host admin address might result in an error. Set the admin address using the Set-HypAdminConnection command before running the New-ProvScheme command. [#336902]
- This release does not support using this product with Microsoft RemoteFX vGPU feature in a Hyper-V host. Instead, use RDP to access RemoteFX functionality such as Hyper-V vGPU. [#375577]
- Director reports the number of GPU machines that have failed to start in the Machine Failure pane on the Dashboard page. However, this information is not displayed when you drill down to view details on the Filters page.

You can also view this information in the Historical trends graph. [#0434722]

- If more GPU machines are provisioned or assigned than the XenServer resource pool can support of the GPU type specified, GPU machines may fail to start. Users assigned to a machine (including those using Personal vDisk) that failed to start may not be able to access their virtual desktop through StoreFront. [#0434505]
- If you power on a GPU machine and it fails to start, you may see the following error message:

Exception 'Failure in PowerOn, PGPU_INSUFFICIENT_CAPACITY_FOR_VGPU

This indicates that there are insufficient GPU Resources to start another machine that uses the GPU. [#434509]

- If multiple users log on to a Desktop OS machine using RDP and ICA protocols and a user locks his/her RDP session, users connecting through ICA cannot log on to the session. To prevent this issue, users should disconnect or log off RDP sessions when they are finished. [#392311]
- When you publish an application with a Windows 8 VDA host and the application shows non-ASCII characters in the notification area, other unrelated characters might also appear in the notification area after reconnection. To resolve this issue, log off from the session and then launch the application again. [#387963]

- The ability to disable session sharing through a registry entry is not supported in this release. As a result, session sharing is always enabled. If the registry key is set to disable session sharing, the first application launches, but subsequent applications do not launch. There is no workaround for this issue. [#383718]
- When a user reconnects to a disconnected session on Windows Server 2012, there is a memory leak in the Desktop Window Manager. If users connect and disconnect frequently to long-lived sessions, such as in the case of an employee using the same session from work and home, this can cause memory resources on the server to be reduced, eventually leading to slow response times and possibly even server failure. This is a third-party issue in the Microsoft code. For information, see: <http://support.microsoft.com/kb/2855336> (to be published in July 2013). [#374261]
- The Help About topics fail when working through Windows PowerShell 3.0. This is a third-party issue with Microsoft. Other help topics are unaffected. [#408866]
- When upgrading from XenDesktop 5 to this release (or to XenDesktop 7.1 or XenDesktop 7.0), a hosted application assigned to both Shared and Private Delivery groups produces a Delivery Group incompatibility error during upgrade. To avoid this error, do not assign hosted applications to both Shared and Private Delivery Groups. [#419424]
- If the Profile management feature is enabled, logon scripts for sessions running Windows Server 2012 R2 or Windows 8.1 are delayed by five minutes by default. Once the session is available, the Logon duration for logon scripts step is not available in Director. The delay is controlled by the Configure Logon Script Delay policy (Enabled = 0). [#407978]
- Desktops may not launch on computers running Windows 8.1 with Microsoft Software Update Management installed. To avoid this, in the Windows 8.1 **Taskbar and Navigation properties** dialog box, on the **Navigation** tab, select all the options in the **Start screen** section. [#408439]
- If you receive the error “You cannot access this session because no licenses are available” when you try to connect through Remote Desktop Protocol to a brokered session, disable these settings in
C:\inetpub\wwwroot\Citrix\Store\App_Data\default.ica: [#422212 and #403855]
 - RDPConnection=false
 - RDP-RedirectDrives=false
 - RDP-RedirectDynamicDrives=false
- The value for the Persistent Cache Threshold policy setting is labelled incorrectly, as Kbps, in Studio. The correct value is bits per second (bps). [# 429478]
- When selecting a custom date range for a Configuration Logging report, the calendar displays might be incorrect. [#452399]
- Machines provisioned on Amazon Web Services or CloudPlatform will not be suspended if their Delivery Group Power Management setting is set to Suspend when disconnected. [#453780]
- Connection times (maximum connection timer, connection timer, and disconnect timer) might fail to work on Windows Server 2012 machines containing Windows Server OS VDAs, causing unexpected session time-out behavior. [#471698]

Installation issues

- Error 1904. Module C:\Program Files (x86)\Citrix\System32\rpm.dll failed to register. HRESULT -2147010895. Contact your support personnel occurs when installing or upgrading the Virtual Delivery Agent (VDA) using the Citrix MetaInstaller, the installation of the third-party Microsoft Visual C++ 2005 Runtime component fails, rolls back, and then falsely notifies the MetaInstaller that the installation completed successfully. Because of this, the MetaInstaller continues to install any remaining VDA components until it reaches the post-install component initialization stage. You cannot continue without the Microsoft Visual C++ 2005 Runtime component being present at this stage. To work around this issue, rerun the MetaInstaller VDA installation, which then successfully reruns the Microsoft Visual C++ 2005 Runtime component installation. Alternatively, see <http://support.microsoft.com/?kbid=947821> and follow Microsoft's documented solution. [#489633]
- Installing a Virtual Delivery Agent for Server OS might fail with error 1935 because of backward compatibility errors in the Microsoft Visual C++ 2005 Redistributable. See the Microsoft website or run Windows Update to check for fixes. [354833]
- After a successful VDA for Windows Server OS installation, but before the machine restarts, the Windows event log might contain several error messages (such as TermService 1035 or 1036, indicating the Terminal Server listener stack was down or the session creation failed). If there are no other installation failure indicators, you can safely ignore those event log messages. [#374134]
- When upgrading from XenDesktop 5.x, make sure that the XenDesktop 5.x Desktop Studio is closed before running the upgrade. Otherwise, Studio may close unexpectedly during the upgrade. [#389374]
- When upgrading, an administrator who was disabled in XenDesktop 5.6 might move to the later version without a role or scope. Check the Administrators display in Studio and edit administrators, as needed. [#394765]
- If you enable the Profile management feature and users find that their default Windows 8 applications (such as Weather, News, and Bing) start the first time they log on, but not after subsequent logons, you might have to reconfigure this feature. This issue has been observed in environments where the user profile is not persisted and if the folder AppData\Local has not been excluded (the default). As a workaround, add the folders AppData\Local\Packages and AppData\Local\Microsoft\Application Shortcuts as exclusions. [#394802]
- During VDA installation or upgrade on Windows 7, you might see a Windows dialog box prompting you to Restart the computer to apply changes. Click Restart Later to continue the upgrade; do not select Restart Now. [#396553]
- Installing VDAs through Active Directory Group Policy using individual MSIs is not recommended and might fail. Citrix recommends using the startup scripts provided on the product installation media, as described in [Install or remove Virtual Delivery Agents using scripts](#). [#383432, #372136]
- The optimization phase of the Virtual Delivery Agent (VDA) installation might take a long time to complete. In some tests, it has taken about half an hour and may take longer. These instances occur when installing the VDA on an image running a Windows operating system, if, on the installation wizard Features page, Optimize Performance

has been selected. This causes the Microsoft Native Image Generator (Ngen) to run. If this occurs, allow the installation process to finish. Citrix recommends that you run Ngen on your VDA base image prior to provisioning virtual desktops to avoid delays caused when it runs in the background of provisioned virtual desktops. [#381437]

- During upgrade, if an error message mentioning PICAlsPorticaV2 entry point not found appears during an upgrade, it can be safely ignored. Complete the upgrade process and restart the machine when prompted. [#423947]
- The VDA for Windows Desktop OS might not install on evaluation versions of Windows 8. The Installation Options screen displays the message “Cannot be installed on this operating system.” The issue occurs because the installation program is incorrectly identifying Windows 8 evaluation versions as unsupported operating systems. A hotfix that addresses the issue is available as Knowledge Center article CTX139660. The hotfix lets you patch the installer before running it on Windows evaluation versions.
- During product installation, machines created by Provisioning Services might fail if .NET Framework 3.5 is not present prior to the installation. To work around this problem, make sure that all NET Framework versions 2.0, 3.0, 3.5, 4.0, 4.5, and 4.5.1 are installed. [#442639, #447851]

Server and Delivery Controller issues

- XenDesktop 7.6 includes a new version of the volume worker package for CloudPlatform. Citrix highly recommends updating the volume worker template in your deployment with this new version. When updating, please note that in-place upgrades for this package are not supported. Therefore, you must first fully uninstall the previous package or build a new volume worker template from scratch. [493211]

Remote PC Access issues

- After upgrading from XenDesktop 5.6 FP1, the Remote PC Access Service administrator name may not display correctly. This does not affect operations. [#437948]
- When an office machine has been instructed to hibernate, a subsequent Remote PC Access session launch may fail. As a workaround for desktop machines that display an error message, try launching the session again. For laptops that display a persistent grey reconnecting screen, restart the PC (remotely from the administrator console using Force Shutdown/Force Restart, or locally with the power button); this can result in data loss. [#441154]
- When relying on the Wake-up Proxy rather than Intel Active Management Technology (AMT) or Wake on LAN packets, a machine might fail to wake up. This is a Microsoft System Center Configuration Manager issue. [#441412]

Studio issues

- Attempting to launch both StoreFront and Studio causes the Citrix console to exit unexpectedly after XenApp and XenDesktop software is installed on a single Windows 2008 R2 SP1 machine. This occurs when launching both StoreFront and Studio; at the end of the installation, from shortcut menus, or if you open StoreFront in the console first, and then open Studio. To work around this issue, force the Native Image Generator (Ngen) to update the .Net native images. To do this, open a command prompt, and then navigate to `c:\windows\microsoft.net\framework64\<v2.0.50727>\`. Run `ngen update /force`. This may take several minutes.

Note: The framework64 version number may vary slightly, but it should always start with 2.0.

[#490819]

- Director does not correctly report licensing errors, and Studio is unable to communicate with the license server. This issue may occur if the license server address for a Delivery Site changes while multiple instances of Studio are open and managing the same XenDesktop or XenApp site. To work around this issue, refresh licensing data in the site by closing all open instances of Studio, reopening a single instance of Studio, and then navigating to the Licensing node. [#492971]
- When using Machine Creation Services (MCS) to provision machines on VMware vSphere, the combination of CPU sockets and cores on the provisioned machines reflects the combination of CPU sockets and cores on the base image used to create the machine catalogs. During MCS catalog creation, if the number of Virtual CPUs selected is higher than the maximum possible on the host, then provisioned machines are created with the maximum possible sockets and cores for that host, without indication to the user. [#331269]
- When using System Center Virtual Machine Manager in a pure IPv6 environment, and using Machine Creation Services to create machine catalogs, all VMs have both IPv4 and IPv6, even if the master VM is configured without IPv4 in the TCP/IP stack. This is a third party issue with Microsoft, and there is no workaround. [#371712]
- When using VMware vSphere in an IPv4 and IPv6 environment with VMware ESX hypervisors configured with VMXNET3 network adapters, all VMs have both IPv4 and IPv6, even if the master VM is configured without IPv4 in the TCP/IP stack. This is a third-party issue with VMware, and there is no workaround. [#371712]
- Long machine catalog names and long storage path names might cause a disk attach error in the VMM job window. Microsoft has identified a maximum limit of 255 characters on the length of the file path for VM resources. This issue has been seen when using local storage on a standalone Hyper-V host, due to the long file path used to store the VMs; however, it is not limited standalone Hyper-V hosts. [#359673]

As a workaround:

- Create VMM MCS catalogs with short names, especially when the storage is accessed using a long path.
- Shorten the path to the storage used to store the VMs.
- To change a database to one that was previously used, you must use the SDK; it cannot be done from Studio. [#355993]

To switch to the Configuration Logging database:

- Set-LogDbConnection -DataStore 'Logging' -DBConnection \$null
- Set-LogDbConnection -DataStore 'Logging' -DBConnection '<new database connection string>'

To switch to the monitoring secondary database:

- Set-MonitorDbConnection -DataStore 'Monitor' -DBConnection \$null
- Set-MonitorDbConnection -DataStore 'Monitor' -DBConnection '<new database connection string>'

For example, the *new database connection string* could be:

'Server=dbserver;Initial Catalog = dbname; Integrated Security = True'

- When you use MCS to provision machines on your hypervisor platform, CPUs are added but no cores. If you change the CPU value during catalog creation, the products licensed on a per CPU basis might need more licenses. For example, your master image has one CPU and four cores and you change the CPU value during catalog creation.

If, during MCS catalog creation, you select more CPUs than the maximum possible on the host, provisioned machines have the maximum number supported for that host and you are not notified of the difference. For example, a Desktop OS machine can use only two physical CPUs; thus, you will see only two even if more are assigned.

As a workaround, ensure your master image VM has the same virtual CPU configuration that you want to deploy for the catalog. [#331274]

- When Lync 2013 client is delivered from a Desktop OS machine or Server OS machine, the video chat feature does not work. See XenDesktop 7.x, XenApp 6.x and Citrix Receiver 4.x Support for Microsoft Lync 2013 VDI Plug-in, (<http://support.citrix.com/article/CTX138408>) for information about using Lync 2013. [#371818]

- When launching a seamless application on a Windows server, the window might not have the Aero theme, even when Enhanced Desktop Experience is enabled.

- Users launching only seamless applications never get the Aero theme.
- Users with a mix of seamless applications and desktops get the Aero theme after establishing the first desktop session; then, seamless applications have the Aero theme.

As a workaround, set the Citrix Enhanced Desktop theme in the default user profile; all users on that VDA get the Enhanced Desktop Experience for their seamless applications. The theme is part of the VDA install and must be set for all VDAs. [#348812]

- Studio messages sent to a Windows 8 machine will display on the Windows 8 Desktop, and not the Windows default (formerly called Metro) display mode. The user must switch to Desktop mode to see the message. This is a third party issue and there is no workaround. [#387356]
- If a Site contains more than one hosting infrastructure object with the same name, the Studio display might not be correct. When you create hosting infrastructure objects (for example, networks and storage), it is best practice to specify a unique name for each. [#384959]

- After using Delegated Administration to create an administrator with a new scope, refresh the Studio display. Otherwise, you might receive a permissions error when you log on as the new administrator and attempt to create a new connection or resource. [#386634]
- Applications hosted on Desktop OS machines with random assignments might fail to open after the loading dialog box disappears. This issue occurs when the time the application takes to start exceeds the default one-minute time-out and the session exits automatically. [#389025]

As Administrator, change the base image and re-provision with a changed timeout value as follows:

Locate the registry key:

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Citrix\wfshell\TWI (Create the key if it is not available.)

Name: ApplicationLaunchWaitTimeoutMS

Type: REG_DWORD

Data: *Required additional time-out, in milliseconds*

Note: Specifying a value of less than 10000 reverts to 10000 because 10 seconds is the minimum override.

- To discover and set up applications in Delivery Groups, make sure that there are some machines that are registered and can be powered on. For App-V application to be discovered, you need to configure App-V Publishing in Studio. [#393676]
- After a user launches the first App-V application, launching a second App-V application too quickly might fail. If this occurs, the user should wait a few minutes so that the initial synchronization can complete, and then launch the second application again. For details about this issue, see [CTX138056](#). [#397521]
- If the antivirus program BitDefender is installed on a VDA, you might not be able to create machine catalogs. There is no work-around for this issue. [#392705]
- After upgrading to XenDesktop 7.5, you cannot create a connection to CloudPlatform or Amazon Web Services (AWS) if the site is configured with a connection to an on-premise hypervisor. You must create a new 7.5 Site. For a hybrid deployment (which includes cloud and non-cloud Sites), you must create separate Sites that share the same StoreFront site. [#454114]
- Creating a machine catalog fails in an environment running VMM 2012 SP1 and Hyper-V 2012 when using a ODX-enabled Storage Area Network. Follow the instructions in <http://support.citrix.com/article/CTX139333> to resolve this issue. [#424040]

Director issues

- The User-based application usage data in the Hosted Application Usage reports, is not accurate for time ranges that exceed the last seven days. This occurs because application data beyond the last seven days is deleted. To avoid using incorrect User-based application usage data, only use data reported within the last seven days. [504642]
- Director displays the Unexpected error. Check your network connection or view server event log for further information popup error on the Trends and Filters page because the XenDesktop database name includes spaces. The API calls used by Director do not support connecting to a database that has a name containing spaces. Follow database naming requirements when renaming a database. [494339]
- After upgrading, Director does not persist an administrator's UI.GlobalSearchResults settings. To work around this issue, manually edit the UI.GlobalSearchResults setting in the web.config file after upgrading. [484066]
- Hot fix inventory may take several hours to update when large numbers of hot fixes are applied at the same time to environments with more than 20,000 desktops. [#489604]
- Historical information is preserved after you have deleted and then re-created a Delivery Group from the same Session Machine Catalog. The data then incorrectly displays that historical information on the Trends graph and table. To create Delivery Groups without preserving historical trend data, do not re-create the Delivery Group until after you have deleted the machine catalog and created the new catalog. [#480010]
- When navigating from the Filters page to the User Device page, user names may not display. If Delivery Controllers cannot access a domain containing user accounts because of Active Directory restrictions, those full user names may not appear on the User Device page. To work around this issue, ensure that the domain where XenDesktop is installed is trusted by the domain to which the end user belongs. [#479517]
- If all Sites within an existing Site Group do not have assigned delegated administrators, the search for machines and end-point devices within the Site Group fails. To allow an administrator to search across all Sites within a Site Group, add the administrator to the Delegated Administrator group that has permissions to the Sites. [#491740]
- When monitoring Windows XP virtual desktops running WinRM 2.0 for users with VDAs earlier than 7, you must change the WinRM port listening order. For details about how to change the setting to 5985,80, see [Advanced configuration](#). [#273609]
- You cannot edit an existing Site Group using the Director Configuration Tool. To work around this issue, open the .xml configuration file from within the Director Configuration folder, and then modify the Site Group setting. [#491681]
- Using Active Directory Users and Computers to configure users with logon scripts fails and data does not appear in the Logon Duration panel. Instead, to configure users with logon scripts, you must use a Group Policy. [#393259]
- The logon duration data from a first-time logon to a Personal vDisk VDA might not be collected or displayed in Director. For subsequent logons, data appears normally. [#383941]

- When you run a console session from a Windows Server 2012 desktop, navigating to the user details page in Director might result in an error and no data will be displayed.

As a workaround, register the VDA, log off the current session, and log in to the VDA again. [#388513]

- In the Infrastructure panel of the Dashboard page, Director displays “Not Available” for Citrix CloudPlatform-based host connections, Amazon Web Services, Hyper-V, and Microsoft System Center Configuration Manager and does not provide status information. [#449806, #446397]

HDX issues

- Configuring HDX MediaStream redirection on a new machine fails. To work around this issue, reboot the end-point machine after installing Receiver. [#494741]
- Sessions fail if using a certificate with the SHA512 algorithm for an SSL/TLS connection. This occurs when using Receiver for HTML5 to launch sessions with Server OS machines running Windows Server 2012 R2. To avoid this issue, do not use the SHA512 algorithm for an SSL/TLS certificate in this type of configuration. [#487284]
- With GPU pass-through and NVIDIA Kepler cards, the first connection attempt may fail for a HDX 3D Pro user device with three or four monitors. If this happens, attempt to connect again. [#422049]
- When a user attempts to connect, change the screen resolution, or change the size of the session screen, the screen may flicker or display as black. This may occur if larger resolutions are selected and the video driver cannot allocate enough memory at boot time to support the resolution. You can view the current resolution setting in the session window by selecting Advanced Settings from the Screen Resolution dialog. To allow the driver to allocate enough memory to support higher resolutions, increase the amount of memory for the VDA. Use the following as guidelines: Windows 7: Sum-of-all-monitors (width x height x 4 BytesPerPixel x 2 BackBuffers) Win8: Sum-of-all-monitors (width x height x 4 BytesPerPixel x 3 BackBuffers). [#494671]
- If the USB Redirection policy is enabled, USB storage and audio devices do not work when the user chooses to redirect their devices. This only occurs on Server OS machines running Windows 2012 and later. To exclude audio and storage devices from the list of devices, use the Client USB Device Redirection Rule policy. For additional information on USB redirection rules and configurations, see <http://support.citrix.com/article/CTX137939>. [#479578]
- When the user attempts to launch a session from a Server OS machine, Receiver displays the "The connection to <app name/desktop name> failed with status (1030)" error message on the user's device after the Session Reliability Connections policy is changed from disabled to enabled by the administrator. To work around this issue, the administrator must restart the VDA for the policy to take effect. [#486073]
- When using Remote PC to run a Lync 2013 session remotely, attached web cameras on client devices are not listed in Lync 2013 in the user's session. To work around this issue, the user can use Device Manager to disable the web cameras on their remote machines. [#482807]
- Even though webcams might support H.264 compression, this release does not support hardware compression, so you must use software compression. for those webcams. To do this, add a registry entry on user devices at HKEY_CURRENT_USER\Software\Citrix\HdxRealTime; add a DWORD registry name DeepCompress_ForceSWEncode. When set to 1, software compression is used. By default, this setting is off and hardware compression is used . [#357356]
- HDX RealTime Webcam video lags if the video resolution is higher than 720p (1280x720). [#350187]
- When using HDX Flash Redirection continuously, the session might become unresponsive. [#350085, 361926]

- HDX RealTime Webcam supports most of raw formats supported by a webcam, but in rare cases, if the webcam has an unsupported format, that webcam might not work as the Citrix HDX Webcam. [#338318]
- Multiple duplicate images might be seen intermittently when using Citrix HDX Webcam with some models of webcams. [#367322]
- HDX RealTime Webcams are not supported for these applications:
 - Citrix GoToMeeting when hosted on Server OS Machines with Windows 2012 operating systems. [#346430]
 - GoToMeeting (on any platform) if the webcam is attached after a meeting has started. [#346140]
 - Microsoft Lync 2013 and Adobe Connect with VDAs on Windows 8, Windows 8.1, and Windows 2012 operating systems. [#340784, 348506, 459732]
 - Microsoft Office Communications Server (OCS) video calls if the Webcam is attached after the call is in progress. [#370236]
 - Microsoft Silverlight. This is an intermittent issue. As a workaround, on the user device, enable the legacy codec by adding a DWORD registry key value name EnableDeepcompress_Client at HKEY_CURRENT_USER\Software\Citrix\HdxRealTime and setting it to 0. [#379779]
 - 64-bit video conferencing applications. Video compression for 64-bit applications is not supported. [#366515]
- When using HDX 3D Pro with the XenDesktop 5.6 Feature Pack 1 Virtual Desktop Agent on Windows XP virtual desktops, during the first connection, the Fine Drawing (2D) check box is selected and sometimes greyed out. This is due to delayed registry updates, which cause the Config tool UI to pick up incorrect default values during initialization. [#353031]

As a workaround, disconnect and reconnect the session.

If the problem persists, clear previous session information by deleting settings under the following registry entry:

HKey_Current_Users\Software\Citrix\HDX3D\BitmapRemotingConfig

- On Windows XP, Citrix HDX webcam might not be detected. As a workaround, install Microsoft Visual C++ 2005 Service Pack 1 Redistributable Package from <http://www.microsoft.com/en-us/download/details.aspx?id=14431> website and try again. [#382733]
- When viewing the Display Adapters node from the Device Manager console applet, the Standard VGA Graphics Adapter appears in the list with a yellow exclamation point (yellow bang). You can ignore this warning because it does not affect functionality. This warning occurs because a legacy model XPDM display driver (Standard VGA Graphics Adapter) is not allowed to load when a new model WDDM display driver (Citrix Display Driver) is installed. [#339390]
- Users might experience issues when attempting to play media files on Windows 8 user devices. This is because this product fails to register the correct default program for client-side content fetching protocols used to stream media files to user devices. As a

workaround for Microsoft Media Streaming (MMS) and Real Time Streaming (RTS) protocols, change the default program used for playing media files from Windows Media Player to Citrix CSF Handler. There is no workaround for the Hypertext Transfer Protocol (HTTP). [#328805]

- TWAIN redirection fails on hosted shared desktops and applications. This is a third party issue related to TWAIN applications that require TWAIN binaries to be located in certain paths. [#300854, 340999]

As a workaround, on your Windows Server 2012 machine running the VDA, copy these files to the following locations:

- Copy "twain_32.dll" to the "\WINDOWS" directory of the User profile (for example, copy twain_32.dll into the folder: "%USERPROFILE%\Windows").
- Copy "twain_32.dll.mui" into the "\WINDOWS\en-US\" directory of the User profile (for example, copy twain_32.dll.mui into the folder: "%USERPROFILE%\Windows\en-US").
- The 64-bit Windows Media Player or QuickTime player cannot play some video files using server-side rendering when HDX MediaStream Windows Media Redirection is disabled. As a workaround, use the 32-bit version of Windows Media Player. [#384759]
- Universal Print Server printers selected in the virtual desktop do not appear in the Devices and Printers window in Windows Control Panel. However, when users are working in applications, they can print using those printers. This issue occurs only on Windows Server 2012 and Windows 8 platforms. [#335153]
- With GPU pass-through and NVIDIA Kepler cards, the first connection attempt may fail for a HDX 3D Pro user device with three or four monitors. The second connection should be successful. [#422049]
- The user's Windows computer stops responding when a GoToMeeting session using a webcam configured for USB redirection is started in a Remote PC Access session with an Intel Core i7 processor-based computer. If this occurs, restart the user's computer and restart the Remote PC Access session. The session resumes where the disconnection occurred. To avoid this occurrence, use HDX webcam video compression instead of USB redirection. For details, see <http://support.citrix.com/proddocs/topic/xendesktop-7/hd-new-graphics-video.html>. [#423284]
- User devices running Receiver for HTML5 might be unable to connect to a Server OS machine running Windows Server 2012 R2. To avoid this issue:
 - Use an existing machine, rather than a machine created with Machine Creation Services (MCS) or Provisioning Services, as the Windows Server OS machine.
 - If you plan to use machines created with MCS, on the master image for the catalog, edit registry and create the following DWORD value:

Caution: Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

HKEY_LOCAL_MACHINE\Software\Citrix\GroupPolicy\Defaults\IcaPolicies\AcceptWebSocketsConnections
HKEY_LOCAL_MACHINE\Software\Citrix\GroupPolicy\Defaults\IcaPolicies\AllowDesktopLaunchForNonA
HKEY_LOCAL_MACHINE\Software\Citrix\GroupPolicy\Defaults\IcaPolicies\WebSocketsPort = 8008

Because the WebSockets port number is set by editing the registry, it is not necessary to enable the Websockets connections Citrix policy for the catalog.

- If you are using a machine created with Provisioning Services, follow the recommendations in [CTX139265](#). [#424064]

Licensing issues

- Errors may occur when installing the Delivery Controller if the most recent version of the license server is not installed. When upgrading to version 7.6, install the latest version of the License Server before installing any other core components. [#510425]
- When licensing is uninstalled and then reinstalled and a read-only product administrator attempts to view Licensing information in Studio, Studio displays the error "You do not have permissions to perform this operation." A read-only administrator does not have the permission to trust a new License Server. As a workaround, a full license administrator must go to the Licensing node and authenticate the License Server. [#380982]
- If you installed the License Server without successfully configuring it (with the post installation License Server Configuration tool), any subsequent License Server upgrade fails. As a workaround, ensure that every License Server installation is configured with the post-installation License Server Configuration tool. [#377079]
- When you try to start the License Administration Console or the Simple License Service, a blank page might display if the Internet Explorer Enhanced Security Configuration is enabled and the License Administration Console or the Simple License Service is not in the Trusted Sites zone. Workaround: Disable Internet Explorer Enhanced Security Configuration. [#382429]
- If port 8083 is in use when you install or upgrade the product, the License Server configuration and installation fail with a License Server Configuration Failed error. As a workaround, check the event log to ensure the error is actually "Port in use." If it is:
 1. Uninstall the License Server by double-clicking on the CTX_Licensing.msi in the x64\Licensing folder on the product installation media.
 2. Run the installer again. It displays some components as Partially installed. Click Install and the installer completes the installation and configures any necessary product components.
 3. Manually install the License Server and specify port numbers that do not conflict with other applications on the machine. [#390815]
- The user list for the License Administration Console and the Citrix Simple License Service Web page does not support non-ASCII characters in user/group names. Due to this limitation, on a Russian operating system, the BUILTIN Administrators group is not added to the user list because it is created with non-ASCII characters. This issue applies to both fresh installs and upgrades. Any users belonging to the BUILTIN Administrators group in an earlier release of XenDesktop and the Simple License Service will not have access to the License Administration Console or the Simple License Service after an upgrade.

As a workaround, add ASCII-character versions of Russian users/groups names post-installation using the License Administration Console interface. Alternatively, install the license server on one of the other supported operating systems. [#395305]
- When you install or upgrade the product and have Perpetual (permanent) licenses, Studio might display your licenses with an expiration date of 01/01/2000. You can ignore this expiration date and launch your desktops and applications. [#402975]

Local App Access issues

- In a Windows 8 or Windows Server 2012 hosting environment, if Local App Access is enabled and the extension for a client hosted app does not have a File Type Association (FTA), FTA redirection fails. The user is prompted to select "Look for an app in the Store" or "More options." [#372834]

As a workaround, use one of these methods on the VDA master image:

- Rename the DelegateExecute registry value for HKEY_CLASSES_ROOT\Unknown\shell\openas\command\DelegateExecute.
- Use Notepad to open a file with the extension. FTA redirection will work for subsequent attempts.
- URL redirection is disabled, by default, by Microsoft on Windows Server 2012. To enable it, disable Internet Explorer enhanced configuration mode. [#356260]
- Changes to Local App Access properties during a session do not take effect automatically. As a workaround, log off and log back on. [#357488]
- If Local App Access applications are launched on Windows 8 or Windows 2012 platforms, those VDAs cannot be launched from the Modern shell. As a workaround, close the local application and then launch the VDA application. [#359670]
- Shellhook.dll is not loaded with Receiver for Windows 3.4 and earlier when local applications are launched. As a workaround, change the value of the registry key LocalAppInit_DLLs to 1 under HKLM\Software\Microsoft\Windows NT\CurrentVersion\Windows. If the workaround is not used, client to server FTA redirection does not work correctly. [#356130]
- URL redirection might fail for Internet sites that have a pop-up blocker enabled. As a workaround, disable the pop-up blocker. However, for security reasons, disabling pop-up blocker is not recommended. [#371220]
- When the Aero mode is enabled for a VDA session, there are inconsistencies between the VDA local applications and the client-hosted applications (for example, ALT+Tab; flashing taskbar entries, jump list, live preview). For compatibility, disable the Aero mode. [#361043]
- Flash Redirection has compatibility issues such as a WMP black screen and flash pseudo-container window out of bounds. As a workaround, disable Flash redirection. [#360182]
- The Desktop Composition Redirection graphics feature is disabled when Local App Access is enabled. To use that feature, disable Local App Access. [#377386]
- With Session Reliability and Local App Access enabled, if network connectivity is disrupted after you click Home in the product toolbar and display the client's desktop, the VDA session might not display the last screen shown before the network disruption. Instead, only the product toolbar and the client's desktop appear. On the toolbar, only the Disconnect option works. [#357769]
- When Local App Access is enabled and a user changes the product session to full screen before or while playing a media file, some or all of the image does not appear. To work around this issue, relaunch the session. [#402702]

Desktop Lock issues

- After installing Citrix Desktop Lock on a domain-joined Windows 8 machine and restarting it, the desktop background may become black and a My Computer window may be displayed instead of the usual Start screen. To log off the machine, type `logoff` in the address bar of the window, and press Enter. For more information about configuring Windows 8 machines with Desktop Lock, see Desktop Lock. [#329075]
- If a Windows 8 or Windows 7 machine fails and the user attempts to restart it by pressing Ctrl+Alt+Del, the Windows Security dialog on the local desktop opens. This issue occurs even when the Citrix Desktop Lock software is installed and configured. To resolve this issue, select Start Task Manager to display the Restart dialog. [#337507]
- The Citrix Desktop Lock does not redirect Adobe Flash content to domain-joined user devices. The content can be viewed but is rendered on the server, not locally. As a workaround, configure Adobe Flash redirection for server-side content fetching to pass the content from the server to the user device. This issue does not occur on non-domain-joined devices or when the content is viewed with the Desktop Viewer. [#263092]
- Failure to start the virtual desktop agent (VDA) on the user device may occur if the device is running Windows 7 with Desktop Lock and Receiver for Windows Enterprise 3.4. This may occur if the user is or is not connected to the Internet. The error message, "No Internet Connectivity," may appear when this occurs. This is a third party issue with Microsoft. For a potential resolution, see <http://technet.microsoft.com/en-us/library/cc766017>. [#408642]

End-user and VDA issues

- Handle leaks by wfica32.exe can occur on the user device when playing Windows Media Player files continuously in a Windows 32-bit XP client session. [#378146]
- Disconnect button is not available to users. As a workaround, provide a shortcut to the TSDiscon.exe utility, which is included with the operating system; this will allow them to disconnect from sessions. [#362937]
- Starting a VDA from a user device with a smart card reader might fail if the user previously started the VDA from that device and selected Disconnect from the Desktop Viewer. In this case, the user might see the smart card credential screen or the message 'Reading smart card.' As a workaround, choose one of the following:
 - Remove and reinsert the smart card in the reader
 - Click Cancel. Then, in the VDA, press Ctrl+Alt+Del. [#322301]
- The user may continue to have access to the remote PC after attempting to disconnect. This occurs when the user selects the Disconnect command from the Start menu. There is a delay after Disconnect is selected. If the user presses Ctrl+Alt+Del during this delay, the VDA on the remote PC remains available for several minutes before disconnecting. During that time, the VDA on the user device freezes until the remote VDA disconnects. [#322301]
- For VDAs installed on Windows 7 and Windows 8 platforms, two mouse pointers might be visible: one movable and one locked to the UI. This is a third party issue with the NVidia driver. As a workaround, you can disable NVidia GRID technology (formerly known as VGX) by running MontereyEnable.exe -disable -reset, and then restarting the machine. [#307921]
- The Microsoft Desktop Composition feature has a scalability cost for VDAs. For users requiring maximum scalability, Desktop Composition should be disabled by Microsoft policy for any user not using Desktop Composition Redirection. [#386602]
- In certain scenarios, when users attempt to unlock a locked session locally, the session relocks itself repeatedly. This issue might occur if the user unplugs or powers off a keyboard locally connected to a Remote PC Access machine during a remote ICA session. As a workaround, users should relaunch the session remotely, disconnect the session, and then log on again from the console. [#382554]
- For VDAs earlier than 7, users' data might not appear in Director even after you correctly configure Windows Remote Management (WinRM) for these VDAs. If this issue occurs, restart the WinRM service and the data should display in Director as expected. [#392047]
- In secure environments, a new VDA might fail to register with a Controller. Specifically, when installing a VDA containing a local security policy setting that allows only administrators to access a computer from the network, the VDA installs but cannot register with a Controller. Instead, a warning is issued that user access rights are not properly configured. For more information, see [CTX117248](#). [#336203]
- Receiver for Windows users cannot log on to stores using pass-through authentication, even though the domain pass-through authentication method is enabled in the StoreFront authentication service. To resolve this issue, run the command `Set-BrokerSite -TrustRequestsSentToTheXmlServicePort $True` from a Windows

PowerShell command prompt on the Controller. [#330775]

- ICA Roundtrip checks are not supported when legacy graphics mode has been specified using a policy for Windows Server 2012 VDAs. There is no workaround for this issue. Note that Windows 8 VDAs do not support legacy mode, so they are not affected by this issue. [#394824]
- With Windows Server 2012 R2 and older Domain Controllers, if you require users to change their password on next login, an error occurs. To work around this problem, remove the Microsoft update KB2883201. [#438725]
- When Passthrough Authentication is implemented for Citrix Storefront on FireFox and Chrome browsers, users are prompted for credentials when launching applications. [#441487]
- For Citrix Receiver for Web with a domain pass-through configuration, when a user logs on to a device using Smartcard and then launches a published desktop, the connection may fail. To work around this issue, edit the default ICA file in the store (for example, in C:\inetpub\wwwroot\Citrix\Store\App_Data\default.ica), and add the following line to the [Application] section:

```
DisableCtrlAltDel=False
```

[#452813]

Personal vDisk issues

To view personal vDisk related known issues, see [Personal vDisks](#).

Provisioning Services issues

To view Provisioning Services issues, see [About Provisioning Services 7.0, 7.1, and 7.6](#)

Features not in this release

The following features are not currently provided or are no longer supported.

- **Secure ICA encryption below 128-bit** – In releases earlier than 7.x, Secure ICA could encrypt client connections for basic, 40-bit, 56-bit, and 128-bit encryption. In 7.x releases, Secure ICA encryption is available only for 128-bit encryption.
- **Legacy printing** – The following printing features are not supported in 7.x releases:
 - Backward compatibility for DOS clients and 16-bit printers, including legacy client printer name.
 - Support for printers connected to Windows 95 and Windows NT operating systems, including enhanced extended printer properties and Win32FavorRetainedSetting.
 - Ability to enable or disable auto-retained and auto-restored printers.
 - DefaultPrnFlag, a registry setting for servers that is used to enable or disable auto-retained and auto-restored printers, which store in user profiles on the server.
- **Secure Gateway** – In releases earlier than 7.x, Secure Gateway was an option to provide secure connections between the server and user devices. NetScaler Gateway is the replacement option for securing external connections.
- **Shadowing users** – In releases earlier than 7.x, administrators set policies to control user-to-user shadowing. In 7.x releases, shadowing end-users is an integrated feature of the Director component, which uses Windows Remote Assistance to allow administrators to shadow and troubleshoot issues for delivered seamless applications and virtual desktops.
- **Power and Capacity Management** – In releases earlier than 7.x, the Power and Capacity Management feature could be used to help reduce power consumption and manage server capacity. The Microsoft Configuration Manager is the replacement tool for this function.
- **Flash v1 Redirection** – Clients that do not support second generation Flash Redirection (including Receiver for Windows earlier than 3.0, Receiver for Linux earlier than 11.100, and Citrix Online Plug-in 12.1) will fall back to server-side rendering for legacy Flash Redirection features. VDAs included with 7.x releases support second generation Flash Redirection features.
- **Local Text Echo** – This feature was used with earlier Windows application technologies to accelerate the display of input text on user devices on high latency connections. It is not included in 7.x releases due to improvements to the graphics subsystem and HDX SuperCodec.
- **Smart Auditor** – In releases earlier than 7.x, Smart Auditor allowed you to record on-screen activity of a user's session. This component is not available in 7.x releases.
- **Single Sign-on** – This feature, which provides password security, is not supported for Windows 8 and Windows Server 2012 environments. It is still supported for Windows

2008 R2 and Windows 7 environments, but is not included with 7.x releases. You can locate it on the Citrix download website: <http://citrix.com/downloads>.

- **Oracle database support** – 7.x releases require a SQL Server database.
- **Health Monitoring and Recovery (HMR)** – In releases earlier than 7.x, HMR could run tests on the servers in a server farm to monitor their state and discover any health risks. In 7.x releases, Director offers a centralized view of system health by presenting monitoring and alerting for the entire infrastructure from within the Director console.
- **Custom ICA files** – Custom ICA files were used to enable direct connection from user devices (with the ICA file) to a specific machine. In 7.x releases, this feature is disabled by default, but can be enabled for normal usage using a local group or can be used in high-availability mode if the Controller becomes unavailable.
- **Management Pack for System Center Operations Manager (SCOM) 2007** – The management pack, which monitored the activity of farms using SCOM, does not support 7.x releases.
- **CNAME function** – The CNAME function was enabled by default in releases earlier than 7.x. Deployments depending on CNAME records for FQDN rerouting and the use of NETBIOS names might fail. In 7.x releases, Delivery Controller auto-update is the replacement feature that dynamically updates the list of Controllers and automatically notifies VDAs when Controllers are added to and removed from the Site. The Controller auto-update feature is enabled by default in Citrix policies, but can be disabled by creating a policy.

Alternatively, you can re-enable the CNAME function in the registry to continue with your existing deployment and allow FQDN rerouting and the use of NETBIOS names. For more information, see [CTX137960](#).

- **Quick Deploy wizard** – In Studio releases earlier than 7.x, this option allowed a fast deployment of a fully installed XenDesktop deployment. The new simplified installation and configuration workflow in 7.x releases eliminates the need for the Quick Deploy wizard option.
- **Remote PC Service configuration file and PowerShell script for automatic administration** – Remote PC is now integrated into Studio and the Controller.
- **Workflow Studio** – In releases earlier than 7.x, Workflow Studio was the graphical interface for workflow composition for XenDesktop. The feature is not supported in 7.x releases.

Features not in Receiver or that have different default values

- **COM Port Mapping** – COM Port Mapping allowed or prevented access to COM ports on the user device. COM Port Mapping was previously enabled by default. In 7.x releases of XenDesktop and XenApp, COM Port Mapping is disabled by default. For details, see [Configure COM Port and LPT Port Redirection settings using the registry](#).
- **LPT Port Mapping** – LPT Port Mapping controls the access of legacy applications to LPT ports. LPT Port Mapping was previously enabled by default. In 7.x releases, LPT Port Mapping is disabled by default.
- **PCM Audio Codec** – Only HTML5 clients support the PCM Audio Codec in 7.x releases.
- **Support for Microsoft ActiveSync.**
- **Proxy Support for Older Versions** – This includes:
 - Microsoft Internet Security and Acceleration (ISA) 2006 (Windows Server 2003).
 - Oracle iPlanet Proxy Server 4.0.14 (Windows Server 2003).
 - Squid Proxy Server 3.1.14 (Ubuntu Linux Server 11.10).

System requirements for XenApp 7.6 and XenDesktop 7.6

The system requirements in this topic are valid when this product version released. System requirements components not covered in this topic (such as StoreFront, host systems, receivers and plug-ins, and Provisioning Services) are described in their respective documentation.

Important: Review the [Prepare to install](#) topic before beginning an installation.

Unless otherwise noted, the component installer deploys software prerequisites automatically (such as .NET and C++ packages) if they are not detected on the machine. The Citrix installation media also contains some of this prerequisite software.

The installation media contains several third-party components. Before using the Citrix software, check for security updates from the third party, and install them.

The disk space values are estimates only, and are in addition to space needed for the product image, operating system, and other software.

If you install all the core components (Controller with SQL Server Express, Studio, Director, StoreFront, and Licensing) on a single server, you need a minimum of 3 GB of RAM to evaluate the product; more is recommended when running an environment for users. Performance will vary depending on your exact configuration, including the number of users, applications, desktops, and other factors.

Quick links to topic sections:

- [Delivery Controller](#)
- [Database](#)
- [Studio](#)
- [Director](#)
- [Virtual Delivery Agent \(VDA\) for Windows Desktop OS](#)
- [Virtual Delivery Agent \(VDA\) for Windows Server OS](#)
- [Hosts / virtualization resources](#)
- [Active Directory functional level support](#)
- [HDX - Desktop Composition Redirection](#)
- [HDX - Windows Media delivery](#)
- [HDX - Flash Redirection](#)

- [HDX 3D Pro](#)
- [HDX - Video conferencing requirements for webcam video compression](#)
- [HDX - Other](#)
- [Other](#)

Important: After you install a component on a Windows Server 2012 R2 system, use the Kerberos Enable Tool (XASsonKerb.exe) to ensure the correct operation of Citrix Kerberos authentication. The tool is located Support > Tools > XASsonKerb folder on the installation media; you must have local administrator privileges to use the tool. To ensure correct Kerberos operation, run xassonkerb.exe -install from a command prompt on the server. If you later apply an update that changes the registry location HKLM\System\CurrentControlSet\Control\LSA\OSConfig, run the command again. To see all available tool options, run the command with the -help parameter.

Delivery Controller

Supported operating systems:

- Windows Server 2012 R2, Standard and Datacenter Editions
- Windows Server 2012, Standard and Datacenter Editions
- Windows Server 2008 R2 SP1, Standard, Enterprise, and Datacenter Editions

Requirements:

- Disk space: 100 MB. Connection leasing (which is enabled by default) adds to this requirement; sizing depends on the number of users, applications, and mode (RDS or VDI). For example, 100,000 RDS users with 100 recently-used applications require approximately 3 GB of space for connection leases; deployments with more applications may require more space. For dedicated VDI desktops, 40,000 desktops require at least 400-500 MB. In any instance, providing several GBs of additional space is suggested.
- Microsoft .NET Framework 3.5 SP1 (Windows Server 2008 R2 only).
- Microsoft .NET Framework 4.5.1 (4.5.2 is also supported).
- Windows PowerShell 2.0 (included with Windows Server 2008 R2) or 3.0 (included with Windows Server 2012 R2 and Windows Server 2012).
- Visual C++ 2005, 2008 SP1, and 2010 Redistributable packages.

Database

Supported Microsoft SQL Server versions for the Site Configuration Database (which initially includes the Configuration Logging Database and the Monitoring Database):

- SQL Server 2014, Express, Standard, and Enterprise Editions.

- SQL Server 2012 SP1, Express, Standard, and Enterprise Editions. By default, SQL Server 2012 SP1 Express is installed when installing the Controller, if an existing supported SQL Server installation is not detected.
- SQL Server 2008 R2 SP2, Express, Standard, Enterprise, and Datacenter Editions.

The following database features are supported (except for SQL Server Express, which supports only standalone mode):

- SQL Server Clustered Instances
- SQL Server Mirroring
- SQL Server 2012 AlwaysOn Availability Groups

Windows authentication is required for connections between the Controller and the SQL Server database.

For information about the latest supported database versions, see [CTX114501](#).

Studio

Supported operating systems:

- Windows 8.1, Professional and Enterprise Editions
- Windows 8, Professional and Enterprise Editions
- Windows 7 Professional, Enterprise, and Ultimate Editions
- Windows Server 2012 R2, Standard and Datacenter Editions
- Windows Server 2012, Standard and Datacenter Editions
- Windows Server 2008 R2 SP1, Standard, Enterprise, and Datacenter Editions

Requirements:

- Disk space: 75 MB
- Microsoft .NET Framework 4.5.1 (4.5.2 is also supported)
- Microsoft .NET Framework 3.5 SP1 (Windows Server 2008 R2 and Windows 7 only)
- Microsoft Management Console 3.0 (included with all supported operating systems)
- Windows PowerShell 2.0 (included with Windows 7 and Windows Server 2008 R2) or 3.0 (included with Windows 8.1, Windows 8, Windows Server 2012 R2, and Windows Server 2012)

Director

Supported operating systems:

- Windows Server 2012 R2, Standard and Datacenter Editions
- Windows Server 2012, Standard and Datacenter Editions
- Windows Server 2008 R2 SP1, Standard, Enterprise, and Datacenter Editions

Requirements:

- Disk space: 50 MB.
- Microsoft .NET Framework 4.5.1 (4.5.2 is also supported).
- Microsoft .NET Framework 3.5 SP1 (Windows Server 2008 R2 only)
- Microsoft Internet Information Services (IIS) 7.0 and ASP.NET 2.0. Ensure that the IIS server role has the Static Content role service installed. If these are not already installed, you are prompted for the Windows Server installation media, then they are installed for you.
- Supported browsers for viewing Director:
 - Internet Explorer 11 and 10.

Compatibility mode is not supported for Internet Explorer. You must use the recommended browser settings to access Director. When you install Internet Explorer, accept the default to use the recommended security and compatibility settings. If you already installed the browser and chose not to use the recommended settings, go to Tools > Internet Options > Advanced > Reset and follow the instructions.

- Firefox ESR (Extended Support Release).
- Chrome.

Virtual Delivery Agent (VDA) for Windows Desktop OS

Supported operating systems:

- Windows 8.1, Professional and Enterprise Editions
- Windows 8, Professional and Enterprise Editions
- Windows 7 SP1, Professional, Enterprise, and Ultimate Editions

To use the Server VDI feature, you can use the command line interface to install a VDA for Windows Desktop OS on a supported server operating system; see [Server VDI](#) for guidance.

- Windows Server 2012 R2, Standard and Datacenter Editions

- Windows Server 2012, Standard and Datacenter Editions
- Windows Server 2008 R2 SP1, Standard, Enterprise, and Datacenter Editions

Requirements:

- Microsoft .NET Framework 4.5.1 (4.5.2 is also supported)
- Microsoft .NET Framework 3.5 SP1 (Windows 7 only)
- Microsoft Visual C++ 2005, 2008, and 2010 Runtimes (32-bit and 64-bit)

Remote PC Access uses this VDA, which you install on physical office PCs.

Several multimedia acceleration features (such as HDX MediaStream Windows Media Redirection) require that Microsoft Media Foundation be installed on the machine on which you install the VDA. If the machine does not have Media Foundation installed, the multimedia acceleration features will not be installed and will not work. Do not remove Media Foundation from the machine after installing the Citrix software; otherwise, users will not be able to log on to the machine. On most Windows 8.1, Windows 8, and Windows 7 editions, Media Foundation support is already installed and cannot be removed. However, N editions do not include certain media-related technologies; you can obtain that software from Microsoft or a third party.

During VDA installation, you can choose to install the HDX 3D Pro version of the VDA for Windows Desktop OS. That version is particularly suited for use with DirectX and OpenGL-driven applications and with rich media such as video.

You cannot install a current version of the VDA on a machine running Windows XP or Windows Vista; however, you can install an earlier Virtual Desktop Agent version on those operating systems, if needed. See [CTX140941](#) for details. The Remote PC Access version in this release is not supported on Windows Vista operating systems.

Virtual Delivery Agent (VDA) for Windows Server OS

Supported operating systems:

- Windows Server 2012 R2, Standard and Datacenter Editions
- Windows Server 2012, Standard and Datacenter Editions
- Windows Server 2008 R2 SP1, Standard, Enterprise, and Datacenter Editions

The installer automatically deploys the following requirements, which are also available on the Citrix installation media in the Support folders:

- Microsoft .NET Framework 4.5.1 (4.5.2 is also supported)
- Microsoft .NET Framework 3.5 SP1 (Windows Server 2008 R2 only)
- Microsoft Visual C++ 2005, 2008, and 2010 Runtimes (32-bit and 64-bit)

The installer automatically installs and enables Remote Desktop Services role services, if they are not already installed and enabled.

Several multimedia acceleration features (such as HDX MediaStream Windows Media Redirection) require that the Microsoft Media Foundation be installed on the machine on which you install the VDA. If the machine does not have Media Foundation installed, the multimedia acceleration features will not be installed and will not work. Do not remove Media Foundation from the machine after installing the Citrix software; otherwise, users will not be able to log on to the machine. On most Windows Server 2012 R2, Windows Server 2012, and Windows Server 2008 R2 editions, the Media Foundation feature is installed through the Server Manager (for Windows Server 2012 R2 and Windows Server 2012: ServerMediaFoundation; for Windows Server 2008 R2: DesktopExperience). However, N editions do not include certain media-related technologies; you can obtain that software from Microsoft or a third party.

Hosts / virtualization resources

Supported platforms:

- XenServer.
 - XenServer 6.2 SP1 plus hotfixes (you must apply SP1 to enable application of future hotfixes)
 - XenServer 6.1
- VMware vSphere. No support is provided for vSphere vCenter Linked Mode operation.
 - VMware vSphere 5.5
 - VMware vSphere 5.1 Update 2
 - VMware vSphere 5.0 Update 2
- System Center Virtual Machine Manager - Includes any version of Hyper-V that can register with the supported System Center Virtual Machine Manager versions.
 - System Center Virtual Machine Manager 2012 R2
 - System Center Virtual Machine Manager 2012 SP1
 - System Center Virtual Machine Manager 2012

You can also deploy this product in the following cloud environments:

- Amazon Web Services (AWS)
 - You can provision applications and desktops on supported Windows server operating systems.
 - SQL Server 2012 Enterprise is not available on AWS.
 - AWS does not offer desktop operating system instances.
 - The Amazon Relational Database Service (RDS) is not supported.
 - See the AWS documentation and [CTX140427](#) for additional information.
- Citrix CloudPlatform
 - The minimum supported version is 4.2.1 with hotfixes 4.2.1-4.

- Deployments were tested using XenServer 6.2 (with Service Pack 1 and hotfix XS62ESP1003) and vSphere 5.1 hypervisors.
- CloudPlatform does not support Hyper-V hypervisors.
- CloudPlatform 4.3.0.1 supports VMware vSphere 5.5.
- See the CloudPlatform documentation (including the Release Notes for your CloudPlatform version) and [CTX140428](#) for additional support and Linux-based system requirements information.

See [CTX131239](#) for updated hypervisor support information.

The following virtualization resource and storage technology combinations are supported for Machine Creation Services and runtime Active Directory account injection into VMs. Combinations marked with an asterisk (*) are recommended.

Virtualization resource	Local Disks	NFS	Block Storage	Storage Link
XenServer	Yes	Yes *	Yes	No
VMware	Yes (no vMotion or dynamic placement)	Yes *	Yes	No
Hyper-V	Yes	No	Yes * (requires Cluster Shared Volumes)	No

The Remote PC Access Wake on LAN feature requires Microsoft System Center Configuration Manager 2012. See [Configuration Manager and Remote PC Access Wake on LAN](#) for details.

Active Directory functional level support

The following functional levels for the Active Directory forest and domain are supported:

- Windows 2000 native
- Windows Server 2003
- Windows Server 2008
- Windows Server 2008 R2
- Windows Server 2012
- Windows Server 2012 R2

HDX - Desktop Composition Redirection

The Windows user device or thin client must support or contain:

- DirectX 9

- Pixel Shader 2.0 (supported in hardware)
- 32 bits per pixel
- 1.5 GHz 32-bit or 64-bit processor
- 1 GB RAM
- 128 MB video memory on the graphic card or an integrated graphics processor

HDX queries the Windows device to verify that it has the required GPU capabilities and automatically reverts to server-side desktop composition if it does not. List the devices with the required GPU capabilities that do not meet the processor speed or RAM specifications in the GPO group for devices excluded from Desktop Composition Redirection.

The minimum available bandwidth is 1.5 Mbps; recommended bandwidth is 5 Mbps. Those values incorporate end-to-end latency.

HDX - Windows Media delivery

The following clients are supported for Windows Media client-side content fetching, Windows Media redirection, and real-time Windows Media multimedia transcoding: Receiver for Windows, Receiver for iOS, and Receiver for Linux.

To use Windows Media client-side content fetching on Windows 8 devices, set the Citrix Multimedia Redirector as a default program: in Control Panel > Programs > Default Programs > Set your default programs, select Citrix Multimedia Redirector and click either Set this program as default or Choose defaults for this program.

GPU transcoding requires an NVIDIA CUDA-enabled GPU with Compute Capability 1.1 or higher; see <http://developer.nvidia.com/cuda/cuda-gpus>.

HDX - Flash Redirection

The following clients and Adobe Flash Players are supported:

- Receiver for Windows (for second generation Flash Redirection features) - Second generation Flash Redirection features require Adobe Flash Player for Other Browsers, sometimes referred to as an NPAPI (Netscape Plugin Application Programming Interface) Flash Player
- Receiver for Linux (for second generation Flash Redirection features) - Second generation Flash Redirection features require Adobe Flash Player for other Linux or Adobe Flash Player for Ubuntu.
- Citrix Online plug-in 12.1 (for legacy Flash Redirection features) - Legacy Flash Redirection features require Adobe Flash Player for Windows Internet Explorer (sometimes referred to as an ActiveX player).

The major version number of the Flash Player on the user device must be greater than or equal to the major version number of the Flash Player on the server. If an earlier version of

the Flash Player is installed on the user device, or if the Flash Player cannot be installed on the user device, Flash content is rendered on the server.

The machines running VDAs require:

- Adobe Flash Player for Windows Internet Explorer (the ActiveX player)
- Internet Explorer versions 7, 8, 9, 10, 11 (in non-Modern UI mode). Flash redirection requires Internet Explorer on the server; with other browsers, Flash content is rendered on the server.
- Protected mode disabled in Internet Explorer (Tools > Internet Options > Security tab > Enable Protected Mode check box cleared). Restart Internet Explorer to effect the change.

HDX 3D Pro

When installing a VDA for Windows Desktop OS, you can choose to install the HDX 3D Pro version.

The physical or virtual machine hosting the application can use GPU Passthrough or Virtual GPU (vGPU):

- GPU Passthrough is available with Citrix XenServer. GPU Passthrough is also available with VMware vSphere and VMware ESX, where it is referred to as virtual Direct Graphics Acceleration (vDGA).
- vGPU is available with Citrix XenServer; see www.citrix.com/go/vGPU (Citrix My Account credentials required).

Citrix recommends that the host computer have at least 4 GB of RAM and four virtual CPUs with a clock speed of 2.3 GHz or higher.

Graphical Processing Unit (GPU):

- For CPU-based compression (including lossless compression), HDX 3D Pro supports any display adapter on the host computer that is compatible with the application being delivered.
- For optimized GPU frame buffer access using the NVIDIA GRID API, HDX 3D Pro requires NVIDIA Quadro cards with the latest NVIDIA drivers. The NVIDIA GRID delivers a high frame rate, resulting in a highly interactive user experience.
- For vGPU using XenServer, HDX 3D Pro requirements include NVIDIA GRID K1 and K2 cards.

User device:

- HDX 3D Pro supports all monitor resolutions that are supported by the GPU on the host computer. However, for optimum performance with the minimum recommended user device and GPU specifications, Citrix recommends a maximum monitor resolution for user devices of 1920 x 1200 pixels for LAN connections, and 1280 x 1024 pixels for WAN connections.

- Citrix recommends that user devices have at least 1 GB of RAM and a CPU with a clock speed of 1.6 GHz or higher. Use of the default deep compression codec, which is required on low-bandwidth connections, requires a more powerful CPU unless the decoding is done in hardware. For optimum performance, Citrix recommends that user devices have at least 2 GB of RAM and a dual-core CPU with a clock speed of 3 GHz or higher.
- For multi-monitor access, Citrix recommends user devices with quad-core CPUs.
- User devices do not need a dedicated GPU to access desktops or applications delivered with HDX 3D Pro.
- Citrix Receiver must be installed.

HDX - Video conferencing requirements for webcam video compression

Supported clients: Citrix Receiver for Windows, Receiver for Mac, and Receiver for Linux.

Supported video conferencing applications:

- Citrix GoToMeeting HDFaces
- Adobe Connect
- Cisco WebEx
- IBM Sametime
- Microsoft Lync 2010 and 2013
- Microsoft Office Communicator
- Google+ Hangouts
- Media Foundation-based video applications on Windows 8.x, Windows Server 2012, and Windows Server 2012 R2
- Skype 6.7. To use Skype on a Windows client, edit the registry on the client and the server:
 - Client registry key HKEY_CURRENT_USER\Software\Citrix\HdxRealTime
 - Name: DefaultHeight , Type: REG_DWORD, Data: 240
 - Name: DefaultWidth, Type: REG_DWORD, Data: 320
 - Server registry key HKEY_LOCAL_MACHINE\SOFTWARE\Citrix\Vd3d\Compatibility
 - Name: skype.exe, Type: REG_DWORD, Data: Set to 0

Other user device requirements:

- Appropriate hardware to produce sound.

- DirectShow-compatible webcam (use the webcam default settings). Webcams that are hardware encoding-capable reduces client-side CPU usage.
- Webcam drivers, obtained from the camera manufacturer if possible.

HDX - Other

UDP audio for Multi-Stream ICA is supported on Receiver for Windows and Receiver for Linux 13.

Echo cancellation is supported on Citrix Receiver for Windows.

Other

- Citrix recommends installing or upgrading to the component software versions provided on the installation media for this release.
 - StoreFront requires 2 GB of memory. See the StoreFront documentation for system requirements. StoreFront 2.0 is the minimum supported version with this release.
 - When using Provisioning Services with this release, the minimum supported Provisioning Services version is 7.0.
 - The Citrix License Server requires 40 MB of disk space. See the licensing documentation for system requirements. The minimum supported Citrix License Server version is 11.12.1.
- Universal Print Server - The Universal Print Server comprises client and server components. The UPClient component is included in the VDA installation. The UPServer component (which you install on each print server where the shared printers reside that you want to provision with the Citrix Universal Print Driver in user sessions) is supported on:
 - Windows Server 2008 R2 SP1
 - Windows Server 2008 32-bit
- The Microsoft Group Policy Management Console (GPMC) is required if you store Citrix policy information in Active Directory rather than the Site Configuration database. For more information, see the Microsoft documentation.
- By default, the Receiver for Windows is installed when you install a VDA. For system requirements information on other platforms, see the Receiver for Windows documentation.
- The Receiver for Linux and the Receiver for Mac are provided on the product installation media. See their documentation for system requirements.
- When using Access Gateway versions earlier than 10.0 with this release, Windows 8.1 and Windows 8 clients are not supported.
- Desktop Lock - Supported operating systems:
 - Windows 7, including Embedded Edition
 - Windows XP Embedded
 - Windows Vista

User devices must be connected to a local area network (LAN).

Supported Receiver: Citrix Receiver for Windows Enterprise 3.4 package (minimum)..

- Client folder redirection - Supported operating systems:
 - Server: Windows Server 2008 R2 SP1, Windows Server 2012, and Windows Server 2012 R2
 - Client (with latest Citrix Receiver for Windows): Windows 7, Windows 8, and Windows 8.1

Technical overview

XenApp and XenDesktop are virtualization solutions that give IT control of virtual machines, applications, licensing, and security while providing anywhere access for any device.

XenApp and XenDesktop allow:

- End users to run applications and desktops independently of the device's operating system and interface.
- Administrators to manage the network and provide or restrict access from selected devices or from all devices.
- Administrators to manage an entire network from a single data center.

XenApp and XenDesktop share a unified architecture called FlexCast Management Architecture (FMA). FMA's key features are the ability to run multiple versions of XenApp or XenDesktop from a single Site and integrated provisioning.

FMA key components

A typical XenApp or XenDesktop environment consists of a few key technology components, which interact when users connect to applications and desktops, and log data about Site activity.

Citrix Receiver

A software client that is installed on the user device, supplies the connection to the virtual machine via TCP port 80 or 443, and communicates with StoreFront using via the StoreFront Service API.

StoreFront

The interface that authenticates users, manages applications and desktops, and hosts the application store. StoreFront communicates with the Delivery Controller using XML.

Delivery Controller

The central management component of a XenApp or XenDesktop Site that consists of services that manage resources, applications, and desktops; and optimize and balance the loads of user connections.

Virtual Delivery Agent (VDA)

An agent that is installed on machines running Windows Server or Windows desktop operating systems that allows these machines and the resources they host to be made available to users. The VDA-installed machines running Windows Server OS allow the machine to host multiple connections for multiple users and are connected to users on one of the following ports:

- TCP port 80 or port 443 if SSL is enabled
- TCP port 2598, if Common Gateway Protocol (CGP) is enabled, which enables session reliability
- TCP port 1494 if CGP is disabled or if the user is connecting with a legacy client

Broker Service

A Delivery Controller service that tracks which users are logged in and where, what session resources the users have, and if users need to reconnect to existing applications. The Broker Service executes PowerShell and communicates with the Broker agent over TCP port 80. It does not have the option to use TCP port 443.

Broker agent

An agent that hosts multiple plugins and collects real-time data. The Broker agent is located on the VDA and is connected to the Controller by TCP port 80. It does not have the option to use TCP port 443.

Monitor Service

A Delivery Controller component that collects historical data and puts it in the Site database by default. The Monitor Service communicates on TCP port 80 or 443.

ICA File/Stack

Bundled user information that is required to connect to the VDA.

Site Database

A Microsoft SQL database that stores data for the Delivery Controller, such as site policies, machine catalogs, and delivery groups.

NetScaler Gateway

A data-access solution that provides secure access inside or outside the LAN's firewall with additional credentials.

Director

A web-based tool that allows administrators access to real-time data from the Broker agent, historical data from the Site database, and HDX data from NetScaler for troubleshooting and support. Director communicates with the Controller on TCP port 80 or 443.

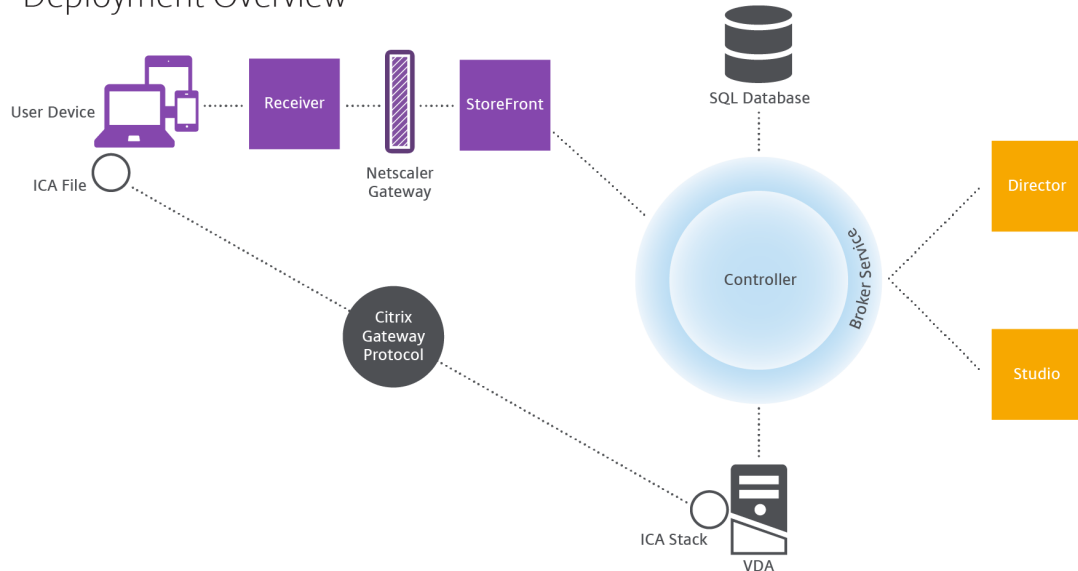
Studio

A management console that allows administrators to configure and manage Sites, and gives access to real-time data from the Broker agent. Studio communicates with the Controller on TCP port 80.

How typical deployments work

XenApp and XenDesktop Sites are made up of machines with dedicated roles that allow for scalability, high availability, and failover, and provide a solution that is secure by design. A XenApp or XenDesktop Site consists of VDA-installed Windows servers and desktop machines, and the Delivery Controller, which manages access.

Deployment Overview



The VDA enables users to connect to desktops and applications. It is installed on server or desktop machines within the data center for most delivery methods, but it can also be installed on physical PCs for Remote PC Access.

The Controller is made up of independent Windows services that manage resources, applications, and desktops, and optimize and balance user connections. Each Site has one or more Controllers, and because sessions are dependent on latency, bandwidth, and network reliability, all Controllers ideally should be on the same LAN.

Users never directly access the Controller. The VDA serves as an intermediary between users and the Controller. When users log on to the Site using StoreFront, their credentials are passed through to the Broker Service, which obtains their profiles and available resources based on the policies set for them.

How user connections are handled

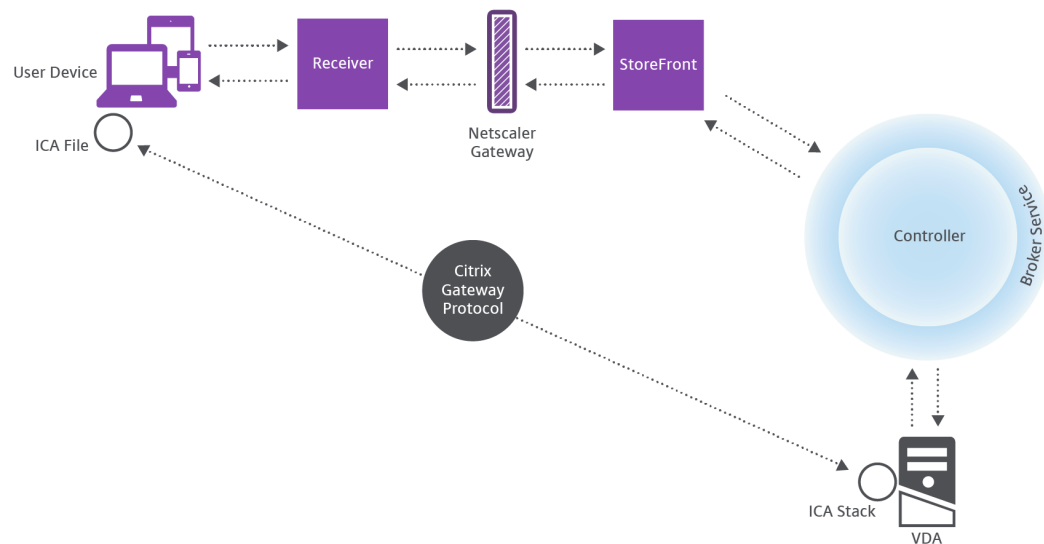
To start a XenApp or XenDesktop session, the user connects either via Citrix Receiver, which is installed on the user's device, or via Receiver for Web (RFW).

Within Receiver, the user selects the physical or virtual desktop or virtual application that is needed.

The user's credentials move through this pathway to access the Controller, which determines what resources are needed by communicating with a Broker Service. It is recommended for administrators to put a SSL certificate on StoreFront to encrypt the

credentials coming from Receiver.

User connections



The Broker Service determines which desktops and applications the user is allowed to access.

Once the credentials are verified, the information about available apps or desktops is sent back to the user through the StoreFront-Receiver pathway. When the user selects applications or desktops from this list, that information goes back down the pathway to the Controller, which determines the proper VDA to host the specific applications or desktop.

The Controller sends a message to the VDA with the user's credentials and sends all the data about the user and the connection to the VDA. The VDA accepts the connection and sends the information back through the same pathways all the way to Receiver. Receiver bundles up all the information that has been generated in the session to create Independent Computing Architecture (ICA) file on the user's device if Receiver is installed locally or on RFW if accessed through the web. As long as the Site was properly set up, the credentials remain encrypted throughout this process.

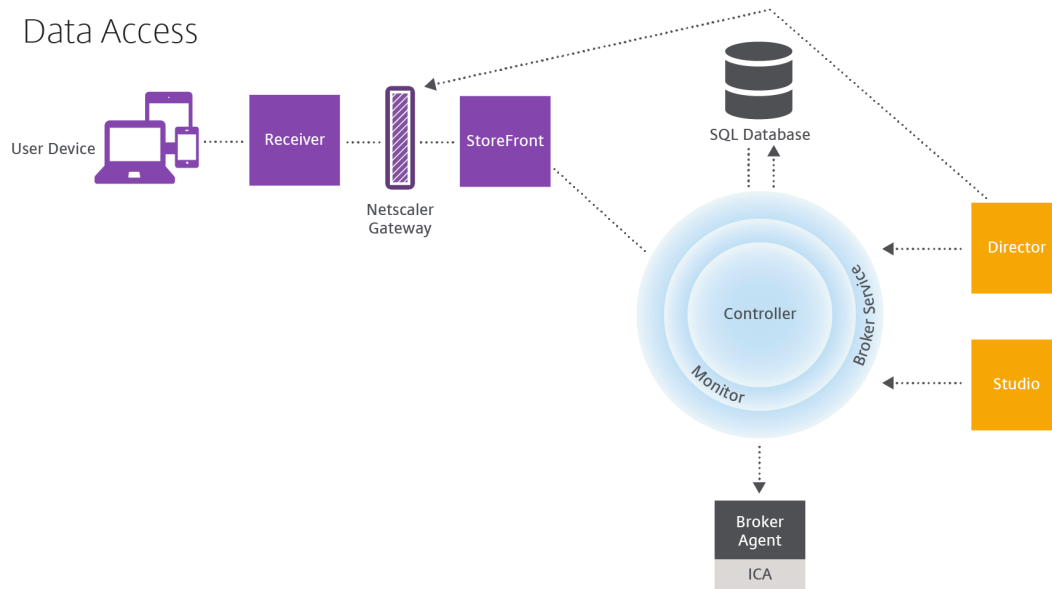
The ICA file is copied to the user's device and establishes a direct connection between the device and the ICA stack running on the VDA. This connection bypasses the management infrastructure: Receiver, StoreFront, and Controller.

The connection between Receiver and the VDA uses the Citrix Gateway Protocol (CGP). If a connection is lost, the Session Reliability feature enables the user to reconnect to the VDA rather than having to relaunch through the management infrastructure. Session Reliability can be enabled or disabled in Studio.

Once the client connects to the VDA, the VDA notifies the Controller that the user is logged on, and the Controller sends this information to the Site database and starts logging data in the Monitoring database.

How data access works

Every XenApp or XenDesktop session produces data that IT can access through Studio or Director. Studio allows administrators to access real-time data from the Broker Agent to better manage sites. Director has access to the same real-time data plus historical data stored in the Monitoring database as well as HDX data from NetScaler Gateway for help-desk support and troubleshooting purposes.



Within the Controller, the Broker Service reports session data for every session on the virtual machine providing real-time data. The Monitor Service also tracks the real-time data and stores it as historical data in the Monitoring database.

Studio can communicate only with the Broker Service; therefore, it has access only to real-time data. Director communicates with the Broker Service (through a plugin in the Broker Agent) to access the Site database.

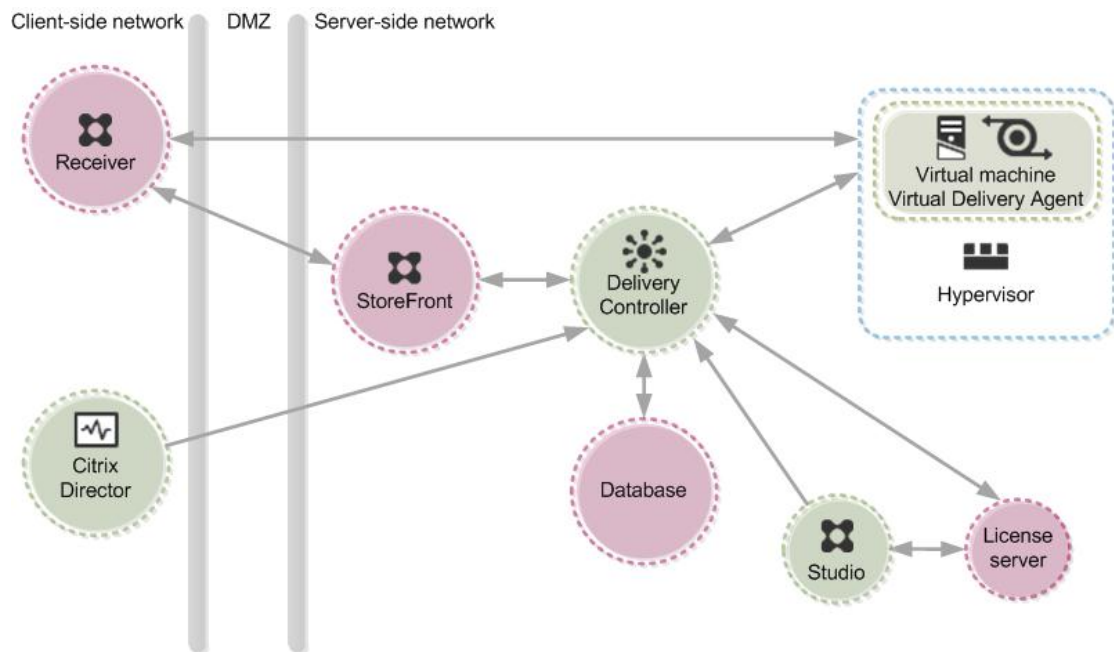
Director can also access NetScaler Gateway to get information on the HDX data.

Related content

- [Concepts and components](#)
- [Active Directory](#)
- [Fault tolerance](#)
- [Delivery methods](#)

Concepts and components

This illustration shows the key components in a typical XenApp or XenDesktop deployment, which is called a Site.



The components in this illustration are:

- **Delivery Controller** – The Delivery Controller is the central management component of any XenApp or XenDesktop Site. Each Site has one or more Delivery Controllers. It is installed on at least one server in the data center. (For Site reliability and availability, install the Controller on more than one server.) The Controller consists of services that communicate with the hypervisor to distribute applications and desktops, authenticate and manage user access, broker connections between users and their virtual desktops and applications, optimize use connections, and load-balance these connections.

Each service's data is stored in the Site database.

The Controller manages the state of the desktops, starting and stopping them based on demand and administrative configuration. In some editions, the Controller allows you to install Profile management to manage user personalization settings in virtualized or physical Windows environments.

- **Database** – At least one Microsoft SQL Server database is required for every XenApp or XenDesktop Site to store all configuration and session information. This database stores the data collected and managed by the services that make up the Controller. Install the database within your data center, and ensure it has a persistent connection to the Controller.
- **Virtual Delivery Agent (VDA)** – The VDA is installed on each physical or virtual machine in your Site that you want to make available to users. It enables the machine to register

with the Controller, which in turn allows the machine and the resources it is hosting to be made available to users. VDAs establish and manage the connection between the machine and the user device, verify that a Citrix license is available for the user or session, and apply whatever policies have been configured for the session. The VDA communicates session information to the Broker Service in the Controller through the broker agent included in the VDA.

XenApp and XenDesktop include VDAs for Windows server and desktop operating systems. VDAs for Windows server operating systems allow multiple users to connect to the server at one time. VDAs for Windows desktops allow only one user to connect to the desktop at a time.

- **StoreFront** — StoreFront authenticates users to Sites hosting resources and manages stores of desktops and applications that users access. It hosts your enterprise application store, which lets you give users self-service access to desktops and applications you make available to them. It also keeps track of users' application subscriptions, shortcut names, and other data to ensure they have a consistent experience across multiple devices.
- **Receiver** — Installed on user devices and other endpoints, such as virtual desktops, Citrix Receiver provides users with quick, secure, self-service access to documents, applications, and desktops from any of the user's devices, including smartphones, tablets, and PCs. Receiver provides on-demand access to Windows, Web, and Software as a Service (SaaS) applications. For devices that cannot install Receiver software, Receiver for HTML5 provides a connection through a HTML5-compatible web browser.
- **Studio** — Studio is the management console that enables you to configure and manage your deployment, eliminating the need for separate management consoles for managing delivery of applications and desktops. Studio provides various wizards to guide you through the process of setting up your environment, creating your workloads to host applications and desktops, and assigning applications and desktops to users. You can also use Studio to allocate and track Citrix licenses for your Site.

Studio gets the information it displays from the Broker Service in the Controller.

- **Director** — Director is a web-based tool that enables IT support and help desk teams to monitor an environment, troubleshoot issues before they become system-critical, and perform support tasks for end users. Director can be installed outside your trusted network. You can use one Director deployment to connect to and monitor multiple XenApp or XenDesktop Sites.

Director shows session and Site information from these sources:

- Real-time session data from the Broker Service in the Controller, which include data the Broker Service gets from the broker agent in the VDA.
- Historical Site data from Monitor Service in the Controller.
- Data about HDX traffic (also known as ICA traffic) captured by HDX Insight from the NetScaler, if your deployment includes a NetScaler and your XenApp or XenDesktop edition includes HDX Insights.

You can also view and interact with a user's sessions using Microsoft Remote Assistance.

- **License server** — License server manages your product licenses. It communicates with the Controller to manage licensing for each user's session and with Studio to allocate license files. You must create at least one license server to store and manage your

license files.

- **Hypervisor** — The hypervisor hosts the virtual machines in your Site. These can be the virtual machines you use to host applications and desktops as well as virtual machines you use to host the XenApp and XenDesktop components. A hypervisor is installed on a host computer dedicated entirely to running the hypervisor and hosting virtual machines.

Citrix XenServer hypervisor is included with XenApp and XenDesktop, but you can use other supported hypervisors, such as Microsoft Hyper-V or VMware vSphere.

Although most implementations of XenApp and XenDesktop require a hypervisor, you don't need one to provide remote PC access or when you are using Provisioning Services (included with some editions of XenApp and XenDesktop) instead of MCS to provision virtual machine.

These additional components, not shown in the illustration above, may also be included in typical XenApp or XenDesktop deployments:

- **Provisioning Services** — Provisioning Services is an optional component of XenApp and XenDesktop available with some editions. It provides an alternative to MCS for provisioning virtual machines. Whereas MCS creates copies of a master image, Provisioning Services streams the master image to user device. Provisioning Services doesn't require a hypervisor to do this, so you can use it to host physical machines. When Provisioning Services is included in a Site, it communicates with the Controller to provide users with resources.
- **NetScaler Gateway** — When users connect from outside the corporate firewall, this release can use Citrix NetScaler Gateway (formerly Access Gateway) technology to secure these connections with SSL. NetScaler Gateway or NetScaler VPX virtual appliance is an SSL VPN appliance that is deployed in the demilitarized zone (DMZ) to provide a single secure point of access through the corporate firewall.
- **Citrix CloudBridge** — In deployments where virtual desktops are delivered to users at remote locations such as branch offices, Citrix CloudBridge (formerly Citrix Branch Repeater or WANScaler) technology can be employed to optimize performance. Repeaters accelerate performance across wide-area networks, so with Repeaters in the network, users in the branch office experience LAN-like performance over the WAN. CloudBridge can prioritize different parts of the user experience so that, for example, the user experience does not degrade in the branch location when a large file or print job is sent over the network. HDX WAN Optimization with CloudBridge provides tokenized compression and data deduplication, dramatically reducing bandwidth requirements and improving performance. For more information, see the Citrix CloudBridge documentation.

Setting up and assigning resources: machine catalogs and Delivery Groups

With XenApp and XenDesktop, you set up the resources you want to provide to users with machine catalogs, but you designate which users have access to these resources with Delivery Groups.

Machine catalogs

Machine catalogs are collections of virtual or physical machines that you manage as a single entity. These machines, and the application or virtual desktops on them, are the resources you want to provide to your users. All the machines in a machine catalog have the same operating system and the same VDA installed. They also have the same applications or virtual desktops available on them. Typically, you create a master image and use it to create identical virtual machines in the catalog.

When you create a machine catalog, you specify the type of machine and provisioning method for the machines in that catalog.

Machine types

- **Windows Server OS machines** – Virtual or physical machines based on a Windows server operating system used for delivering XenApp published apps, also known as server-based hosted applications, and XenApp published desktops, also known as server-hosted desktops. These machines allow multiple users to connect to them at one time.
- **Desktop OS machines** – Virtual or physical machines based on a Windows desktop operating system used for delivering VDI desktops (desktops running Windows desktop operating systems that can be fully personalized, depending on the options you choose), and VM-hosted apps (applications from desktop operating systems) and hosted physical desktops. Only one user at a time can connect each of these desktops.
- **Remote PC Access** – User devices that are included on a whitelist, enabling users to access resources on their office PCs remotely, from any device running Citrix Receiver. Remote PC Access enables you to manage access to office PCs through your XenDesktop deployment.

Provisioning methods

- **Machine Creation Services (MCS)** – A collection of services that create virtual servers and desktops from a master image on demand, optimizing storage utilization and providing a virtual machine to users every time they log on. Machine Creation Services is fully integrated and administered in Citrix Studio.
- **Provisioning Services** – Enables computers to be provisioned and reprovisioned in real-time from a single shared-disk image. Provisioning Services manages target devices as a device collection. The desktop and applications are delivered from a Provisioning Services vDisk that is imaged from a master target device, which enables you to leverage the processing power of physical hardware or virtual machines. Provisioning Services is managed through its own console.
- **Existing images** – Applies to desktops and applications that you have already migrated to virtual machines in the data center. You must manage target devices on an individual basis or collectively using third-party electronic software distribution (ESD) tools.

Delivery Groups

Delivery Groups are collections of users given to access a common group of resources. Delivery Groups contain machines from your machine catalogs and Active Directory users who have access to your Site. Often it makes sense to assign users to your Delivery Groups by their Active Directory group because both Active Directory groups and Delivery Groups are ways of grouping together users with similar requirements.

Each Delivery Group can contain machines from more than one machine catalog, and each machine catalog can contribute machines to more than one Delivery Group, but each individual machine can only belong to one Delivery Group at a time. You can set up a Delivery Group to deliver applications, desktops, or both.

You define which resources users in the Delivery Group can access. For example, if you want to deliver different applications to different users, one way to do this is to install all the applications you want to deliver on the master image for one machine catalog and create enough machines in that catalog to distribute among several Delivery Groups. Then you configure each Delivery Group to deliver a different subset of the applications installed on the machines.

XenApp and XenDesktop 7.6 differ from XenApp 6.5 and previous versions

If you are familiar with XenApp 6.5 and previous versions of XenApp, it may be helpful to think of XenApp 7.6 and XenDesktop 7.6 in terms of how they differ from those versions.

Although they are not exact equivalents, the following table helps map functional elements from XenApp 6.5 and previous versions to XenApp 7.6 and XenDesktop 7.6:

Instead of this in XenApp 6.5 and before:	Think of this in XenApp and XenDesktop 7.6:
Independent Management Architecture (IMA)	FlexCast Management Architecture (FMA)
Farm	Site
Worker Group	machine catalog Delivery Group
Worker	Virtual Delivery Agent (VDA) Server OS machine, Server OS VDA Desktop OS machine, Desktop OS VDA
Remote Desktop Services (RDS) or Terminal Services machine	Server OS machine, Server OS VDA
Zone and Data Collector	Delivery Controller
Delivery Services Console	Citrix Studio and Citrix Director
Publishing applications	Delivering applications
Data store	Database
Load Evaluator	Load Management Policy
Administrator	Delegated Administrator Role Scope

XenApp 7.6 and XenDesktop 7.6 are based on FlexCast Management Architecture (FMA). FMA is a service-oriented architecture that allows interoperability and management modularity across Citrix technologies. FMA provides a platform for application delivery, mobility, services, flexible provisioning, and cloud management.

FMA replaces the Independent Management Architecture (IMA) used in XenApp 6.5 and previous versions.

These are the key elements of FMA in terms of how they relate to elements of XenApp 6.5 and previous versions:

Delivery Sites

Farms were the top-level objects in XenApp 6.5 and previous versions. In XenApp 7.6 and XenDesktop 7.6, the Delivery Site is the highest level item. Sites offer applications and desktops to groups of users.

FMA requires that you must be in a domain to deploy a site. For example, to install the servers, your account must have local administrator privileges and be a domain user in the Active Directory.

Machine catalogs and Delivery Groups

Machines hosting applications in XenApp 6.5 and previous versions belonged to Worker Groups for efficient management of the applications and server software. Administrators could manage all machines in a Worker Group as a single unit for their application management and load-balancing needs. Folders were used to organize applications and machines.

In XenApp 7.6 and XenDesktop 7.6, you use a combination of machine catalogs and Delivery Groups to manage machines, load balancing, and hosted applications or desktops.

Virtual Delivery Agents

In XenApp 6.5 and previous versions, worker machines in Worker Groups ran applications for the user and communicated with data collectors. In XenApp 7.6 and XenDesktop 7.6, the VDA communicates with Delivery Controllers that manage the user connections.

Delivery Controllers

In XenApp 6.5 and previous versions there was a zone master responsible for user connection requests and communication with hypervisors. In XenApp 7.6 and XenDesktop 7.6, Controllers in the Site distribute and handle connection requests.

XenApp 6.5 and previous versions, zones provided a way to aggregate servers and replicate data across WAN connections. Although zones have no exact equivalent in XenApp 7.6 and XenDesktop 7.6, you can provide users with applications that cross WANs and locations. You can design Delivery Sites for a specific geographical location or data center and then allow your users access to multiple Delivery Sites. App Orchestration with XenApp 7.6 and XenDesktop 7.6 provides capabilities for managing multiple Sites in multiple geographies.

Citrix Studio and Citrix Director

Use the Studio console to configure your environments and provide users with access to applications and desktops. Studio replaces the Delivery Services Console in XenApp 6.5 and previous versions.

Administrators use Director to monitor the environment, shadow user devices, and troubleshoot IT issues. To shadow users, Microsoft Remote Assistance must be enabled; it is enabled by default when the VDA is installed.

Delivering applications

XenApp 6.5 and previous versions used the Publish Application wizard to prepare applications and deliver them to users. In XenApp 7.6 and XenDesktop 7.6, you use Studio to create and add applications to make them available to users who are included in a Delivery Group. Using Studio, you first configure a Site, create and specify machine catalogs, and then create Delivery Groups within those machine catalogs. The Delivery Groups determine which users have access to the applications you deliver.

Database

XenApp 7.6 and XenDesktop 7.6 do not use the IMA data store for configuration information. They use a Microsoft SQL Server database to store configuration and session information.

Load Management Policy

In XenApp 6.5 and previous versions, load evaluators use predefined measurements to determine the load on a machine. User connections can be matched to the machines with less load.

In XenApp 7.6 and XenDesktop 7.6, use load management policies for balancing loads across machines.

Delegated Administrators

In XenApp 6.5 and previous versions, you created custom administrators and assigned them permissions based on folders and objects. In XenApp 7.6 and XenDesktop 7.6, custom administrators are based on role and scope pairs. A role represents a job function and has defined permissions associated with it to allow delegation. A scope represents a collection of objects. Built-in administrator roles have specific permissions sets, such as help desk, applications, hosting, and catalog. For example, help desk administrators can work only with individual users on specified sites, while full administrators can monitor the entire deployment and resolve systemwide IT issues.

The transition to FMA also means some features available in XenApp 6.5 and previous versions may be implemented differently or may require you to substitute other features, components, or tools to achieve the same goals.

Instead of this in XenApp 6.5 and before:	Use this in XenApp and XenDesktop 7.6:
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Session prelaunch and session linger configured with policy settings	<p>Session prelaunch and session linger configured by editing Delivery Group settings.</p> <p>As in XenApp 6.5, these features help users connect to applications quickly, by starting sessions before they are requested (session prelaunch) and keeping sessions active after a user closes all applications (session linger). In XenApp and XenDesktop 7.6, you enable these features for specified users by configuring these settings for existing Delivery groups. See Configure session prelaunch and session linger.</p>
Support for unauthenticated (anonymous) users provided by granting rights to anonymous user when setting the properties of published applications	Support for unauthenticated (anonymous) users provided by configuring this option when setting user properties of a Delivery Group. See Users .
Local host cache permits a worker servers to function even when a connection to the data store is not available	Connection leasing enables users to connect and reconnect to their most recently used applications and desktops, even when the Site database is not available. The connection leasing feature supplements the SQL Server high availability best practices. See Connection leasing .
Application streaming	App-V delivers streamed applications, managed using Studio.
Web Interface	Citrix recommends you transition to StoreFront.
SmartAuditor	Use configuration logging to log all session activities from an administrative perspective or use a third-party, Citrix-ready tool to record sessions.

Active Directory

Active Directory is required for authentication and authorization. The Kerberos infrastructure in Active Directory is used to guarantee the authenticity and confidentiality of communications with the Delivery Controllers. For information about Kerberos, see the Microsoft documentation.

The [System requirements](#) topic lists the supported functional levels for the forest and domain. To use Policy Modeling, the domain controller must be running on Windows Server 2003 to Windows Server 2008 R2; this does not affect the domain functional level.

This product supports:

- Deployments in which the user accounts and computer accounts exist in domains in a single Active Directory forest. User and computer accounts can exist in arbitrary domains within a single forest. All domain functional levels and forest functional levels are supported in this type of deployment.
- Deployments in which user accounts exist in an Active Directory forest that is different from the Active Directory forest containing the computer accounts of the controllers and virtual desktops. In this type of deployment, the domains containing the Controller and virtual desktop computer accounts must trust the domains containing user accounts. Forest trusts or external trusts can be used. All domain functional levels and forest functional levels are supported in this type of deployment.
- Deployments in which the computer accounts for Controllers exist in an Active Directory forest that is different from one or more additional Active Directory forests that contain the computer accounts of the virtual desktops. In this type of deployment a bi-directional trust must exist between the domains containing the Controller computer accounts and all domains containing the virtual desktop computer accounts. In this type of deployment, all domains containing Controller or virtual desktop computer accounts must be at "Windows 2000 native" functional level or higher. All forest functional levels are supported.

Optionally, Virtual Delivery Agents (VDAs) can use information published in Active Directory to determine which Controllers they can register with (*discovery*). This method is supported primarily for backward compatibility, and is available only if the VDAs are in the same Active Directory forest as the Controllers. For information about this discovery method see [Active Directory OU-based Controller discovery](#) and [CTX118976](#).

Deploy in a multiple Active Directory forest environment

Note: This information applies to minimum version XenDesktop 7.1 and XenApp 7.5. It does not apply to earlier versions of XenDesktop or XenApp.

In an Active Directory environment with multiple forests, if one-way or two-way trusts are in place you can use DNS forwarders for name lookup and registration. To allow the appropriate Active Directory users to create computer accounts, use the Delegation of

Control wizard. Refer to Microsoft documentation for more information about this wizard.

No reverse DNS zones are necessary in the DNS infrastructure if appropriate DNS forwarders are in place between forests.

The SupportMultipleForest key is necessary if the VDA and Controller are in separate forests, regardless of whether the Active Directory and NetBios names are different. The SupportMultipleForest key is only necessary on the VDA. Use the following information to add the registry key:

Caution: Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

- HKEY_LOCAL_MACHINE\Software\Citrix\VirtualDesktopAgent\SupportMultipleForest
 - Name: SupportMultipleForest
 - Type: REG_DWORD
 - Data: 0x00000001 (1)

You might need reverse DNS configuration if your DNS namespace is different than that of Active Directory.

If external trusts are in place during setup, the ListOfSIDs registry key is required. The ListOfSIDs registry key is also necessary if the Active Directory FQDN is different than the DNS FQDN or if the domain containing the Domain Controller has a different Netbios name than the Active Directory FQDN. To add the registry key, use the following information:

- For a 32-bit or 64-bit VDA, locate the registry key
HKEY_LOCAL_MACHINE\Software\Citrix\VirtualDesktopAgent\ListOfSIDs
 - Name: ListOfSIDs
 - Type: REG_SZ
 - Data: Security Identifier (SID) of the Controllers

When external trusts are in place, make the following changes on the VDA:

1. Locate the file <ProgramFiles>\Citrix\Virtual Desktop Agent\brokeragentconfig.exe.config.
2. Make a backup copy of the file.
3. Open the file in a text editing program such as Notepad.
4. Locate the text allowNtlm="false" and change the text to allowNtlm="true".
5. Save the file.

After adding the ListOfSIDs registry key and editing the brokeragent.exe.config file, restart the Citrix Desktop Service to apply the changes.

The following table lists the supported trust types:

Trust type	Transitivity	Direction	Supported in this release
Parent and child	Transitive	Two-way	Yes
Tree-root	Transitive	Two-way	Yes
External	Nontransitive	One-way or two-way	Yes
Forest	Transitive	One-way or two-way	Yes
Shortcut	Transitive	One-way or two-way	Yes
Realm	Transitive or nontransitive	One-way or two-way	No

For more information about complex Active Directory environments, see [CTX134971](#).

Fault tolerance

This topic outlines ways in which you can increase the level of fault tolerance in your deployment to make sure that business-critical applications and desktops are always available.

Configure database fault tolerance

All information is stored in the Site configuration database; Delivery Controllers communicate only with the database and not with each other. A Controller can be unplugged or turned off without affecting other Controllers in the Site. This means, however, that the Site configuration database forms a single point of failure. If the database server fails, existing connections to virtual desktops will continue to function until a user either logs off or disconnects from a virtual desktop; new connections cannot be established if the database server is unavailable.

Citrix recommends that you back up the database regularly so that you can restore from the backup if the database server fails. In addition, there are several high availability solutions to consider for ensuring automatic failover:

- **SQL Mirroring** — This is the recommended solution. Mirroring the database makes sure that, should you lose the active database server, the automatic failover process happens in a matter of seconds, so that users are generally unaffected. This method, however, is more expensive than other solutions because full SQL Server licenses are required on each database server; you cannot use SQL Server Express edition for a mirrored environment.
- **Using the hypervisor's high availability features** — With this method, you deploy the database as a virtual machine and use your hypervisor's high availability features. This solution is less expensive than mirroring as it uses your existing hypervisor software and you can also use SQL Express. However, the automatic failover process is slower, as it can take time for a new machine to start for the database, which may interrupt the service to users.
- **SQL Clustering** — The Microsoft SQL clustering technology can be used to automatically allow one server to take over the tasks and responsibilities of another server that has failed. However, setting up this solution is more complicated, and the automatic failover process is typically slower than with alternatives such as SQL Mirroring.
- **AlwaysOn Availability Groups** is an enterprise-level high-availability and disaster recovery solution introduced in SQL Server 2012 to enable you to maximize availability for one or more user databases. AlwaysOn Availability Groups requires that the SQL Server instances reside on Windows Server Failover Clustering (WSFC) nodes. For more information, see [AlwaysOn Availability Groups \(SQL Server\)](#).

Note: Installing a Controller on a node in an SQL clustering or SQL mirroring installation is not supported.

Configure a Site to use a mirror database

The configuration process involves tasks an administrator completes using SQL Server management tools before creating the Site. The remaining tasks occur when the administrator runs the Site creation wizard.

A mirror environment requires at least two SQL Server machines (in the following example, SQL Server A and SQL Server B). SQL Server Express edition cannot be used as either a principal or mirror.

Using Microsoft SQL Server management tools, configure the SQL Server databases:

1. Install the SQL Server software on SQL Server A and SQL Server B.
2. On SQL Server A, create the database intended to be used as the principal (for example, myDatabaseMirror).
 - Make sure that the database uses the full recovery model and not the simple model. (The simple model is configured by default, but prevents the transaction log from being backed up.)
 - Use the following collation setting when creating the database: Latin1_General_100_CI_AS_KS (where Latin1_General varies depending on the country; for example Japanese_100_CI_AS_KS). If this collation setting is not specified during database creation, subsequent creation of the service schemas within the database will fail, and an error similar to "<service>: schema requires a case-insensitive database" appears (where <service> is the name of the service whose schema is being created).
 - Enable a Read-Committed snapshot as described in [CTX137161](#). It is important to enable this before the database is mirrored to avoid errors.
3. On SQL Server A, back up the database to a file and copy it to SQL Server B.
4. On SQL Server B, restore the backup file to that server (SQL Server B).
5. On SQL Server A, start mirroring.

The next step depends on whether the Citrix administrator (that is, the person running the Site creation wizard) also has full database privileges:

- If the Citrix administrator has database privileges (the same person is the database administrator and the Citrix administrator), Studio does everything for you:
 1. The Citrix administrator uses Studio to create a Site, specifying the address of the previously-created SQL Server A database and its name (myDatabaseMirrorForXD).
 2. The database scripts are automatically applied and the principal and mirror databases are set.
- If the Citrix administrator does not have database privileges, the Citrix administrator must get help from a database administrator:
 1. The Citrix administrator uses Studio to create a Site, specifying the address of the previously-created SQL Server and its name (myDatabaseMirrorForXD).

2. In the Site creation wizard, selecting Generate Script generates a mirror script and a primary script. The Citrix administrator gives those scripts to the database administrator, who applies the scripts (the mirror script should be applied first). The database administrator must tell the Citrix administrator when that task is completed.
3. Back in Studio, the Citrix administrator can now complete the Create Site wizard. The principal and mirror databases are set.

To verify mirroring after creating the Site, run the PowerShell cmdlet `get-configdbconnection` to make sure that the Failover Partner has been set in the connection string to the mirror.

If you later add, move, or remove a Delivery Controller in a mirrored database environment, see [Add, remove, or move Controllers, or move a VDA](#) for considerations.

Ensure desktop and application access if Controllers fail

If all Delivery Controllers in a Site fail, you can configure the Virtual Delivery Agents to operate in high availability mode so that users can continue to access and use their desktops and applications. In high availability mode, the VDA accepts direct ICA connections from users, rather than connections brokered by the Controller.

This feature is for use only on the rare occasion when communication with all Controllers fails; it is not an alternative to other high availability solutions. For more information, see [CTX127564](#).

When the database is not available

The connection leasing feature supplements the SQL Server high availability best practices by enabling users to connect and reconnect to their most recently used applications and desktops, even when the Site database is not available. For details, see [Connection leasing](#).

Key use cases and delivery methods

It's challenging to meet the needs of every user with one virtualization deployment. XenApp and XenDesktop allow administrators to customize the user experience with a variety of methods sometimes referred to as FlexCast models.

This collection of delivery methods — each with its own advantages and disadvantages — provide the best user experience in any use-case scenario.

Mobilize Windows applications on mobile devices

Touch-screen devices, such as tablets and smartphones, are now standard in mobility. These devices can cause problems when running Windows-based applications that typically utilize full-size screens and rely on right-click inputs for full functionality.

XenApp with Citrix Receiver offers a secure solution that allows mobile-device users access to all the functionality in their Windows-based apps without the cost of rewriting those apps for native mobile platforms.

The XenApp published apps delivery method utilizes HDX Mobile technology that solves the problems associated with mobilizing Windows applications. This method allows Windows applications to be refactored for a touch experience while maintaining features such as multitouch gestures, native menu controls, camera, and GPS functions. Many touch features are available natively in XenApp and XenDesktop and do not require any application source code changes to activate.

These features include:

- Automatic display of the keyboard when an editable field has the focus
- Larger picker control to replace Windows combo box control
- Multitouch gestures, such as pinch and zoom
- Inertia-sensed scrolling
- Touchpad or direct-cursor navigation

Reduce PC refresh costs

Upgrading physical machines is a daunting task many businesses face every three to five years, especially if the business needs to maintain the most up-to-date operating systems and applications. Growing businesses also face daunting overhead costs of adding new machines to their network.

The VDI Personal vDisk delivery method provides fully personalized desktop operating systems to single users on any machine or thin client using server resources. Administrators can create virtual machines whose resources — such as processing, memory, and storage —

are stored in the network's data center.

This can extend the life of older machines, keep software up to date, and minimize downtime during upgrades.

Ensure secure access to virtual apps and desktops for contractors and partners

Network security is an ever-growing problem, especially when working with contractors, partners, and other third-party contingent workers who need access to a company's apps and data. The workers may also need loaner laptops or other devices, which cause additional cost concerns.

Data, applications, and desktops are stored behind the firewall of the secure network with XenDesktop and XenApp, so the only thing the end user transmits is user-device inputs and outputs, such as keystrokes, mouse clicks, audio, and screen updates. By maintaining these resources in a data center, XenDesktop and XenApp offer a more secure remote access solution than using the typical SSL VPN.

With a VDI with Personal vDisk deployment, administrators can utilize thin clients or users' personal devices by creating a virtual machine on a network server and providing a single-user desktop operating system. This allows IT to maintain security with third-party workers without the need of purchasing expensive equipment.

Accelerate Migration

When switching to a new operating system, IT can face the challenge of delivering legacy and incompatible applications.

With virtual-machine-hosted apps, users can run older applications through Citrix Receiver on the upgraded virtual machine without any compatibility issues. This allows IT additional time to resolve and test application compatibility issues, ease users into the transition, and make help desk calls more efficient.

Additional benefit for using XenDesktop during migration include:

- Reducing complexity for desktops
- Improving IT's control
- Enhancing end-user flexibility in terms of device usage and workspace location

Enable designers and engineers by virtualizing professional 3-D graphics apps

Many design firms and manufacturing companies rely heavily on professional 3-D graphics applications. These companies face financial strain from the costs of powerful hardware to support this type of software and also logistic problems that come with the sharing of large design files via FTP, email, and similar ad hoc methods.

XenDesktop's hosted physical desktop delivery method provides a single desktop image to workstations and blade servers without the need of hypervisors to run graphic-intensive 3-D applications on a native operating system.

All files are saved in a central data center within the network, so sharing large design files to other users in the network is faster and more secure because the files are not being transferred from one workstation to another.

Transform call centers

Businesses that need large-scale call centers face the difficult challenge of maintaining adequate staffing for peak periods while not overprovisioning machines during less busy hours.

The Pooled VDI delivery method provides multiple users access to a standardized desktop dynamically at a minimal cost when provisioning a large number of users. The pooled machines are allocated on a per-session, first-come, first-served basis.

There is less day-to-day management of these virtual machines because any change made during the session is discarded when the user logs off. This also increases security.

The XenApp hosted desktops delivery method is another viable option for transforming call centers. This method hosts multiple user desktops on a single server-based operating system.

This is a more cost-efficient method than Pooled VDI, but with XenApp hosted desktops, users are restricted from installing applications, changing system settings, and restarting the server.

New deployments

To build a XenApp or XenDesktop deployment:

1. Set up the virtualization environment to host and manage the components of your XenApp or XenDesktop environment.

See [System requirements](#) for supported versions of the virtualization platforms, management tools, and cloud deployment solutions listed here.

You can use these virtualization platforms to host and manage machines in your XenApp or XenDesktop environment:

- XenServer. See [XenServer](#) for information on setting up and using XenServer.
- VMware vSphere. See [Prepare the virtualization environment: VMware](#) for guidance on setting up and using VMware vSphere with XenApp or XenDesktop.
- Hyper-V with Microsoft System Center Virtualization Machine Manager (VMM). See [Prepare the virtualization environment: Microsoft System Center Virtual Machine Manager](#) for guidance on setting up and using Hyper-V with VMM with XenApp or XenDesktop.

You can use Microsoft System Center Configuration Manager with Citrix Connector 7.5 for System Center Configuration Manager 2012 to manage physical and virtual machines in your XenApp or XenDesktop environment or use it to enable the Wake on LAN feature of Remote PC Access. See [Prepare for using Microsoft System Center Configuration Manager](#).

You can use these cloud deployment solutions to host product components and provision virtual machines. These solutions pool computing resources to build public, private, and hybrid Infrastructure as a Service (IaaS) clouds.

- Amazon Web Services, see [CTX140427](#).
 - Citrix CloudPlatform, see [CTX140428](#).
2. Set up the non-Citrix infrastructure components required to build your XenApp or XenDesktop Site. These include at least one domain controller running Active Directory Domain Services.
 3. Install the Citrix components that make up your XenApp or XenDesktop Site. You can install components using a wizard-based graphical interface or a command-line interface, which enables scripted installation. Both methods install most prerequisites automatically.
 - a. Before beginning any installation, review the [System requirements](#). Also, read and complete the [Prepare to install](#) checklist.
 - b. Install the core components: Delivery Controller, Citrix Studio, Citrix Director, Citrix License Server, and Citrix StoreFront. See [Install using the graphical interface](#) or [Install using the command line](#) for information on installing these components.

- c. From Studio, create a Site. See [Create a Site](#).
- d. Install a Virtual Delivery Agent (VDA), either on the master image you will use to create virtual machines or directly on each machine. See [Install using the graphical interface](#) or [Install using the command line](#) for information on installing the VDA. You may also want to see [Install or remove Virtual Delivery Agents using scripts](#).


For Remote PC Access deployments, install a VDA for Desktop OS on each office PC. Citrix recommends using the VDA installer's command line interface and your existing Electronic Software Distribution (ESD) methods.

- e. Optionally, install the Universal Print Server on the print servers in your environment. See [Install using the graphical interface](#) or [Install using the command line](#) for information on installing the Universal Print Server.
4. Optionally, integrate additional Citrix components into your XenApp or XenDesktop deployment. For example:
 - Provisioning Services is an optional component of XenApp and XenDesktop that provisions machines by streaming a master image to target devices. See [Provisioning Services](#).
 - Citrix NetScaler Gateway is a secure application access solution that provides administrators granular application-level policy and action controls to secure access to applications and data. See [Citrix NetScaler Gateway](#).
 - Citrix CloudBridge is a set of appliances that optimize WAN performance. See [Citrix CloudBridge](#).
 5. Set up the resources you will deliver to users. How you do this depends on the delivery method you are using, but this is the basic sequence for most delivery methods:
 - a. Using your hypervisor's management tool, create a master image that defines the desktops or applications you want to provide. See [Prepare a master image](#).
 - b. Create a machine catalog containing physical and virtual machines from that master image. See [Create a machine catalog](#).
 - If you are using Machine Creation Services to provision machines, you can add machines to the machine catalog from within Studio.
 - If you are using Provisioning Services to provision machines, you add machines to the machine catalog from the Provisioning Services console.
 - c. From Studio, create a Delivery Group to specify which users can access these machines and the applications installed on them. See [Delivery groups](#).

Prepare to install

The following tables list tasks to complete and things to consider or be aware of before installing the core components (Delivery Controller, Citrix Studio, Citrix Director, Citrix License Server, StoreFront) and Virtual Delivery Agents (VDAs).

Core component and general installation preparation


	Description
	<p>First:</p> <ul style="list-style-type: none"> • If you are unfamiliar with the product, review the Technical overview and related content. • Check <i>Known issues</i> for installation issues you might encounter. • If you are installing components in a cloud environment, see CTX140427 for Amazon Web Services or see CTX140428 for Citrix CloudPlatform. • If you are using XenServer for your virtualization environment, see the XenServer documentation for guidance. • If you are using VMware or Microsoft System Center Virtual Machine Manager for your virtualization environment, see the linked topics.
	<p>Decide where you will install the components and then prepare the machines and operating systems.</p> <ul style="list-style-type: none"> • Review System requirements for supported operating systems and versions for the Controller, Studio, Director, Virtualization resources, and VDAs. The Citrix StoreFront and the Citrix License Server requirements topics specify their supported platforms. <ul style="list-style-type: none"> • You can install the core components on the same server or on different servers. For example, to manage a smaller deployment remotely, you can install Studio on a different machine than the server where you installed the Controller. To accommodate future expansion, consider installing components on separate servers; for example, install the License Server and Director on different servers. • You can install both the Delivery Controller and the Virtual Delivery Agent for Windows Server OS on the same server. Launch the installer and select the Delivery Controller (plus any other core components you want on that machine); then launch the installer again and select the Virtual Delivery Agent for Windows Server OS. • Be sure that each operating system has the latest updates. • Be sure that all machines have synchronized system clocks. Synchronization is required by the Kerberos infrastructure that secures communication between the machines. • Components are installed in C:\Program Files\Citrix by default. You can specify a different location during installation, but it must have execute permissions for network service. • Most component prerequisites are installed automatically; however, the <i>System requirements</i> topic notes exceptions.

	<p>Decide where to install the SQL Server software for the Site Configuration Database.</p> <ul style="list-style-type: none"> • By default, SQL Server 2012 Express is installed automatically on the server when you install the Controller, if another instance is not detected. Alternatively, you can separately install a supported SQL Server version on that server or on a different server. In such cases, the SQL Server software does not need to be installed before you install the core components, but it must be installed before you create the Site. • Review the database considerations in the <i>Plan</i> topics, and set up any supported redundancy infrastructure. <p>Important: Windows authentication is required between the Controller and the database.</p>
	<p>Decide how you want ports opened.</p> <p>By default, the following ports are opened automatically if the Windows Firewall Service is running, even if the firewall is not enabled. You can disable this default action and open the ports manually if you use a third-party firewall or no firewall, or if you just prefer to do it yourself.</p> <ul style="list-style-type: none"> • Controller: TCP 80, 443 • Director: TCP 80, 443 • License Server: TCP 7279, 8082, 8083, 27000 • StoreFront: TCP 80, 443 <p>Tip: For complete port information, see CTX101810.</p>
	<p>Configure your Active Directory domain.</p> <ul style="list-style-type: none"> • In addition to being a domain user, you must be a local administrator on the machines where you are installing core components. • Do not attempt to install any components on a domain controller. • The <i>System requirements</i> topic lists the supported functional levels. See the Microsoft documentation for instructions. <p>When you install the License Server, that user account is automatically made a full administrator on the license server.</p>
	<p>Before you install Director, decide if you will use the shadowing feature of Director, which uses Windows Remote Assistance.</p>

Good to know:

- If a component does not install successfully, the process stops with an error message. Components that installed successfully are retained; you do not need to reinstall them.
- Studio starts automatically after it is installed. You can disable this action during installation.
- When you create objects before, during, and after installation, it is best practice to specify unique names for each object (for example networks, groups, catalogs, resources).
- After installing components in Amazon Web Services (AWS), you will need to know the region, availability zone, VPC name, subnet addresses, domain name, security group names, and credentials when you use Studio to create a Site.

VDA installation preparation

	Description
	<p>If you will be installing a VDA for Windows Desktop OS, decide if you want to install the HDX 3D Pro version.</p> <p>The HDX3D Pro feature delivers desktops and applications that perform best with a GPU for hardware acceleration. For more information, see the HDX 3D Pro documentation.</p>
	<p>Decide how you will use the VDA.</p> <p>The default setting assumes that you will use a master image containing an installed VDA with Machine Creation Services or Provisioning Services to create other virtual machines. You can override this default if you want to install the VDA on an existing machine.</p>
	<p>Decide if you want to install Citrix Receiver for Windows (CitrixReceiver.exe).</p> <p>You can disable this default action.</p>
	<p>Decide how you want ports opened.</p> <p>By default, the following ports are opened automatically if the Windows Firewall Service is running, even if the firewall is not enabled. You can disable this default action and open the ports manually if you use a third-party firewall or no firewall, or if you just prefer to do it yourself.</p> <ul style="list-style-type: none"> • Controller: TCP 80, 1494, 2598, 8008 <ul style="list-style-type: none"> • For communication between user devices and virtual desktops, configure inbound TCP on ports 1494 and 2598 as port exceptions. For security, Citrix recommends that you do not use these registered ports for anything other than the ICA protocol and the Common Gateway Protocol. • For communication between Controllers and virtual desktops, configure inbound port 80 as a port exception. • Windows Remote Assistance: TCP 3389 <p>Windows opens this port automatically if the feature is enabled, even if you choose to open the ports manually.</p> • Real-Time Audio Transport: UDP 16500-16509 <p>Tip: For complete port information, see CTX101810.</p>

	<p>Decide how you will specify the locations of installed Controllers.</p> <ul style="list-style-type: none"> • Manually, by entering the Fully Qualified Domain Name (FQDN) of the Controller. Although you can specify a Controller that is not currently in the domain, a VDA can connect only to a Controller in the domain. Also, you can test the connection only for Controllers in the domain. • Using Active Directory, if the Controller is in the domain. • Allowing Machine Creation Services to specify the Controller. • Later, by rerunning the installer, using Citrix policies, setting registry values, or using Active Directory OUs. <p>Citrix Group Policy settings that specify Controller locations will override settings provided during installation.</p> <p>After you initially specify the Controller location, you can use the auto-update feature to update VDAs when additional Controllers are installed.</p>
	<p>Decide if you want to use the following features:</p> <ul style="list-style-type: none"> • Optimize performance: When this feature is enabled, the optimization tool is used for VDAs running in a VM on a hypervisor. VM optimization includes disabling offline files, disabling background defragmentation, and reducing event log size. For more information, see CTX125874. Do not enable this option if you will be using Remote PC Access. Default = enabled. • Windows Remote Assistance: When this feature is enabled, Windows Remote Assistance is used with the user shadowing feature of Director, and Windows automatically opens TCP port 3389 in the firewall, even if you choose to open firewall ports manually. Default = enabled. • Real-Time Audio Transport for audio: When this feature is enabled, UDP is used for audio packets, which can improve audio performance. Default = enabled. • Personal vDisk: (Available only when installing a VDA for Windows Desktop OS on a VM.) When this feature is enabled, Personal vDisks can be used with a master image. For more information, see Personal vDisks. Default = disabled.

Good to know:

- The Print Spooler Service is enabled by default on the Windows server. If you disable this service, you cannot successfully install a VDA for Windows Server OS. Therefore, ensure that this service is enabled before installing a VDA.
- The installer automatically detects your operating system and allows you to install only the VDA type supported on that system: VDA for Windows Server OS or VDA for Windows Desktop OS.
- Profile management is installed during VDA installation.
- When you install the VDA, a new local user group called Direct Access Users is automatically created. On a VDA for Windows Desktop OS, this group applies only to RDP connections; on a VDA for Windows Server OS, this group applies to ICA and RDP connections.
- When you install a VDA for Windows Server OS, Remote Desktop Services role services are automatically installed and enabled (if they are not already installed and enabled).
- For Remote PC Access configurations, install the VDA for Windows Desktop OS on each physical office PC that users will access remotely.
- As an alternative to using the full-product ISO to install VDAs, you can use a standalone VDA installation package. For details, see [Install VDAs using the standalone package](#).

Virtual Desktop Agents on Windows XP or Windows Vista

The latest Virtual Delivery Agents (VDAs) are not supported on Windows XP or Windows Vista systems. Additionally, some of the features in this release (and other recent releases) cannot be used on those operating systems. To use the full functionality in this release, Citrix recommends you replace Windows XP or Windows Vista systems with Windows 7 or Windows 8, then install a Virtual Delivery Agent from this release.

To accommodate cases when you must continue to accommodate machines running Windows XP or Windows Vista, you can install an earlier Virtual Desktop Agent version (5.6 FP1 with certain hotfixes). See [CTX140941](#) for details.

Keep in mind that:

- You cannot install core components (Controller, Studio, Director, StoreFront, Citrix License Server) on a Windows XP or Windows Vista system.
- Remote PC Access is not supported on Windows Vista systems.
- Citrix support for Windows XP ended April 8, 2014 when Microsoft ended its extended support.
- Continuing to use older VDAs can affect feature availability and VDA registration with the Controller; see [Mixed environment considerations](#).

Prepare the virtualization environment: VMware

Follow this guidance if you use VMware to provide virtual machines.

Install and configure your hypervisor

1. Install vCenter Server and the appropriate management tools. (No support is provided for vSphere vCenter Linked Mode operation.)
2. Create a VMware user account with the following permissions, at the DataCenter level, at a minimum. This account has permissions to create new VMs and is used to communicate with vCenter.

SDK	User Interface
Datastore.AllocateSpace	Datastore > Allocate space
Datastore.Browse	Datastore > Browse datastore
Datastore.FileManagement	Datastore > Low level file operations
Network.Assign	Network > Assign network
Resource.AssignVMToPool	Resource > Assign virtual machine to resource pool
System.Anonymous, System.Read, and System.View	Added automatically.
Task.Create	Tasks > Create task
VirtualMachine.Config.AddRemoveDevice	Virtual machine > Configuration > Add or remove device
VirtualMachine.Config.AddExistingDisk	Virtual machine > Configuration > Add existing disk
VirtualMachine.Config.AddNewDisk	Virtual machine > Configuration > Add new disk
VirtualMachine.Config.AdvancedConfig	Virtual machine > Configuration > Advanced
VirtualMachine.Config.CPUCount	Virtual machine > Configuration > Change CPU Count
VirtualMachine.Config.Memory	Virtual machine > Configuration > Memory
VirtualMachine.Config.RemoveDisk	Virtual machine > Configuration > Remove disk
VirtualMachine.Config.Resource	Virtual machine > Configuration > Change resource
VirtualMachine.Config.Settings	Virtual machine > Configuration > Settings
VirtualMachine.Interact.PowerOff	Virtual machine > Interaction > Power Off
VirtualMachine.Interact.PowerOn	Virtual machine > Interaction > Power On
VirtualMachine.Interact.Reset	Virtual machine > Interaction > Reset

VirtualMachine.Interact.Suspend	Virtual machine > Interaction > Suspend
VirtualMachine.Inventory.Create	Virtual machine > Inventory > Create new
VirtualMachine.Inventory.CreateFromExisting	Virtual machine > Inventory > Create from existing
VirtualMachine.Inventory.Delete	Virtual machine > Inventory > Remove
VirtualMachine.Inventory.Register	Virtual machine > Inventory > Register
VirtualMachine.Provisioning.Clone	Virtual machine > Provisioning > Clone template
VirtualMachine.Provisioning.DiskRandomAccess	Virtual machine > Provisioning > Allow disk access
VirtualMachine.Provisioning.GetVmFiles	Virtual machine > Provisioning > Allow virtual machine download
VirtualMachine.Provisioning.PutVmFiles	Virtual machine > Provisioning > Allow virtual machine files upload
VirtualMachine.Provisioning.DeployTemplate	Virtual machine > Provisioning > Deploy template
VirtualMachine.Provisioning.MarkAsVM	Virtual machine > Provisioning > Mark as virtual machine
VirtualMachine.State.CreateSnapshot	vSphere 5.0, Update 2 and vSphere 5.1, Update 1: Virtual machine > State > Create snapshot vSphere 5.5: Virtual machine > Snapshot management > Create snapshot
VirtualMachine.State.RemoveSnapshot	vSphere 5.0, Update 2 and vSphere 5.1, Update 1: Virtual machine > State > Remove snapshot vSphere 5.5: Virtual machine > Snapshot management > Remove snapshot
VirtualMachine.State.RevertToSnapshot	vSphere 5.0, Update 2 and vSphere 5.1, Update 1: Virtual machine > State > Revert to snapshot vSphere 5.5: Virtual machine > Snapshot management > Revert to snapshot

- If you want the VMs you create to be tagged, add the following permissions for the user account:

SDK	User Interface
Global.ManageCustomFields	Global > Manage custom attributes
Global.SetCustomField	Global > Set custom attribute

To ensure that you use a clean base image for creating new VMs, tag VMs created with Machine Creation Services to exclude them from the list of VMs available to use as base images.

Obtain and import a certificate

To protect vSphere communications, Citrix recommends that you use HTTPS rather than HTTP. HTTPS requires digital certificates. Citrix recommends you use a digital certificate issued from a certificate authority in accordance with your organization's security policy.

If you are unable to use a digital certificate issued from a certificate authority, and your organization's security policy permits it, you can use the VMware-installed self-signed certificate. Add the VMware vCenter certificate to each Controller. Follow this procedure:

1. Add the fully qualified domain name (FQDN) of the computer running vCenter Server to the hosts file on that server, located at %SystemRoot%/WINDOWS/system32/Drivers/etc/. This step is required only if the FQDN of the computer running vCenter Server is not already present in the domain name system.
2. Obtain the vCenter certificate using any of the following methods:
 - From the vCenter server:
 - a. Copy the file rui.crt from the vCenter server to a location accessible on your Delivery Controllers.
 - b. On the Controller, navigate to the location of the exported certificate and open the rui.crt file.
 - Download the certificate using a web browser. If you are using Internet Explorer, depending on your user account, you may need to right-click on Internet Explorer and choose Run as Administrator to download or install the certificate.
 - a. Open your web browser and make a secure web connection to the vCenter server; for example https://server1.domain1.com
 - b. Accept the security warnings.
 - c. Click on the address bar where it shows the certificate error.
 - d. View the certificate and click on the Details tab.
 - e. Select Copy to file and export in .CER format, providing a name when prompted to do so.
 - f. Save the exported certificate.
 - g. Navigate to the location of the exported certificate and open the .CER file.
 - Import directly from Internet Explorer running as an administrator:

- a. Open your web browser and make a secure web connection to the vCenter server; for example `https://server1.domain1.com`.
 - b. Accept the security warnings.
 - c. Click on the address bar where it shows the certificate error.
 - d. View the certificate.
- Import the certificate into the certificate store on each of your Controllers:
 - a. Click Install certificate, select Local Machine, and then click Next.
 - b. Select Place all certificates in the following store, and then click Browse.
 - c. If you are using Windows Server 2008 R2:
 - i. Select the Show physical stores check box.
 - ii. Expand Trusted People.
 - iii. Select Local Computer.
 - iv. Click Next, then click Finish.
 - If you are using Windows Server 2012 or Windows Server 2012 R2:
 - i. Select Trusted People, then click OK.
 - ii. Click Next, then click Finish.

Important: If you change the name of the vSphere server after installation, you must generate a new self-signed certificate on that server before importing the new certificate.

Create a master VM

Use a master VM to provide user desktops and applications.

1. Install a VDA on the master VM, selecting the option to optimize the desktop, which improves performance.
2. Take a snapshot of the master VM to use as a back-up. For more information, see Prepare a master image.

Create virtual desktops

If you are using Studio to create VMs, rather than selecting an existing machine catalog, specify the following information when setting up your hosting infrastructure to create virtual desktops.

1. Select the VMware vSphere host type.

2. Enter the address of the access point for the vCenter SDK (<https://vmware.example.com/sdk>).
3. Enter the credentials for the VMware user account you set up earlier that has permissions to create new VMs. Specify the username in the form *domain/username*.

Prepare the virtualization environment: Microsoft System Center Virtual Machine Manager

Follow this guidance if you use Hyper-V with Microsoft System Center Virtual Machine Manager (VMM) to provide virtual machines.

This release supports:

- VMM 2012 — Provides improved management capabilities, letting you manage the entire virtualized datacenter as well as virtual machines. This release now orchestrates cluster host patching as well as integrating with Windows Server Update Services, allowing you to define baselines of patches that each host needs.
- VMM 2012 SP1 — Provides performance improvements for Machine Creation Services (MCS) when using SMB 3.0 on file servers with clustered shared volumes and Storage Area Networks (SANs). These file shares provide low cost caching and reduced IO on the SAN storage improving the performance.
- VMM 2012 R2 — Enables at-scale management of major Windows Server 2012 R2 capabilities, including running VM snapshots, dynamic VHDX resize, and Storage Spaces.

This release supports only Generation 1 virtual machines with VMM 2012 R2. Generation 2 virtual machines are not supported for Machine Creation Services (MCS) and Provisioning Services deployments. When creating VMs with MCS or Provisioning Services, Generation 2 VMs do not appear in the selection list for a master VM; they have Secure Boot enabled by default, which prevents the VDA from functioning properly.

Upgrade VMM

- Upgrade from VMM 2012 to VMM 2012 SP1 or VMM 2012 R2

For VMM and Hyper-V Hosts requirements, see <http://technet.microsoft.com/en-us/library/gg610649.aspx>. For VMM Console requirements, see <http://technet.microsoft.com/en-us/library/gg610640.aspx>.

A mixed Hyper-V cluster is not supported. An example of a mixed cluster is one in which half the cluster is running Hyper-V 2008 and the other is running Hyper-V 2012.

- Upgrade from VMM 2008 R2 to VMM 2012 SP1

If you are upgrading from XenDesktop 5.6 on VMM 2008 R2, follow this sequence to avoid XenDesktop downtime.

1. Upgrade VMM to 2012 (now running XenDesktop 5.6 and VMM 2012)
2. Upgrade XenDesktop to the latest version (now running the latest XenDesktop and VMM 2012)
3. Upgrade VMM from 2012 to 2012 SP1 (now running the latest XenDesktop and VMM 2012 SP1)

- Upgrade from VMM 2012 SP1 to VMM 2012 R2

If you are starting from XenDesktop or XenApp 7.x on VMM 2012 SP1, follow this sequence to avoid XenDesktop downtime.

1. Upgrade XenDesktop or XenApp to the latest version (now running the latest XenDesktop or XenApp, and VMM 2012 SP1)
2. Upgrade VMM 2012 SP1 to 2012 R2 (now running the latest XenDesktop or XenApp, and VMM 2012 R2)

Installation and configuration summary

1. Install and configure a hypervisor.
 - a. Install Microsoft Hyper-V server and VMM on your servers. All Delivery Controllers must be in the same forest as the VMM servers.
 - b. Install the System Center Virtual Machine Manager console on all Controllers.
 - c. Verify the following account information:
 - The account you use to specify hosts in Studio is a VMM administrator or VMM delegated administrator for the relevant Hyper-V machines. If this account only has the delegated administrator role in VMM, the storage data is not listed in Studio during the host creation process.
 - The user account used for Studio integration must also be a member of the administrators local security group on each Hyper-V server to support VM life cycle management (such as VM creation, update, and deletion).

Note: Installing Controller on a server running Hyper-V is not supported.

2. Create a master VM.
 - a. Install a Virtual Delivery Agent on the master VM, and select the option to optimize the desktop. This improves performance.
 - b. Take a snapshot of the master VM to use as a backup.
For more information, see Prepare a master image.
3. Create virtual desktops. If you are using MCS to create VMs, when creating a Site or a connection,
 - a. Select the Microsoft virtualization host type.
 - b. Enter the address as the fully qualified domain name of the host server.
 - c. Enter the credentials for the administrator account you set up earlier that has permissions to create new VMs.
 - d. In the Host Details dialog box, select the cluster or standalone host to use when creating new VMs.

Important: Browse for and select a cluster or standalone host even if you are using a single Hyper-V host deployment.

MCS on SMB 3 file shares

For Machine Catalogs created with MCS on SMB 3 file shares for VM storage, make sure that credentials meet the following requirements so that calls from the Controller's Hypervisor Communications Library (HCL) connect successfully to SMB storage:

- VMM user credentials must include full read write access to the SMB storage.

- Storage virtual disk operations during VM life cycle events are performed through the Hyper-V server using the VMM user credentials.

When you use SMB as storage, enable the Authentication Credential Security Support Provider (CredSSP) from the Controller to individual Hyper-V machines when using VMM 2012 SP1 with Hyper-V on Windows Server 2012. For more information, see [CTX137465](#).

Using a standard PowerShell V3 remote session, the HCL uses CredSSP to open a connection to the Hyper-V machine. This feature passes Kerberos-encrypted user credentials to the Hyper-V machine, and the PowerShell commands in the session on the remote Hyper-V machine run with the credentials provided (in this case, those of the VMM user), so that communication commands to storage work correctly.

The following tasks use PowerShell scripts that originate in the HCL and are then sent to the Hyper-V machine to act on the SMB 3.0 storage.

- **Consolidate Master Image** - A master image creates a new MCS provisioning scheme (machine catalog). It clones and flattens the master VM ready for creating new VMs from the new disk created (and removes dependency on the original master VM).

ConvertVirtualHardDisk on the root\virtualization\v2 namespace

Example:

```
$ims = Get-WmiObject -class $class -namespace "root\virtualization\v2";  
$result = $ims.ConvertVirtualHardDisk($diskName, $vhdaext)  
$result
```

- **Create difference disk** - Creates a difference disk from the master image generated by consolidating the master image. The difference disk is then attached to a new VM.

CreateVirtualHardDisk on the root\virtualization\v2 namespace

Example:

```
$ims = Get-WmiObject -class $class -namespace "root\virtualization\v2";  
$result = $ims.CreateVirtualHardDisk($vhdaext);  
$result
```

- **Upload identity disks** - The HCL cannot directly upload the identity disk to SMB storage. Therefore, the Hyper-V machine must upload and copy the identity disk to the storage. Because the Hyper-V machine cannot read the disk from the Controller, the HCL must first copy the identity disk through the Hyper-V machine as follows.
 1. The HCL uploads the Identity to the Hyper-V machine through the administrator share.
 2. The Hyper-V machine copies the disk to the SMB storage through a PowerShell script running in the PowerShell remote session. A folder is created on the Hyper-V machine and the permissions on that folder are locked for the VMM user only (through the remote PowerShell connection).
 3. The HCL deletes the file from the administrator share.
 4. When the HCL completes the identity disk upload to the Hyper-V machine, the remote PowerShell session copies the identity disks to SMB storage and then deletes

it from the Hyper-V machine.

The identity disk folder is recreated if it is deleted so that it is available for reuse.

- **Download identity disks** - As with uploads, the identity disks pass through the Hyper-V machine to the HCL. The following process creates a folder that only has VMM user permissions on the Hyper-V server if it does not exist.
 1. The HyperV machine copies the disk from the SMB storage to local Hyper-V storage through a PowerShell script running in the PowerShell V3 remote session.
 2. HCL reads the disk from the Hyper-V machine's administrator share into memory.
 3. HCL deletes the file from the administrator share.
- **Personal vDisk creation** - If the administrator creates the VM in a Personal vDisk machine catalog, you must create an empty disk (PvD).

The call to create an empty disk does not require direct access to the storage. If you have PvD disks that reside on different storage than the main or operating system disk, then use remote PowerShell to create the PvD in a directory folder that has the same name of the VM from which it was created. For CSV or LocalStorage, do not use remote PowerShell. Creating the directory before creating an empty disk avoids VMM command failure.

From the Hyper-V machine, perform a mkdir on the storage.

Prepare for using Microsoft System Center Configuration Manager

Sites that use System Center Configuration Manager (Configuration Manager) 2012 to manage access to applications and desktops on physical devices can extend that use to XenApp or XenDesktop through these integration options.

- **Citrix Connector 7.5 for Configuration Manager 2012** - Citrix Connector provides a bridge between Configuration Manager and XenApp or XenDesktop. The Connector enables you to unify day-to-day operations across the physical environments you manage with Configuration Manager and the virtual environments you manage with XenApp or XenDesktop. For information about the Connector, see [Citrix Connector 7.5 for System Center Configuration Manager 2012](#).
- **Configuration Manager Wake Proxy feature** - Whether or not your environment includes Citrix Connector, the Remote PC Access Wake on LAN feature requires Configuration Manager. For more information, see [Configuration Manager and Remote PC Access Wake on LAN](#).
- **XenApp and XenDesktop properties** - XenApp and XenDesktop properties enable you to identify Citrix virtual desktops for management through Configuration Manager. These properties are automatically used by the Citrix Connector but can also be manually configured, as described in the following section.

Properties

Properties are available to Microsoft System Center Configuration Manager 2012 and 2012 R2 to manage virtual desktops.

Boolean properties displayed in Configuration Manager 2012 may appear as 1 or 0, not true or false.

The properties are available for the Citrix_virtualDesktopInfo class in the Root\Citrix\DesktopInformation namespace. Property names come from the Windows Management Instrumentation (WMI) provider.

Property	Description
AssignmentType	Sets the value of IsAssigned. Valid values are: <ul style="list-style-type: none">• ClientIP• ClientName• None• User - Sets IsAssigned to True
BrokerSiteName	Site; returns the same value as HostIdentifier.

DesktopCatalogName	Machine Catalog associated with the desktop.
DesktopGroupName	Delivery Group associated with the desktop.
HostIdentifier	Site; returns the same value as BrokerSiteName.
IsAssigned	True to assign the desktop to a user, set to False for a random desktop.
IsMasterImage	Allows decisions about the environment. For example, you may want to install applications on the Master Image and not on the provisioned machines, especially if those machines are in a clean state on boot machines. Valid values are: <ul style="list-style-type: none"> • True on a VM that is used as a master image (this value is set during installation based on a selection). • Cleared on a VM that is provisioned from that image.
IsVirtualMachine	True for a virtual machine, false for a physical machine.
OSChangesPersist	False if the desktop operating system image is reset to a clean state every time it is restarted; otherwise, true.
PersistentDataLocation	The location where Configuration Manager stores persistent data. This is not accessible to users.
PersonalvDiskDriveLetter	For a desktop with a Personal vDisk, the drive letter you assign to the Personal vDisk.
BrokerSiteName, DesktopCatalogName, DesktopGroupName, HostIdentifier	Determined when the desktop registers with the Controller; they are null for a desktop that has not fully registered.

To collect the properties, run a hardware inventory in Configuration Manager. To view the properties, use the Configuration Manager Resource Explorer. In these instances, the names may include spaces or vary slightly from the property names. For example, **BrokerSiteName** may appear as Broker Site Name. For information about the following tasks, see [Citrix WMI Properties and System Center Configuration Manager 2012](#):

- Configure Configuration Manager to collect Citrix WMI properties from the Citrix VDA
- Create query-based device collections using Citrix WMI properties
- Create global conditions based on Citrix WMI properties
- Use global conditions to define application deployment type requirements

You can also use Microsoft properties in the Microsoft class CCM_DesktopMachine in the Root\ccm_vdi namespace. For more information, see the Microsoft documentation.

Configuration Manager and Remote PC Access Wake on LAN

For information about planning for and delivering Remote PC Access, see [Remote PC Access](#) and [Provide users with Remote PC Access](#).

To configure the Remote PC Access Wake on LAN feature, complete the following before installing a VDA on the office PCs and using Studio to create or update the Remote PC Access deployment:

- Configure Configuration Manager 2012 within the organization, and then deploy the Configuration Manager client to all Remote PC Access machines, allowing time for the scheduled SCCM inventory cycle to run (or forcing one manually, if required). The access credentials you specify in Studio to configure the connection to Configuration Manager must include collections in the scope and the Remote Tools Operator role.
- For Intel Active Management Technology (AMT) support:
 - The minimum supported version on the PC must be AMT 3.2.1.
 - Provision the PC for AMT use with certificates and associated provisioning processes.
- For Configuration Manager Wake Proxy and/or magic packet support:
 - Configure Wake on LAN in each PC's BIOS settings.
 - For Configuration Manager Wake Proxy support, enable the option in Configuration Manager. For each subnet in the organization that contains PCs that will use the Remote PC Access Wake on LAN feature, ensure that three or more machines can serve as sentinel machines.
 - For magic packet support, configure network routers and firewalls to allow magic packets to be sent, using either a subnet-directed broadcast or unicast.

After you install the VDA on office PCs, enable or disable power management when you create the Remote PC Access deployment in Studio.

- If you enable power management, specify connection details: the Configuration Manager address and access credentials, plus a name.
- If you do not enable power management, you can add a power management (Configuration Manager) connection later and then edit a Remote PC Access machine catalog to enable power management and specify the new power management connection.

You can edit a power management connection to configure the use of the Configuration Manager Wake Proxy and magic packets, as well as change the packet transmission method.

Install using the graphical interface

Before beginning any installation, review and complete the tasks in [Prepare to install](#).

Launch the installer graphical interface:

1. Download the product package and unzip it. Optionally, burn a DVD of the ISO file.
2. Log on to the server where you are installing the components, using a local administrator account.
3. Insert the DVD in the drive or mount the ISO file. If the installer does not launch automatically, double-click the AutoSelect application or the mounted drive.
4. Select the component you want to install:
 - If you're just getting started, select Delivery Controller. From there, you can install the Delivery Controller and optionally, Studio, Director, License Server, and StoreFront on the same server.
 - If you've already installed some components and want to extend your deployment, click the component you want to install from the right column. This column offers core components and the Universal Print Server, which you can install on your print server.
 - To install a Virtual Delivery Agent (VDA), click the available VDA entry - the installer knows which one is right for the operating system where you're running the installer.

Later, if you want to customize a VDA that you've already installed:

1. From the Windows feature for removing or changing programs, select Citrix Virtual Delivery Agent <version-number>, then right-click and select Change.
2. Select Customize Virtual Delivery Agent Settings. When the installer launches, you can change the Controller addresses, TCP/IP port to register with the Controller (default = 80), or whether to automatically open Windows Firewall port exceptions.

You can also use the graphical interface to upgrade components; see [Upgrade a deployment](#).

As an alternative to using the full-product ISO to install VDAs, you can use a standalone VDA installation package. For details, see [Install VDAs using the standalone package](#).

Install using the command line

Use the command line interface to:

- Install one or more core components: Delivery Controller, Citrix Studio, Citrix Director, License Server, and StoreFront.
- Install a Virtual Delivery Agent (VDA) on a master image or on a virtual or physical machine.

You can also customize scripts provided on the media, then use them to install and remove VDAs in Active Directory.

- Customize a previously-installed VDA.
- Install a Universal Print Server, which provisions network session printers. (The Controller already has the Universal Print Server functionality; you need only install the Universal Print Server on the print servers in your environment.)

You can also:

- Remove components from this version that you previously installed, using the `/remove` or `/removeall` options. For details, see [Remove components](#).
- Upgrade components; for details, see [Upgrade a deployment](#).

To see command execution progress and return values, you must be the original administrator or use 'Run as administrator.' For more information, see the Microsoft command documentation.

Important: Before beginning an installation, read and complete the tasks in [Prepare to install](#).

Install core components using the command line

From the `\x64\XenDesktop Setup` directory on the media, run the `XenDesktopServerSetup.exe` command. The following table describes command options.

Note: To install XenApp, include the `/xenapp` option on the command line. To install XenDesktop, do not include the `/xenapp` option.

Option	Description
<code>/help</code> or <code>/h</code>	Displays command help.
<code>/quiet</code> or <code>/passive</code>	No user interface appears during the installation. The only evidence of the installation process is in Windows Task Manager. If this option is omitted, the graphical interface launches.

<code>/logpath <i>path</i></code>	Log file location. The specified folder must already exist; the installer does not create it. Default = "%TEMP%\Citrix\XenDesktop Installer"
<code>/noreboot</code>	Prevents a restart after installation. (For most core components, a restart is not enabled by default.)
<code>/remove</code>	Removes the core components specified with the <code>/components</code> option.
<code>/removeall</code>	Removes all installed core components.
<code>/xenapp</code>	Installs XenApp. If this option is omitted, XenDesktop is installed.
<code>/configure_firewall</code>	Opens all ports in the Windows firewall needed by components being installed, if the Windows Firewall Service is running, even if the firewall is not enabled. If you are using a third-party firewall or no firewall, you must manually open the ports.
<code>/components <i>component</i> [,<i>component</i>] ...</code>	<p>(Required.) Comma-separated list of components to install or remove. Valid values are:</p> <ul style="list-style-type: none"> • CONTROLLER - Controller • DESKTOPSTUDIO - Studio • DESKTOPDIRECTOR - Director • LICENSESERVER - Citrix Licensing • STOREFRONT - StoreFront <p>If this option is omitted, all components are installed (or removed, if the <code>/remove</code> option is also specified).</p>
<code>/installdir <i>directory</i></code>	Existing empty directory where components will be installed. Default = c:\Program Files\Citrix.
<code>/tempdir <i>directory</i></code>	Directory that holds temporary files during installation. Default = c:\Windows\Temp.
<code>/nosql</code>	Prevents installation of Microsoft SQL Server Express on the server where you are installing the Controller. If this option is omitted, SQL Server Express will be installed.
<code>/no_remote_assistance</code>	(Valid only when installing Director.) Prevents the installation and enabling of the Windows Remote Assistance feature.

For example, the following command installs a XenDesktop Controller, Studio, Citrix Licensing, and SQL Server Express on the server. Ports required for component communications will be opened automatically.

```
\x64\XenDesktop Setup\XenDesktopServerSetup.exe /components
controller,desktopstudio,licenseserver /configure_firewall
```

The following command installs a XenApp Controller, Studio, and SQL Server Express on the server. Ports required for component communication will be opened automatically.

```
\x64\XenDesktop Setup\XenDesktopServerSetup.exe /xenapp /components
controller,desktopstudio /configure_firewall
```

Install a VDA using the command line

When installing a VDA for use with Remote PC Access, specify only options that are valid on physical machines (not VMs or master images) and for VDAs for Windows Desktop OS.

From the \x64\XenDesktop Setup directory on the product media, run the XenDesktopVdaSetup.exe command. The following table describes command options. Unless otherwise noted, options apply to physical and virtual machines, and to VDAs for Windows Desktop OS and VDAs for Windows Server OS.

Option	Description
/h or /help	Displays command help.
/quiet or /passive	No user interface appears during the installation. The only evidence of the installation and configuration process is in Windows Task Manager. If this option is omitted, the graphical interface launches.
/logpath <i>path</i>	Log file location. The specified folder must already exist; the installer does not create it. Default = "%TEMP%\Citrix\XenDesktop Installer"
/noreboot	Prevents a restart after installation. The VDA will not be fully available for use until after a restart.
/remove	Removes the components specified with the /components option.
/removeall	Removes all installed VDA components.
/reconfig	Customizes previously-configured VDA settings when used with the /portnumber, /controllers, or /enable_hdx_ports options. If you specify this option without also specifying the /quiet option, the graphical interface for customizing the VDA launches.
/portnumber <i>port</i>	(Valid only if the /reconfig option is specified.) Port number to enable for communications between the VDA and the Controller. The previously-configured port is disabled, unless it is port 80.
/components component[,component]	Comma-separated list of components to install or remove. Valid values are: <ul style="list-style-type: none"> • VDA - installs the VDA • PLUGINS - installs the Citrix Receiver for Windows (CitrixReceiver.exe) If this option is omitted, all components are installed.
/installdir <i>directory</i>	Existing empty directory where components will be installed. Default = c:\Program Files\Citrix.

<code>/tempdir <i>directory</i></code>	Directory to hold temporary files during installation. (This option is not available in the graphical interface.) Default = c:\Windows\Temp.
<code>/site_guid <i>guid</i></code>	Globally Unique Identifier of the site Active Directory Organizational Unit (OU). This associates a virtual desktop with a Site when you are using Active Directory for discovery (auto-update is the recommended and default discovery method). The site GUID is a site property displayed in Studio. Do not specify both the <code>/site_guid</code> and <code>/controllers</code> options.
<code>/controllers "<i>controller</i> [<i>controller</i>] [...]"</code>	Space-separated Fully Qualified Domain Names (FQDNs) of Controllers with which the VDA can communicate, enclosed in quotation marks. Do not specify both the <code>/site_guid</code> and <code>/controllers</code> options.
<code>/xa_server_location <i>url</i></code>	URL of the server for Windows server applications.
<code>/enable_remote_assistance</code>	Enables Windows Remote Assistance for use with Director. If you specify this option, Windows opens TCP port 3389 in the firewall, even if you omit the <code>/enable_hdx_ports</code> option.
<code>/enable_hdx_ports</code>	Opens ports in the Windows firewall required by the Controller and features you specified (Windows Remote Assistance, real-time transport, and optimize), if the Windows Firewall Service is detected, even if the firewall is not enabled. If you are using a different firewall or no firewall, you must configure the firewall manually.
<code>/optimize</code>	Enables optimization for VDAs running in a VM on a hypervisor. VM optimization includes disabling offline files, disabling background defragmentation, and reducing event log size. Do not specify this option for Remote PC Access. For more information about the optimization tool, see CTX125874 .
<code>/baseimage</code>	(Valid only when installing a VDA for Windows Desktop OS on a VM.) Enables the use of Personal vDisks with a master image. For more information, see Personal vDisks .
<code>/enable_hdx_3d_pro</code>	Installs the VDA for HDX 3D Pro. For more information, see the HDX 3D Pro documentation.
<code>/enable_real_time_transport</code>	Enables or disables use of UDP for audio packets (Real-Time Audio Transport for audio). Enabling this feature can improve audio performance. Include the <code>/enable_hdx_ports</code> option if you want the UDP ports opened automatically if the Windows Firewall Service is detected.
<code>/masterimage</code>	(Valid only when installing a VDA on a VM.) Sets up the VDA as a master image.
<code>/virtualmachine</code>	(Valid only when installing a VDA on a VM.) Overrides detection by the installer of a physical machine, where BIOS information passed to VMs makes them appear as physical machines.

/nodesktopexperience	(Valid only when installing a VDA for Windows Server OS.) Prevents enabling of the Enhanced Desktop Experience feature. This feature is also controlled with the Enhanced Desktop Experience Citrix policy setting.
/nocitrixwddm	(Valid only on Windows 7 machines that do not include a WDDM driver.) Disables installation of the Citrix WDDM driver.
/servervdi	Installs a VDA for Windows Desktop OS on a supported Windows Server. Omit this option when installing a VDA for Windows Server OS on a Windows Server. Before using this option, see Server VDI .
/installwithsecurebootenable d	Allows VDA installation when Secure Boot is enabled. If this option is omitted, a warning displays that Secure Boot must be disabled to successfully install a VDA.
/exclude "Personal vDisk","Machine Identity Service"	(Valid only when upgrading from an earlier 7.x VDA version on a physical machine.) Excludes Personal vDisk and Machine Identity Service from the upgrade. For advanced use of this option, see CTX140972 .

For example, the following command installs a VDA for Windows Desktop OS and Citrix Receiver to the default location on a VM. This VDA will be used as a master image. The VDA will register initially with the Controller on the server named 'Contr-Main' in the domain 'mydomain,' and will use Personal vDisks, the optimization feature, and Windows Remote Assistance.

```
\x64\XenDesktop Setup\XenDesktopVdaSetup.exe /quiet /components  
vda,plugins /controllers "Contr-Main.mydomain.local" /enable_hdx_ports /optimize  
/masterimage /baseimage /enable_remote_assistance
```

The following command installs a VDA for Windows Desktop OS and Citrix Receiver to the default location on an office PC that will be used with Remote PC Access. The machine will not be restarted after the VDA is installed; however, a restart is required before the VDA can be used. The VDA will register initially with the Controller on the server named 'Contr-East' in the domain 'mydomain,' and will use UDP for audio packets. HDX ports will be opened if the Windows Firewall service is detected.

```
\x64\XenDesktop Setup\XenDesktopVdaSetup.exe /quiet  
/components vda,plugins /controllers "Contr-East.mydomain.local" /enable_hdx_ports  
/enable_real_time_transport /noreboot
```

As an alternative to using the full-product ISO to install VDAs, you can use a standalone VDA installation package. For details, see [Install VDAs using the standalone package](#).

Customize a VDA using the command line

After you install a VDA, you can customize several settings. From the \x64\XenDesktop Setup directory on the product media, run the XenDesktopVdaSetup.exe command, using one or more of the following options, which are described above.

- /reconfigure - this option is required when customizing a VDA
- /h or /help

- /quiet
- /noreboot
- /controllers
- /portnumber *port*
- /enable_hdx_ports

Install the Universal Print Server using the command line

Run one of the following commands on each print server:


- On a supported 32-bit operating system: From the \x86\Universal Print Server\ directory on the Citrix installation media, run UpsServer_x86.msi.
- On a supported 64-bit operating system: From the \x64\Universal Print Server\ directory on the Citrix installation media, run UpsServer_x64.msi.

Create a Site

A Site is the name you give to a product deployment. It comprises the Delivery Controllers and the other core components, VDAs, virtual resource connections (if used), plus the machine catalogs and Delivery Groups you create and manage. A Site does not necessarily correspond to a geographical location, although it can. You create the Site after you install the components and before creating machine catalogs and Delivery Groups.

Prepare

The following table describes the tasks to complete and things to consider or be aware of before starting the Site creation wizard in Studio.

 Description	
	<p>Decide which type of Site you will create:</p> <ul style="list-style-type: none">• Application and desktop delivery Site - When you choose to create an application and desktop delivery Site, you can further choose to create a <i>full deployment</i> Site (recommended) or a <i>empty</i> Site. (Empty Sites are only partially configured, and are usually created by advanced users.)• Remote PC Access Site - Allows designated users to remotely access their office PCs through a secure connection. If you will use the Remote PC Access Wake on LAN feature, complete the tasks described in Configuration Manager and Remote PC Access Wake on LAN. <p>If you create an application and desktop delivery deployment now, you can add a Remote PC Access deployment later. Conversely, if you create a Remote PC Access deployment now, you can add a full deployment later.</p>

Site creation includes creating the Site Configuration database. Make sure the SQL Server software is installed before you create a Site.

To create the database, you must be a local administrator and a domain user. You must also either have SQL Server permissions, or you can generate scripts to give to your database administrator to run.

- Permissions - you need the following permissions when setting up the database; the permissions can be explicitly configured or acquired by Active Directory group membership:

Operation	Purpose	Server role	Database role
Database creation	Create a suitable empty database	dbcreator	
Schema creation	Create all service-specific schemas and add the first Controller to the Site	securityadmin *	db_owner
Add Controller	Add a Controller (other than the first) to the Site	securityadmin *	db_owner
Add Controller (mirror server)	Add a Controller login to the database server currently in the mirror role of a mirrored database	securityadmin *	
Schema update	Apply schema updates or hotfixes		db_owner

* While technically more restrictive, in practice, the securityadmin server role should be treated as equivalent to the sysadmin server role.

When using Studio to perform these operations, the user account must be a member of the sysadmin server role.

If your Studio user credentials do not include these permissions, you are prompted for SQL Server user credentials.

- Scripts - If your database server is locked down and you do not have the required SQL Server permissions, the Site creation wizard can generate two database scripts: one that sets up the database and the other to use in a mirroring environment. After you request script generation, you give the generated scripts to your database administrator (or someone with required SQL Server permissions) to run on the database server, and the mirrored database, if needed. After the script is executed and the database is successfully created, you can finish creating the Site.

	<p>Consider if you will use the 30-day free trial license that allows you to add license files later, or if you will use existing licenses. You can add or download license files from within the Site creation wizard.</p>
	<p>Configure your virtualization resource (host) environment.</p> <p>If you use XenServer:</p> <ul style="list-style-type: none"> • See the XenServer documentation. • You must provide the credentials for a VM Power Admin or higher-level user. • Citrix recommends using HTTPS to secure communications with XenServer. To use HTTPS, you must replace the default SSL certificate that was installed on XenServer with a certificate from a trusted authority; see CTX128656. • You can configure high availability if it is enabled on the XenServer. • Citrix recommends that you select all servers in the pool to allow communication with XenServer if the pool master fails. • You can also select a GPU type and group, or passthrough, if the XenServer supports vGPU. The display indicates if the selection has dedicated GPU resources. <p>If you use VMware, see that product's documentation and Prepare the virtualization environment: VMware.</p> <p>If you are using Hyper-V, see that product's documentation and Prepare the virtualization environment: Microsoft System Center Virtual Machine Manager.</p> <p>Decide if you will use Machine Creation Services (MCS) or other tools to create VMs on the virtualization resources.</p> <p>Decide if you will use shared or local storage. Shared storage is available through the network. If you use shared storage, you can enable the use of IntelliCache to reduce load on the storage device. For information, see Use IntelliCache for XenServer connections.</p> <p>Decide if you will use Personal vDisks and whether they will use shared or local storage. Personal vDisks can use the same or different storage as the VMs.</p> <p>If you installed product components in a cloud environment, you will need the API key and secret key values when configuring the first connection. You can export the key file containing those values from AWS or CloudPlatform, and then import them into the Site creation wizard.</p> <p>When you create a Site for a cloud deployment, you will also need the region, availability zone, VPC name, subnet addresses, domain name, security group names, and credentials you configured in AWS.</p>
	<p>Decide if you will use App-V publishing, and configure those resources, if needed.</p>

Good to know:

- When you create a Remote PC Access Site:
 - A machine catalog named Remote PC Access Machines, and a Delivery Group named Remote PC Access Desktops are automatically created.
 - You must specify users or user groups; there is no default action that automatically adds all users.
 - You can enable the Wake on LAN feature (power management) and specify the Microsoft System Center Configuration Manager (ConfigMgr) address and credentials, plus a connection name.
- The user who creates a Site becomes a Full Administrator; for more information, see Delegated Administration.
- When an empty database is created, it has default attributes except:
 - The collation sequence is set to Latin1_General_100_CI_AS_KS (where Latin1_General varies, depending on the country, for example Japanese_100_CI_AS_KS). If this collation setting is not specified during database creation, subsequent creation of the service schemas within the database will fail, and an error similar to "<service>: schema requires a case-insensitive database" appears. (When a database is created manually, any collation sequence can be used, provided it is case-sensitive, accent-sensitive, and kanatype-sensitive; the collation sequence name typically ends with _CI_AS_KS.)
 - The recovery mode is set to Simple. For use as a mirrored database, change the recovery mode to Full.
- When you create the Site Configuration Database, it also stores configuration changes recorded by the Configuration Logging Service, plus trend and performance data that is used by the Monitoring Service and displayed by Citrix Director. If you use those features and store more than seven days of data, Citrix recommends that you specify different locations for the Configuration Logging Database and the Monitoring Database (known as the *secondary databases*) after you create a Site.
- At the end of the Site creation wizard, you are asked if you want to participate in the Citrix Customer Experience Improvement Program. When you join this program, anonymous statistics and usage information is sent to Citrix; see [About the Citrix Customer Experience Improvement Program](#) for more information.

Create

Start Studio, if it is not already open. After you choose to create a Site from the center pane, specify the following:

- The type of Site and the Site name.
- Database information. If you chose during Controller installation to have the default SQL Server Express database installed, some information is already provided. If you use a database server that is installed on a different server, enter the database server and

name:

Database type	What to enter	With this database configuration
Standalone or mirror	<i>servername</i>	The default instance is used and SQL Server uses the default port.
	<i>servername\INSTANCENAME</i>	A named instance is used and SQL Server uses the default port.
	<i>servername,port-number</i>	The default instance is used and SQL Server uses a custom port. (The comma is required.)
Other	<i>cluster-name</i>	A clustered database.
	<i>availability-group-listener</i>	An AlwaysOn database.

After you click Next and are alerted that the services could not connect to a database, indicate that you want Studio to create it. If you do not have permission to edit the database, use Generate database script. The scripts must be run before you can finish creating the Site.

- License Server address in the form *name:[port]*, where *name* is a Fully Qualified Domain Name (FQDN), NetBIOS, or IP address; FQDN is the recommended format. If you omit the port number, the default is 27000. You cannot proceed until a successful connection is made to the license server.
- (Remote PC Access Sites only.) Power management information, including ConfigMgr connection information.
- Connection information to your virtualization resource and storage information. If you are not using a resource, or if you will use Studio to manage user desktops hosted on dedicated blade PCs, select the connection type None.
- App-V management and App-V publishing server information.
- (Remote PC Access Sites only.) User and machine accounts information.
 - User information. Click Add Users. Select users and user groups, and then click Add users.
 - Machine accounts information. Click Add machine accounts. Select machine accounts, and then click Add machine accounts. Click Add OUs. Select the domain and Organizational Units, and indicate if items in subfolders should be included. Click Add OUs.

Test a Site configuration

You can view an HTML report of the site test results. To run the tests:

1. From Studio, click the Studio (<site-name>) entry at the top of the left pane.
2. In the center pane, click Test site.

Install or remove Virtual Delivery Agents using scripts

The installation media contains sample scripts that install, upgrade, or remove Virtual Delivery Agents (VDAs) for groups of machines in Active Directory. You can also apply the scripts to individual machines, and use them to maintain master images used by Machine Creation Services and Provisioning Services.

Required access:

- The scripts need Everyone Read access to the network share where the VDA installation command, `XenDesktopVdaSetup.exe`, is located.
- Logging details are stored on each local machine. If you also want to log results centrally for review and analysis, the scripts need Everyone Read and Write access to the appropriate network share.

To check the results of running a script, examine the central log share. Captured logs include the script log, the installer log, and the MSI installation logs. Each installation or removal attempt is recorded in a time-stamped folder. The folder title indicates if the operation was successful with the prefix PASS or FAIL. You can use standard directory search tools to quickly find a failed installation or removal in the central log share, rather than searching locally on the target machines.

Important: Before beginning any installation, read and complete the tasks in [Prepare to install](#).

To install or upgrade VDAs using the script

1. Obtain the sample script InstallVDA.bat from \Support\AdDeploy\ on the installation media. Citrix recommends that you make a backup of the original script before customizing it.
2. Edit the script:
 - Specify the version of the VDA to install: `SET DESIREDVERSION`. For example, version 7 can be specified as 7.0; the full value can be found on the installation media in the ProductVersion.txt file (such as 7.0.0.3018); however, a complete match is not required.
 - Specify the network share location from which the installer will be invoked. Point to the root of the layout (the highest point of the tree): the appropriate version of the installer (32-bit or 64-bit) will be called automatically when the script runs. For example: `SET DEPLOYSHARE=\\fileserver1\share1`.
 - Optionally, specify a network share location for storing centralized logs. For example: `SET LOGSHARE=\\fileserver1\log1`.
 - Specify VDA configuration options as described in [Install using the command line](#). The /quiet and /noreboot options are included by default in the script and are required: `SET COMMANDLINEOPTIONS=/QUIET /NOREBOOT`.
3. Using Group Policy Startup Scripts, assign the script to the OU in Active Directory where your machines are located. This OU should contain only machines on which you want to install the VDA. When the machines in the OU are restarted, the script runs on all of them, installing a VDA on each machine that has a supported operating system.

To remove VDAs using the script

1. Obtain the sample script UninstallVDA.bat from \Support\AdDeploy\ on the installation media. Citrix recommends that you make a backup of the original script before customizing it.
2. Edit the script.
 - Specify the version of the VDA to remove: `SET CHECK_VDA_VERSION`. For example, version 7 can be specified as 7.0; the full value can be found on the installation media in the ProductVersion.txt file (such as 7.0.0.3018); however, a complete match is not required.
 - Optionally, specify a network share location for storing centralized logs.
3. Using Group Policy Startup Scripts, assign the script to the OU in Active Directory where your machines are located. This OU should contain only machines from which you want to remove the VDA. When the machines in the OU are restarted, the script runs on all of them, removing a VDA from each machine.

Troubleshooting

The script generates internal log files that describe script execution progress. The script copies a Kickoff_VDA_Startup_Script log to the central log share within seconds of starting the deployment to the machine, so that you can verify that the overall process is working. If this log is not copied to the central log share as expected, you can troubleshoot further by inspecting the local machine: the script places two debugging log files in the %temp% folder on each machine, for early troubleshooting:

- Kickoff_VDA_Startup_Script_<DateTimeStamp>.log
- VDA_Install_ProcessLog_<DateTimeStamp>.log

Review the content of these logs to ensure that the script is:

- Running as expected.
- Properly detecting the target operating system.
- Correctly configured to point to the ROOT of the DEPLOYSHARE share (contains the file named AutoSelect.exe).
- Capable of authenticating to both the DEPLOYSHARE and LOG shares.

Install VDAs using the standalone package

As an alternative to using the full-product XenApp or XenDesktop ISO to install Virtual Delivery Agents (VDAs), you can use a standalone VDA installation package. The smaller package more easily accommodates deployments using Electronic Software Delivery (ESD) packages that are staged or copied locally, have physical machines, or have remote offices.

The standalone VDA package is intended primarily for deployments that use command-line (silent) installation - it supports the same command line parameters as the `XenDesktopVdaSetup.exe` command, which is used by the full-product installer. The package also offers a graphical interface that is very similar to the VDA installer on the full-product ISO.

There are two self-extracting standalone VDA packages: one for installation on supported server OS machines, and another for supported workstation (desktop) OS machines.

Prerequisites and considerations

The supported operating systems for VDAs, plus other requirements before installation, are listed in [System requirements for XenApp 7.6 and XenDesktop 7.6](#). See [Prepare to install](#) for details about the information you provide and choices you make during VDA installation.

The VDA package automatically deploys prerequisites, if the machine does not already have them; this includes Microsoft Visual C++ 2005, 2008, and 2010 Runtimes (32-bit and 64-bit) and .NET Framework 4.5.1. When installing on a supported server OS machine, the Remote Desktop Services (RDS) role services are installed and enabled before installing the VDA. Alternatively, you can install the prerequisites yourself before installing the VDA.

Exception: Verify that Windows Server 2008 R2 and Windows 7 machines have at least .NET 3.5.1 installed before you start the VDA installation.

About restarts ...

- A restart is required at the end of the VDA installation.
- To minimize the number of additional restarts needed during the installation sequence, ensure that .NET Framework 4.5.1 or 4.5.2 is installed before beginning the VDA installation. Also, for Windows Server OS machines, install and enable the RDS role services before installing the VDA. (Other prerequisites do not typically require machine restarts, so you can let the installer take care of those for you.)
- If you do not install prerequisites before beginning the VDA installation, and you specify the `/noreboot` option for a command line installation, you must manage the restarts. For example, when using automatic prerequisite deployment, the installer will suspend after installing RDS, waiting for a restart; be sure to run the command again after the restart, to continue with the VDA installation.

If you use the graphical interface or the command line interface option that runs the package, the files in the package are extracted to the Temp folder. More disk space is required on the machine when extracting to the Temp folder than when using the full-product ISO. Files extracted to the Temp folder are not automatically deleted, but you can manually delete them (from C:\Windows\Temp\Ctx-*, where * is a random Globally Unique Identifier) after the installation completes. Alternatively, use a third party utility that can extract cabinet archives from EXE files (such as 7-Zip) to extract the files to a directory of your choice, and then run the XenDesktopVdaSetup.exe command.

If your deployment uses Microsoft System Center Configuration Manager, a VDA installation might appear to fail with exit code 3, even though the VDA installed successfully. To avoid the misleading message, you can wrap your installation in a CMD script or change the success codes in your Configuration Manager package. For more information, see the forum discussion [here](#).

How to use

Important: You must either have elevated administrative privileges before starting the installation, or use "Run as administrator."

1. Download the appropriate package to the machine where you will be installing the VDA. Citrix account credentials are required to access the download site.

Where are you installing the VDA?	Download this package
On a supported server OS machine	VDA_ServerSetup.exe
On a supported workstation (desktop) OS machine	VDA_WorkstationSetup.exe

For single user, single server OS deployments (for example, delivering Windows Server 2012 to one user for web development), use the VDA_WorkstationSetup.exe package. For more information, see [Server VDI](#).

2. Install the VDA using the graphical interface or the command line interface.

Remember: You must either have elevated administrative privileges before starting the installation, or use "Run as administrator."

Using the graphical interface:

Right-click the downloaded package and choose Run as administrator. The installer launches and proceeds through the installation wizard. The restart at the end of the wizard is required before the VDA can be used in a site. (The wizard is the same as the one used in the full-product ISO to install a VDA; you won't encounter anything different.)

Using the command line interface:

You have two options:

- **Run the package.**

Run the downloaded package as if it was the XenDesktopVdaSetup.exe command in everything except its name. See [Install using the command line](#) and [CTX140972](#) for parameter information.

For example, the most common installation command used for Remote PC Access installs a VDA on a physical office PC, without installing Citrix Receiver or Citrix Profile Manager. The machine will not automatically be restarted after the VDA is installed; however, a restart is required before the VDA can be used. The VDA will register initially with the Controller on the server named 'Contr-East'. Ports will be opened if the Windows Firewall Service is detected.

```
VDAWorkstationSetup.exe /quiet /components vda /exclude "Citrix User Profile Manager" /controllers "Contr-East.domain.com" /enable_hdx_ports /noreboot
```

- **Extract the files from the package and then run XenDesktopVdaSetup.exe.**

To extract the files before installing, use a third party utility that can extract cabinet archives from EXE files (such as 7-Zip). Then, in a separate command, run XenDesktopVdaSetup.exe from the directory containing the extracted content. See [Install using the command line](#) and [CTX140972](#) for parameter information.

Machine catalogs

Collections of physical or virtual machines are managed as a single entity called a session machine catalog. Many deployments create a master image or template on their host, and then use that in the machine catalog as a guide for Citrix tools (such as Machine Creation Services or Provisioning Services) to create VMs from the image/template. A catalog can also contain physical machines.

After you create a machine catalog, tests run automatically to ensure that it is configured correctly. When the tests complete, you can view a test report. You can also run the tests later on demand from Citrix Studio *site-name* in the Studio navigation pane.

After the tests complete, [Delivery groups](#).

Create a machine catalog

If you will use Citrix tools (Machine Creation Services or Provisioning Services) to create VMs for your deployment, prepare a master image or template on your host hypervisor. Then, create the machine catalog.

Make sure the host has sufficient processors, memory, and storage to accommodate the number of machines you will create.

Prepare a master image

The master image contains the operating system, non-virtualized applications, VDA, and other software. VMs are created in a machine catalog, based on a master image you created earlier and specify when you create the catalog.

Good to know:

- Master image is also known as clone image, golden image, or base image.
- Cloud deployments use templates rather than master images. See the template guidance in [CTX140428](#) for CloudPlatform, and [CTX140427](#) for AWS.
- When using Provisioning Services, you can use a master image or a physical computer as the master target device.
- Remote PC Access machine catalogs do not use master images.
- Microsoft KMS activation considerations when using Machine Creation Services:
 - If your deployment includes 7.x VDAs with a XenServer 6.1 or 6.2, vSphere, or Microsoft System Center Virtual Machine Manager host, you do not need to manually re-arm Microsoft Windows or Microsoft Office.
 - If your deployment includes a 5.x VDA with a XenServer 6.0.2 host, see [CTX128580](#).

Important: If you are using Provisioning Services or Machine Creation Services, do not run Sysprep on master images.

1. Using your hypervisor's management tool, create a new master image and then install the operating system, plus all service packs and updates.

The number of vCPUs and amount of memory are not critical at this point because you can change those values when you create the machine catalog. However, be sure to configure the amount of hard disk space required for desktops and applications, because that value cannot be changed later or in the catalog.

2. Make sure that the hard disk is attached at device location 0. Most standard master image templates configure this location by default, but some custom templates may not.

3. Install and configure the following software on the master image:
 - Integration tools for your hypervisor (such as XenServer Tools, Hyper-V Integration Services, or VMware tools). If you omit this step, your applications and desktops might not function correctly.
 - A VDA for Windows Server OS or VDA for Windows Desktop OS (Citrix recommends installing the latest version to allow access to the newest features. During installation, enable the optimization option, which improves performance by reconfiguring certain Windows features.
 - Third-party tools as needed, such as anti-virus software or electronic software distribution agents. Configure services such as Windows Update with settings that are appropriate for users and the machine type.
 - Third-party applications that you are not virtualizing. Citrix recommends virtualizing applications because it significantly reduces costs by eliminating the need to update the master image after adding or reconfiguring an application. In addition, fewer installed applications reduce the size of the master image hard disks, which saves storage costs.
 - App-V clients with the recommended settings, if you plan to publish App-V applications.
 - When using Machine Creation Services, and you will localize Microsoft Windows, install the locales and language packs. During provisioning, when a snapshot is created, the provisioned VMs use the installed locales and language packs.
4. When using Provisioning Services, create a VHD file for the vDisk from your master target device before you join the master target device to a domain.
5. Join the master image to the domain where desktops and applications will be members, and make sure that the master image is available on the host where the machines will be created.
6. Citrix recommends that you create and name a snapshot of your master image so that it can be identified later. If you specify a master image rather than a snapshot when creating a machine catalog, Studio creates a snapshot, but you cannot name it.

Prepare a master image for GPU-capable machines on XenServer - When using XenServer for your hosting infrastructure, GPU-capable machines require a dedicated master image. Those VMs require video card drivers that support GPUs and must be configured to allow the VM to operate with software that uses the GPU for operations.

1. In XenCenter, create a VM with standard VGA, networks, and vCPU.
2. Update the VM configuration to enable GPU use (either Passthrough or vGPU).
3. Install a supported operating system and enable RDP.
4. Install XenServer Tools and NVIDIA drivers.
5. Turn off the Virtual Network Computing (VNC) Admin Console to optimize performance, and then restart the VM.
6. You are prompted to use RDP. Using RDP, install the VDA and then restart the VM.

7. Optionally, create a snapshot for the VM as a baseline template for other GPU master images.
8. Using RDP, install customer-specific applications that are configured in XenCenter and use GPU capabilities.

Create a machine catalog

Before you start the machine catalog creation wizard, review the following procedure to learn about the choices you will make and information you will supply. When you start the wizard, some of the items may not appear or they may have different titles, based on your environment and the selections you make.

From Studio:

- If you have created a Site but haven't yet created a machine catalog, Studio will guide you to the correct starting place to create a machine catalog.
- If you have already created a machine catalog and want to create another, select Machine Catalogs in the Studio navigation pane, and then select Create Machine Catalog in the Actions pane.

The wizard walks you through the items described below.

- Operating system

Each catalog contains machines of only one type:

- Windows Server OS - A Windows Server OS catalog provides desktops and applications that can be shared by multiple users.
- Windows Desktop OS - A Windows Desktop OS catalog provides desktops and applications that are assigned to individual users.
- Remote PC Access - A Remote PC Access catalog provides users with remote access to their physical office desktop machines. Remote PC Access does not require a VPN to provide security.

Amazon Web Services (AWS) supports only Server OS machine catalogs (and Server VDI, see [Server VDI](#)), not Desktop OS or Remote PC Access catalogs.

- Machine management

Indicate whether machines in the catalog will be power managed through Studio:

- Machines are power managed through Studio or provisioned through a cloud environment (for example, VMs or blade PCs). This option is available only if you have a hypervisor or cloud environment connection already configured. You probably configured a connection when you created the Site. If not, you can create a new connection later and then edit the machine catalog.

- Machines are not power managed through Studio (for example, physical machines).

Indicate which tool you will use to deploy machines:

- Machine Creation Services (MCS) - Uses a master image or template to create and manage virtual machines.
 - MCS is not available for physical machines.
 - Machine catalogs in cloud environments use MCS.
- Provisioning Services - Manages target devices as a device collection. A Provisioning Services vDisk imaged from a master target device delivers desktops and applications. This option is not available for cloud deployments.
- Other - A tool that manages machines already in the data center. Citrix recommends you use Microsoft System Center Configuration Manager or another third-party application to ensure that the machines in the catalog are consistent.

- Desktop experience

For machine catalogs containing Desktop OS machines that will be used to deliver desktops:

- Specify whether users will connect to a new (random) desktop each time they log on, or if they will connect to the same (static) desktop each time.
- If users connect to the same desktop, specify what will happen to any changes they make on the desktop. You can save changes to a separate Personal vDisk or the user's local VM disk, or you can discard changes. (If you choose to save changes to the separate Personal vDisk, you specify the drive letter and size later in the wizard.)
- Master image or machine template

Select the master image (non-cloud) or machine template (cloud) you created earlier. Remember: If you are using Provisioning Services or Machine Creation Services, do not run Sysprep on master images.

- Security

(Cloud environments) Select one or more security groups for the VMs; these are shown only if the availability zone supports security groups. Choose whether machines will use shared hardware or account-dedicated hardware.

- Virtual machines or Device collection or VMs and users

Specify how many virtual machines to create. You can choose how many virtual CPUs and the amount of memory (in MB) each machine will have. Each VM will have a 32 GB hard disk; this value is set in the master image, it cannot be changed in the catalog.

If you indicated previously that user changes to desktops should be saved on a separate Personal vDisk, specify its size in gigabytes and the drive letter.

If you plan to use multiple Network Interface Cards (NICs), associate a virtual network with each card. For example, you can assign one card to access a specific secure network, and another card to access a more commonly-used network. You can also add or remove NICs from this wizard.

- Machine accounts

(Remote PC Access catalogs) Specify the Active Directory machine accounts or Organizational Units (OUs) to add that correspond to users or user groups.

You can choose a previously-configured power management connection or elect not to use power management. If you want to use power management but a suitable connection hasn't been configured yet, you can create that connection later and then edit the machine catalog to update the power management settings.

- Computer accounts

Each machine in the catalog must have a corresponding Active Directory computer account. Indicate whether to create new accounts or use existing accounts, and the location for those accounts.

- If you choose to create new accounts, you must have access to a domain administrator account for the domain where the machines will reside.
- If you use existing accounts, make sure you have enough unused computer accounts for the machines that will be created.

You can browse Active Directory to locate the existing accounts, or you can import a .csv file that lists the account names. The imported file content must use the format:

```
[ADComputerAccount]  
ADcomputeraccountname.domain  
...
```

For catalogs containing physical machines or existing machines, select or import existing accounts and assign each machine to both an Active Directory computer account and to a user account.

For machines created with Provisioning Services, computer accounts for target devices are managed differently; see the Provisioning Services documentation. Also specify the account naming scheme for the machines that are created - hash marks (#) in the scheme represent sequential numbers or letters that will be included with additional name text you provide.

- Name and description

On the final page of the creation wizard, you specify the name and description of the machine catalog. This information appears in Studio.

Manage machine catalogs

For random machine catalogs, you can maintain users' desktops by applying global changes (such as Windows updates, anti-virus software updates, operating system upgrades, or configuration changes) to the master image. Then modify the machine catalog to use the updated master image so users receive the updated desktop the next time they log on. You can make significant changes for large numbers of users in one operation.

For static and Remote PC Access machine catalogs, you must manage updates to users' desktops outside of Studio, either on an individual basis or collectively using third-party software distribution tools. For machines created through Provisioning Services, updates to users' desktops are propagated through the vDisk.

Citrix recommends that you save copies or snapshots of master images before you make updates. The database keeps a historical record of the master images used with each machine catalog. Do not delete, move, or rename master images. You can revert a machine catalog to use the previous version of the master image if users encounter problems with updates you deployed to their desktops, thereby minimizing user downtime.

Add machines

Before you start:

- Make sure the virtualization host has sufficient processors, memory, and storage to accommodate the additional machines.
- Make sure that you have enough unused Active Directory computer accounts. If using existing accounts, keep in mind that the number of machines you can add is limited by the number of accounts available.
- If you will use Studio to create Active Directory computer accounts for the additional machines, you must also have appropriate domain administrator permission.

1. Select Machine Catalogs in the Studio navigation pane.
2. Select a machine catalog and then select Add machines in the Actions pane.
3. Select the number of virtual machines to add.
4. If you indicate that new Active Directory accounts should be created (this step is required if there are insufficient existing accounts for the number of VMs you are adding):
 - Select the domain and location where the accounts will be created.
 - Specify an account naming scheme, using hash marks to indicate where sequential numbers or letters will appear (a name cannot begin with a number). For example, a naming scheme of PC-Sales-## (with 0-9 selected) results in computer accounts named PC-Sales-01, PC-Sales-02 , PC-Sales-03, etc.

If you indicate that existing Active Directory accounts should be used:

- Either browse to the accounts or click Import and specify a .csv file containing account names. Make sure that there are enough accounts for all the machines you're adding.
- Studio manages these accounts, so either allow Studio to reset the passwords for all the accounts or specify the account password (which must be the same for all accounts).

The machines are created as a background process, and can be lengthy when creating a large number of machines. Machine creation continues even if you close Studio.

Change a machine catalog description or change Remote PC Access settings

1. Select Machine Catalogs in the Studio navigation pane.
2. Select a catalog and then select Edit Machine Catalog in the Actions pane.
3. (Remote PC Access catalogs only) On the Power Management page, you can change a Remote PC Access catalog's power management settings and select a power management connection. On the Organizational Units page, add or remove OUs.

On the Description page, change the machine catalog description.

Rename a machine catalog

1. Select Machine Catalogs in the Studio navigation pane.
2. Select a catalog and then select Rename Machine Catalog in the Actions pane.
3. Enter the new name.

Delete a machine catalog

Before deleting a machine catalog, ensure that:

- All users are logged off and that no disconnected sessions are running.
- Maintenance mode is turned on for all machines in the catalog, and then all machines are shut down.
- The catalog is not associated with a Delivery Group.

1. Select Machine Catalogs in the Studio navigation pane.
2. Select a catalog and then select Delete Machine Catalog in the Actions pane.
3. Indicate whether the machines in the catalog should be deleted. If you choose to delete the machines, indicate whether the associated computer accounts should be left as-is, disabled, or deleted in Active Directory.

Delete machines from a machine catalog

After you delete a machine from a catalog, users no longer can access it. Before deleting a machine, ensure that:

- User data is backed up or no longer required.
- All users are logged off. Turning on maintenance mode will stop users from connecting to a machine.
- Desktops are not powered on or suspended.

1. Select Machine Catalogs in the Studio navigation pane.
2. Select a catalog and then select View Machines in the Actions pane.
3. Select one or more machines and then click Turn On Maintenance Mode in the Actions pane.
4. Select Delete in the Actions pane.
5. Choose whether to delete the machines being removed. If you choose to delete the machines, select what to do with the associated Active Directory computer accounts:

In machine catalog	In Active Directory
Leave	Do not change
Remove	Do not remove
Remove	Disable
Remove	Delete

Manage Active Directory computer accounts

To manage Active Directory accounts in a machine catalog, you can:

- Free unused machine accounts by removing Active Directory computer accounts from Desktop OS and Server OS machine catalogs. Those accounts can then be used for other machines.
 - Add accounts so that when more machines are added to the catalog, the computer accounts are already in place
1. Select Machine Catalogs in the Studio navigation pane.
 2. Select a machine catalog and then select Manage AD accounts in the Actions pane.
 3. Choose whether to add or delete computer accounts.
 - If you add accounts, you are prompted to specify what to do with the account passwords: either reset them all or enter a password that applies to all accounts. You might reset passwords if you do not know the current account passwords; you must have permission to perform a password reset. If you enter a password, the

password will be changed on the accounts as they are imported.

- If you delete an account, you are prompted to choose whether the account in Active Directory should be kept, disabled, or deleted.

Update a master image

Update a master image to apply changes to all the desktops and applications in a machine catalog that were created with that master image. Managing common aspects through a single master image lets you deploy system-wide changes such as Windows updates or configuration changes to a large number of machines quickly.

After preparing and testing a new/updated master image on the host (see [Prepare a master image](#)), modify the machine catalog to use it.

Note the following:

- Citrix recommends that you save copies or snapshots of master images before you make updates. The database keeps a historical record of the master images used with each machine catalog. You can revert a machine catalog to use the previous version of the master image if users encounter problems with updates you deployed to their desktops, thereby minimizing user downtime. Do not delete, move, or rename master images; otherwise, you will not be able to revert a machine catalog to use them.

Although Studio can create a snapshot, Citrix recommends that you create a snapshot using the hypervisor management console, and then select that snapshot in Studio. This enables you to provide a meaningful name and description rather than an automatically generated name.

- For GPU master images, you can change the master image only through the XenServer XenCenter console.
- For machine catalogs that use Provisioning Services, you must publish a new vDisk to apply changes to the catalog. For details, see the [Provisioning Services documentation](#).
- After updating the master image, you must restart the machines through Studio for the changes to take effect and be available to your users. This may occur automatically; for example, when a user logs off a desktop, or it may occur as part of a configured restart schedule. Alternatively, you can restart a machine from Studio.

1. Select Machine Catalogs in the Studio navigation pane.
2. Select a machine catalog and then select Update Machines in the Actions pane.
3. On the Master Image page, select the host and the new/updated master image.
4. On the Rollout Strategy page, specify when the new or updated master image is applied to users' machines: on the next shutdown or immediately.
 - If you choose to update the image on the next shutdown, you can notify users of the update.
 - If you choose to update the image immediately, you can specify whether to restart all machines at the same time or at specified intervals. You can send a notification

message to users 1, 5, or 15 minutes before they are logged off and the machine restarted.

Revert to the previous version of the master image

1. Select Machine Catalogs in the Studio navigation pane.
2. Select the machine catalog and then select Rollback machine update in the Actions pane.
3. Specify how to apply the reverted master image to user desktops, as described above.

The rollback strategy is applied only to desktops that need to be reverted. For desktops that have not been updated with the new/updated master image that prompted the rollback (for example, desktops with users who have not logged off), users do not receive messages and are not forced to log off.

Upgrade a machine catalog

Upgrade the machine catalog after you upgrade the VDAs on the machines to a newer version. Citrix recommends upgrading all VDAs to the latest version so they can all access the newest features.

Note: If you have Windows XP or Windows Vista machines, they must use an earlier VDA version, and will not be able to use the latest product features. If you cannot upgrade those machines to a currently supported Windows operating system, Citrix recommends you keep them in a separate machine catalog. For more information, see VDAs on machines running Windows XP or Windows Vista and Mixed VDA support.

Before you upgrade a machine catalog:

- If you're using Provisioning Services, upgrade the VDA version in the Provisioning Services console.
 - Start the upgraded machines so that they register with the Controller. This lets Studio determine that the machines in the machine catalog need upgrading.
1. Select Machine Catalogs in the Studio navigation pane.
 2. Select the machine catalog. The Details tab in the lower pane displays version information.
 3. Select Upgrade Catalog.
 - If Studio detects that the catalog needs upgrading, it displays a message. Follow the prompts.
 - If one or more machines cannot be upgraded, a message explains why. Citrix recommends you resolve machine issues before upgrading the machine catalog to ensure that all machines function properly.

Revert a machine catalog upgrade

Before you revert a machine catalog upgrade, if you used Provisioning Services to create the machine catalog, change the VDA version in the Provisioning Services console.

1. Select Machine Catalogs in the Studio navigation pane.
2. Select the machine catalog. The Details tab in the lower pane displays version information.
3. Select Undo and then follow the prompts.

Delivery groups

A Delivery group is a collection of machines selected from one or more machine catalogs. The Delivery group specifies which users can use those machines, and the applications available to those users.

Begin by creating the Delivery group. Later, you can change the initial settings and configure additional ones.

Create a Delivery Group

To create a Delivery Group:

1. Select Delivery Groups in the Studio navigation pane.
2. Select Create Delivery Group in the Actions pane. The wizard walks you through the items described below.

Machines

Select a machine catalog and specify the number of machines you want to use from the catalog.

- At least one machine must remain unused in the selected machine catalog.
- A machine catalog can be specified in more than one Delivery group; however, a machine can be used in only one Delivery group.
- A Delivery group can use more than one machine catalog; however, those catalogs must contain the same machine types (Server OS, Desktop OS, or Remote PC Access). In other words, you cannot mix machine types in a Delivery group or in a machine catalog.
- Similarly, you cannot create a Delivery group containing Desktop OS machines from a machine catalog configured for static desktops and machines from a machine catalog configured for random desktops.
- Each machine in a Remote PC Access machine catalog is automatically associated with a Delivery group.

Delivery type

The type indicates what the Delivery group offers: only desktops, only applications, or both desktops and applications. Delivery groups with static Desktop OS machines cannot offer both desktops and applications.

Users

Specify the users and user groups who can use the applications and/or desktops in the Delivery group.

There are two types of users: authenticated and unauthenticated (unauthenticated is also called anonymous). You can configure one or both types.

- **Authenticated** - The users and group members you specify by name must present credentials (such as smart card or user name and password) to StoreFront or Citrix Receiver to access applications and desktops.
- **Unauthenticated (anonymous)** - For Delivery Groups containing Server OS machines, you can select a check box that will allow users to access applications and desktops without presenting credentials to StoreFront or Citrix Receiver. For example, when users access applications through kiosks, the application might require credentials, but the Citrix access portal and tools do not. An Anonymous Users Group is created when you install the Delivery Controller.
 - To grant access to unauthenticated users, each machine in the Delivery Group must have a VDA for Windows Server OS (minimum version 7.6) installed. When unauthenticated users are enabled, you must have an unauthenticated StoreFront store.
 - Unauthenticated user accounts are created on demand when a session is launched, and named AnonXYZ, in which XYZ is a unique three-digit value.
 - Unauthenticated user sessions have a default idle timeout of 10 minutes, and are logged off automatically when the client disconnects. Reconnection, roaming between clients, and Workspace Control are not supported.

The following table describes your choices.

Enable access for	Add/assign users and user groups?	Enable the "Give access to unauthenticated users" check box?
Only authenticated users	Yes	No
Only unauthenticated users	No	Yes
Both authenticated and unauthenticated users	Yes	Yes

For Desktop groups containing Desktop OS machines, you can import user data (a list of users) after you create the Delivery group. See [Import or export user lists](#).

Applications

A list displays the applications that were discovered on a machine created from the master image, a template in the machine catalog, or on the App-V management server. Choose one or more applications to add to the Delivery group.

You can also add (create) applications manually. You'll need to provide the path to the executable, working directory, optional command line arguments, and display names for administrators and users.

You can change an application's properties; see [Change application properties](#) for details.

You cannot create applications for Remote PC Access Delivery groups.

By default, applications you add are placed in a folder named *Applications*. Folders can make it easier to manage large numbers of applications. You can specify a different folder when you add the application; however, it's easier to manage folders later. See [Manage application folders](#) for details.

If you publish two applications with the same name to the same users, change the Application name (for user) property in Studio; otherwise, users will see duplicate names in Receiver.

StoreFront

Select or add StoreFront URLs that will be used by the Citrix Receiver that is installed on each machine in the Delivery group. You can also specify the StoreFront server address later by selecting Configuration > StoreFront in the navigation pane.

Manage settings in Delivery Groups

The following topics describe how to configure and manage most of the settings you can specify and update for Delivery Groups:

- [Applications](#)
- [Machines](#)
- [Remote PC Access](#)
- [Sessions](#)
- [Users](#)

The information below describes settings that are not covered in those topics.

Change basic settings

1. Select Delivery Groups in the Studio navigation pane.
2. Select a Delivery Group, and then select Edit Delivery Group in the Actions pane.
3. On the User Settings page, you can change the following:

Setting	Description
Description	The text that StoreFront uses and that users see.
Enabled check box	Whether or not the Delivery Group is enabled.
Desktops per user	(Desktop OS machines only) The maximum number of shared desktops that a user can have active at the same time. In assign-on-first-use deployments, this value specifies how many desktops users can assign to themselves.
Time zone	
Enable Secure ICA	Secures communications to and from machines in the Delivery Group using SecureICA, which encrypts the ICA protocol (default level is 128-bit; the level can be changed using the SDK). Citrix recommends using additional encryption methods such as SSL/TLS encryption when traversing public networks. Also, SecureICA does not check data integrity.

Upgrade a Delivery Group

Upgrade a Delivery Group after you upgrade the VDAs on its machines.

Note: If you must continue using earlier VDA versions, newer product features may not be available. For more information, see [Upgrade a deployment](#).

Before you start the Delivery Group upgrade:

- If you use Provisioning Services, upgrade the VDA version in the Provisioning Services console.
 - Start the machines containing the new VDA so that they can register with the Controller. This process tells Studio what needs upgrading in the Delivery Group.
1. Select Delivery Groups in the Studio navigation pane.
 2. Select the Delivery Group and then select Upgrade Delivery Group in the Actions pane.

Before starting the upgrade process, Studio tells you which, if any, machines cannot be upgraded and why. You can then cancel the upgrade, resolve the machine issues, and then start the Delivery Group upgrade again.

After the Delivery Group upgrade completes, you can revert the machines to their previous states by selecting the Delivery Group and then selecting Undo in the Actions pane.

Manage machines in a Delivery Group

Unless otherwise noted, the following procedures are supported for all Delivery Group types: Server OS, Desktop OS, and Remote PC Access.

Shut down and restart machines

Note: This procedure is not supported for Remote PC Access machines.

1. Select Delivery Groups in the Studio navigation pane.
2. Select the Delivery Group and then select View Machines in the Actions pane.
3. Select the machine and select one of the following in the Actions pane (some options may not be available, depending on the machine state):
 - Force shut down — Forcibly powers off the machine and refreshes the list of machines.
 - Restart — Requests the operating system to shut down and then start the machine again. If the operating system cannot comply, the machine remains in its current state.
 - Suspend — Pauses the machine without shutting it down, and refreshes the list of machines.
 - Shut down — Requests the operating system to shut down.

If the machine does not shut down within 10 minutes, it is powered off. If Windows attempts to install updates during the shutdown, there is a risk that the machine will be powered off before the updates finish.

Note: Citrix recommends that you prevent Desktop OS machine users from selecting Shut Down within a session. See the Microsoft policy documentation for details.

Power manage machines

Note: You can power manage only virtual Desktop OS machines, not physical ones (including Remote PC Access machines). Desktop OS machines with GPU capabilities cannot be suspended, so power off operations fail. For Server OS machines, see Create a restart schedule

Machines can be in one of the following states:

Delivery Group	State
Random	Randomly allocated and in use
	Unallocated and unconnected

Static (assigned)	Permanently allocated and in use
	Permanently allocated and unconnected (but ready)
	Unallocated and unconnected

During normal use, static Delivery Groups typically contain both permanently allocated and unallocated machines. Initially, all machines are unallocated (except for those manually allocated when the Delivery Group was created). As users connect, machines become permanently allocated. You can fully power manage the unallocated machines in those Delivery Groups, but only partially manage the permanently allocated machines.

- **Pools and buffers** - For random Delivery Groups and unallocated machines in static Delivery Groups, a pool is a set of unallocated (or temporarily allocated) machines that are kept in a powered-on state, ready for users to connect; a user gets a machine immediately after log on. The pool size (the number of machines kept powered-on) is configurable by time of day. (For static Delivery Groups, use the SDK to configure the pool.)

A buffer is an additional standby set of unallocated machines that are turned on when the number of machines in the pool falls below a threshold that is a percentage of the Delivery Group size. For large Delivery Groups, a significant number of machines might be turned on when the threshold is exceeded, so plan Delivery Group sizes carefully or use the SDK to adjust the default buffer size.

- **Power state timers** - You can use power state timers to suspend machines after users have disconnected for a specified amount of time. For examples, machines will suspend automatically outside of office hours if users have been disconnected for at least ten minutes. Random machines or machines with Personal vDisks automatically shut down when users log off, unless you configure the ShutdownDesktopsAfterUse Delivery Group property in the SDK.

You can configure timers for weekdays and weekends, and for peak and nonpeak intervals.

- **Partial power management of permanently allocated machines** - For permanently allocated machines, you can set power state timers, but not pools or buffers. The machines are turned on at the start of each peak period, and turned off at the start of each off-peak period; you do not have the fine control that you have with unallocated machines over the number of machines that become available to compensate for machines that are consumed.

To power manage virtual Desktop OS machines:

1. Select Delivery Groups in the Studio navigation pane.
2. Select a Delivery Group, and then select Edit Delivery Group in the Actions pane.
3. On the Power Management page, select Weekdays in the Power manage machines dropdown. (By default, weekdays are Monday to Friday.)
4. For random Delivery Groups, in Machines to be powered on, select Edit and then specify the pool size during weekdays. Then, select the number of machines to power on.
5. In Peak hours, set the peak and off-peak hours for each day.
6. Set the power state timers for peak and non-peak hours during weekdays:

- In During peak hours > When disconnected, specify the delay (in minutes) before suspending any disconnected machine in the Delivery Group, and select Suspend.
- In During off-peak hours > When disconnected, specify the delay before turning off any logged-off machine in the Delivery Group, and select Shutdown. This timer is not available for Delivery Groups with random machines.

8. Select Weekend in the Power manage machines dropdown, and then configure the peak hours and power state timers for weekends.

Use the SDK to:

- Shut down, rather than suspend, machines in response to power state timers, or if you want the timers to be based on logoffs, rather than disconnections.
- Change the default weekday and weekend definitions.

Create a restart schedule

Note: You can use a restart schedule for Server OS machines only. For Desktop OS machines, see Power manage machines.

To configure a restart schedule:

1. Select Delivery Groups in the Studio navigation pane.
2. Select a Delivery Group, and then select Edit Delivery Group in the Actions pane,
3. On the Restart Schedule page:
 - In the Restart machines drop-down, choose how often to restart the machines.
 - In the Restart first group at fields, specify the hour and minute (in 24-hour format) when the first server will begin the restart process.
 - In the Restart additional groups every drop-down, indicate whether all servers should be restarted at once, or how much time should be allowed to restart every server in the Delivery Group.

For example, assume a Delivery Group has five servers, a Restart first group at time of 13:00 (1:00 pm), and a Restart additional groups every selection of 1 hour. That duration (60 minutes) is divided by the number of machines (five), which yields a restart interval of 12 minutes. So, the restart times are 1:00 pm, 1:12 pm, 1:24 pm, 1:36 pm, and 1:48 pm. This gives all five machines the chance to complete their restart at the end of the specified interval (1 hour).

- Indicate whether you want to send a message to users at a specified interval before they are logged off. The notification will be sent relative to each server's calculated restart time, as described in the example.

You cannot perform an automated power-on or shutdown in Studio.

Prevent users from connecting to a machine (maintenance mode)

When you need to temporarily stop new connections to machines, you can turn on maintenance mode for one or all the machines in a Delivery Group. You might do this before applying patches or using management tools.

- When a Server OS machine is in maintenance mode, users can connect to existing sessions, but cannot start new sessions.
- When a Desktop OS machine (or a PC using Remote PC Access) is in maintenance mode, users cannot connect or reconnect. Current connections remain connected until they disconnect or log off.

1. Select Delivery Groups in the Studio navigation pane.
2. Select a Delivery Group.
3. To turn on maintenance mode for all machines in the Delivery Group, select Turn On Maintenance Mode in the Actions pane.

To turn on maintenance mode for one machine:

- a. Select View Machines in the Actions pane.
 - b. Select a machine, and then select Turn On Maintenance Mode in the Actions pane.
4. To turn maintenance mode off for one or all machines in a Delivery Group, follow the previous instructions, but select Turn Off Maintenance Mode in the Actions pane.

Windows Remote Desktop Connection (RDC) settings also affect whether a Server OS machine is in maintenance mode. Maintenance mode is on when any of the following occur:

- Server maintenance mode is set to on, as described above.
- RDC is set to Don't allow connections to this computer.
- RDC is not set to Don't allow connections to this computer, and the Remote Host Configuration User Logon Mode setting is one of the following:
 - Allow reconnections, but prevent new logons
 - Allow reconnections, but prevent new logons until the server is restarted.

Reallocate machines (change users)

Note: You can reallocate only Desktop OS machines, not Server OS machines or machines created through Provisioning Services.

1. Select Delivery Groups in the Studio navigation pane.
2. Select a Delivery Group.
3. To reallocate more than one machine:

- a. Select Edit Delivery Group in the Actions pane.
 - b. On the Machine Allocation (User Assignment) page, select machines and specify the new users.
4. To reallocate one machine:
 - a. Select View Machines in the Actions pane.
 - b. Select a machine, and then select Change User in the Actions pane.
 - c. Add or remove the user.

Change the maximum number of machines per user

1. Select Delivery Groups in the Studio navigation pane.
2. Select a Delivery Group, and then select Edit Delivery Group in the Actions pane.
3. On the User Settings page, set the desktops per user value.

Identify machines using tags

Note: You can use tags only on Desktop OS machines.

You can use tags to refine a machine search or to limit machine access. You can add any number of tags of any length.

1. Select Delivery Groups in the Studio navigation pane.
2. Select a Delivery Group, and then select View Machines in the Actions pane.
3. Select a machine.
4. To add tags, select Add Tag in the Actions menu and then enter one or more tags, separated by semicolons (;).

To change or remove tags, select Edit Tags in the Actions menu and then make the necessary changes.

Load manage

Note: You can load manage Server OS machines only.

Load Management measures the server load and determines which server to select under the current environment conditions. This selection is based on:

- **Server maintenance mode status** - a Server OS machine is considered for load balancing only when maintenance mode is off. (See Prevent users from connecting to a machine (maintenance mode) for details.)

- **Server load index** - determines how likely a server delivering Server OS machines is to receive connections. The index is a combination of load evaluators: the number of sessions and the settings for performance metrics such as CPU, disk, and memory use. You specify the load evaluators in load management policy settings.
 - You can monitor the load index in Director, Studio search, and the SDK.
 - In Studio, the Server Load Index column is hidden by default. To display it, select a machine, right-select a column heading and then choose Select Column. In the Machine category, select Load Index.
 - In the SDK, use the Get-BrokerMachine cmdlet.
A server load index of 10000 indicates that the server is fully loaded. If no other servers are available, users might receive a message that the desktop or application is currently unavailable when they launch a session.
- **Concurrent logon tolerance policy setting** - the maximum number of concurrent requests to log on to the server. (This setting is equivalent to load throttling in XenApp versions earlier than 7.5.)

If all servers are at or higher than the concurrent logon tolerance setting, the next logon request is assigned to the server with the lowest pending logons. If more than one server meets this criteria, the server with the lowest load index is selected.

For more information, see the *Policy settings reference*.

Remove a machine

Removing a machine deletes it from a Delivery Group but does not delete it from the machine catalog that the Delivery Group uses. Therefore, the machines are available for assignment to other Delivery Groups.

Machines must be shut down before they can be removed. To temporarily stop users from connecting to a machine while you are removing it, put the machine into maintenance mode before shutting it down.

Keep in mind that machines may contain personal data, so use caution before allocating the machine to another user. You may want to reimagine the machine.

1. Select Delivery Groups in the Studio navigation pane.
2. Select a Delivery Group and the select View Machines in the Actions pane.
3. Make sure that the machine is shut down.
4. Select Remove from Delivery Group in the Actions pane.

Restrict access to machines

Any changes you make to restrict access to machines in a Delivery Group supersede previous settings, regardless of the method you use. You can:

- Restrict access for administrators using Delegated Administration scopes. You can create and assign a scope that permits administrators to access all applications, and another scope that provides access to only certain applications. See the Delegated Administration documentation for details.
- Restrict access for users through SmartAccess policy expressions that filter user connections made through NetScaler Gateway.
 1. Select Delivery Groups in the Studio navigation pane.
 2. Select the Delivery Group and then select Edit Delivery Group in the Actions pane.
 3. On the Access policy page, select Connections through NetScaler Gateway.
 4. To choose a subset of those connections, select Connections meeting any of the following filters. Then define the NetScaler Gateway site, and add, edit, or remove the SmartAccess policy expressions for the allowed user access scenarios. For details, see the NetScaler Gateway documentation.
- Restrict access for users through exclusion filters on access policies that you set in the SDK. Access policies are applied to Delivery Groups to refine connections. For example, you can restrict machine access to a subset of users, and you can specify allowed user devices. Exclusion filters further refine access policies. For example, for security you can deny access to a subset of users or devices.

By default, exclusion filters are disabled.

For example, for a teaching lab on a subnet in the corporate network, to prevent access from that lab to a particular Delivery Group, regardless of who is using the machines in the lab, use the following command: `Set-BrokerAccessPolicy -Name VPDesktops_Direct -ExcludedClientIPFilterEnabled $True` -

You can use the asterisk (*) wildcard to match all tags that start with the same policy expression. For example, if you add the tag `VPDesktops_Direct` to one machine and `VPDesktops_Test` to another, setting the tag in the `Set-BrokerAccessPolicy` script to `VPDesktops_*` applies the filter to both machines.

Update a machine

1. Select Delivery Groups in the Studio navigation pane.
2. Select the Delivery Group, select View Machines in the Action pane.
3. Select a machine and then select Update machines in the Actions pane.
 - To choose a different master image, select Master image. Then select a snapshot. Expanding a selected snapshot displays associated master images.
 - To apply changes and notify machine users, select Rollout notification to end-users. Then specify:
 - When to update the master image: now or on the next restart.
 - The restart distribution time: all machines at the same time or at time variations.
 - If and when users will be notified of the restart, plus the message they will receive.

Manage applications in a Delivery Group

Add applications

To add an application to a Delivery Group:

1. Select Delivery Groups in the Studio navigation pane.
2. Select the Delivery Group.
3. Select Add Applications in the Actions pane.

A list displays the applications that were discovered on a machine created from the master image, a template in the machine catalog, or on the App-V management server. Choose one or more applications to add to the Delivery Group.

You can also add (create) applications manually. You'll need to provide the path to the executable, working directory, optional command line arguments, and display names for administrators and users.

You can change an application's properties; see below.

By default, applications you add are placed in a folder named Applications. For more information about application folders, see below.

Duplicate, disable, rename, edit tags, or delete an application

To duplicate, disable, rename, edit tags, or delete an application:

1. Select Delivery Groups in the Studio navigation pane.
2. Select the Applications tab in the middle pane and then select the application.
3. Select the appropriate task in the Actions pane.

Good to know:

- When you duplicate an application, it is automatically renamed and placed adjacent to the original.
- Deleting an application removes it from the Delivery Group but not from the master image.
- To move an application to a different application folder, see below.

Change application properties

To change the properties of an application:

1. Select Delivery Groups in the Studio navigation pane.
2. Select the Applications tab in the middle pane and then select the application.
3. Select Properties in the Actions pane.

You can view and change the following:

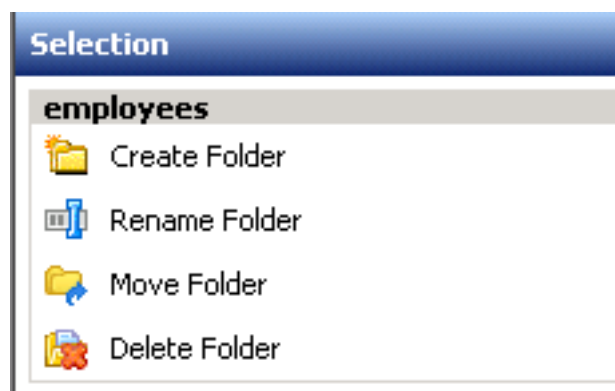
Property to view or change	Select this page
Application name	Identification
Category in Receiver	Delivery
Command line arguments	Location
Description	Identification
File extensions	File Type Association
File type association	File Type Association
Icon	Delivery
Keywords for StoreFront	Identification
Path to executable	Location
Shortcut on user's desktop	Delivery
Visibility	Limit Visibility
Working directory	Location

Application changes might not take effect for current application users until they log off their sessions.

Manage application folders

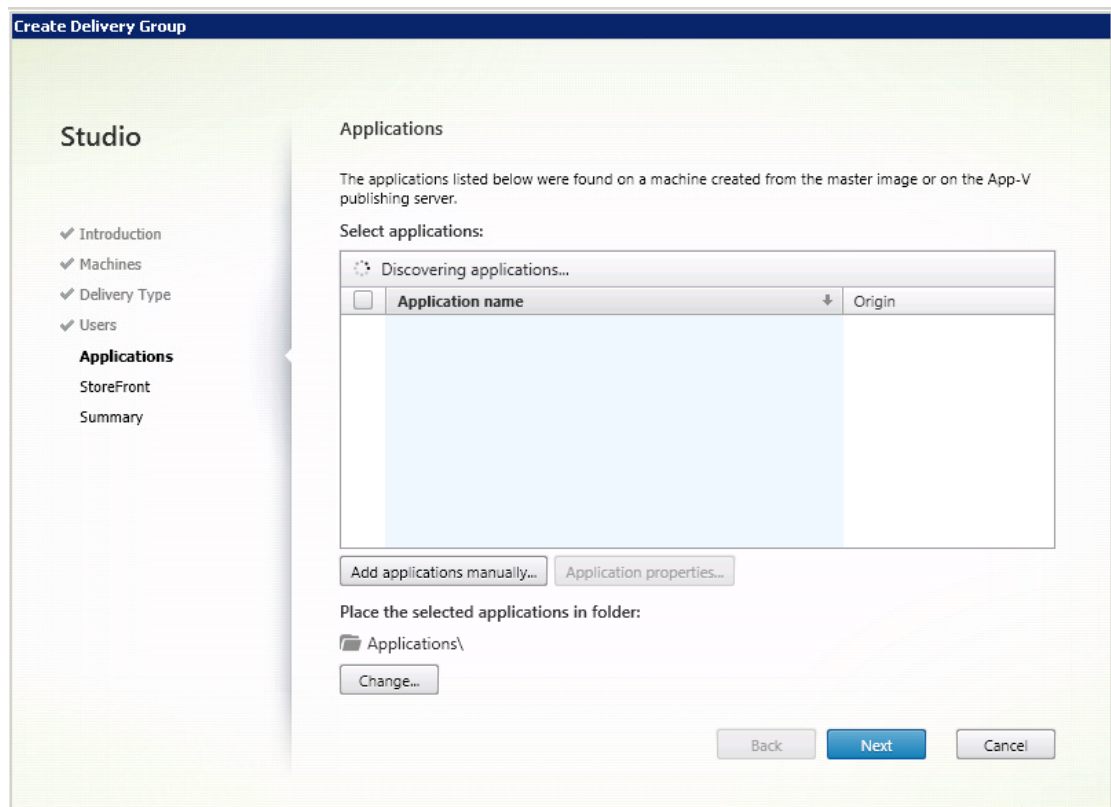
This brief video shows you how to use application folders in Studio.

None



By default, applications you add are placed in a folder named *Applications*. You can:

- Create additional folders and then move applications into those new folders.
 - Folders can be nested up to five levels.
 - Folders do not have to contain applications; empty folders are allowed.
 - Folders are listed alphabetically unless you move them or specify a different location when you create them.
 - You can have more than one folder with the same name, as long as each has a different parent folder. Similarly, you can have more than one application with the same name, as long as each is in a different folder.
- Move a folder to the same or a different level. Moving is easiest using drag-and-drop.
- Rename or delete a folder you created. You cannot rename or delete the Applications folder, but you can move all the applications it contains to other folders you create.

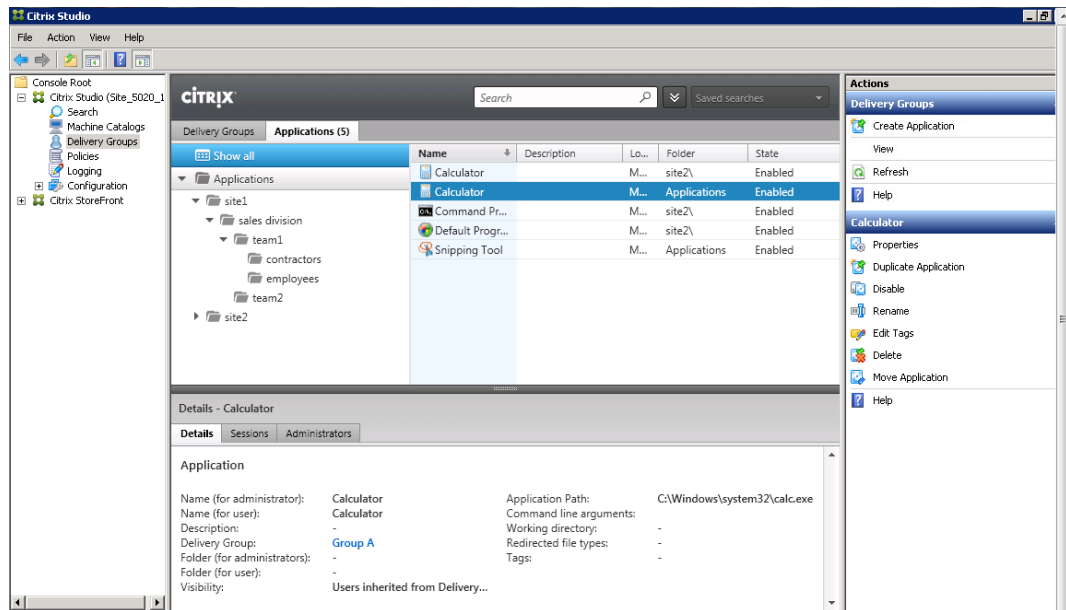


You can also create folders for applications when you create a Delivery Group.

You must have View Applications permission to see the applications in folders, and you must have Edit Application Properties permission for all applications in the folder to remove, rename, or delete a folder that contains applications. For details, see Delegated Administration.

Tip: The following instructions use the Actions pane in Studio. Alternatively, you can use right-click menus or drag and drop. If you create or move a folder in a location you did not intend, you can drag and drop it to the correct location.

Select Delivery Groups in the Studio navigation pane, and then select the Applications tab in the middle pane.



To view all folders (excluding nested folders), click Show all.

- To create a folder:
 1. To place the new folder at the highest level (not nested under another folder), select the top Applications folder. To place the new folder under an existing folder other than Applications, select that folder.
 2. Select Create Folder in the Actions pane. Enter a 1-64 character name for the folder. Spaces are permitted.
- To move a folder:
 1. Select the folder and then select Move Folder in the Actions pane. (You can move only one folder at a time unless the folder contains nested folders.)
 2. To move the folder to the highest level (not nested under another folder), select the top Applications folder. To move a new folder under an existing folder other than Applications, select that folder.
- To rename a folder, select the folder, and then select Rename Folder in the Actions pane. Enter a 1-64 character new name.
- To delete a folder, select the folder, and then select Delete Folder in the Actions pane. When you delete a folder that contains applications and other folders, those objects are also deleted. Deleting an application removes the application assignment from the Delivery Group; it does not remove it from the machine.
- To move applications into a folder, select one or more applications, and then select Move Application in the Actions pane. Select the folder.

To add or move applications to folders from within the Create Delivery Group wizard, select one or more applications on the Applications page, and then select Change.

- To move the application to an existing folder, select that folder.

- To move the application to a new folder:
 - To create a folder at the highest level (not nested under another folder), select the top Applications folder and then select New folder. Specify a 1-64 character folder name. Spaces are allowed.
 - To create a new nested folder under an existing folder (other than Applications), select an existing folder and then select New folder. Specify a 1-64 character folder name. Spaces are allowed.

Manage users in a Delivery Group

Add users, remove users, and enable/disable access to unauthenticated (anonymous) users

There are two types of users: authenticated and unauthenticated (unauthenticated is also called anonymous). You can configure one or both types.

- **Authenticated** - The users and group members you specify by name must present credentials (such as smart card or user name and password) to StoreFront or Citrix Receiver to access applications and desktops.
- **Unauthenticated (anonymous)** - For Delivery Groups containing Server OS machines, you can select a check box that will allow users to access applications and desktops without presenting credentials to StoreFront or Citrix Receiver. For example, when users access applications through kiosks, the application might require credentials, but the Citrix access portal and tools do not. An Anonymous Users Group is created when you install the Delivery Controller.
 - To grant access to unauthenticated users, each machine in the Delivery Group must have a VDA for Windows Server OS (minimum version 7.6) installed. When unauthenticated users are enabled, you must have an unauthenticated StoreFront store.
 - Unauthenticated user accounts are created on demand when a session is launched, and named AnonXYZ, in which XYZ is a unique three-digit value.
 - Unauthenticated user sessions have a default idle timeout of 10 minutes, and are logged off automatically when the client disconnects. Reconnection, roaming between clients, and Workspace Control are not supported.

1. Select Delivery Groups in the Studio navigation pane.

2. Select a Delivery Group, and then select Edit Delivery Group in the Actions pane.

3. The following table describes your choices.

Enable access for	Add/assign users and user groups?	Enable the "Give access to unauthenticated users" check box?
Only authenticated users	Yes	No
Only unauthenticated users	No	Yes
Both authenticated and unauthenticated users	Yes	Yes

For Desktop Groups containing Desktop OS machines, you can import user data (a list of users) after you create the Delivery Group. See Import or export user lists below.

Import or export user lists

For Delivery Groups containing physical Desktop OS machines, you can import user information from a .csv file after you create the Delivery Group. You can also export user information to a .csv file. The .csv file can contain data from a previous product version.

The first line in the .csv file must contain comma-separated column headings (in any order), which can include: ADComputerAccount, AssignedUser, VirtualMachine, and HostId. Subsequent lines in the file contain comma-separated data. The ADComputerAccount entries can be common names, IP addresses, distinguished names, or domain and computer name pairs.

To import or export user information:

1. Select Delivery Groups in the Studio navigation pane.
2. Select a Delivery Group, and then select Edit Delivery Group in the Actions pane.
3. On the Machine Allocation page, select the Import list or Export list button, and then browse to the file location.

Manage sessions through Delivery Groups

Log off or disconnect a session, or send a message to users

1. Select Delivery Groups in the Studio navigation pane.
2. Select a Delivery Group and then select View Machines in the Actions pane.
3. To log a user off a session, select the session or desktop and select Log off in the Actions pane. The session closes and the machine becomes available to other users, unless it is allocated to a specific user.

To disconnect a session, select the session or desktop, and select Disconnect in the Actions pane. Applications continue to run and the machine remains allocated to that user. The user can reconnect to the same machine.

To send a message to users, select the session, machine, or user, and then select Send message in the Actions pane. Enter the message.

You can configure power state timers for Desktop OS machines to automatically handle unused sessions. See Power manage machines for details.

Configure session prelaunch and session linger

Note: These features are supported on Server OS machines only.

This brief video shows you how to configure session prelaunch and session linger:

None

The session prelaunch and session linger features help specified users access applications quickly, by starting sessions before they are requested (session prelaunch) and keeping application sessions active after a user closes all applications (session linger).

By default, session prelaunch and session linger are not used: a session starts (launches) when a user starts an application, and remains active until the last open application in the session closes.

Considerations:

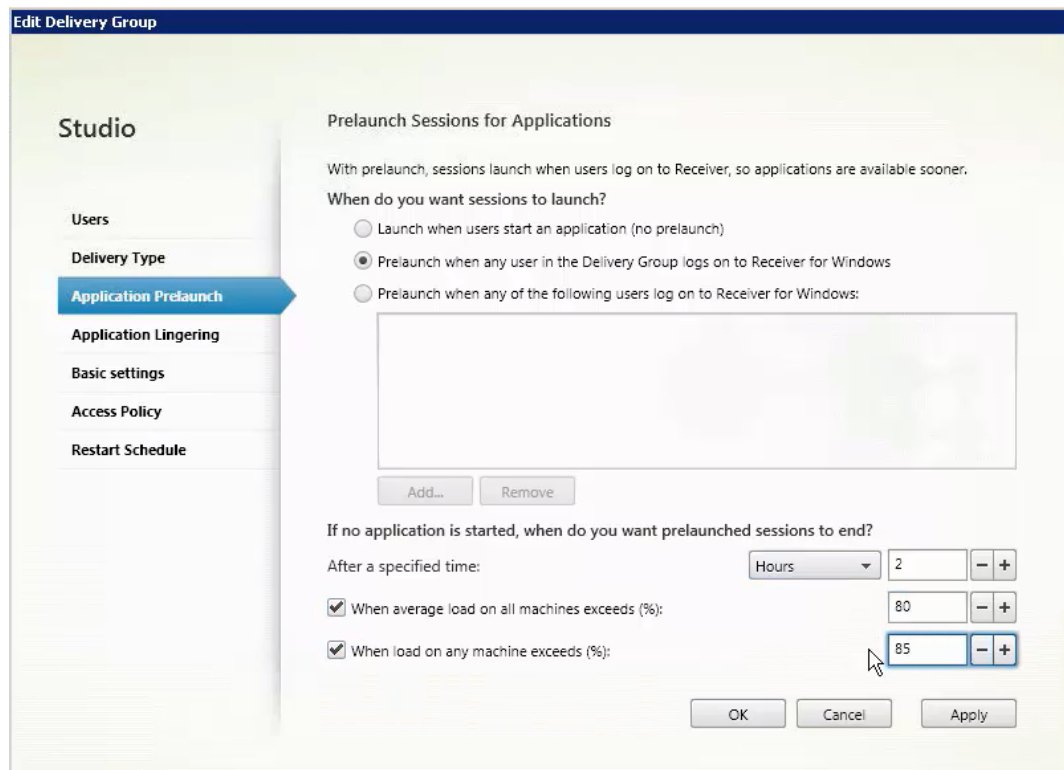
- The Delivery Group must support applications, and the machines must be running a VDA for Server OS, minimum version 7.6.
- These features are supported only when using Citrix Receiver for Windows, and also require additional Receiver configuration. For instructions, search for “session

prelaunch” in the eDocs content for your Receiver for Windows version.

- When using session prelaunch:
 - Physical client machines cannot use the suspend or hibernate power management functions.
 - Client machine users can lock their sessions but should not log off.
- Prelaunched and lingering sessions consume a license, but only when connected. Unused prelaunched and lingering sessions disconnect after 15 minutes by default. This value can be configured in PowerShell (New/Set-BrokerSessionPreLaunch cmdlet).
- Careful planning and monitoring of your users’ activity patterns are essential to tailoring these features to complement each other. Optimal configuration balances the benefits of earlier application availability for users against the cost of keeping licenses in use and resources allocated.
- You can also configure session prelaunch for a scheduled time of day in Receiver.

To enable session prelaunch:

1. Select Delivery Groups in the Studio navigation pane.
2. Select a Delivery Group, and then click Edit Delivery Group in the Actions pane.
3. On the Application Prelaunch page, enable session prelaunch by choosing when sessions should launch:
 - When a user starts an application. This is the default setting; session prelaunch is disabled.
 - When any user in the Delivery Group logs on to Receiver for Windows.
 - When anyone in a list of users and user groups logs on to Receiver for Windows. Be sure to also specify users or user groups if you choose this option.



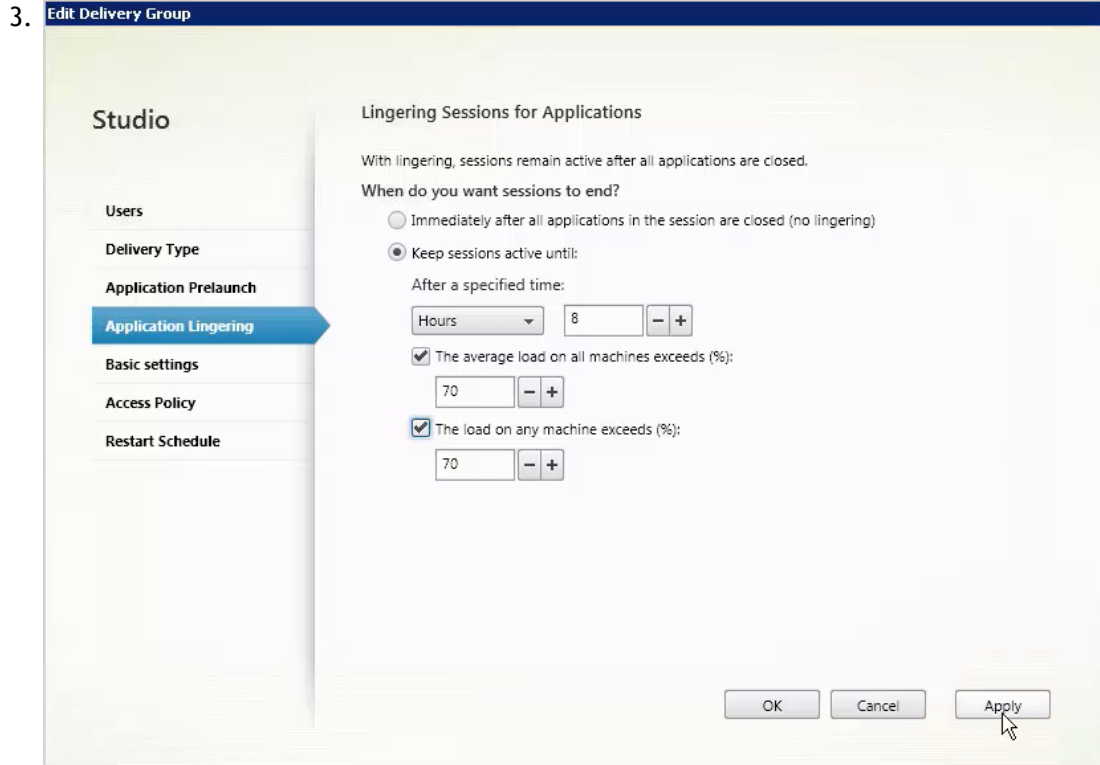
4. A prelaunched session is replaced with a regular session when the user starts an application. If the user does not start an application (the prelaunched session is unused), the following settings affect how long that session remains active. For details about these settings, see *How long unused prelaunched and lingering sessions remain active* below.

- When a specified time interval elapses. You can change the time interval (1-99 days, 1-2376 hours, or 1-142,560 minutes).
- When the average load on all machines in the Delivery Group exceeds a specified percentage (1-99%).
- When the load on any machine in the Delivery Group exceeds a specified percentage (1-99%).

Recap: A prelaunched session remains active until one of the following events occurs: a user starts an application, the specified time elapses, or a specified load threshold is exceeded.

To enable session linger:

1. Select Delivery Groups in the Studio navigation pane.
2. Select a Delivery Group, and then click Edit Delivery Group in the Actions pane.



On the Application Linging page, enable session linger by selecting the Keep sessions active until radio button.

4. Several settings affect how long a lingering session remains active if the user does not start another application. For details about these settings, see *How long prelaunched and lingering sessions remain active* below.

- When a specified time interval elapses. You can change the time interval (1-99 days, 1-2376 hours, or 1-142,560 minutes).
- When the average load on all machines in the Delivery Group exceeds a specified percentage (1-99%).
- When the load on any machine in the Delivery Group exceeds a specified percentage (1-99%).

Recap: A lingering session remains active until one of the following events occurs: a user starts an application, the specified time elapses, or a specified load threshold is exceeded.

How long unused prelaunched and lingering sessions remain active - There are several ways to specify how long an unused session remains active if the user does not start an application: a configured timeout and server load thresholds. You can configure all of them; the event that occurs first will cause the unused session to end.

- **Timeout** - A configured timeout specifies the number of minutes, hours, or days an unused prelaunched or lingering session remains active. If you configure too short a timeout, prelaunched sessions will end before they provide the user benefit of quicker application access. If you configure too long a timeout, incoming user connections might be denied because the server doesn't have enough resources.

You cannot disable this timeout from Studio, but you can in the SDK (New/Set-BrokerSessionPreLaunch cmdlet). If you disable the timeout, it will not appear in the Studio display for that Delivery Group or in the Edit Delivery Group wizard.

- **Thresholds** - Automatically ending prelaunched and lingering sessions based on server load ensures that sessions remain open as long as possible, assuming server resources are available. Unused prelaunched and lingering sessions will not cause denied connections because they will be ended automatically when resources are needed for new user sessions.

You can configure two thresholds: the average percentage load of all servers in the Delivery Group, and the maximum percentage load of a single server in the Delivery Group. When a threshold is exceeded, the sessions that have been in the prelaunch or lingering state for the longest time are ended, sessions are ended one-by-one at minute intervals until the load falls below the threshold. (While the threshold is exceeded, no new prelaunch sessions are started.)

Servers with VDAs that have not registered with the Controller, and servers in maintenance mode are considered fully loaded. An unplanned outage will cause prelaunch and lingering sessions to be ended automatically to free capacity.

XenApp published apps and desktops

Use Server OS machines to deliver XenApp published apps and XenApp published desktops.

This table describe the situations, users, and considerations for using these delivery methods.

Use Case	<p>You want</p> <p>Inexpensive server-based delivery to minimize the cost of delivering applications to a large number of users, while providing a secure, high-definition user experience.</p> <p>Your users</p> <p>Perform well-defined tasks and do not require personalization or offline access to applications. Users may include task workers such as call center operators and retail workers, or users that share workstations.</p> <p>Application types</p> <p>Any application.</p>
Benefits and considerations	<p>Benefits</p> <p>Manageable and scalable solution within your datacenter.</p> <p>Most cost effective application delivery solution.</p> <p>Hosted applications are managed centrally and users cannot modify the application, providing a user experience that is consistent, safe, and reliable.</p> <p>Considerations</p> <p>Users must be online to access their applications.</p>
User experience	<p>User requests one or more applications from StoreFront, their Start menu, or a URL you provide to them.</p> <p>Applications are delivered virtually and display seamlessly in high definition on user devices.</p> <p>Depending on profile settings, user changes are saved when the user's application session ends. Otherwise, the changes are deleted.</p>

Process, host, and deliver applications	<p>Process</p> <p>Application processing takes place on hosting machines, rather than on the user devices.</p> <p>The hosting machine can be a physical or a virtual machine.</p> <p>Host</p> <p>Applications and desktops reside on a Server OS machine.</p> <p>Machines become available through machine catalogs.</p> <p>Delivery</p> <p>Machines within machine catalogs are organized into Delivery groups that deliver the same set of applications to groups of users.</p> <p>Server OS machines support:</p> <ul style="list-style-type: none"> • Desktop and applications Delivery groups that host both desktops and applications. • Application Delivery groups that host only applications.
Session management and assignment	<p>Sessions</p> <p>Server OS machines run multiple sessions from a single machine to deliver multiple applications and desktops to multiple, simultaneously connected users. Each user requires a single session from which they can run all their hosted applications.</p> <p>For example, a user logs on and requests an application. One session on that machine becomes unavailable to other users. A second user logs on and requests an application which that machine hosts. A second session on the same machine is now unavailable. If both users request additional applications, no additional sessions are required because a user can run multiple application using the same session. If two more users log on and request desktops, and two sessions are available on that same machine, that single machine is now using four sessions to host four different users.</p> <p>Random machine assignments</p> <p>Within the Delivery group to which a user is assigned, a machine on the least loaded server is selected. A machine with session availability is randomly assigned to deliver applications to a user when that user logs on.</p>

To deliver XenApp published apps:

1. Install the applications you want to deliver on a master image running a supported Windows server OS.
2. Create a machine catalog for this master image or update an existing catalog with the master image.

3. Create an application Delivery group to deliver the application to users.
4. From the list of application installed, select the application you want to deliver.

To deliver XenApp published desktops:

1. Install apps on a master image running a supported Windows server OS.
2. Create a machine catalog for this master image or update an existing catalog with the master image.
3. Create a desktop Delivery group to deliver the desktops to users.

VM hosted apps

Use Desktop OS machines to deliver VM hosted app.

This table describe the situations, users, and considerations for using this delivery method.

Use Case	<p>You want</p> <p>A client-based application delivery solution that is secure, provides centralized management, and supports a large number of users per host server (or hypervisor), while providing users with applications that display seamlessly in high-definition.</p> <p>Your users</p> <p>Are internal, external contractors, third-party collaborators, and other provisional team members.</p> <p>Your users do not require off line access to hosted applications.</p> <p>Application types</p> <p>Applications that might not work well with other applications or might interact with the operation system, such as Microsoft .NET framework. These types of applications are ideal for hosting on virtual machines.</p> <p>Applications running on older operating systems such as Windows XP or Windows Vista, and older architectures, such as 32-bit or 16-bit. By isolating each application on its own virtual machine, if one machine fails, it does not impact other users.</p>
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Benefits and considerations	<p>Benefits</p> <p>Applications and desktops on the master image are securely managed, hosted, and run on machines within your datacenter, providing a more cost effective application delivery solution.</p> <ul style="list-style-type: none">· On log on, users can be randomly assigned to a machine within a Delivery Group that is configured to host the same application.· You can also statically assign a single machine to deliver an application to a single user each time that user logs on. Statically assigned machines allow users to install and manage their own applications on the virtual machine. <p>Considerations</p> <p>Running multiple sessions is not supported on Desktop OS machines. Therefore, each user consumes a single machine within a Delivery group when they log on, and users must be online to access their applications.</p> <p>This method may increase the amount of server resources for processing applications and increase the amount of storage for users' Personal vDisks.</p>
User experience	<p>The same seamless application experience as hosting shared applications on Server OS machines.</p>
Process, host, and deliver applications	<p>Process</p> <p>The same as Server OS machines except they are virtual Desktop OS machines.</p> <p>Host</p> <p>The same as Server OS machines except they are virtual Desktop OS machines.</p> <p>Delivery</p> <p>The same as Server OS machines except Desktop OS machines can exist only in a desktop Delivery group.</p>

Session management and assignment	<p>Sessions</p> <p>Desktop OS machines run a single desktop session from a single machine. When accessing applications only, a single user can use multiple applications (and is not limited to a single application) because the operating system sees each application as a new session.</p> <p>Random and static machine assignments</p> <p>Within a Delivery group to which a user is assigned, when users log on they can access:</p> <ul style="list-style-type: none"> • Statically assigned machine so that each time the user logs on to the same machine. • Randomly assigned machine that is selected based on session availability.
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To deliver VM hosted apps:

1. Install the applications you want to deliver on a master image running a supported Windows desktop OS.
2. Create a machine catalog for this master image or update an existing catalog with the master image.

When defining the desktop experience for the machine catalog, decide whether you want users to connect to a new VM each time they log in or connect to the same machine each time they log in.

3. Create an application Delivery group to deliver the application to users.
4. From the list of application installed, select the application you want to deliver.

VDI desktops

Use Desktop OS machines to deliver VDI desktops.

VDI desktops are hosted on virtual machines and provide each user with a desktop operating system.

VDI desktops require more resources than XenApp published desktops, but do not require that applications installed on them support server-based operating systems. In addition, depending on the type of VDI desktop you choose, these desktops can be assigned to individual users and allow these users a high degree of personalization.

When you create a machine catalog for VDI desktops, you create one of these types of desktops:

- Random non-persistent desktops, also known as Pooled VDI desktops. Each time a user logs on to use one of these desktops, they connect to a dynamically selected desktop in a pool of desktops based on a single master image. All changes to the desktop are lost when the machine reboots.
- Static non-persistent desktop. The first time a user logs on to use one of these desktops, the user is assigned a desktop from a pool of desktops based on a single master image. After the first use, each time a user logs in to use one of these desktops, the user connects to the same desktop that user was assigned on first use. All changes to the desktop are lost when the machine reboots.
- Static persistent, also known as VDI with Personal vDisk. Unlike other types of VDI desktops, these desktops can be fully personalized by users. The first time a user logs on to use one of these desktops, the user is assigned a desktop from a pool of desktops based on a single master image. After the first use, each time a user logs in to use one of these desktops, the user connects to the same desktop that user was assigned on first use. Changes to the desktop are retained when the machine reboots because they are stored in a Personal vDisk.

To deliver VDI desktops:

1. Create a master image running a supported Windows desktop OS.
2. Create a machine catalog for this master image or update an existing catalog with the master image.

When defining the desktop experience for the machine catalog, decide whether you want users to connect to a new VM each time they log in or connect to the same machine each time they log in and specify how changes to the desktop are retained.

3. Create a desktop Delivery group to deliver the desktops to users.

Remote PC Access

Remote PC Access allows an end user to log on remotely from virtually anywhere to the physical Windows PC in the office. The Virtual Delivery Agent (VDA) is installed on the office PC; it registers with the Delivery Controller and manages the HDX connection between the PC and the end user client devices. Remote PC Access supports a self-service model; after you set up the whitelist of machines that users are permitted to access, those users can join their office PCs to a Site themselves, without administrator intervention. The Citrix Receiver running on their client device enables access to the applications and data on the office PC from the Remote PC Access desktop session.

A user can have multiple desktops, including more than one physical PC or a combination of physical PCs and virtual desktops.

Note: Remote PC Access is valid only for XenDesktop licenses; sessions consume licenses in the same way as other XenDesktop sessions.

Active Directory considerations:

- Before configuring the remote PC deployment site, set up your Organizational Units (OUs) and security groups and then create user accounts. Use these accounts to specify users for the Delivery Groups you will use to provide Remote PC Access.
- If you modify Active Directory after a machine has been added to a machine catalog, Remote PC Access does not reevaluate that assignment. You can manually reassign a machine to a different catalog, if needed.
- If you move or delete OUs, those used for Remote PC Access can become out of date. VDAs might no longer be associated with the most appropriate (or any) machine catalog or Delivery Group.

Machine catalog and Delivery Group considerations:

- A machine can be assigned to only one machine catalog and one Delivery Group at a time.
- You can put machines in one or more Remote PC Access machine catalogs.
- When choosing Machine Accounts for a machine catalog, select the lowest applicable OU to avoid potential conflicts with machines in another catalog. For example, in the case of Bank/officers/tellers, select tellers.
- You can allocate all machines from one remote PC machine catalog through one or more Delivery Groups. For example, if one group of users requires certain policy settings and another group requires different settings, assigning the users to different Delivery Groups enables you to filter the HDX policies according to each Delivery Group.
- If your IT infrastructure assigns responsibility for servicing users based on geographic location, department, or some other category, you can group machines and users accordingly to allow for delegated administration. Ensure that each administrator has permissions for both the relevant machine catalogs and the corresponding Delivery Groups.

- For users with office PCs running Windows XP, create a separate machine catalog and Delivery Group for those systems. When choosing machine accounts for that catalog in Studio, select the checkbox indicating that some machines are running Windows XP.

Deployment considerations:

- You can create a Remote PC Access deployment and then add traditional Virtual Desktop Infrastructure (VDI) desktops or applications later. You can also add Remote PC Access desktops to an existing VDI deployment.
 - Consider whether to enable the Windows Remote Assistance feature when you install the VDA on the office PC. This option allows help desk teams using Director to view and interact with a user sessions using Windows Remote Assistance.
 - Consider how you will deploy the VDA to each office PC. Citrix recommends using electronic software distribution such as Active Directory scripts and Microsoft System Center Configuration Manager. The installation media contains sample Active Directory scripts.
 - Each office PC must be domain-joined with a wired network connection.
 - Windows 7 Aero is supported on the office PC, but not required.
 - Connect the keyboard and mouse directly to the PC or laptop, not to the monitor or other components that can be turned off. (If you must connect input devices to components such as monitors, they should not be turned off.)
 - If you are using smart cards, see [Smart cards](#).
 - Remote PC Access can be used on most laptop computers. To improve accessibility and deliver the best connection experience, configure the laptop power saving options to those of a desktop PC. For example:
 - Disable the Hibernate feature.
 - Disable the Sleep feature.
 - Set the close lid action to Do Nothing.
 - Set the *press the power button action* to Shut Down.
 - Disable video card energy saving features.
 - Disable network interface card energy saving features.
 - Disable battery saving technologies.
- The following are not supported for Remote PC Access devices:
- Docking and undocking the laptop.
 - KVM switches or other components that can disconnect a session.
 - Hybrid PCs (including All-in-One and NVIDIA Optimus laptops and PCs).
 - Install Citrix Receiver on each client device that remotely accesses the office PC.

- Multiple users with remote access to the same office PC see the same icon in Receiver. When any user remotely logs on to the PC, that resource appears as unavailable to other users.
- By default, a remote user's session is automatically disconnected when a local user initiates a session on that machine (by pressing CTRL+ALT+DEL). To prevent this automatic action, add the following registry entry on the office PC, and then restart the machine.

Caution: Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

```
HKLM\SOFTWARE\Citrix\PortICA\RemotePC] "SasNotification"=dword:00000001
```

After the registry change and machine restart, if a local user presses CTRL+ALT+DEL to log on to that PC while it is in use by a remote user, the remote user receives a prompt asking whether or not to allow or deny the local user's connection. Allowing the connection will disconnect the remote user's session.

The following XenDesktop features are not supported for Remote PC Access deployments:

- Creating master images and virtual machines
- Delivering hosted applications
- Personal vDisks
- Client folder redirection

Wake on LAN

Remote PC Access supports Wake on LAN, which gives users the ability to turn on physical PCs remotely. This feature enables users to keep their office PCs turned off when not in use, saving energy costs. It also enables remote access when a machine has been turned off inadvertently, such as during weather events.

The Remote PC Access Wake on LAN feature is supported on both of the following:

- PCs that support Intel Active Management Technology (AMT)
- PCs that have the Wake on LAN option enabled in the BIOS

You must configure Microsoft System Center Configuration Manager (ConfigMgr) 2012 to use the Wake on LAN feature. ConfigMgr provides access to invoke AMT power commands for the PC, plus Wake-up proxy and magic-packet support. Then, when you use Studio to create a Remote PC Access deployment (or when you add another power management connection to be used for Remote PC Access), you enable power management and specify ConfigMgr access information.

Additionally:

- Using AMT power operations is preferred for security and reliability; however, support is also provided for two non-AMT methods: ConfigMgr Wake-up proxy and raw magic packets.
- On AMT-capable machines only, the Wake on LAN feature also supports the Force-Shutdown and Force-Restart actions in Studio and Director. Additionally, a Restart action is available in StoreFront and Receiver.

For more information, see [Configuration Manager and Remote PC Access Wake on LAN](#) and [Provide users with Remote PC Access](#).

Provide users with Remote PC Access

Using Remote PC Access, desktop users can securely access resources on the office PC while experiencing the benefits of Citrix HDX technology.

Note: Remote PC Access is valid only for XenDesktop licenses.

1. To use the Remote PC Access power management feature (also known as *Remote PC Access Wake on LAN*), complete the configuration tasks on the PCs and on Microsoft System Center Configuration Manager (ConfigMgr) before creating the Remote PC Access deployment in Studio. See [Configuration Manager and Remote PC Access Wake on LAN](#) for details.
2. When creating the initial Remote PC Access deployment, you can enable or disable power management for the machines in the default Remote PC Access Machine Catalog. If you enable power management, specify ConfigMgr connection information. Then specify users and machine accounts. See [Create a Site](#) for more information. Creating a Remote PC deployment does not prevent VDI use of the Site in the future.

Creating a Remote PC Access deployment creates a default machine catalog named *Remote PC Access Machines* and a default delivery group named *Remote PC Access Desktops*.

3. When creating another machine catalog for use with Remote PC Access:
 - Operating System: Select Remote PC Access, and choose a power management connection. You can also choose not to use power management. If there are no configured power management connections, you can add one after you finish the machine catalog creation wizard (connection type = Microsoft Configuration Manager Wake on LAN), and then edit the machine catalog, specifying that new connection.
 - Machine Accounts: You can select from the machine accounts or Organizational Units (OUs) displayed, or add machine accounts and OUs.
4. Install the VDA on the office PC used for local and remote access. Typically, you deploy the VDA automatically using your package management software; however, for proof-of-concept or small deployments, you can install the VDA manually on each office PC.

After the VDA is installed, the next domain user that logs on to a console session (locally or through RDP) on the office PC is automatically assigned to the Remote PC desktop. If additional domain users log on to a console session, they are also added to the desktop user list, subject to any restrictions you have configured.

Note: To use RDP connections outside of your XenApp or XenDesktop environment, you must add users or groups to the Direct Access Users group.

5. Instruct users to download and install Citrix Receiver onto each client device they will use to access the office PC remotely. Citrix Receiver is available from <http://www.citrix.com> or the application distribution systems for supported mobile devices.

You can edit a power management connection to configure advanced settings. You can enable:

- Wake-up proxy delivered by ConfigMgr.
- Wake on LAN (magic) packets. If you enable Wake on LAN packets, you can select a Wake on LAN transmission method: subnet-directed broadcasts or Unicast.

The PC uses AMT power commands (if they are supported), plus any of the enabled advanced settings. If the PC does not use AMT power commands, it uses the advanced settings.

Troubleshooting

The Delivery Controller writes the following diagnostic information about Remote PC Access to the Windows Application Event log. Informational messages are not throttled. Error messages are throttled by discarding duplicate messages.

- 3300 (informational) - Machine added to catalog
- 3301 (informational) - Machine added to delivery group
- 3302 (informational) - Machine assigned to user
- 3303 (error) - Exception

When power management for Remote PC Access is enabled, subnet-directed broadcasts might fail to start machines that are located on a different subnet from the Controller. If you need power management across subnets using subnet-directed broadcasts, and AMT support is not available, try the Wake-up proxy or Unicast method (ensure those settings are enabled in the advanced properties for the power management connection).

Manage Remote PC Access Delivery Groups

If a machine in a Remote PC Access machine catalog is not assigned to a user, Studio temporarily assigns the machine to a Delivery Group associated with that machine catalog. This temporary assignment provides information, so that the machine can be assigned later to a user. The Delivery Group to machine catalog association has a priority value.

Priority determines to which Delivery Group that machine is assigned when it registers with the system or when a user needs a machine assignment. The lower the value, the higher the priority. If a Remote PC Access machine catalog has multiple Delivery Group assignments, the software selects the match with the highest priority. You can set this priority value using the PowerShell SDK.

Add or remove a Remote PC Access machine catalog association

When first created, Remote PC Access machine catalogs are associated with a Delivery Group. This means that machine accounts or Organizational Units added to the machine catalog later can be added to the Delivery Group. This association can be switched off or on.

1. Select Delivery Groups in the Studio navigation pane.
2. Select a Remote PC Access Delivery Group.
3. In the Details section, select the Catalogs tab and then select a Remote PC Access machine catalog.
4. To add or restore an association, select Add Desktops. To remove an association, select Remove Association.

App-V

Microsoft Application Virtualization (App-V) lets you deploy, update, and support applications as services. Users access applications without installing them on their own devices. App-V and Microsoft User State Virtualization (USV) provide access to applications and data, regardless of location and connection to the Internet.

This release supports App-V 5.0 (the App-V 4.6 2 client is no longer supported). The App-V 5.0 client does not support offline access to applications. App-V integration support includes using SMB shares for applications; the HTTP protocol is not supported.

Applications are available seamlessly without any pre-configuration or changes to operating system settings. App-V contains the following components:

- Management server — Provides a centralized console to manage App-V 5.0 infrastructure and deliver virtual applications to both the App-V Desktop Client as well as a Remote Desktop Services Client. The App-V management server authenticates, requests, and provides the security, metering, monitoring, and data gathering required by the administrator. The server uses Active Directory and supporting tools to manage users and applications.
- Publishing server — Provides App-V clients with applications for specific users, and hosts the virtual application package for streaming. It fetches the packages from the management server.
- Client — Retrieves virtual applications, publishes the applications on the client, and automatically sets up and manages virtual environments at runtime on Windows devices. The App-V client is installed on the VDA and stores user-specific virtual application settings, such as registry and file changes in each user's profile.

You can launch App-V applications from Server OS and Desktop OS Delivery Groups:

- Through Citrix Receiver
- From the Start menu
- Through the App-V client and Citrix Receiver
- Simultaneously by multiple users on multiple devices
- Through Citrix StoreFront

Modified App-V application properties are implemented when the application is started. For example, for applications with a modified display name or customized icon, the modification appears when users start the application.

There is no change in App-V applications performance when a desktop and application Delivery Group is changed to an application-only Delivery Group.

Only an App-V server-based deployment in which an administrator uses an App-V management server and publishing server to manage App-V applications is supported.

Configure App-V

To deliver App-V applications:

1. Deploy App-V, as described in the instructions in <http://technet.microsoft.com/en-us/virtualization/hh710199>.
2. Publish the App-V applications on the App-V management server. Configure settings such as permissions and File Type Association. These settings already exist if you already deployed App-V.
3. Optionally, change App-V publishing server settings; see below.
4. Install the App-V client on VDAs.
5. During Site creation in Studio, specify the App-V publishing and management server URLs with port numbers. These servers are automatically used by the Delivery Groups.
6. Install the App-V client in the master image for machine catalogs. Configure the client with settings such as ShareContentStoreMode and EnablePackageScripts. (You do not need to configure the App-V Publishing Server in the master image because it is configured during application launch.)
7. During Delivery Group creation, select the App-V applications.

The applications are now available.

You can specify or change App-V server information after you create a Site. Select Configuration > App-V Publishing in the Studio navigation pane and then selecting entries in the Actions pane. You can add App-V publishing by specifying URLs with port numbers for the App-V management and publishing servers. You can also edit or remove those addresses. If you refresh the App-V applications, the display indicates if there is a problem connecting to a server and removes entries for applications that are no longer available.

App-V publishing server settings

To change publishing server settings, Citrix recommends using the SDK cmdlets on the Controller.

- To view publishing server settings, enter `Get-CtxAppvServerSetting -AppVPublishingServer <pubServer>`.
- To ensure that App-V applications launch properly, enter `Set-CtxAppvServerSetting -UserRefreshOnLogon 0`.

The following cmdlet changes the settings of the App-V publishing server on the Controller. Not all parameters are mandatory.

```
Set-CtxAppvServerSetting -AppVPublishingServer
<pubServer> -UserRefreshOnLogon <bool> -UserRefreshEnabled <bool>
-UserRefreshInterval <int> -UserRefreshIntervalUnit <Day/Hour>
-GlobalRefreshOnLogon <bool> -GlobalRefreshEnabled <bool>
```

-GlobalRefreshInterval <int> -GlobalRefreshIntervalUnit <Day/Hour>

Note: If you previously used GPO policy settings for managing publishing server settings, the GPO settings override any App-V integration settings, including the previous cmdlet settings. This may result in App-V application launch failure. Citrix recommends that you remove all GPO policy settings and configure the same settings using the SDK.

Troubleshoot

- If the Test connection operation returns an error when you specify App-V management server and publishing server addresses in Studio, check the following:

1. The App-V server is powered on: either send a Ping command or check the IIS Manager (each App-V server should be in a Started and Running state).
2. PowerShell remoting is enabled on the App-V server. If it is not, follow the procedure in <http://technet.microsoft.com/en-us/magazine/ff700227.aspx>.
3. The App-V server is added to Active Directory.

If the Studio machine and the App-V server are in different Active Directory domains that do not have a trust relationship, from the PowerShell console on the Studio machine, run `winrm s winrm/Config/client '@(TrustedHosts="<App-V server FQDN>")'`. If TrustedHosts is managed by GPO, the following error message will display: "The config setting TrustedHosts cannot be changed because use is controlled by policies. The policy would need to be set to "Not Configured" in order to change the config setting". If this message displays, add an entry for the App-V server name to the TrustedHosts policy in GPO (Administrative Templates > Windows Components > Windows Remote Management (WinRM) > WinRM Client).

4. The Studio administrator is also an App-V server administrator.
5. File sharing is enabled on the App-V server: enter `\\<App-V server FQDN>` in Windows Explorer or with the Run command.
6. The App-V server has the same file sharing permissions as the App-V administrator: on the App-V server, add an entry for `\\<App-V Server FQDN>` in Stored User Names and Passwords, specifying the credentials of the user who has administrator privileges on the App-V server. For guidance, see <http://support.microsoft.com/kb/306541>.

- If Application discovery fails, check the following:

1. Studio administrator is an App-V management server administrator.
2. The App-V management server is running. Check this by opening the IIS Manager; the server should be in a Started and Running state.
3. PowerShell remoting is enabled on the App-V servers. If either is not enabled, follow the procedure in <http://technet.microsoft.com/en-us/magazine/ff700227.aspx>.

4. Packages have appropriate security permissions for the Studio administrator to access.

- If App-V applications do not launch, check the following:

1. The publishing server is running. Check this by opening the IIS Manager; the server should be in a Started and Running state.
2. App-V packages have appropriate security permissions so that users can access.
3. On the VDA:

- Make sure that Temp is pointing to the correct location, and that there is enough space available in the Temp directory.
- Make sure that the App-V client is installed, and no earlier than version 5.0.
- Make sure you have Administrator permissions and run `Get-AppvClientConfiguration`. Make sure that `EnablePackageScripts` is set to 1. If it is not set to 1, run `Set-AppvClientConfiguration -EnablePackageScripts $true`.

Citrix recommends that you perform this step when you create a master image so that all VDAs created from the master image have the correct configuration.

- From the Registry editor (regedit), go to `HKEY_LOCAL_MACHINE\SOFTWARE\Policies\Citrix\AppV`. Make sure that the `AppVServers` key has the following value format: `AppVManagementServer+metadata;PublishingServer` (for example: `http://xmas-demo-appv.blrstrm.com+0+0+0+1+1+0+1;http://xmas-demo-appv.blrstrm.com:8082`).
- Make sure that `CtxAppVCOMAdmin` has administrator privileges. During VDA installation `CtxAppVCOMAdmin` is usually created and added to the Local Administrators Group on the VDA machine. However, depending on the Active Directory policy, this user might lose the administrative association.

Run `compmgmt.msc` and browse to Local Users and Groups Users. If `CtxAppVCOMAdmin` is not an administrator, edit the group policy or contact your administrator, so that this user account retains its administrative association.

4. On the master image where the App-V client is installed, the PowerShell `ExecutionPolicy` should be set to `RemoteSigned` because the AppV client module provided by Microsoft is not signed, and this `ExecutionPolicy` allows PowerShell to run unsigned local scripts and cmdlets. Use one of the following methods to set the `ExecutionPolicy`:
 - Logged in as administrator, enter the following PowerShell cmdlet: `Set-ExecutionPolicy RemoteSigned`.
 - From Group Policy settings, go to Computer Configuration > Policies > Administrative Templates > Windows Components > Windows PowerShell > Turn on Script Execution.
5. Check the publishing servers:
 - Run `Get-AppvPublishingServer *` to display the list of publishing servers.
 - Check whether `UserRefreshonLogon` is set to False. If not, the first App-V application launch typically fails.
 - With Administrator privileges, run `Set-AppvPublishingServer` and set `UserRefreshonLogon` to False.

If these steps do not resolve the issues, enable and examine the logs.

Enable logs

To enable Studio logs:

1. Create the folder C:\CtxAppvLogs.
2. Go to C:\ProgramFiles\Citrix\StudioAppVInegration\SnapIn\Citrix.Appv.Admin.V1 and open CtxAppvCommon.dll.config in a text editor such as Notepad, as an administrator. Uncomment the following line:

```
<add key = "LogFileName" value = "C:\CtxAppvLogs\log.txt" />
```

To enable VDA logs:

1. Create the folder C:\CtxAppvLogs.
2. Go to C:\ProgramFiles\Citrix\ Virtual Desktop Agent, and open CtxAppvCommon.dll.config in a text editor such as Notepad, as an administrator. Uncomment the following line:

```
<add key = "LogFileName" value = "C:\CtxAppvLogs\log.txt" />
```

3. Uncomment the following line and set the value field to 1, as shown in the following example:

```
<add key = "EnableLauncherLogs" value = "1" />
```

All configuration-related logs are located at C:\CtxAppvLogs. The application launch logs are located at:

- XenDesktop 7.1 and later, and XenApp 7.5 and later — %LOCALAPPDATA%\Citrix\CtxAppvLogs.
- XenDesktop 7.0 — %LocalAppData%\temp\CtxAppVLogs
LOCALAPPDATA resolves to the local folder for the logged in user. Make sure to check in the local folder of the launching user (for whom application launch failed).

4. As administrator, restart the Broker service or restart the VDA machine to start logging.

Local App Access and URL redirection

Local App Access seamlessly integrates locally installed Windows applications into a hosted desktop environment without changing from one computer to another. With Local App Access, you can:

- Access applications installed locally on a physical laptop, PC, or other device directly from the virtual desktop.
- Provide a flexible application delivery solution. If users have local applications that you cannot virtualize or that IT does not maintain, those applications still behave as though they are installed on a virtual desktop.
- Eliminate double-hop latency when applications are hosted separately from the virtual desktop, by putting a shortcut to the published application on the user's Windows device.
- Use applications such as:
 - Video conferencing software such as GoToMeeting.
 - Specialty or niche applications that are not yet virtualized.
 - Applications and peripherals that would otherwise transfer large amounts of data from a user device to a server and back to the user device, such as DVD burners and TV tuners.

In XenApp and XenDesktop, hosted desktop sessions use *URL redirection* to launch Local App Access applications. URL redirection makes the application available under more than one URL address. It launches a local browser (based on the browser's URL blacklist) by selecting embedded links within a browser in a desktop session. If you navigate to a URL that is not present in the blacklist, the URL is opened in the desktop session again.

URL redirection works only for desktop sessions, not application sessions. The only redirection feature you can use for application sessions is host-to-client content redirection, which is a type of server FTA. This FTA redirects certain protocols to the client, such as http, https, rtsp, or mms. For example, if you only open embedded links with http, the links directly open with the client application. There is no URL blacklist or whitelist support.

When Local App Access is enabled, URLs that are displayed to users as links from locally-running applications, from user-hosted applications, or as shortcuts on the desktop are redirected in one of the following ways:

- From the user's computer to the hosted desktop
- From the XenApp or XenDesktop server to the user's computer
- Rendered in the environment in which they are launched (not redirected)

To specify the redirection path of content from specific Web sites, configure the URL whitelist and URL blacklist on the Virtual Delivery Agent. Those lists contain multi-string

registry keys that specify the URL redirection policy settings; for more information, see the Local App Access policy settings.

URLs can be rendered on the VDA with the following exceptions:

- Geo/Locale information – Web sites that require locale information, such as msn.com or news.google.com (opens a country specific page based on the Geo). For example, if the VDA is provisioned from a data center in the UK and the client is connecting from India, the user expects to see in.msn.com but instead sees uk.msn.com.
- Multimedia content – Web sites containing rich media content, when rendered on the client device, give the end users a native experience and also save bandwidth even in high latency networks. Although there is Flash redirection feature, this complements by redirecting sites with other media types such as Silverlight. This is in a very secure environment. That is, the URLs that are approved by the administrator are run on the client while the rest of the URLs are redirected to the VDA.

In addition to URL redirection, you can use *File Type Association (FTA) redirection*. FTA launches local applications when a file is encountered in the session. If the local app is launched, it must have access to the file to open it. Therefore, you can only open files that reside on network shares or on client drives (using client drive mapping) using local applications. For example, when opening a PDF file, if a PDF reader is a local app, then the file opens using that PDF reader. Because the local app can access the file directly, there is no network transfer of the file through ICA to open the file.

Requirements, considerations, and limitations

Local App Access is supported on the valid operating systems for VDAs for Windows Server OS and VDAs for Windows Desktop OS, and requires Citrix Receiver for Windows version 4.1 (minimum). The following browsers are supported:

- Internet Explorer 8, 9, 10, and 11
- Firefox 3.5 through 21.0
- Chrome 10

Review the following considerations and limitations when using Local App Access and URL redirection.

- Local App Access is designed for full-screen, virtual desktops spanning all monitors:
 - The user experience can be confusing if Local App Access is used with a virtual desktop that runs in windowed mode or does not cover all monitors.
 - For multiple monitors, when one monitor is maximized it becomes the default desktop for all applications launched in that session, even if subsequent applications typically launch on another monitor.
 - The feature supports one VDA; there is no integration with multiple concurrent VDAs.
- Some applications can behave unexpectedly, affecting users:

- Users might be confused with drive letters, such as local C: rather than virtual desktop C: drive.
- Available printers in the virtual desktop are not available to local applications.
- Applications that require elevated permissions cannot be launched as client-hosted applications.
- There is no special handling for single-instance applications (such as Windows Media Player).
- Local applications appear with the Windows theme of the local machine.
- Full-screen applications are not supported. This includes applications that open to full screen, such as PowerPoint slide shows or photo viewers that cover the entire desktop.
- Local App Access copies the properties of the local application (such as the shortcuts on the client's desktop and Start menu) on the VDA; however, it does not copy other properties such as shortcut keys and read-only attributes.
- Applications that customize how overlapping window order is handled can have unpredictable results. For example, some windows might be hidden.
- Shortcuts are not supported, including My Computer, Recycle Bin, Control Panel, Network Drive shortcuts, and folder shortcuts.
- The following file types and files are not supported: custom file types, files with no associated programs, zip files, and hidden files.
- Taskbar grouping is not supported for mixed 32-bit and 64-bit client-hosted or VDA applications, such as grouping 32-bit local applications with 64-bit VDA applications.
- Applications cannot be launched using COM. For example, if you click an embedded Office document from within an Office application, the process launch cannot be detected, and the local application integration fails.
- URL redirection supports only explicit URLs (that is, those appearing in the browser's address bar or found using the in-browser navigation, depending on the browser).
- URL redirection works only with desktop sessions, not with application sessions.
- The local desktop folder in a VDA session does not allow users to create new files.
- Multiple instances of a locally-running application behave according to the taskbar settings established for the virtual desktop. However, shortcuts to locally-running applications are not grouped with running instances of those applications. They are also not grouped with running instances of hosted applications or pinned shortcuts to hosted applications. Users can close only windows of locally-running applications from the Taskbar. Although users can pin local application windows to the desktop Taskbar and Start menu, the applications might not launch consistently when using these shortcuts.

Interaction with Windows

The Local App Access interaction with Windows includes the following behaviors.

- Windows 8 and Windows Server 2012 short cut behavior
 - Windows Store applications installed on the client are not enumerated as part of Local App Access shortcuts.
 - Image and video files are usually opened by default using Windows store applications. However, Local App Access enumerates the Windows store applications and opens shortcuts with desktop applications.
- Local Programs
 - For Windows 7, the folder is available in the Start menu.
 - For Windows 8, Local Programs is available only when the user chooses All Apps as a category from the Start screen. Not all subfolders are displayed in Local Programs.
- Windows 8 graphics features for applications
 - Desktop applications are restricted to the desktop area and are covered by the Start screen and Windows 8 style applications.
 - Local App Access applications do not behave like desktop applications in multi-monitor mode. In multi-monitor mode, the Start screen and the desktop display on different monitors.
- Windows 8 and Local App Access URL Redirection
 - Because Windows 8 Internet Explorer has no add-ons enabled, use desktop Internet Explorer to enable URL redirection.
 - In Windows Server 2012, Internet Explorer disables add-ons by default. To implement URL Redirection, disable Internet Explorer enhanced configuration. Then reset the Internet Explorer options and restart to ensure that add-ons are enabled for standard users.

Configure Local App Access and URL redirection

To use Local App Access and URL redirection with Citrix Receiver:

- Install Receiver on the local client machine. You can enable both features during Receiver installation or you can enable Local App Access template using the Group Policy editor.
- Set the Allow local app access policy setting to Enabled. You can also configure URL whitelist and blacklist policy settings for URL redirection. For more information, see [Local App Access policy settings](#).

Enable local app access and URL redirection during Receiver installation

To enable Local App Access and URL redirection for all local applications:

1. Set the Allow local app access policy setting to Enabled. When this setting is enabled, the VDA allows the client to decide whether administrator-published applications and Local App Access shortcuts are enabled in the session. (When this setting is disabled, both administrator-published applications and Local App Access shortcuts do not work for the VDA.) This policy setting applies to the entire machine, as well as the URL redirection policy.
2. Enable Local App Access and URL redirection when you install Citrix Receiver for all users on a machine. This action also registers the browser add-ons required for URL redirection.

From the command prompt, run the appropriate command to install the Receiver with the following option:

```
CitrixReceiver.exe /ALLOW_CLIENTHOSTEDAPPSURL=1
```

```
CitrixReceiverWeb.exe /ALLOW_CLIENTHOSTEDAPPSURL=1
```

Enable the local app access template using the Group Policy editor

1. Run gpedit.msc.
2. Select Computer Configuration. Right-click Administrative Templates and select Add/Remote Templates > Add.
3. Add the icaclient.adm template located in the Receiver Configuration folder (usually in c:\Program Files (x86)\Citrix\Online Plugin\Configuration). (After the icaclient.adm template is added to Computer Configuration, it is also available in User Configuration.)
4. Expand Administrative Templates > Classic Administrative Templates (ADM) > Citrix Components > Citrix Receiver > User Experience.
5. Select Local App Access settings.
6. Select Enabled and then select Allow URL Redirection. For URL redirection, register browser add-ons using the command line, as described below.

Provide access to only published applications

To provide access to only published applications:

1. On the server where the Delivery Controller is installed, run regedit.exe.
 - a. Navigate to HKLM\Software\Wow6432Node\Citrix\DesktopStudio.
 - b. Add the REG_DWORD entry ClientHostedAppsEnabled with a value of 1. (A 0 value disables Local App Access.)
2. Restart the Delivery Controller server and then restart Studio.
3. Publish Local App Access applications.
 - a. Select Delivery Groups in the Studio navigation pane and then select the Applications tab.
 - b. Select Create Local Access Application in the Actions pane.
 - c. Select the desktop Delivery Group.
 - d. Enter the full executable path of the application on the user's local machine.
 - e. Indicate if the shortcut to the local application on the virtual desktop will be visible on the Start menu, the desktop, or both.
 - f. Accept the default values on the Name page and then review the settings.
4. Enable Local App Access and URL redirection when you install Citrix Receiver for all users on a machine. This action also registers the browser add-ons required for URL redirection.

From the command prompt, run the command to install the Receiver with the following option:

```
CitrixReceiver.exe /ALLOW_CLIENTHOSTEDAPPSURL=1
```

```
CitrixReceiverWeb.exe /ALLOW_CLIENTHOSTEDAPPSURL=1
```

5. Set the Allow local app access policy setting to Enabled. When this setting is enabled, the VDA allows the client to decide whether administrator-published applications and Local App Access shortcuts are enabled in the session. (When this setting is disabled, both administrator-published applications and Local App Access shortcuts do not work for the VDA.)

Register browser add-ons

Note: The browser add-ons required for URL redirection are registered automatically when you install Receiver from the command line with the /ALLOW_CLIENTHOSTEDAPPSURL=1 option.

You can use the following commands to register and unregister one or all add-ons:

- To register add-ons on a client device: `<client-installation-folder>\redirector.exe /reg<browser>`
- To unregister add-ons on a client device: `<client-installation-folder>\redirector.exe /unreg<browser>`
- To register add-ons on a VDA: `<VDAinstallation-folder>\VDARedirector.exe /reg<browser>`
- To unregister add-ons on a VDA: `<VDAinstallation-folder>\VDARedirector.exe /unreg<browser>`

where `<browser>` is IE, FF, Chrome, or All.

For example, the following command registers Internet Explorer add-ons on a device running Receiver.

```
C:\Program Files\Citrix\ICA Client\redirector.exe /regIE
```

The following command registers all add-ons on a Windows Server OS VDA.

```
C:\Program Files (x86)\Citrix\System32\VDARedirector.exe /regAll
```

URL interception across browsers

Description	Configuration
By default, Internet Explorer redirects the URL entered. If the URL is not in the blacklist but is redirected to another URL by the browser or website, the final URL is not redirected, even if it is on the blacklist.	For URL redirection to work correctly, enable the add-on when prompted by the browser. If the add-ons using Internet options or the add-ons in the prompt are disabled, URL redirection does not work correctly.
The Firefox add-ons always redirect the URLs.	When an add-on is installed, Firefox prompts to allow/prevent installing the add-on on a new tab page. You must allow the add-on for the feature to work.
The Chrome add-on always redirects the final URL that is navigated and not the entered URLs.	The extensions have been installed externally. If you disable the extension, the URL redirection feature does not work in Chrome. If the URL redirection is required in Incognito mode, allow the extension to run in that mode in the browser Settings.

Configure local application behavior on logoff and disconnect

1. On the hosted desktop, run gpedit.msc.
 - a. Navigate to HKEY_LOCAL_MACHINE\SOFTWARE\Citrix\Client Hosted Apps\Policies\Session State.
 - b. Add the REG_DWORD entry Terminate with one of the values:
 - 1 - Local applications continue to run when a user logs off or disconnects from the virtual desktop. Upon reconnection, local applications are reintegrated if they are available in the local environment.
 - 3 - Local applications close when a user logs off or disconnects from the virtual desktop.

Server VDI

Use the Server VDI (Virtual Desktop Infrastructure) feature to deliver a desktop from a server operating system for a single user.

- Enterprise administrators can deliver server operating systems as VDI desktops, which can be valuable for users such as engineers and designers.
- Service Providers can offer desktops from the cloud; those desktops comply with the Microsoft Services Provider License Agreement (SPLA).

You can use the Enhanced Desktop Experience Citrix policy setting to make the server operating system look like a Windows 7 operating system.

The following features cannot be used with Server VDI:

- Personal vDisks
- HDX 3D Pro
- Hosted applications
- Local App Access
- Direct (non-brokered) desktop connections
- Remote PC Access

Server VDI is supported on the same server operating systems as the VDA for Windows Server OS.

1. Prepare the Windows server for installation: ensure that Remote Desktop Services role services are not installed and that users are restricted to a single session:
 - Use Windows Server Manager to ensure that the Remote Desktop Services role services are not installed. If they were previously installed, remove them.
 - Ensure that the 'Restrict each user to a single session' property is enabled.
 - On Windows Server 2008 R2, access this property through Administrative Tools > Remote Desktop Services > Remote Desktop Session Host Configuration. In the Edit settings > General section, the Restrict each user to a single session setting should indicate Yes.
 - On Windows Server 2012, edit the registry and set the Terminal Server setting fSingleSessionPerUser to 1.
2. For Windows Server 2008 R2, install Microsoft .NET Framework 3.5 SP1 on the server before installing the VDA.
3. Use the command line interface to install a VDA on a supported server or server master image, specifying the /quiet and /servervdi options. (By default, the installer blocks

the Windows Desktop OS VDA on a server operating system; using the command line overrides this behavior.)

`XenDesktopVdaSetup.exe /quiet /servervdi`

Do not include options for features that are not supported with Server VDI, such as `/baseimage`, `/enable_hdx_3d_pro`, or `/xa_server_location`.

4. Create a Machine Catalog for Server VDI.
 - a. On the Operating System page, select Windows Desktop OS.
 - b. On the Summary page, specify a machine catalog name and description for administrators that clearly identifies it as Server VDI; this will be the only indicator in Studio that the catalog supports Server VDI.

When using Search in Studio, the Server VDI catalog you created is displayed on the Desktop OS Machines tab, even though the VDA was installed on a server.
5. Create a Delivery Group and assign the Server VDI catalog you created in the previous step.

Remove components

To remove components, Citrix recommends using the Windows feature for removing or changing programs. Alternatively, you can remove components using the command line, or a script on the installation media.

When you remove components, prerequisites are not removed, and firewall settings are not changed. When you remove a Controller, the SQL Server software and the databases are not removed.

Before removing a Controller, remove it from the Site. Before removing Studio or Director, Citrix recommends closing them.

If you upgraded a Controller from an earlier deployment that included Web Interface, you must remove the Web Interface component separately; you cannot use the installer to remove Web Interface.

To remove components using the Windows feature for removing or changing programs

From the Windows feature for removing or changing programs:

- To remove a Controller, Studio, Director, License Server, or StoreFront, select Citrix XenApp <version> or Citrix XenDesktop <version>, then right-click and select Uninstall. The installer launches, and you can select the components to be removed.

Alternatively, you can remove StoreFront by right-clicking Citrix StoreFront and selecting Uninstall.

- To remove a VDA, select Citrix Virtual Delivery Agent <version>, then right-click and select Uninstall. The installer launches and you can select the components to be removed.
- To remove the Universal Print Server, select Citrix Universal Print Server, then right-click and select Uninstall.

To remove core components using the command line

From the \x64\XenDesktop Setup directory on the installation media, run the XenDesktopServerSetup.exe command.

- To remove one or more components, use the /remove and /components options.
- To remove all components, use the /removeall option.

For command and parameter details, see [Install using the command line](#).

For example, the following command removes Studio.

```
\x64\XenDesktop Setup\XenDesktopServerSetup.exe /remove /components studio
```

To remove a VDA using the command line

From the \x64\XenDesktop Setup directory on the installation media, run the XenDesktopVdaSetup.exe command.

- To remove one or more components, use the /remove and /components options.
- To remove all components, use the /removeall option.

For command and parameter details, see [Install using the command line](#).

For example, the following command removes the VDA and Receiver.

```
\x64\XenDesktop Setup\XenDesktopVdaSetup.exe /removeall
```

To remove VDAs using a script in Active Directory; see [Install or remove Virtual Delivery Agents using scripts](#).

Upgrades and migration

Upgrade

Upgrading changes deployments to the newest component versions without having to set up new machines or Sites; this is known as an *in-place upgrade*. You can upgrade:

- From XenDesktop version 5 (or a later version) to XenDesktop 7.6
- From XenApp version 7.5 to XenApp 7.6

You can also upgrade a XenApp 6.5 worker server to a XenApp 7.6 VDA for Windows Server OS. This is a supplementary activity to migrating XenApp 6.5.

To upgrade a XenDesktop 5 (or later) farm or a XenApp 7.5 Site:

1. Run the installer on the machines where the core components and VDAs are installed. The software determines if an upgrade is available and installs the newer version.
2. Use the newly upgraded Studio to upgrade the database and the Site.

For more information, see [Upgrade a deployment](#).

To upgrade a XenApp 6.5 worker server to a XenApp 7.6 VDA:

1. Run the product installer on the XenApp 6.5 worker server. The software removes the server from the XenApp 6.5 farm, removes the XenApp 6.5 software, and installs a 7.6 VDA for Windows Server OS.
2. After upgrading the server, add it to machine catalogs and Delivery Groups in the 7.6 Site.

For more information, see [Upgrade a XenApp 6.5 worker to a new VDA for Windows Server OS](#).

Migrate

Migrating moves data from an earlier deployment to the newest version. You can migrate a XenApp 6.5 or a XenDesk 4 deployment. Migrating includes installing 7.6 components and creating a new Site, exporting data from the older farm, and then importing the data to the new Site.

To migrate from XenApp 6.5:

1. Install core components and create a new XenApp Site.
2. From the XenApp 6.5 controller, use PowerShell cmdlets to export policy and/or farm data to XML files. You can edit the XML file content to tailor the information you will import.

3. From the new 7.6 Site, use PowerShell cmdlets and the XML files to import policy and/or application data to the new Site.
4. Complete post-migration tasks on the new Site.

For more information, see [Migrate XenApp 6.x](#).

To migrate from XenDesktop 4:

1. Install core components and create a new XenDesktop Site.
2. From the XenDesktop 4 farm, use the export command tool to export farm data to an XML file. You can edit the XML file content to tailor the information you will import.
3. From the 7.6 Site, use the import command tool and the XML file to import the farm data to the new Site.
4. Complete post-migration tasks on the new Site.

For more information, see [Migrate XenDesktop 4](#).

Upgrade a deployment

You can upgrade certain deployments to newer versions without having to first set up new machines or Sites; this is called an *in-place upgrade*. You can upgrade:

- From XenDesktop version 5 (or a later version) to the latest released (current) XenDesktop version
- From XenApp version 7.5 (or a later version) to the latest released (current) XenApp version

You can also use the XenApp 7.6 installer to upgrade a XenApp 6.5 worker server to a XenApp 7.6 VDA for Windows Server OS. This is a supplementary activity to migrating XenApp 6.5; see [Upgrade a XenApp 6.5 worker to a new VDA for Windows Server OS](#).

To start an upgrade, you run the installer from the new version to upgrade previously installed core components (Delivery Controller, Citrix Studio, Citrix Director, Citrix License Server) and VDAs. The installer determines which components require upgrading and then starts the upgrade at your command. After upgrading the components, you use the newly upgraded Studio to upgrade the Site database and the Site.

In this content, the word *product* refers to XenApp 7.x or XenDesktop 7.x, unless otherwise noted.

You cannot upgrade:

- From an Early Release or Technology Preview version
- From a XenApp version earlier than 7.5 (except replacing XenApp 6.5 software on a server with a current VDA for Server OS; see [Migrate XenApp 6.x](#))
- From a XenDesktop version earlier than 5.6; see [Migrate XenDesktop 4](#)
- From XenApp to XenDesktop, or from XenDesktop to XenApp

Which product component versions can be upgraded?

Using the product installer and Studio, you can upgrade:


- Delivery Controllers 5 or later
- VDA 5.0 SP1 or later
 - Unlike earlier VDA releases, you must use the product installer to upgrade VDAs; you cannot use MSIs.
 - If the installer detects Receiver for Windows (Receiver.exe) on the machine, it is upgraded to the Receiver version included on the product installation media.

- If the installer detects Receiver for Windows Enterprise (CitrixReceiverEnterprise.exe) on the machine, it is upgraded to Receiver for Windows Enterprise 3.4.
- Director 1 or later
- Database - This upgrades the schema and migrates data for the Site database (plus the Configuration Logging and Monitoring databases, if you're upgrading from an earlier 7.x version)
- Personal vDisk

Using the guidance in the feature/product documentation, upgrade the following if needed:

- Provisioning Services (for XenApp 7.x and XenDesktop 7.x, Citrix recommends using the latest released version; the minimum supported version is Provisioning Services 7.0).
 - Upgrade the Provisioning Services server using the server rolling upgrade, and the clients using vDisk versioning.
 - Provisioning Services 7.x does not support creating new desktops with XenDesktop 5 versions. So, although existing desktops will continue to work, you cannot use Provisioning Services 7.x to create new desktops until you upgrade XenDesktop. Therefore, if you plan a mixed environment of XenDesktop 5.6 and 7.x Sites, do not upgrade Provisioning Services to version 7.
- Microsoft System Center Virtual Machine Manager SCVMM. The current product supports SCVMM 2012 and SCVMM 2012 SP1; XenDesktop 5.x supports earlier versions. Use the following upgrade sequence to avoid downtime:
 1. If you have Controllers running versions earlier than XenDesktop 5.6 FP1, upgrade them to XenDesktop 5.6 FP1 (see the XenDesktop documentation for that version).
 2. Upgrade the SCVMM server to SCVMM 2012; see the Microsoft documentation for instructions.
 3. Upgrade XenDesktop components to the current version.
 4. Optionally, upgrade the SCVMM server to SCVMM 2012 SP1.
- StoreFront.

Requirements, limits, and preparation

	
	You must use the product installer's graphical or command-line interface to upgrade core components and VDAs; you cannot import or migrate data from an earlier version.
	<p>If you install or upgrade any components to the new version but choose not to upgrade other components (on different machines) that require upgrade, Studio will remind you.</p> <p>For example, if an upgrade includes new versions of the Controller and Studio, and you upgrade only the Controller (but you do not run the installer on the machine where Studio is installed), Studio will not let you continue to manage the Site until you upgrade Studio.</p>
	<p>Before upgrading the Citrix License Server, be sure your Subscription Advantage date is valid for the new product version.</p> <p>If you are upgrading from an earlier 7.x product version, the date must be at least 2013.0522.</p>
	You cannot upgrade XenDesktop Express Edition. Obtain and install a license for a currently supported edition, then upgrade it.
	Before beginning any upgrade activity, back up the database, as described in CTX135207 , so you can restore it if any issues are discovered after the database upgrade.
	Optionally, back up templates and upgrade hypervisors, if used.
	If you must continue to run earlier version Sites and current version Sites, see Mixed environment considerations .
	If you have VDAs installed on Windows XP or Windows Vista machines, see VDAs on machines running Windows XP or Windows Vista .
	If you do not plan to upgrade all VDAs to the latest version, review Mixed VDA support .
	If your deployment includes Web Interface, Citrix recommends using StoreFront.
	In addition to being a domain user, you must be a local administrator on the machines where you are upgrading product components.
	You cannot upgrade from XenDesktop to XenApp, or from XenApp to XenDesktop.
	Review the upgrade sequence below so you can plan for and mitigate potential outages.

Mixed environment considerations

When your environment contains Sites/farms with different product versions (a mixed environment), Citrix recommends using StoreFront to aggregate applications and desktops from different product versions. For details, see the StoreFront documentation.

- Generally, the current Studio and Director versions manage/monitor only current Sites. (Although this version of Director can monitor XenDesktop 5.x VDAs, some data

(including logon duration) will not be available for those VDAs.) For example, you cannot manage a XenDesktop 7.1 Site with Studio version 7.6. Similarly, you cannot manage a XenDesktop 7.6 Site with a Studio version 7.1.

- You can use current VDAs in deployments containing earlier Controller versions. Keep in mind that in such cases, new features in the current release may not be available. See *Mixed VDA considerations* below.
- Sites with Controllers at version 5.x and VDAs at version 7.x should remain in that state only temporarily. Ideally, you should complete the upgrade of all components as soon as possible.
- In a mixed environment, continue using the Studio and Director versions for each release, but make sure that different versions are installed on separate machines.
- If you plan to run XenDesktop 5.6 and 7.x Sites simultaneously and use Provisioning Services for both, either deploy a new Provisioning Services for use with the 7.x Site, or upgrade the current Provisioning Services and be unable to provision new workloads in the XenDesktop 5.6 Site.
- Do not upgrade a standalone Studio version until you are ready to use the new version.

VDAs on machines running Windows XP or Windows Vista

You cannot upgrade VDAs installed on machines running Windows XP or Windows Vista to a 7.x version. You must use VDA 5.6 FP1 with certain hotfixes; see [CTX140941](#) for instructions. Although earlier-version VDAs will run in a 7.x Site, they cannot use many of its features, including:

- Features noted in Studio that require a newer VDA version.
- Configuring App-V applications from Studio.
- Configuring Receiver StoreFront addresses from Studio.
- Automatic support for Microsoft Windows KMS licensing when using Machine Creation Services. See [CTX128580](#).
- Information in Director:
 - Logon times and logon end events impacting the logon duration times in the Dashboard, Trends, and User Detail views.
 - Logon duration breakdown details for HDX connection and authentication time, plus duration details for profile load, GPO load, logon script, and interactive session establishment.
 - Several categories of machine and connection failure rates.
 - Activity Manager in the Help Desk and User Details views.

Citrix recommends reimaging Windows XP and Windows Vista machines to a supported operating system version and then installing the latest VDA.

Mixed VDA support

When you upgrade the product to a later version, Citrix recommends you upgrade all the core components and VDAs so you can access all the new and enhanced features in your edition. For example, to use the session prelaunch, session linger, and unauthenticated users features in the 7.6 release, the VDAs must have a minimum version of 7.6 installed.

In some environments, you may not be able to upgrade all VDAs to the most current version. In this scenario, when you create a machine catalog, you can specify the VDA version installed on the machines. By default, this setting specifies the latest recommended VDA version; you need to consider changing this setting only if the machine catalog contains machines with earlier VDA versions. However, mixing VDA versions in a machine catalog can have unintended effects

As noted above, if your deployment includes Windows XP and Windows Vista systems, you must use an earlier VDA version, and the machine catalog containing those machines must specify VDA version 5.6 FP1. The VDAs will register successfully with the Controller, but those machines will be unable to use many of the new features in the 7.x versions (including StoreFront). This also applies to any machines you add to that catalog that have 7.x version VDAs. The following graphic illustrates this.

In the above case, if you must continue to use older VDAs, place them in a machine catalog by themselves.

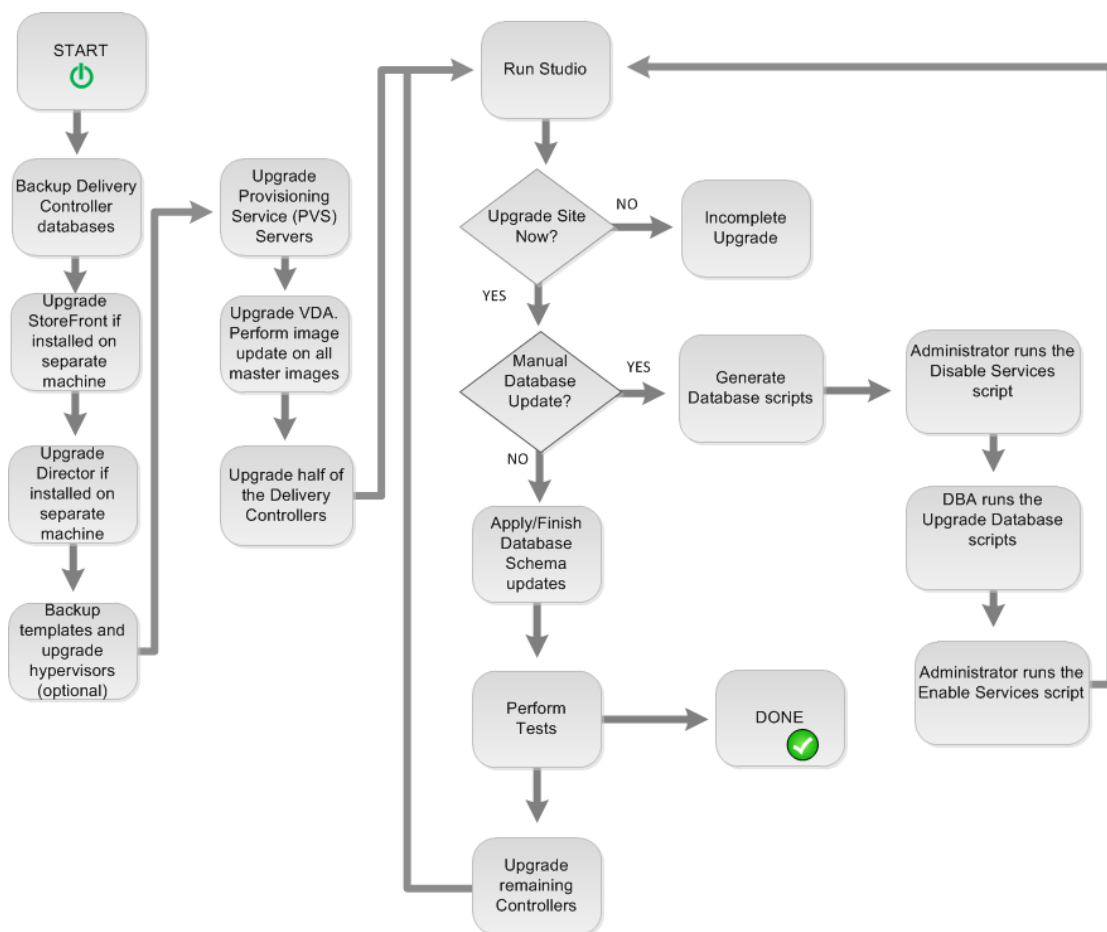
If a machine catalog is created with the default recommended VDA version setting, and any of the machines in the catalog has an earlier VDA version installed, those machines will not be able to register with the Controller and will not work.

For example, assume the most recent VDA version is 7.6. You create a machine catalog with the default VDA setting: "7.6 (recommended, to access the latest features)." You add three machines to that catalog: two with VDA 7.6 and one with VDA 7.1.

In this example, the machine with VDA 7.1 will not register with the Controller. If you cannot upgrade that VDA, consider creating a separate machine catalog configured with a VDA setting of "version 7.0 or later" and adding that machine. Although that machine will not be able to take advantage of new 7.6 features, it will be able to register with the Controller.

Upgrade sequence

If components are installed on different machines, you run the installer on each of those machines.



The upgrade sequence is illustrated below; descriptions follow.

To run the product installer graphical interface, log on to the machine and then insert the media or mount the ISO drive for the new release. Double-click AutoSelect. To use the command-line interface, see *Install using the command line*.

1. If more than one core component is installed on the same server (for example, the Controller, Studio, and License Server) and several of those components have new versions available, they will all be upgraded when you run the installer on that server. If any core components are installed on machines other than the Controller, run the installer on each of those machines (in the preferred order: License Server, StoreFront, and then Director).
2. Upgrade the Provisioning Services servers and clients, using the guidance in the Provisioning Services documentation.
3. Run the product installer on machines containing VDAs. Although you can upgrade VDAs before or after upgrading the Controllers, Citrix recommends you do so before, because it allows you to quickly enable new features after the upgrade.

When upgrading VDAs from an earlier 7.x version that are installed on physical machines (including Remote PC Access), use the command-line interface with the parameter: `/EXCLUDE "Personal vDisk","Machine Identity Service"`. For example:

```
C:\x64\XenDesktop Setup\XenDesktopVdaSetup.exe /EXCLUDE
    "Personal vDisk","Machine Identity Service"
```

4. Run the product installer on half of the Controllers. (This will also upgrade any other core components installed on those servers.) For example, if your Site has four Controllers, run the installer on two of them.
 - Leaving half of the Controllers active allows users to access the Site. VDAs can register with the remaining Controllers. There may be times when the Site has reduced capacity because fewer Controllers are available. The upgrade causes only a brief interruption in establishing new client connections during the final database upgrade steps. The upgraded Controllers cannot process requests until the entire Site is upgraded.
 - If your Site has only one Controller, the Site is inoperable during the upgrade.
5. If Studio is installed on a different machine than one of the Controllers you upgraded in the previous step, run the installer on the machine where Studio is installed.
6. From the newly upgraded Studio, upgrade the Site database. For details, see Upgrade the database and Site below.
7. From the newly upgraded Studio, select Citrix Studio *site-name* in the navigation pane. Select the Common Tasks tab. Select Upgrade remaining Delivery Controllers.
8. After completing the upgrade and confirming completion, close and then reopen Studio.
9. In the Site Configuration section of the Common Tasks page, select Perform registration. Registering the Controllers makes them available to the Site.
10. After you select Finish when the upgrade completes, you are offered the opportunity to enroll in the Citrix Customer Experience Improvement Program (CEIP), which collects anonymous information about your deployment. That information is then used to improve product quality, reliability, and performance.
11. After upgrading components, the database, and the Site, use Studio to:
 - Test the newly-upgraded Site. From Studio, select Citrix Studio *site-name* in the navigation pane. Select the Common Tasks tab and then select Test Site. These tests were run automatically after you upgraded the database, but you can run them again at any time.
 - Update all master images that use the upgraded VDA.
 - Upgrade machine catalogs and Delivery Groups.

Upgrade the database and Site

After upgrading the core components and VDAs, use the newly upgraded Studio to initiate an automatic or manual database and Site upgrade.

- For an automatic database upgrade, the Studio user's permissions must include the ability to update the SQL Server database schema (for example, the db_owner database role).
- If the Studio user does not have those permissions, initiating a manual database upgrade will generate scripts. The Studio user runs some of the scripts from Studio; the database administrator runs other scripts using a tool such as SQL Server Management

Studio.

Important: Citrix strongly recommends you back up the database before upgrading, as described in [CTX135207](#).

During a database upgrade, product services are disabled. During that time, Controllers cannot broker new connections for the Site, so plan carefully.

After the database upgrade completes and product services are enabled, Studio tests the environment and configuration, and then generates an HTML report. If problems are identified, you can restore the database backup. After resolving issues, you can upgrade the database again.

Upgrade the database and Site automatically - Launch the newly upgraded Studio. After you choose to start the Site upgrade automatically and confirm that you are ready, the database and Site upgrade proceeds.

Upgrade the database and Site manually - This process includes generating and running scripts.

1. Launch the newly upgraded Studio. After you choose to manually upgrade the Site, the wizard checks for License Server compatibility and requests confirmation. After you confirm that you have backed up the database, the wizard generates and displays the scripts and a checklist of upgrade steps.
2. If you are upgrading from XenDesktop 5, run the following scripts in the order shown:

Script	Description
DisableServices.ps1	PowerShell script to be run by the Studio user on a Controller to disable product services.
UpgradeDatabase.sql	SQL script to be run by the database administrator using a tool such as SQL Server Management Studio.
EnableServices.ps1	PowerShell script to be run by the Studio user on a Controller to enable product services.

3. If you are upgrading from an earlier 7.x product version, run the following scripts in the order shown:

Script	Description
DisableServices.ps1	PowerShell script to be run by the Studio user on a Controller to disable product services.
UpgradeSiteDatabase.sql	SQL script to be run by the database administrator on the server containing the Site database, using a tool such as SQL Server Management Studio.
UpgradeMonitorDatabase.sql	SQL script to be run by the database administrator on the server containing the Monitor database, using a tool such as SQL Server Management Studio.
UpgradeLoggingDatabase.sql	SQL script to be run by the database administrator on the server containing the Configuration Logging database, using a tool such as SQL Server Management Studio. Run this script only if this database changes (for example, after applying a hotfix).

Upgrade a deployment

EnableServices.ps1	PowerShell script to be run by the Studio user on a Controller to enable product services.
--------------------	--

4. After you complete the displayed checklist tasks, select Finish upgrade.

Upgrade a XenApp 6.5 worker to a new VDA for Windows Server OS

When you run the XenApp 7.6 installer on a XenApp 6.5 worker server, it:

- Removes the server from the XenApp 6.5 farm (this task automatically invokes the XenApp 6.5 installer's command-line interface)
- Removes the XenApp 6.5 software
- Installs a new (XenApp 7.6 or later supported release) VDA for Windows Server OS

When you use the installer's graphical interface, you are guided through the same wizard that you used when installing VDAs for Windows Server OS in your new XenApp Site. Similarly, the command-line interface uses the same commands and parameters you use to install other VDAs.

You are probably already familiar with using the installer from installing your XenApp 7.6 core components and other VDAs. To review preparatory information, see [VDA installation preparation](#). Then, launch the installer ([Install using the graphical interface](#)) or issue the command (Install a VDA using the command line) on the XenApp 6.5 worker server.

Good to know:

- This upgrade is valid on XenApp 6.5 servers that are configured in session-host only mode (also called *session-only* or *worker* servers).
- Uninstalling XenApp 6.5 requires several server restarts. When using the command-line interface, you can use the `/NOREBOOT` option to inhibit that automatic action; however, you must restart the server for the uninstallation and subsequent installation to proceed.
- If an error occurs during the XenApp uninstallation process, check the uninstall error log referenced in the error message. Uninstall log files reside in the folder `"%TEMP%\Citrix\XenDesktop Installation\XenApp 6.5 Uninstall Log Files\"`.
- After you upgrade the XenApp 6.5 worker servers, from Studio in the new XenApp Site, create Machine Catalogs (or edit existing catalogs) for the upgraded workers.
- If you migrated policy and application settings from a XenApp 6.5 controller server (see [Migrate XenApp 6.x](#)), assign the Delivery Groups containing the migrated published applications to the machine catalog that hosted those applications in XenApp 6.5.

Troubleshooting

Symptoms: Removal of the XenApp 6.5 software fails. The uninstall log contains the message: "Error 25703. An error occurred while plugging XML into Internet Information Server. Setup cannot copy files to your IIS Scripts directory. Please make sure that your IIS installation is correct."

- Cause: The issue occurs on systems where (1) during the initial XenApp 6.5 installation, you indicated that the Citrix XML Service (CtxHttp.exe) should not share a port with IIS, and (2) .NET Framework 3.5.1 is installed.
- Resolution:
 1. Remove the Web Server (IIS) role using the Windows Remove Server Roles wizard. (You can reinstall the Web Server (IIS) role later.)
 2. Restart the server.
 3. Using Add/Remove Programs, uninstall the following:
 - a. Citrix XenApp 6.5
 - b. Microsoft Visual C++ 2005 Redistributable (x64), version 8.0.56336
 4. Restart the server.
 5. Run the XenApp 7.6 installer to install the VDA for Windows Server OS.

Migrate XenApp 6.x

Important: Review this entire article before beginning a migration.

The XenApp 6.x Migration Tool (the *migration tool*) is a collection of PowerShell scripts containing cmdlets that migrate XenApp 6.x (6.0 or 6.5) policy and farm data. On the XenApp 6.x controller server, you run export cmdlets that gather that data into XML files. Then, from the XenApp 7.6 Controller, you run import cmdlets that create objects using the data gathered during the export.

The following sequence summarizes the migration process; details are provided later.

1. On a XenApp 6.0 or 6.5 controller:
 - a. Import the PowerShell export modules.
 - b. Run the export cmdlets to export policy and/or farm data to XML files.
2. Copy the XML files (and icons folder if you chose not to embed them in the XML files during the export) to the XenApp 7.6 Controller.
3. On the XenApp 7.6 Controller:
 - a. Import the PowerShell import modules.
 - b. Run the import cmdlets to import policy and/or farm data (applications), using the XML files as input.
4. Complete post-migration steps.

Before you run an actual migration, you can export your XenApp 6.x settings and then perform a *preview import* on the XenApp 7.6 site. The preview identifies possible failure points so you can resolve issues before running the actual import. For example, a preview might detect that an application with the same name already exists in the new XenApp 7.6 site. You can also use the log files generated from the preview as a migration guide.

Unless otherwise noted, the term 6.x refers to XenApp 6.0 or 6.5.

New in this release

This December 2014 release (version 20141125) contains the following updates:

- Exporting applications and policies from a XenApp 6.0 farm has been introduced as an experimental feature. If you encounter issues using the migration tool on a XenApp 6.0 farm, report them to the support forum <http://discussions.citrix.com/forum/1411-xenapp-7x/>, so that Citrix can investigate them for potential improvements to the tool.
- New packaging - the XAMigration.zip file now contains two separate, independent packages: ReadIMA.zip and ImportFMA.zip. To export from a XenApp 6.x server, you need only ReadIMA.zip. To import to a XenApp 7.6 server, you need only ImportFMA.zip.

- The Export-XAFarm cmdlet supports a new parameter (EmbedIconData) that eliminates the need to copy icon data to separate files.
- The Import-XAFarm cmdlet supports three new parameters:
 - MatchServer - import applications from servers whose names match an expression
 - NotMatchServer - import applications from servers whose names do not match an expression
 - IncludeDisabledApps - import disabled applications
- Prelaunched applications are not imported.
- The Export-Policy cmdlet works on XenDesktop 7.x.

A video overview of the migration tool is available [here](#).

Migration Tool package

The migration tool is available from a Citrix download site. The XAMigration.zip file contains two separate, independent packages:

- ReadIMA.zip - contains the files used to export data from your XenApp 6.x farm, plus shared modules.

Module or file	Description
ExportPolicy.psm1	PowerShell script module for exporting XenApp 6.x policies to an XML file.
ExportXAFarm.psm1	PowerShell script module for exporting XenApp 6.x farm settings to an XML file.
ExportPolicy.psd1	PowerShell manifest file for script module ExportPolicy.psm1.
ExportXAFarm.psd1	PowerShell manifest file for script module ExportXAFarm.psm1.
LogUtilities.psm1	Shared PowerShell script module that contains logging functions.
XmlUtilities.psd1	PowerShell manifest file for script module XmlUtilities.psm1.
XmlUtilities.psm1	Shared PowerShell script module that contains XML functions.

- ImportFMA.zip - contains the files used to import data to your XenApp 7.6 farm, plus shared modules.

Module or file	Description
ImportPolicy.psm1	PowerShell script module for importing policies to XenApp 7.6.
ImportXAFarm.psm1	PowerShell script module for importing applications to XenApp 7.6

ImportPolicy.psd1	PowerShell manifest file for script module ImportPolicy.psm1.
ImportXAFarm.psd1	PowerShell manifest file for script module ImportXAFarm.psm1.
PolicyData.xsd	XML schema for policy data.
XAFarmData.xsd	XML schema for XenApp farm data.
LogUtilities.psm1	Shared PowerShell script module that contains logging functions.
XmlUtilities.psd1	PowerShell manifest file for script module XmlUtilities.psm1.
XmlUtilities.psm1	Shared PowerShell script module that contains XML functions.

Limitations

- Not all policies settings are imported; see Policy settings not imported. Settings that are not supported are ignored and noted in the log file.
- While all application details are collected in the output XML file during the export operation, only server-installed applications are imported into the XenApp 7.6 site. Published desktops, content, and most streamed applications are not supported (see the Import-XAFarm cmdlet parameters in Step-by-step: import data for exceptions).
- Application servers are not imported.
- Many application properties are not imported because of differences between the XenApp 6.x Independent Management Architecture (IMA) and the XenApp 7.6 FlexCast Management Architecture (FMA) technologies; see Application property mapping.
- A Delivery Group is created during the import. See Advanced use for details about using parameters to filter what is imported.
- Only Citrix policy settings created with the AppCenter management console are imported; Citrix policy settings created with Windows Group Policy Objects (GPOs) are not imported.
- The migration scripts are intended for migrations from XenApp 6.x to XenApp 7.6 only.

Security considerations

The XML files created by the export scripts can contain sensitive information about your environment and organization, such as user names, server names, and other XenApp farm, application, and policy configuration data. Store and handle these files in secure environments.

Carefully review the XML files before using them as input when importing policies and applications, to ensure they contain no unauthorized modifications.

Policy object assignments (previously known as policy filters) control how policies are applied. After importing the policies, carefully review the object assignments for each policy to ensure that there are no security vulnerabilities resulting from the import. Different sets of users, IP addresses, or client names may be applied to the policy after the import. The allow/deny settings may have different meanings after the import.

Logging and error handling

The scripts provide extensive logging that tracks all cmdlet executions, informative messages, cmdlet execution results, warnings, and errors.

- Most Citrix PowerShell cmdlet use is logged. All PowerShell cmdlets in the import scripts that create new site objects are logged.
- Script execution progress is logged, including the objects being processed.
- Major actions that affect the state of the flow are logged, including flows directed from the command line.
- All messages printed to the console are logged, including warnings and errors.
- Each line is time-stamped to the millisecond.

Citrix recommends specifying a log file when you run each of the export and import cmdlets.

If you do not specify a log file name, the log file is stored in the current user's home folder (specified in the PowerShell \$HOME variable) if that folder exists; otherwise, it is placed in the script's current execution folder. The default log name is "XFarmYYYYMMDDHHmmSS-xxxxxx" where the last six digits constitute a random number.

By default, all progress information is displayed. To suppress the display, specify the NoDetails parameter in the export and import cmdlet.

Generally, a script stops execution when an error is encountered, and you can run the cmdlet again after clearing the error conditions.

Conditions that are not considered errors are logged; many are reported as warnings, and script execution continues. For example, unsupported application types are reported as warnings and are not imported. Applications that already exist in the XenApp 7.6 site are not imported. Policy settings that are deprecated in XenApp 7.6 are not imported.

The migration scripts use many PowerShell cmdlets, and all possible errors might not be logged. For additional logging coverage, use the PowerShell logging features. For example, PowerShell transcripts log everything that is printed to the screen. For more information, see the help for the Start-Transcript and Stop-Transcript cmdlets.

Requirements, preparation, and best practices

Important: Remember to review this entire article before beginning a migration.

You should understand basic PowerShell concepts about execution policy, modules, cmdlets, and scripts. Although extensive scripting expertise is not required, you should

understand the cmdlets you execute. Use the Get-Help cmdlet to review each migration cmdlet's help before executing it. For example:

Get-Help -full Import-XAFarm

Specify a log file on the command line and always review the log file after running a cmdlet. If a script fails, check and fix the error identified in the log file and then run the cmdlet again.

Good to know:

- To facilitate application delivery while two deployments are running (the XenApp 6.x farm and the new XenApp 7.6 site), you can aggregate both deployments in StoreFront or Web Interface. See the eDocs documentation for your StoreFront or Web Interface release (Manage > Create a store).
- Application icon data is handled in one of two ways:
 - If you specify the EmbedIconData parameter in the Export-XAFarm cmdlet, exported application icon data is embedded in the output XML file.
 - If you do not specify the EmbedIconData parameter in the Export-XAFarm cmdlet, exported application icon data is stored under a folder named by appending the string "-icons" to the base name of the output XML file. For example, if the XmlOutputFile parameter is "FarmData.xml" then the folder "FarmData-icons" is created to store the application icons.

The icon data files in this folder are .txt files that are named using the browser name of the published application (although the files are .txt files, the stored data is encoded binary icon data, which can be read by the import script to re-create the application icon). During the import operation, if the icon folder is not found in the same location as the import XML file, generic icons are used for each imported application.

- The names of the script modules, manifest files, shared module, and cmdlets are similar. Use tab completion with care to avoid errors. For example, Export-XAFarm is a cmdlet. ExportXAFarm.psd1 and ExportXAFarm.psm1 are files that cannot be executed.
- In the step-by-step sections below, most *<string>* parameter values show surrounding quotation marks. These are optional for single-word strings.

For exporting from the XenApp 6.x server:

- The export must be run on a XenApp 6.x server configured with the *controller and session-host* (commonly known as *controller*) server mode.
- To run the export cmdlets, you must be a XenApp administrator with permission to read objects. You must also have sufficient Windows permission to run PowerShell scripts; the step-by-step procedures below contain instructions.
- Ensure the XenApp 6.x farm is in a healthy state before beginning an export. Back up the farm database. Verify the farm's integrity using the Citrix IMA Helper utility ([CTX133983](#)): from the IMA Datastore tab, run a Master Check (and then use the DSCheck option to resolve invalid entries). Repairing issues before the migration helps prevent export failures. For example, if a server was removed improperly from the farm, its data might remain in the database; that could cause cmdlets in the export script to fail (for example, Get-XAServer -ZoneName). If the cmdlets fail, the script

fails.

- You can run the export cmdlets on a live farm that has active user connections; the export scripts read only the static farm configuration and policy data.

For importing to the XenApp 7.6 server:

- You can import data to XenApp 7.6 deployments (and later supported versions). You must install a XenApp 7.6 Controller and Studio, and create a site before importing the data you exported from the XenApp 6.x farm. Although VDAs are not required to import settings, they allow application file types to be made available.
- To run the import cmdlets, you must be a XenApp administrator with permission to read and create objects. A Full Administrator has these permissions. You must also have sufficient Windows permission to run PowerShell scripts; the step-by-step procedures below contain instructions.
- No other user connections should be active during an import. The import scripts create many new objects, and disruptions may occur if other users are changing the configuration at the same time.

Remember that you can export data and then use the -Preview parameter with the import cmdlets to see what would happen during an actual import, but without actually importing anything. The logs will indicate exactly what would happen during an actual import; if errors occur, you can resolve them before starting an actual import.

Step-by-step: export data

A video of an export walk-through is available [here](#).

Complete the following steps to export data from a XenApp 6.x controller to XML files.

1. Download the XAMigration.zip migration tool package from the Citrix download site. For convenience, place it on a network file share that can be accessed by both the XenApp 6.x farm and the XenApp 7.6 site. Unzip XAMigration.zip on the network file share. There should be two zip files: ReadIMA.zip and ImportFMA.zip.
2. Log on to the XenApp 6.x controller as a XenApp administrator with at least read-only permission and Windows permission to run PowerShell scripts.
3. Copy ReadIMA.zip from the network file share to the XenApp 6.x controller. Unzip and extract ReadIMA.zip on the controller to a folder (for example: C:\XAMigration).
4. Open a PowerShell console and set the current directory to the script location. For example:

`cd C:\XAMigration`
5. Check the script execution policy by running Get-ExecutionPolicy.
6. Set the script execution policy to at least RemoteSigned to allow the scripts to be executed. For example:

`Set-ExecutionPolicy RemoteSigned`

7. Import the module definition files ExportPolicy.psd1 and ExportXAFarm.psd1:

```
Import-Module .\ExportPolicy.psd1
```

```
Import-Module .\ExportXAFarm.psd1
```

Good to know:

- If you intend to export only policy data, you can import only the ExportPolicy.psd1 module definition file. Similarly, if you intend to export only farm data, import only ExportXAFarm.psd1.
 - Importing the module definition files also adds the required PowerShell snap-ins.
 - Do not import the .psm1 script files.
8. To export policy data, run the Export-Policy cmdlet.

Parameter	Description
-XmlOutputFile "<string>.xml"	XML output file name; this file will hold the exported data. Must have an .xml extension. The file must not exist, but if a path is specified, the parent path must exist. Default: None; this parameter is required.
-LogFile "<string>"	Log file name. An extension is optional. The file is created if it does not exist. If the file exists and the NoClobber parameter is also specified, an error is generated; otherwise, the file's content is overwritten. Default: See Logging and error handling
-NoLog	Do not generate log output. This overrides the LogFile parameter if it is also specified. Default: False; log output is generated
-NoClobber	Do not overwrite an existing log file specified in the LogFile parameter. If the log file does not exist, this parameter has no effect. Default: False; an existing log file is overwritten
-NoDetails	Do not send detailed reports about script execution to the console. Default: False; detailed reports are sent to the console

-SuppressLogo	<p>Do not print the message "XenApp 6.x to XenApp/XenDesktop 7.6 Migration Tool Version #yyyyMMdd-hhmm#" to the console. This message, which identifies the script version, can be helpful during troubleshooting; therefore, Citrix recommends omitting this parameter.</p> <p>Default: False; the message is printed to the console</p>
---------------	---

Example: The following cmdlet exports policy information to the XML file named MyPolicies.xml. The operation is logged to the file named MyPolicies.log.

```
Export-Policy -XmlOutputFile ".\MyPolicies.XML"
-LogFile ".\MyPolicies.Log"
```

- To export farm data, run the Export-XAFarm cmdlet, specifying a log file and an XML file.

Parameter	Description
-XmlOutputFile "<string>.xml"	<p>XML output file name; this file will hold the exported data. Must have an .xml extension. The file must not exist, but if a path is specified, the parent path must exist.</p> <p>Default: None; this parameter is required.</p>
-LogFile "<string>"	<p>Log file name. An extension is optional. The file is created if it does not exist. If the file exists and the NoClobber parameter is also specified, an error is generated; otherwise, the file's content is overwritten.</p> <p>Default: See Logging and error handling</p>
-NoLog	<p>Do not generate log output. This overrides the LogFile parameter if it is also specified.</p> <p>Default: False; log output is generated</p>
-NoClobber	<p>Do not overwrite an existing log file specified in the LogFile parameter. If the log file does not exist, this parameter has no effect.</p> <p>Default: False; an existing log file is overwritten</p>

-NoDetails	<p>Do not send detailed reports about script execution to the console.</p> <p>Default: False; detailed reports are sent to the console</p>
-SuppressLogo	<p>Do not print the message "XenApp 6.x to XenApp/XenDesktop 7.6 Migration Tool Version #yyyyMMdd-hhmm#" to the console. This message, which identifies the script version, can be helpful during troubleshooting; therefore, Citrix recommends omitting this parameter.</p> <p>Default: False; the message is printed to the console</p>
-IgnoreAdmins	<p>Do not export administrator information. See Advanced use for how-to-use information.</p> <p>Default: False; administrator information is exported</p>
-IgnoreApps	<p>Do not export application information. See Advanced use for how-to-use information.</p> <p>Default: False; application information is exported</p>
-IgnoreServers	<p>Do not export server information.</p> <p>Default: False: server information is exported</p>
-IgnoreZones	<p>Do not export zone information.</p> <p>Default: False; zone information is exported.</p>
-IgnoreOthers	<p>Do not export information such as configuration logging, load evaluators, load balancing policies, printer drivers, and worker groups.</p> <p>Default: False; other information is exported</p>
-AppLimit <integer>	<p>Number of applications to be exported. See Advanced use for how-to-use information.</p> <p>Default: All applications are exported</p>

-EmbedIconData	<p>Embed application icon data in the same XML file as the other objects.</p> <p>Default: Icons are stored separately. See Requirements, preparation, and best practices for details</p>
-SkipApps <integer>	<p>Number of applications to skip. See Advanced use for how-to-use information.</p> <p>Default: No applications are skipped</p>

Example: The following cmdlet exports farm information to the XML file named MyFarm.xml. The operation is logged to the file MyFarm.log. A folder named "MyFarm-icons" is created to store the application icon data files; this folder is at the same location as MyFarm.XML.

```
Export-XAFarm -XmlOutputFile ".\MyFarm.XML"
-LogFile ".\MyFarm.Log"
```

After the export scripts complete, the XML files specified on the command lines contain the policy and XenApp farm data. The application icon files contain icon data files, and the log file indicate what occurred during the export.

Step-by-step: import data

A video of an import walk-through is available [here](#).

Remember that you can run a preview import (by issuing the Import-Policy or Import-XAFarm cmdlet with the Preview parameter) and review the log files before performing an actual import.

Complete the following steps to import data to a XenApp 7.6 site, using the XML files generating from the export.

1. Log on to the XenApp 7.6 controller as an administrator with read-write permission and Windows permission to run PowerShell scripts.
2. If you have not unzipped the migration tool package XAMigration on the network file share, do so now. Copy ImportFMA.zip from the network file share to the XenApp 7.6 Controller. Unzip and extract ImportFMA.zip on the Controller to a folder (for example: C:\XAMigration).
3. Copy the XML files (the output files generated during the export) from the XenApp 6.x controller to the same location on the XenApp 7.6 Controller where you extracted the ImportFMA.zip files.

If you chose not to embed the application icon data in the XML output file when you ran the Export-XAFarm cmdlet, be sure to copy the icon data folder and files to the same location on the XenApp 7.6 controller as the output XML file containing the application data and the extracted ImportFMA.zip files.

4. Open a PowerShell console and set the current directory to the script location.

```
cd C:\XAMigration
```

5. Check the script execution policy by running Get-ExecutionPolicy.
6. Set the script execution policy to at least RemoteSigned to allow the scripts to be executed. For example:

```
Set-ExecutionPolicy RemoteSigned
```

7. Import the PowerShell module definition files ImportPolicy.psd1 and ImportXAFarm.psd1:

```
Import-Module .\ImportPolicy.psd1
```

```
Import-Module .\ImportXAFarm.psd1
```

Good to know:

- If you intend to import only policy data, you can import only the ImportPolicy.psd1 module definition file. Similarly, if you intend to import only farm data, import only ImportXAFarm.psd1.
 - Importing the module definition files also adds the required PowerShell snap-ins.
 - Do not import the .psm1 script files.
8. To import policy data, run the Import-Policy cmdlet, specifying the XML file containing the exported policy data.

Parameter	Description
-XmlInputFile "<string>.xml"	XML input file name; this file contains data collected from running the Export-Policy cmdlet. Must have an .xml extension. Default: None; this parameter is required.
-XsdFile "<string>"	XSD file name. The import scripts use this file to validate the syntax of the XML input file. See Advanced use for how-to-use information. Default: PolicyData.XSD
-LogFile "<string>"	Log file name. If you copied the export log files to this server, consider using a different log file name with the import cmdlet. Default: See Logging and error handling
-NoLog	Do not generate log output. This overrides the LogFile parameter, if it is also specified. Default: False; log output is generated

-NoClobber	<p>Do not overwrite an existing log file specified in the LogFile parameter. If the log file does not exist, this parameter has no effect.</p> <p>Default: False; an existing log file is overwritten</p>
-NoDetails	<p>Do not send detailed reports about script execution to the console.</p> <p>Default: False; detailed reports are sent to the console</p>
-SuppressLogo	<p>Do not print the message "XenApp 6.x to XenApp/XenDesktop 7.6 Migration Tool Version #yyyyMMdd-hhmm#" to the console. This message, which identifies the script version, can be helpful during troubleshooting; therefore, Citrix recommends omitting this parameter.</p> <p>Default: False; the message is printed to the console</p>
-Preview	<p>Perform a preview import: read data from the XML input file, but do not import objects to the site. The log file and console indicate what occurred during the preview import. A preview shows administrators what would happen during a real import.</p> <p>Default: False; a real import occurs</p>

Example: The following cmdlet imports policy data from the XML file named MyPolicies.xml. The operation is logged to the file named MyPolicies.log.

```
Import-Policy -XmlInputFile ".\MyPolicies.XML"
-LogFile ".\MyPolicies.Log"
```

- To import applications, run the Import-XAFarm cmdlet, specifying a log file and the XML file containing the exported farm data.

Parameter	Description
-XmlInputFile "<string>.xml"	<p>XML input file name; this file contains data collected from running the Export-XAFarm cmdlet. Must have an .xml extension.</p> <p>Default: None; this parameter is required.</p>

-XsdFile "<string>"	<p>XSD file name. The import scripts use this file to validate the syntax of the XML input file. See Advanced use for how-to-use information.</p> <p>Default: XAFarmData.XSD</p>
-LogFile "<string>"	<p>Log file name. If you copied the export log files to this server, consider using a different log file name with the import cmdlet.</p> <p>Default: See Logging and error handling</p>
-NoLog	<p>Do not generate log output. This overrides the LogFile parameter, if it is also specified.</p> <p>Default: False; log output is generated</p>
-NoClobber	<p>Do not overwrite an existing log file specified in the LogFile parameter. If the log file does not exist, this parameter has no effect.</p> <p>Default: False; an existing log file is overwritten</p>
-NoDetails	<p>Do not send detailed reports about script execution to the console.</p> <p>Default: False; detailed reports are sent to the console</p>
-SuppressLogo	<p>Do not print the message "XenApp 6.x to XenApp/XenDesktop 7.6 Migration Tool Version #yyyyMMdd-hhmm#" to the console. This message, which identifies the script version, can be helpful during troubleshooting; therefore, Citrix recommends omitting this parameter.</p> <p>Default: False; the message is printed to the console</p>
-Preview	<p>Perform a preview import: read data from the XML input file, but do not import objects to the site. The log file and console indicate what occurred during the preview import. A preview shows administrators what would happen during a real import.</p> <p>Default: False; a real import occurs</p>

-DeliveryGroupName "<string>"	<p>Delivery Group name for all imported applications. See Advanced use for how-to-use information.</p> <p>Default: "<xenapp-farm-name> - Delivery Group"</p>
-MatchFolder "<string>"	<p>Import only those applications in folders with names that match the string. See Advanced use for how-to-use information.</p> <p>Default: No matching occurs</p>
-NotMatchFolder "<string>"	<p>Import only those applications in folders with names that do not match the string. See Advanced use for how-to-use information.</p> <p>Default: No matching occurs</p>
-MatchServer "<string>"	<p>Import only those applications from servers whose names match the string. See Advanced use for how-to-use information.</p>
-NotMatchServer "<string>"	<p>Import only those applications from servers whose names do not match the string. See Advanced use for how-to-use information.</p> <p>Default: No matching occurs</p>
-MatchWorkerGroup "<string>"	<p>Import only those applications published to worker groups with names that match the string. See Advanced use for how-to-use information.</p> <p>Default: No matching occurs</p>
-NotMatchWorkerGroup "<string>"	<p>Import only those applications published to worker groups with names that do not match the string. See Advanced use for how-to-use information.</p> <p>Default: No matching occurs</p>
-MatchAccount "<string>"	<p>Import only those applications published to user accounts with names that match the string. See Advanced use for how-to-use information.</p> <p>Default: No matching occurs</p>

-NotMatchAccount "<string>"	Import only those applications published to user accounts with names that do not match the string. See Advanced use for how-to-use information. Default: No matching occurs
-IncludeStreamedApps	Import applications of type "StreamedToClientOrServerInstalled" . (No other streamed applications are imported.) Default: Streamed applications are not imported
-IncludeDisabledApps	Import applications that have been marked as disabled. Default: Disabled applications are not imported

Example: The following cmdlet imports applications from the XML file named MyFarm.xml. The operation is logged to the file named MyFarm.log.

```
Import-XAFarm -XmlInputFile ".\MyFarm.XML"
-LogFile ".\MyFarm.Log"
```

10. After the import completes successfully, complete the post-migration tasks.

Post-migration tasks

After successfully importing XenApp 6.x policies and farm settings into a XenApp 7.6 site, use the following guidance to ensure that the data has been imported correctly.

- **Policies and policy settings**

Importing policies is essentially a copy operation, with the exception of deprecated settings and policies, which are not imported. The post-migration check essentially involves comparing the two sides.

1. The log file lists all the policies and settings imported and ignored. First, review the log file and identify which settings and policies were not imported.
2. Compare the XenApp 6.x policies with the policies imported to XenApp 7.6. The values of the settings should remain the same (except for deprecated policy settings, as noted in the next step).
 - If you have a small number of policies, you can perform a side-by-side visual comparison of the policies displayed in the XenApp 6.x AppCenter and the policies displayed in the XenApp 7.6 Studio.
 - If you have a large number of policies, a visual comparison might not be feasible. In such cases, use the policy export cmdlet (Export-Policy) to export the XenApp 7.6 policies to a different XML file, and then use a text diff tool (such as windiff) to compare that file's data to the data in the XML file used

during the policy export from XenApp 6.x.

3. Use the information in the Policy settings not imported section to determine what might have changed during the import. If a XenApp 6.x policy contains only deprecated settings, as a whole policy, it is not imported. For example, if a XenApp 6.x policy contains only HMR test settings, that policy is completely ignored because there is no equivalent setting supported in XenApp 7.6.

Some XenApp 6.x policy settings are no longer supported, but the equivalent functionality is implemented in XenApp 7.6. For example, in XenApp 7.6, you can configure a restart schedule for Server OS machines by editing a Delivery Group; this functionality was previously implemented through policy settings.

4. Review and confirm how filters will apply to your XenApp 7.6 site versus their use in XenApp 6.x; significant differences between the XenApp 6.x farm and the XenApp 7.6 site could change the effect of filters.

- **Filters**

Carefully examine the filters for each policy. Changes may be required to ensure they still work in XenApp 7.6 as originally intended in XenApp 6.x.

Filter	Considerations
Access Control	Access Control Should contain the same values as the original XenApp 6.x filters and should work without requiring changes.
Citrix CloudBridge	A simple Boolean; should work without requiring changes.
Client IP Address	Lists client IP address ranges; each range is either allowed or denied. The import script preserves the values, but they may require changes if different clients connect to the XenApp 7.6 VDA machines.
Client Name	Similar to the Client IP Address filter, the import script preserves the values, but they may require changes if different clients connect to the XenApp 7.6 VDA machines.
Organizational Unit	<p>Values might be preserved, depending on whether or not the OUs can be resolved at the time they are imported. Review this filter closely, particularly if the XenApp 6.x and XenApp 7.6 machines reside in different domains. If you do not configure the filter values correctly, the policy may be applied to an incorrect set of OUs.</p> <p>The OUs are represented by names only, so there is a small chance that an OU name will be resolved to an OU containing different members from the OUs in the XenApp 6.x domain. Even if some of the values of the OU filter are preserved, you should carefully review the values.</p>

User or Group	<p>Values might be preserved, depending on whether or not the accounts can be resolved at the time they are imported.</p> <p>Similar to OUs, the accounts are resolved using names only, so if the XenApp 7.6 site has a domain with the same domain and user names, but are actually two different domains and users, the resolved accounts could be different from the XenApp 6.x domain users. If you do not properly review and modify the filter values, incorrect policy applications can occur.</p>
Worker Group	<p>Worker groups are not supported in XenApp 7.6. Consider using the Delivery Group, Delivery Group Type, and Tag filters, which are supported in XenApp 7.6 (not in XenApp 6.x).</p> <ul style="list-style-type: none"> • Delivery Group: Allows policies to be applied based on Delivery Groups. Each filter entry specifies a Delivery Group and can be allowed or denied. • Delivery Group Type: Allows policies to be applied based on the Delivery Group types. Each filter specifies a Delivery Group type that can be allowed or denied. • Tag: Specifies policy application based on tags created for the VDA machines. Each tag can be allowed or denied.

To recap, filters that involve domain user changes require the most attention if the XenApp 6.x farm and the XenApp 7.6 site are in different domains. Because the import script uses only strings of domain and user names to resolve users in the new domain, some of the accounts might be resolved and others might not. While there is only a small chance that different domains and users have the same name, you should carefully review these filters to ensure they contain correct values.

• Applications

The application importing scripts do not just import applications; they also create objects such as Delivery Groups. If the application import involves multiple iterations, the original application folder hierarchies can change significantly.

1. First, read the migration log files that contain details about which applications were imported, which applications were ignored, and the cmdlets that were used to create the applications.
2. For each application:
 - Visually check to ensure the basic properties were preserved during the import. Use the information in the Application property mapping section to determine which properties were imported without change, not imported, or initialized using the XenApp 6.x application data.
 - Check the user list. The import script automatically imports the explicit list of users into the application's limit visibility list in XenApp 7.6. Check to ensure that the list remains the same.
3. Application servers are not imported. This means that none of the imported applications can be accessed yet. The Delivery Groups that contain these

applications must be assigned machine catalogs that contain the machines that have the published applications' executable images. For each application:

- Ensure that the executable name and the working directory point to an executable that exists in the machines assigned to the Delivery Group (through the machine catalogs).
 - Check a command line parameter (which may be anything, such as file name, environment variable, or executable name). Verify that the parameter is valid for all the machines in the machine catalogs assigned to the Delivery Group.
- **Log files**

The log files are the most important reference resources for an import and export. This is why existing log files are not overwritten by default, and default log file names are unique.

As noted in the “Logging and error handling” section, if you chose to use additional logging coverage with the PowerShell Start-Transcript and Stop-Transcript cmdlets (which record everything typed and printed to the console), that output, together with the log file, provides a complete reference of import and export activity.

Using the time stamps in the log files, you can diagnose certain problems. For example, if an export or import ran for a very long time, you could determine if a faulty database connection or resolving user accounts took most of the time.

The commands recorded in the log files also tell you how some objects are read or created. For example, to create a Delivery Group, several commands are executed to not only create the Delivery Group object itself, but also other objects such as access policy rules that allow application objects to be assigned to the Delivery Group.

The log file can also be used to diagnose a failed export or import. Typically, the last lines of the log file indicate what caused the failure; the failure error message is also saved in the log file. Together with the XML file, the log file can be used to determine which object was involved in the failure.

After reviewing and testing the migration, you can:

1. Upgrade your XenApp 6.5 worker servers to current Virtual Delivery Agents (VDAs) by running the 7.6 installer on the server, which removes the XenApp 6.5 software and then automatically installs a current VDA. See [Upgrade a XenApp 6.5 worker to a new VDA for Windows Server OS](#) for instructions.

For XenApp 6.0 worker servers, you must manually uninstall the XenApp 6.0 software from the server. You can then use the 7.6 installer to install the current VDA. You cannot use the 7.6 installer to automatically remove the XenApp 6.0 software.

2. From Studio in the new XenApp site, create machine catalogs (or edit existing catalogs) for the upgraded workers.
3. Add the upgraded machines from the machine catalog to the Delivery Groups that contain the applications installed on those VDAs for Windows Server OS.

Advanced use

By default, the Export-Policy cmdlet exports all policy data to an XML file. Similarly, Export-XAFarm exports all farm data to an XML file. You can use command line parameters to more finely control what is exported and imported.

- **Export applications partially** - If you have a large number of applications and want to control how many are exported to the XML file, use the following parameters:
 - AppLimit - Specifies the number of applications to export.
 - SkipApps - Specifies the number of applications to skip before exporting subsequent applications.

You can use both of these parameters to export large quantities of applications in manageable chunks. For example, the first time you run Export-XAFarm, you want to export only the first 200 applications, so you specify that value in the AppLimit parameter.

```
Export-XAFarm -XmlOutputFile "Apps1-200.xml"  
-AppLimit "200"
```

The next time you run Export-XAFarm, you want to export the next 100 applications, so you use the SkipApps parameter to disregard the applications you've already exported (the first 200), and the AppLimit parameter to export the next 100 applications.

```
Export-XAFarm -XmlOutputFile "Apps201-300.xml"  
-AppLimit "100" -SkipApps "200"
```

- **Do not export certain objects** - Some objects can be ignored and thus do not need to be exported, particularly those objects that are not imported; see Policy settings not imported and Application property mapping. Use the following parameters to prevent exporting unneeded objects:
 - IgnoreAdmins - Do not export administrator objects
 - IgnoreServers - Do not export server objects
 - IgnoreZones - Do not export zone objects
 - IgnoreOthers - Do not export configuration logging, load evaluator, load balancing policy, printer driver, and worker group objects
 - IgnoreApps - Do not export applications; this allows you to export other data to an XML output file and then run the export again to export applications to a different XML output file.

You can also use these parameters to work around issues that could cause the export to fail. For example, if you have a bad server in a zone, the zone export might fail; if you include the IgnoreZones parameter, the export continues with other objects.

- **Delivery Group names** - If you do not want to put all of your applications into one Delivery Group (for example, because they are accessed by different sets of users and published to different sets of servers), you can run Import-XAFarm multiple times, specifying different applications and a different Delivery Group each time. Although you can use PowerShell cmdlets to move applications from one Delivery Group to another after the migration, importing selectively to unique Delivery Groups can reduce

or eliminate the effort of moving the applications later.

1. Use the `DeliveryGroupName` parameter with the `Import-XAFarm` cmdlet. The script creates the specified Delivery Group if it doesn't exist.
2. Use the following parameters with regular expressions to filter the applications to be imported into the Delivery Group, based on folder, worker group, user account, and/or server names. Enclosing the regular expression in single or double quotation marks is recommended. For information about regular expressions, see [http://msdn.microsoft.com/en-us/library/hs600312\(v=vs.110\).aspx](http://msdn.microsoft.com/en-us/library/hs600312(v=vs.110).aspx).

- `MatchWorkerGroup` and `NotMatchWorkerGroup` - For example, for applications published to worker groups, the following cmdlet imports applications in the worker group named "Productivity Apps" to a XenApp 7.6 Delivery Group of the same name:

```
Import-XAFarm -XmlInputFile XAFarm.xml -LogFile XAFarmImport.log  
-MatchWorkerGroup 'Productivity Apps' -DeliveryGroupName 'Productivity Apps'
```

- `MatchFolder` and `NotMatchFolder` - For example, for applications organized in application folders, the following cmdlet imports applications in the folder named "Productivity Apps" to a XenApp 7.6 Delivery Group of the same name.

```
Import-XAFarm -XmlInputFile XAFarm.xml -LogFile XAFarmImport.log  
-MatchFolder 'Productivity Apps' -DeliveryGroupName 'Productivity Apps'
```

For example, the following cmdlet imports applications in any folder whose name contains "MS Office Apps" to the default Delivery Group.

```
Import-XAFarm -XmlInputFile .\TheFarmApps.XML -MatchFolder ".*MS Office Apps/.*"
```

- `MatchAccount` and `NotMatchAccount` - For example, for applications published to Active Directory users or user groups, the following cmdlet imports applications published to the user group named "Finance Group" to a XenApp 7.6 Delivery Group named "Finance."

```
Import-XAFarm -XmlInputFile XAFarm.xml -LogFile XAFarmImport.log  
-MatchAccount 'DOMAIN\Finance Group' -DeliveryGroupName 'Finance'
```

- `MatchServer` and `NotMatchServer` - For example, for applications organized on servers, the following cmdlet imports applications associated with the server not named "Current" to a XenApp Delivery Group named "Legacy."

```
Import-XAFarm -XmlInputFile XAFarm.xml -LogFile XAFarmImport.log  
-NotMatchServer 'Current' -DeliveryGroupName 'Legacy'
```

- **Customization** - PowerShell programmers can create their own tools. For example, you can use the export script as an inventory tool to keep track of changes in a XenApp 6.x farm. You can also modify the XSD files or (create your own XSD files) to store additional data or data in different formats in the XML files. You can specify a nondefault XSD file with each of the import cmdlets.

Note: Although you can modify script files to meet specific or advanced migration requirements, support is limited to the scripts in their unmodified state. Citrix Technical Support will recommend reverting to the unmodified scripts to determine expected behavior and provide support, if necessary.

Troubleshooting

- If you are using PowerShell version 2.0 and you added the Citrix Group Policy PowerShell Provider snap-in or the Citrix Common Commands snap-in using the Add-PSSnapIn cmdlet, you might see the error message "Object reference not set to an instance of an object" when you run the export or import cmdlets. This error does not affect script execution and can be safely ignored.
- Avoid adding or removing the Citrix Group Policy PowerShell Provider snap-in in the same console session where the export and import script modules are used, because those script modules automatically add the snap-in. If you add or remove the snap-in separately, you might see one of the following errors:
 - "A drive with the name 'LocalGpo' already exists." This error appears when the snap-in is added twice; the snap-in attempts to mount the drive LocalGpo when it's loaded, and then reports the error.
 - "A parameter cannot be found that matches parameter name 'Controller'." This error appears when the snap-in has not been added but the script attempts to mount the drive. The script is not aware that the snap-in was removed. Close the console and launch a new session. In the new session, import the script modules; do not add or remove the snap-in separately.
- When importing the modules, if you right-click a .psd1 file and select Open or Open with PowerShell, the PowerShell console window will rapidly open and close until you stop the process. To avoid this error, enter the complete PowerShell script module name directly in the PowerShell console window (for example, Import-Module .\ExportPolicy.psd1).
- If you receive a permission error when running an export or import, ensure you are a XenApp administrator with permission to read objects (for export) or read and create objects (for import). You must also have sufficient Windows permission to run PowerShell scripts.
- If an export fails, check that the XenApp 6.x farm is in a healthy state by running the DSMaint and DSCheck utilities on the XenApp 6.x controller server.
- If you run a preview import and then later run the import cmdlets again for an actual migration, but discover that nothing was imported, verify that you removed the Preview parameter from the import cmdlets.

Policy settings not imported

The following computer and user policy settings are not imported because they are no longer supported. The features and components that support these settings have either been replaced by new technologies/components or the settings do not apply because of architectural and platform changes.

Computer policy settings not imported

- Connection access control
- CPU management server level

- DNS address resolution
- Farm name
- Full icon caching
- Health monitoring, Health monitoring tests
- License server host name, License server port
- Limit user sessions, Limits on administrator sessions
- Load evaluator name
- Logging of logon limit events
- Maximum percent of servers with logon control
- Memory optimization, Memory optimization application exclusion list, Memory optimization interval, Memory optimization schedule: day of month, Memory optimization schedule: day of week, Memory optimization schedule: time
- Offline app client trust, Offline app event logging, Offline app license period, Offline app users
- Prompt for password
- Reboot custom warning, Reboot custom warning text, Reboot logon disable time, Reboot schedule frequency, Reboot schedule randomization interval, Reboot schedule start date, Reboot schedule time, Reboot warning interval, Reboot warning start time, Reboot warning to users, Scheduled reboots
- Shadowing *
- Trust XML requests (configured in StoreFront)
- Virtual IP adapter address filtering, Virtual IP compatibility programs list, Virtual IP enhanced compatibility, Virtual IP filter adapter addresses programs list
- Workload name
- XenApp product edition, XenApp product model
- XML service port

* Replaced with Windows Remote Assistance

User policy settings not imported

- Auto connect client COM ports, Auto connect client LPT ports
- Client COM port redirection, Client LPT port redirection
- Client printer names
- Concurrent logon limit

- Input from shadow connections *
- Linger disconnect timer interval, Linger terminate timer interval
- Log shadow attempts *
- Notify user of pending shadow connections *
- Pre-launch disconnect timer interval, Pre-launch terminate timer interval
- Session importance
- Single Sign-On, Single Sign-On central store
- Users who can shadow other users, Users who cannot shadow other users *

* Replaced with Windows Remote Assistance

Application types not imported

The following application types are not imported.

- Server desktops
- Content
- Streamed applications (App-V is the new method used for streaming applications)

Application property mapping

The farm data import script imports only applications. The following application properties are imported without change.

IMA Property	FMA Property
AddToClientDesktop	ShortcutAddedToDesktop
AddToClientStartMenu	ShortcutAddedToStartMenu
BrowserName	Name
ClientFolder	ClientFolder
CommandLineExecutable	CommandLineExecutable
CpuPriorityLevel	CpuPriorityLevel
Description	Description
DisplayName	PublishedName
Enabled	Enabled
StartMenuFolder	StartMenuFolder
WaitOnPrinterCreation	WaitForPrinterCreation
WorkingDirectory	WorkingDirectory

FolderPath	AdminFolderName
------------	-----------------

Note: IMA and FMA have different restrictions on folder name length. In IMA, the folder name limit is 256 characters; the FMA limit is 64 characters. When importing, applications with a folder path containing a folder name of more than 64 characters are skipped. The limit applies only to the folder name in the folder path; the entire folder path can be longer than the limits noted. To avoid applications from being skipped during the import, Citrix recommends checking the application folder name length and shortening it, if needed, before exporting.

The following application properties are initialized or uninitialized by default, or set to values provided in the XenApp 6.x data:

FMA Property	Value
Name	Initialized to the full path name, which contains the IMA properties FolderPath and DisplayName, but stripped of the leading string "Applications\"
ApplicationType	HostedOnDesktop
CommandLineArguments	Initialized using the XenApp 6.x command line arguments
IconFromClient	Uninitialized; defaults to false
IconUid	Initialized to an icon object created using XenApp 6.x icon data
SecureCmdLineArgumentsEnabled	Uninitialized; defaults to true
UserFilterEnabled	Uninitialized; defaults to false
UUID	Read-only, assigned by the Controller
Visible	Uninitialized; defaults to true

The following application properties are partially migrated:

IMA Property	Comments
FileTypes	Only the file types that exist on the new XenApp site are migrated. File types that do not exist on the new site are ignored. File types are imported only after the file types on the new site are updated.
IconData	New icon objects are created if the icon data has been provided for the exported applications.
Accounts	The user accounts of an application are split between the user list for the Delivery Group and the application. Explicit users are used to initialize the user list for the application. In addition, the "Domain Users" account for the domain of the user accounts is added to the user list for the Delivery Group.

The following XenApp 6.x properties are not imported:

IMA Property	Comments
ApplicationType	Ignored.
HideWhenDisabled	Ignored.

AccessSessionConditions	Replaced by Delivery Group access policies.
AccessSessionConditionsEnabled	Replaced by Delivery Group access policies.
ConnectionsThroughAccessGatewayAllowed	Replaced by Delivery Group access policies.
OtherConnectionsAllowed	Replaced by Delivery Group access policies.
AlternateProfiles	FMA does not support streamed applications.
OfflineAccessAllowed	FMA does not support streamed applications.
ProfileLocation	FMA does not support streamed applications.
ProfileProgramArguments	FMA does not support streamed applications.
ProfileProgramName	FMA does not support streamed applications.
RunAsLeastPrivilegedUser	FMA does not support streamed applications.
AnonymousConnectionsAllowed	FMA uses a different technology to support unauthenticated (anonymous) connections.
ApplicationId, SequenceNumber	IMA-unique data.
AudioType	FMA does not support advanced client connection options.
EncryptionLevel	SecureICA is enabled/disabled in Delivery Groups.
EncryptionRequired	SecureICA is enabled/disabled in Delivery Groups.
SslConnectionEnabled	FMA uses a different SSL implementation.
ContentAddress	FMA does not support published content.
ColorDepth	FMA does not support advanced window appearances.
MaximizedOnStartup	FMA does not support advanced window appearances.
TitleBarHidden	FMA does not support advanced window appearances.
WindowsType	FMA does not support advanced window appearances.
InstanceLimit	FMA does not support application limits.

MultipleInstancesPerUserAllowed	FMA does not support application limits.
LoadBalancingApplicationCheckEnabled	FMA uses a different technology to support load balancing.
PreLaunch	FMA uses a different technology to support session prelaunch.
CachingOption	FMA uses a different technology to support session prelaunch.
ServerNames	FMA uses a different technology.
WorkerGroupNames	FMA does not support worker groups.

Migrate XenDesktop 4

You can transfer data and settings from a XenDesktop 4 farm to a XenDesktop 7.x Site using the Migration Tool, which is available in the Support > Tools > MigrationTool folder on the XenDesktop installation media. The tool includes:

- The export tool, XdExport, which exports XenDesktop 4 farm data to an XML file (default name: XdSettings.xml). The XML file schema resides in the file XdFarm.xsd.
- The import tool, XdImport, which imports the data by running the PowerShell script Import-XdSettings.ps1.

To successfully use the Migration Tool, both deployments must have the same hypervisor version (for example, XenServer 6.2), and Active Directory environment.

You cannot use this tool to migrate XenApp, and you cannot migrate XenDesktop 4 to XenApp.

Tip: You can upgrade XenDesktop 5 (or later XenDesktop versions) to the current XenDesktop version; see [Upgrade a deployment](#).

Limitations

Not all data and settings are exported. The following configuration items are not migrated because they are exported but not imported:

- Administrators
- Delegated administration settings
- Desktop group folders
- Licensing configuration
- Registry keys

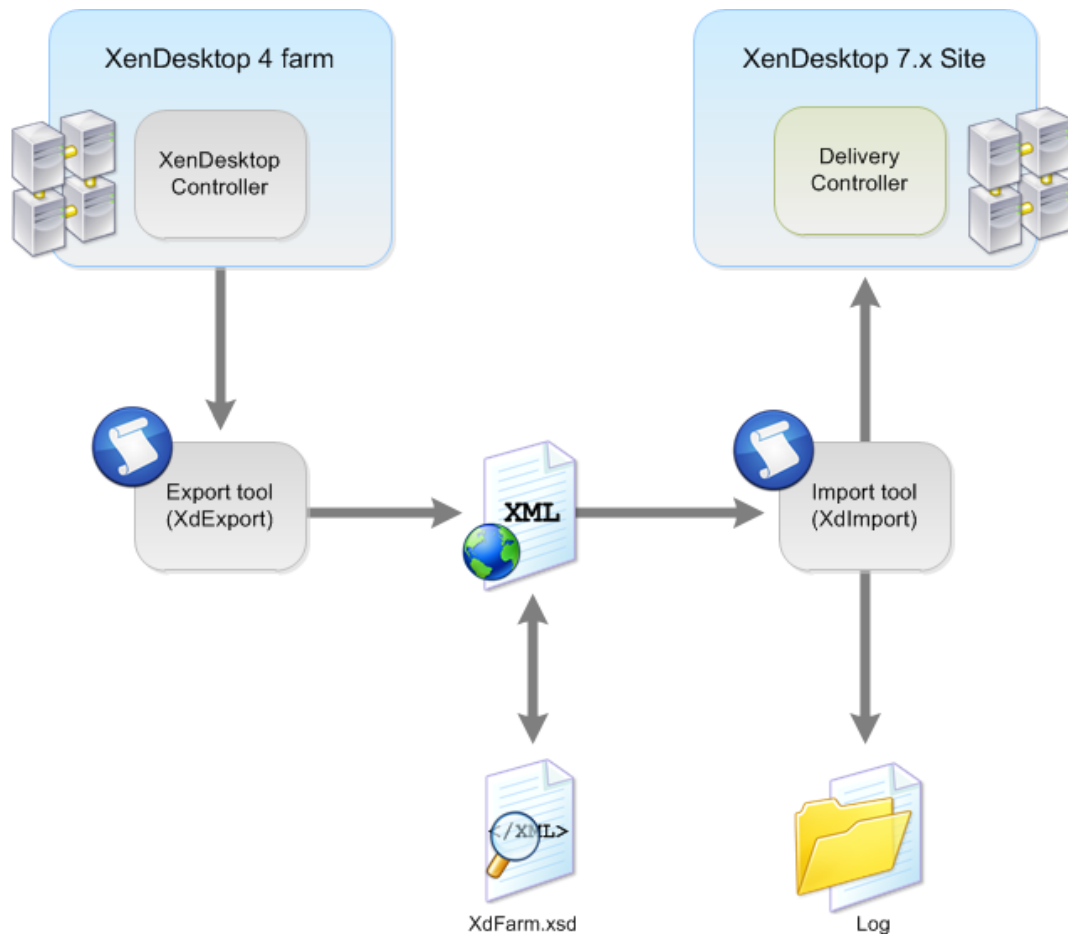
These use cases are not directly supported in migration:

- Merging settings of policies or desktop group or hosting settings.
- Merging private desktops into random Delivery Groups.
- Adjusting existing component settings through the migration tools.

For more information, see [What is and is not migrated](#).

Migration steps

The following figure summarizes the migration process.



The migration process follows this sequence:

1. In the Studio console on the XenDesktop 4 Controller, turn on maintenance mode for all machines to be exported.
2. Export data and settings from your XenDesktop 4 farm to an XML file using XdExport; see [Export from a XenDesktop 4 farm](#).
3. Edit the XML file so that it contains only the data and settings you want to import into your new XenDesktop Site; see [Edit the Migration Tool XML file](#).
4. Import the data and settings from the XML file to your new XenDesktop Site using XdImport; see [Import XenDesktop 4 data](#).
5. To make additional changes, repeat steps 3 and 4. After making changes, you might want to import additional desktops into existing Delivery Groups. To do so, use the Mergedesktops parameter when you import.
6. Complete the post-migration tasks; see [Post-migration tasks](#).

Before migrating

Complete the following before beginning a migration:

- Make sure you understand which data can be exported and imported, and how this applies to your own deployment. See [What is and is not migrated](#).
- Citrix strongly recommends that you manually back up the Site database so that you can restore it if any issues are discovered.
- Install the XenDesktop 7.x components and create a Site, including the database.
- To migrate from XenDesktop 4 , all VDAs must be at a XenDesktop 5.x level so that they are compatible with both XenDesktop 4 and XenDesktop 7.x controllers. After the Controller infrastructure is fully running XenDesktop 7.x, Windows 7 VDAs can be upgraded to XenDesktop 7.x. For details, see [Migration examples](#).

Export from a XenDesktop 4 farm

The export tool, XdExport, extracts data from a single XenDesktop 4 farm and produces an XML file from representations of the data values.

The schema of the XML file resides in the file XdFarm.xsd, which is included in the migration tool download XdExport.zip and XdImport.zip.

Run XdExport on a XenDesktop 4 Controller in the farm from which you want to export data. This machine must have the XenDesktop 4 PowerShell SDK installed. You must have the following permissions to export the data:

- The user identity of at least read-only Citrix administrator of the farm.
- Permission to read the registry.

Although not recommended, you can run the tool while the XenDesktop Controller is in active use (for example, users are logged in to VDAs).

Citrix strongly recommends:

- The XenDesktop 4 Controller on which you run the tool be up-to-date with public hotfixes.
- Not making configuration changes to the Site while the export is running (for example, removing Desktop Groups).

1. Download XdExport.zip and extract the files to the XenDesktop 4 Controller.
2. At a command line prompt, run XdExport.exe with the following optional parameters:

Parameter	Description
-Verbose	Generates messages providing detailed progress information.
-FilePath <path>	Indicates the location of the XML file to which the farm data is exported. Default = .\XdSettings.xml
-Overwrite	Overwrites any file existing in the location specified in -FilePath. If you do not supply this parameter and an output file already exists, the tool fails with the message "Error: File already exists. Specify -Overwrite to allow the file to be overwritten. "
-? or -help	Displays text describing the parameters and exits without exporting any data.

3. If the tool runs successfully, the message Done appears. The XdSettings.xml file resides in the location specified in the FilePath parameter. If the tool fails, an error message appears.

Edit the Migration Tool XML file

Before importing data to a XenDesktop 7.x Site, check and edit the contents of the XML file generated by the export tool (XdExport), particularly if you migrate in multiple stages and import some users, Delivery Groups, and policies before importing others.

Use any text editor to view or change the file contents; you can use a specialized XML editor such as Microsoft XML Notepad.

Some elements within the XML content must be present for the XML file to be accepted by the import tool (XdImport).

The required XML schema is defined in the XdFarm.xsd file that is supplied as part of the Migration Tool download. When working with this file:

- A minOccurs attribute with a value of 1 or more indicates that particular elements must be present if the parent element is present.
- If the XML file supplied to the Import tool is not valid, the tool halts and an error message appears that should enable you to locate where the problem lies in the XML file.

Import a subset of desktops or Delivery Groups

To import only a subset of Delivery Groups and desktops, edit the contents of the DesktopGroups element. The DesktopGroups element can hold many DesktopGroup elements, and within each DesktopGroup element there is a Desktops element that can contain many Desktop elements.

Do not delete the DesktopGroups element, although you can delete all the DesktopGroup elements and leave it empty. Similarly, within each DesktopGroup element, the Desktops element must be present but can be empty of Desktop elements.

Delete Desktop or DesktopGroup elements to avoid importing particular single machines or entire Delivery Groups. For example, the XML file contains:

```
<DesktopGroups>
  <DesktopGroup name="Group1">
    ...
    <Desktops>
      <Desktop sameName="DOMAIN\MACHINE1$">
        ...
      </Desktop>
    </Desktops>
    ...
  </DesktopGroup>
  <DesktopGroup name="Group2">
    ...
    <Desktops>
      <Desktop samName="DOMAIN\MACHINE2$">
```

```
...
  </Desktop>
  <Desktop samName="DOMAIN\MACHINE3$">
...
  </Desktop>
</Desktops>
...
</DesktopGroup>
</DesktopGroups>
```

In this example, the edits prevent Group1 group from being imported. Only Machine3 from the Group2 group will be imported:

```
<DesktopGroups>
  <DesktopGroup name="Group2">
...
    <Desktops>
      <Desktop samName="DOMAIN\MACHINE3$">
...
    </Desktop>
  </Desktops>
...
  </DesktopGroup>
</DesktopGroups>
```

Manage Delivery Groups with duplicate names

In XenDesktop 4, Desktop Groups can be organized in folders, Desktop Groups with the same name can appear in different folders, and the internal desktop group name is the name that appears to users. In this release, Delivery Groups cannot be placed in folders, and each Delivery Group must have a unique internal name, and the name that appears to users can be different from the internal name. To accommodate these differences, you might have to rename Desktop Groups.

For example, in your XenDesktop 4 farm, you could have two different Desktop Groups that appear with the name "My Desktop" to two different users, and you could use Desktop Groups folders to achieve this. If these Delivery Groups are to remain separate in the XenDesktop 7.x Site, you must edit the Desktop Group names in the XML file to make them unique.

If a Delivery Group in the XenDesktop 7.x Site has the same name as a Desktop Group to be imported, and the Delivery Groups are to remain separate in the XenDesktop 7.x Site, you must edit the XenDesktop 4 Desktop Group name in the XML file to keep the name unique in the Site. If the Desktop Group to be imported is really the same as the XenDesktop 7.x Delivery Group, and the machines in the XML file are to be merged into the existing Desktop Group, you do not need to rename the Desktop Group; instead, specify the `-MergeDesktops` parameter to the Import tool. For example, if the XML file contains:

```
<DesktopGroups>
  <DesktopGroup name="My Desktop">
...
    <Folder>\Sales</Folder>
  </DesktopGroup>
```

```
<DesktopGroup name="My Desktop">
...
  <Folder>\Finance</Folder>
</DesktopGroup>
</DesktopGroups>
```

Remove the duplicate names as follows:

```
<DesktopGroups>
  <DesktopGroup name="Sales Desktops">
...
    <Folder>\Sales</Folder>
  </DesktopGroup>
  <DesktopGroup name="Finance Desktops">
...
    <Folder>\Finance</Folder>
  </DesktopGroup>
</DesktopGroups>
```

Manage policy imports

You can delete policies from the XML file, and you can specify unique names to avoid policy name duplication. There is no support for merging policies.

- When you import policy data, either all policies are imported successfully or, if there is any failure, no policy data is imported.
- Importing large numbers of policies with many settings can take several hours.
- If you import policies in batches, their original prioritization may be affected. When you import policies, the relative priorities of the imported policies are maintained, but they are given higher priority than policies already in the Site. For example, if you have four policies to import with priority numbers 1 to 4, and you decide to import them in two batches, you should import policies with priorities 3 and 4 first, because the second batch of policies automatically gets higher priority.

To import only a subset of policies into the XenDesktop 7.x Site, edit the contents of the Policies element. The Policies element can hold many Policy elements. You must not delete the Policies element, although you can delete all the Policy elements and leave it empty. Delete entire Policy elements to avoid importing particular XenDesktop 4 farm policies. For example, if the XML file contains:

```
<Policies>
  <Policy name="Sales Policy">
...
  </Policy>
...
</Policies>
```

To avoid importing any XenDesktop 4 policies, and avoid clashes with policies already configured in the XenDesktop 7.x Site, edit the file to remove the individual Policy elements as follows:


```
<Policies>  
</Policies>
```

Alternatively, edit the file so that the policy is imported with a different name as follows:

```
<Policies>  
  <Policy name="XD4 Sales Policy">  
    ...  
  </Policy>  
  ...  
</Policies>
```

Import XenDesktop 4 data

The import tool, XdImport, reads settings from XenDesktop 4 that are contained in the XML file produced by the export tool, XdExport, and applies those settings to an existing XenDesktop 7.x Site. The Import tool uses the PowerShell script Import-XdSettings.ps1.

To apply only a subset of the exported data, edit the XML file before running the Import tool. For example, you might want to remove desktop groups and policies that are not needed in your XenDesktop 7.x deployment. The import tool runs successfully if you leave entire elements empty. For example, you can delete all the desktop groups without causing any issues. The tool always validates the XML file before attempting to import any data.

Run XdImport on any machine on which all the XenDesktop 7.x SDKs are installed. You must be a Full XenDesktop administrator identity to run the tool.

Before you import, make sure that you have set up a XenDesktop 7.x Site, including its database. Citrix recommends that you complete the import to XenDesktop 7.x before any user testing or general Site configuration occurs. Merge configurations only when the Site is not in use.

1. Create a XenDesktop 7.x Site.
2. Download XdImport.zip and extract the files to the machine where you will run the tool.
3. In a PowerShell session, run Import-XdSettings.ps1 with the following parameters:

Parameter	Description
-----------	-------------

-HypervisorConnectionCredentials	<p>(Required.) A PowerShell hash table that maps Hypervisor addresses to PSCredential instances as required for the creation of Hypervisor connections. Default = @{}</p> <p>Enter credentials for the Hypervisor to which the XenDesktop 4 farm connects.</p> <p>For a single Hypervisor, create the argument as follows:</p> <pre>\$credential = Get-Credential \$mappings = @{"http://<HypervisorIP>" =\$credential} .\Import-XdSettings.ps1 -FilePath. \XdSettings.xml -HypervisorConnectionCredentials \$mappings</pre> <p>The address specified in the hash table must exactly match the address in the XML file.</p> <p>For example, with both a XenServer and a VMware hypervisor, create the following argument:</p> <pre>\$Xencredential = Get-Credential \$VMWcredential = Get-Credential \$mappings = @{"http://<XenHypervisorIP>" = \$Xencredential;"http://<VmWHypervisorIP>/SDK" = \$VMWcredential} .\Import-XdSettings.ps1 -FilePath. \XdSettings.xml -HypervisorConnectionCredentials \$mappings</pre>
-FilePath <path>	<p>(The value for <path> is required.) The location of the XML file from which the farm data is to be imported.</p>
-AdminAddress	<p>The name of a Controller in the XenDesktop 7.x Site. Default = localhost</p>
-MergeDesktops	<p>Adds desktops defined in the XML file to Delivery Groups in the XenDesktop 7.x Site that have the same name as the groups described in the XML file. The associated machines and users are also added.</p> <p>If this parameter is not supplied, no content is added to existing Delivery Groups in the XenDesktop 7.x Site.</p>

-SkipMachinePolicy	The script does not create a machine policy that contains site-level settings. If you do not supply this parameter and the machine policy for the Site exists, the script fails.
-WhatIf	Completes a trial run to determine what would be changed in or added to the XenDesktop 7.x Site. Including this parameter sends the information to the log file, but does not change the Site.
-LogFilePath <path>	Indicates the full path of the log file. The log file contains text describing all writes performed against the XenDesktop 7.x Site. Default = .\Import-XdSettings.log
-? or -help	Displays information about parameters and exits without importing any data.

If the XML file contains policy data, either all policies are imported successfully or if there is any failure, no policy data is imported. Importing large numbers of policies with many settings can take several hours.

When the script completes, the message Done appears. After successfully importing the data from the XML file, you can either run further export and import iterations, or if you have imported all the relevant data, complete the post-migration tasks.

Post-migration tasks

After successfully importing data from a XenDesktop 4 farm to a XenDesktop 7.x Site, complete the following tasks before using the new Site for production work:

- Upgrade the Virtual Delivery Agents (VDAs). Although it is not required, Citrix recommends that you upgrade VDAs before upgrading Controllers, Studio, or Director.
 - For Windows Vista and Windows XP, upgrade to XenDesktop 5.6 Feature Pack 1 Virtual Desktop Agent.
 - For Windows 7, upgrade to the XenDesktop 7.x Virtual Delivery Agent.
- Create administrators you need for the XenDesktop 7.x Site.
- Update user devices – Citrix recommends that you update user devices with the latest version of Citrix Receiver to benefit from hotfixes and to receive support for the latest features.
- Modify the imported desktops to use registry-based Controller discovery, and point them to the XenDesktop 7.x Controllers using one of the following methods:
 - Manually edit the registry to remove the unnecessary Organizational Unit (OU) GUID registry entry, and add a ListOfDDCs registry entry.
 - Set up a machine policy to distribute the list of Controllers to the desktops, using the Active Directory policy GPMC.msc. You cannot use Studio to configure this setting.

Registry-based Controller discovery is the default for XenDesktop 7.x, but Active Directory-based discovery is still available.

- Optionally, implement the following registry key settings described in the best practices for XenDesktop registry-based registration in [CTX133384](#):
 - HeartbeatPeriodMS
 - PrepareSessionConnectionTimeoutSec
 - MaxWorkers
 - DisableActiveSessionReconnect
 - ControllersGroupGuid

If you do not perform this action, the default XenDesktop 7.x settings for these keys are used.

- Turn off maintenance mode for the imported machines if they were in maintenance mode in XenDesktop 4 before the XML file was generated.
- Check the XenDesktop 7.x settings to make sure that they are correct, particularly if you had changed the PortICAConfig XML file on XenDesktop 4.

Post-migration tasks

- Review all migrated components to make sure that the migration was successful.

Migration examples

Example 1: Single large-scale XenDesktop 4 farm to a XenDesktop 7 Site

In this example, a XenDesktop 4 farm is in use. The XenDesktop 4 farm has 50 desktop groups, where each group contains an average 100 desktops. The XenDesktop 4 desktops are provided through Provisioning Services (PVS), and the machines are running on VMware ESX hypervisors. The VDA installed on all the VMs is the XenDesktop version 4.

Migration steps

1. Upgrade all XenDesktop 4 VDAs to XenDesktop 5.6 Feature Pack 1 VDA software. This allows the VDAs to register with both the XenDesktop 4 controller and the XenDesktop 7 Delivery Controller.
 - For Windows 7 VDAs, see [Upgrading the Virtual Desktop Agent on a VM or Blade Computer](#).
 - For Windows XP and Windows Vista VDAs, see Virtual Desktop Agents on Windows XP or Windows Vista.
2. Make sure that all users log off the XenDesktop 4 farm.
3. Make sure that all these machines are in maintenance mode.
4. Run the export tool (XdExport) on the XenDesktop 4 farm.
5. Install XenDesktop 7 components.
 - a. Use Studio to create a full production mode Site.
 - b. If Provisioning Services is part of the deployment, upgrade the Provisioning Services server and agents.
 - c. Upgrade the License Server and associated licenses.
6. Unzip the Import Tool (XdImport) to a local directory on the XenDesktop 7 Controller.
7. Copy the XML file (XdSettings.xml) generated in Step 4 by the export tool to the local directory.
8. From the PowerShell console of the Studio root node on the XenDesktop 7 Site, start a PowerShell session.
9. Run the import tool (XdImport), passing the credentials of the associated hypervisors and the path of the XML file.
10. Manually recreate administrator settings from the Administrator node in the Studio navigation pane; see Delegated Administration for details.

11. Modify the imported desktops to use registry-based Controller discovery; and point them to the new XenDesktop 7 Controller.
12. For VDAs running on Windows 7, Citrix recommends you upgrade those VDAs to use the XenDesktop 7 VDA for Windows Desktop OS, which provides access to all new features.

After upgrading the VDAs to XenDesktop 7 for machines in a catalog or Delivery Group, upgrade the catalog (see [Manage machine catalogs](#)) and Delivery Groups (see [Manage settings in Delivery Groups](#)).

13. Turn off maintenance mode for the Delivery Groups.
14. Configure StoreFront to provide the desktops formerly provided through Web Interface. See the StoreFront documentation.

Example 2: XenDesktop 4 farm export with a partial import to XenDesktop 7.1 Site

In this example, the migration occurs in a number of steps, each step migrating a subset of the remaining desktops. A XenDesktop 4 farm is in use, and a XenDesktop 7.1 Site has already been created and is in use. The XenDesktop 4 farm has 50 desktop groups, and each group contains an average 100 desktops. The XenDesktop 4 desktops are provided through Provisioning Services, and the machines are running on Citrix XenServer hypervisors. The VDA installed on all the VMs is the XenDesktop version 4.

Migration steps

1. Run the export tool on the XenDesktop 4 farm.
 - a. Unzip the Export Tool (XdExport) on one of the Desktop Delivery Controllers in the farm.
 - b. As a Citrix Administrator, run the export tool with no parameters.
2. Copy and edit the resulting XML file so that it contains only the groups and desktops that you want to migrate.
3. In the XenDesktop 4 farm, make sure that all users on desktops to be migrated have logged off and turn on maintenance mode for all desktops that are to be migrated.
4. Unzip the Import Tool (XdImport) to a local directory on the XenDesktop 7.1 Delivery Controller.
5. Copy the edited XML to the local directory.
6. From the PowerShell console of the Studio root node on the XenDesktop 7.1 Site, start a PowerShell session.
7. Run the Import Tool (XdImport), passing the credentials of the associated hypervisors and the path of the XML file.
8. Manually recreate Administrator settings from the Administrator node in the Studio navigation pane; see Delegated Administration for details.

9. Modify the imported desktops to use registry-based Controller discovery; and point them to the new XenDesktop 7.1 Controller.
10. Upgrade all VDAs to the appropriate VDA software:
 - For Windows 7 VDAs:
 - Upgrade to XenDesktop 7 Virtual Delivery Agents as described in [Upgrading the Virtual Desktop Agent on a VM or Blade Computer](#)
 - After upgrading all VDA software to XenDesktop 7 for machines in a catalog or Delivery Group, upgrade the catalog (see [Manage machine catalogs](#)) and Delivery Groups (see [Manage settings in Delivery Groups](#)).
 - For Windows XP and Windows Vista VDAs, upgrade to XenDesktop 5.6 FP1; see [Virtual Desktop Agents on Windows XP or Windows Vista](#).
11. Turn off maintenance mode for the Delivery Groups.
12. Configure StoreFront to provide the desktops formerly provided through Web Interface. See the StoreFront documentation.

What is and is not migrated

What is migrated

Although not all inclusive, the following table describes what happens to the most significant data during migration to this release. Unless noted, the data type is imported.

Data type	Notes
Desktop Groups	<p>Desktop Groups become Delivery Groups in this release. Desktop Group icons are not exported.</p> <p>SecurelcaRequired is set to True if the DefaultEncryptionLevel in XenDesktop 4 is not Basic.</p> <p>If a Desktop Group in the XenDesktop 4 farm has the same name as a Delivery Group in the XenDesktop 7.x Site, you can add desktops belonging to the XenDesktop 4 group to a Delivery group of the same name in the target Site.</p> <p>To do this, specify the MergeDesktops parameter when you run the import tool. The settings of the XenDesktop 7.x Delivery Group are not overwritten with the settings of the XenDesktop 4 group. If this parameter is not specified and there is a group with the same name as one defined in the XML file, the tool displays an error and stops before any data is imported.</p>
Desktops	<p>You cannot add private desktops to a random Delivery Group. Random desktops cannot be added to a static Delivery Group.</p>
Machines	<p>Machines are imported into four machine catalogs. The following machine catalogs are automatically created in the XenDesktop 7.x Site by the import tool:</p> <ul style="list-style-type: none">• Imported existing random (for pooled VMs)• Imported existing static (for assigned VMs)• Imported physical random (for pooled PCs or blades)• Imported physical static (for private PCs or blades). <p>Any subsequent import of machines uses the same four machine catalogs.</p>

Pool management pools	<p>Includes multi-pool pools, and idle pool settings including schedule.</p> <ul style="list-style-type: none"> • PeakBuffersizePercent is set to 10% by default. • OffPeakBufferSizePercent is set to 10% by default. • Any unselected days in the Business days setting on XenDesktop 4 are imported as part of the Weekend power time scheme in this release. • HostingXD4 action times are rounded up to the nearest minute. • Start times are rounded down to the nearest hour. • End times are rounded up to the nearest hour.
Farm settings	<p>The following farm settings are imported as a Machine policy:</p> <ul style="list-style-type: none"> • IcaKeepAlive • AutoClientReconnect • SessionReliability <p>The setting to enable Flash player is not imported.</p>
Policies	<p>Some policy data is imported. Filters, settings, and printers are imported as User policies. For further details of user policy export and import, see the other table in this topic.</p> <ul style="list-style-type: none"> • New access policy rules are created from XenDesktop 4 group settings. • When policies are imported, their relative priority order is preserved. However, they are always added with a higher priority than any existing policies on the XenDesktop 7.x Site. • Policy merging is not supported. <p>There is no option to import policies into Active Directory. They are always stored in the Site.</p>
User assignments	

Hypervisor settings	<p>This parameter is required with the XdlImport tool.</p> <p>Hypervisor addresses are exported, but not the credentials required to access those hypervisors. To create hypervisor connections in the XenDesktop 7.x Site, extract the addresses from the XML file and create a PowerShell hash table that maps them to the relevant credential instances. Then specify this hash table in the import tool HypervisorConnectionCredentials parameter. For further details, see Import XenDesktop 4 data</p> <p>Merging or updating hypervisor settings for existing Desktop Groups and hypervisor connections is not supported.</p>
Administrators	(Not imported.) No administrator data is imported, including data about delegated administrators. You create new administrators for your XenDesktop 7.x Site.
Licensing configuration	(Not imported.) Includes information such as the License Server name and edition. License files are not exported.
Desktop Group folders	(Not imported.) This release does not support Desktop Group folders. If there are duplicate Desktop Group names (because different folders in the XenDesktop 4 farm contained groups with the same names) and you do not edit names in the XML file, the Import Tool halts.
Registry keys	(Not imported.) For information on implementing registry keys, see Post-migration tasks .

User policy data

The following table describes how User policy data is exported and imported.

XenDesktop 4 category and setting	XML file	XenDesktop 7.x category and setting
Bandwidth\Visual Effects\Session Limits	ClientOEMVCBandwidth	Not imported
OEM Virtual Channels		
Client Devices\Resources\Other	DisableOEMVirtualChannels	Not imported
Turn off OEM virtual channels		
User Workspace\Time Zones	DoNotUseClientLocalTime	Not imported
Do not use client's local time		

Security\Encryption SecureICA encryption	ClientSecurityRequirement	Not imported
Bandwidth\SpeedScreen Image acceleration using lossy compression	LossyCompression settings	ICA\Visual Display\Still Images Lossy compression level Lossy compression threshold value Heavyweight compression ICA\Visual Display\Moving Images Progressive compression level Progressive compression threshold value
Bandwidth\Visual Effects Turn off desktop wallpaper	TurnOffWallpaper	ICA\Desktop UI Desktop wallpaper
Bandwidth\Visual Effects Menu animation	TurnOffMenuWindowAnimation	ICA\Desktop UI Menu animation
Bandwidth\Visual Effects Turn off window contents while dragging	DoNotShowWindowContentsWhileDragging	ICA\Desktop UI View window contents while dragging
Bandwidth\Visual Effects\Session Limits Audio	ClientAudioBandwidth__AllowedBandWidth	ICA\Bandwidth Audio redirection bandwidth limit

Bandwidth\Visual Effects\Session Limits Clipboard	ClientClipboardBandwidth__AllowedBandWidth	ICA\Bandwidth Clipboard redirection bandwidth limit
Bandwidth\Visual Effects\Session Limits COM Ports	ClientComBandwidth__AllowedBandWidth	COM port redirection is deprecated in XenDesktop 7.x
Bandwidth\Visual Effects\Session Limits Drives	ClientDriveBandwidth__AllowedBandWidth	ICA\Bandwidth File redirection bandwidth limit
Bandwidth\Visual Effects\Session Limits LPT Ports	ClientLptBandwidth__AllowedBandWidth	LPT port redirection is deprecated in XenDesktop 7.x
Bandwidth\Visual Effects\Session Limits Overall Session	OverallBandwidth__AllowedBandWidth	ICA\Bandwidth Overall session bandwidth limit
Bandwidth\Visual Effects\Session Limits Printer	LimitPrinterBandWidth__AllowedBandWidth	ICA\Bandwidth Printer redirection bandwidth limit
Client Devices\Resources\Audio Microphones	ClientAudioMicrophone__TurnOn	ICA\Audio Client microphone redirection
Client Devices\Resources\Audio Sound Quality	ClientAudioQuality__Quality	ICA\Audio Audio quality
Client Devices\Resources\Audio Turn off speakers	DisableClientAudioMapping	ICA\Audio Client audio redirection
Client Devices\Resources\Drives Connection	ConnectClientDriveAtLogon__TurnOn	ICA\File Redirection Auto connect drives

Client Devices\Resources\Drives Turn off Floppy disk drives	DisableClientDriveMapping__DisableFloppyDrive	ICA\File Redirection Client floppy drives
Client Devices\Resources\Drives Turn off Hard drives	DisableClientDriveMapping__DisableHardDrive	ICA\File Redirection Client fixed drives
Client Devices\Resources\Drives Turn off CD-ROM drives	DisableClientDriveMapping__DisableCdrom	ICA\File Redirection Client optical drives
Client Devices\Resources\Drives Turn off Remote drives	DisableClientDriveMapping__DisableRemote	ICA\File Redirection Client network drives
Client Devices\Resources\Drives Turn off USB disk drives	DisableClientDriveMapping__DisableUSB	ICA\File Redirection Client removable drives
Client Devices\Resources\Drives\Optimize Asynchronous writes	CDMAsyncWrites	ICA\File Redirection User asynchronous writes
Client Devices\Resources\Other Turn off clipboard mapping	DisableClientClipboardMapping	ICA Client clipboard redirection
Client Devices\Resources\Ports Turn off COM ports	DisableClientCOMPortMapping	COM port redirection is deprecated in XenDesktop 7.x
Client Devices\Resources\Ports Turn off LPT ports	DisableClientLPTPortMapping	LPT port redirection is deprecated in XenDesktop 7.x
Client Devices\Resources\USB USB	RemoteUSBDevices__DisableRemoteUSBDevices	ICA\USB Devices Client USB device redirection

Printing\Client Printers Auto-creation	ConnectClientPrinterAtLogon__Flag	ICA\Printing\Client Printers Auto-create client printers
Printing\Client Printers Legacy client printers	LegacyClientPrinters__TurnOn	ICA\Printing\Client Printers Client printer names
Printing\Client Printers Printer properties retention	ModifiedPrinterProperties__WriteMethod	ICA\Printing\Client Printers Printer properties retention
Printing\Client Printers Print job routing	ClientPrintingForNetworkPrinter__TurnOn	ICA\Printing\Client Printers Direct connections to print servers
Printing\Client Printers Turn off client printer mapping	DisableClientPrinterMapping	ICA\Printing Client printer redirection
Printing\Drivers Native printer driver auto-install	PrintDriverAutoInstall__TurnOn	ICA\Printing\Drivers Automatic installation of inbox printer drivers
Printing\Drivers Universal driver	ClientPrintDriverToUse	ICA\Printing\Drivers Universal print driver use
Printing\Session printers Session printers	NetworkPrinters	ICA\Printing Session printers
Printing\Session printers Choose client's default printer	DefaultToMainClientPrinter__NetworkDefault DefaultToMainClientPrinter__TurnOn	ICA\Printing Default printer

What is not migrated

Not all XenDesktop 4 components are supported in this release. The following items are not migrated:

- **Virtual Delivery Agent** - Before a XenDesktop 7.x Delivery Controller can manage virtual desktops from XenDesktop 4, you must upgrade the VDAs to a minimum release of XenDesktop 5.x. For information about upgrading VDAs, see [Post-migration tasks](#).
- **Controllers** - You must deploy new Controller servers. You cannot upgrade a XenDesktop 4 Controller to a XenDesktop 7.x Site. XenDesktop 7.x Sites cannot join a XenDesktop 4 farm, and XenDesktop 4 Controllers cannot join a XenDesktop 7.x Site. In addition, each version has different server requirements; XenDesktop 4 requires Windows Server 2003 and XenDesktop 7.x requires later Windows Server versions.
- **Web Interface** - Citrix recommends using StoreFront with XenDesktop 7.x. See the StoreFront documentation for installation and setup details. When the XenDesktop installer detects Web Interface, it installs StoreFront, but does not remove Web Interface.
- **Active Directory Organizational Unit (OU) configuration** - Sharing an Organizational Unit (OU) between two farms or two Sites, or a farm and a Site is not supported. If you plan to configure the new Site to use Active Directory-based Controller discovery rather than the default registry-based Controller discovery, you must create a new OU to support it.
- **PortICAConfig XML file** - If you have changed the default settings for this file you may need to configure these settings for the new Site through Group Policy Objects.
- **Configuration logging settings provided through XenDesktop 4 Service Pack 1.**
- **Provisioning Services-related data.**
- **Applications.**
- **List of Controllers.**
- **NetScaler Gateway.**
- **Event log throttling settings.**

Security

XenApp and XenDesktop offer a secure-by-design solution that allows you to tailor your environment to your security needs.

One security concern IT faces with mobile workers is lost or stolen data. By hosting applications and desktops, XenApp and XenDesktop securely separate sensitive data and intellectual property from end-point devices by keeping all data in a data center. When policies are enabled to allow data transfer, all data is encrypted.

The XenDesktop and XenApp data centers also make incident response easier with a centralized monitoring and management service. Director allows IT to monitor and analyze data that is being accessed around the network, and Studio allows IT to patch and remedy most vulnerabilities in the data center instead of fixing the problems locally on each end-user device.

XenApp and XenDesktop also simplify audits and regulatory compliance because investigators can use a centralized audit trail to determine who accessed what applications and data. Director gathers historical data regarding updates to the system and user data usage by accessing Configuration Logging and OData API.

Delegated Administration allows you to set up administrator roles to control access to XenDesktop and XenApp at a granular level. This allows flexibility in your organization to give certain administrators full access to tasks, operations, and scopes while other administrators have limited access.

XenApp and XenDesktop give administrators granular control over users by applying policies at different levels of the network – from the local level to the Organizational Unit level. This control of policies determines if a user, device, or groups of users and devices can connect, print, copy/paste, or map local drives, which could minimize security concerns with third-party contingency workers. Administrators can also use the Desktop Lock feature so end users can only use the virtual desktop while preventing any access to the local operating system of the end-user device.

Administrators can increase security on XenApp or XenDesktop by configuring the Site to use the Secure Sockets Layer (SSL) security protocol of the Controller or between end users and Virtual Delivery Agents (VDA). Transport Layer Security (TLS) security protocol can also be enabled on a Site to provide server authentication, data stream encryption, and message integrity checks for a TCP/IP connection.

XenApp and XenDesktop also support multifactor authentication for Windows or a specific application. Multifactor authentication could also be used to manage all resources delivered by XenApp and XenDesktop. These methods include:

- Tokens
- Smart cards
- RADIUS
- Kerberos

- Biometrics

XenDesktop can be integrated with many third-party security solutions, ranging from identity management through to antivirus software. A list of supported products can be found at <http://www.citrix.com/ready>.

Select releases of XenApp and XenDesktop are certified for Common Criteria standard. For a list of those standards, go to <http://www.commoncriteriaportal.org/cc/>.

Related content

- [Security best practices and considerations](#)
- Delegated Administration
- [Smart cards](#)
- [SSL](#)
- [Desktop Lock](#)

Security best practices and considerations

This topic describes:

- General security best practices when using this release, and any security-related differences between this release and a conventional computer environment
- Managing user privileges
- Deployment scenarios and their security implications
- Remote PC Access security considerations

Your organization may need to meet specific security standards to satisfy regulatory requirements. This document does not cover this subject, because such security standards change over time. For up-to-date information on security standards and Citrix products, consult <http://www.citrix.com/security/>.

Security best practices

Keep all machines in your environment up to date with security patches. One advantage is that you can use thin clients as terminals, which simplifies this task.

Protect all machines in your environment with antivirus software.

Protect all machines in your environment with perimeter firewalls, including at enclave boundaries as appropriate.

If you are migrating a conventional environment to this release, you may need to reposition an existing perimeter firewall or add new perimeter firewalls. For example, suppose there is a perimeter firewall between a conventional client and database server in the data center. When this release is used, that perimeter firewall must instead be placed so that the virtual desktop and user device are on one side, and the database servers and Delivery Controllers in the data center are on the other side. You should therefore consider creating an enclave within your data center to contain the database servers and Controllers. You should also consider having protection between the user device and the virtual desktop.

All machines in your environment should be protected by a personal firewall. When you install core components and Virtual Delivery Agents (VDAs), you can choose to have the ports required for component and feature communication opened automatically if the Windows Firewall Service is detected (even if the firewall is not enabled). You can also choose to configure those firewall ports manually. If you use a different firewall, you must configure the firewall manually.

Note: TCP ports 1494 and 2598 are used for ICA and CGP and are therefore likely to be open at firewalls so that users outside the data center can access them. Citrix recommends that you do not use these ports for anything else, to avoid the possibility of

inadvertently leaving administrative interfaces open to attack. Ports 1494 and 2598 are officially registered with the Internet Assigned Number Authority (see <http://www.iana.org/>).

All network communications should be appropriately secured and encrypted to match your security policy. You can secure all communication between Microsoft Windows computers using IPsec; refer to your operating system documentation for details about how to do this. In addition, communication between user devices and desktops is secured through Citrix SecureICA, which is configured by default to 128-bit encryption. You can configure SecureICA when you are creating or updating an assignment; see Change basic settings.

Managing user privileges

Grant users only the capabilities they require. Microsoft Windows privileges continue to be applied to desktops in the usual way: configure privileges through User Rights Assignment and group memberships through Group Policy. One advantage of this release is that it is possible to grant a user administrative rights to a desktop without also granting physical control over the computer on which the desktop is stored.

When planning for desktop privileges, note:

- By default, when non-privileged users connect to a desktop, they see the time zone of the system running the desktop instead of the time zone of their own user device. For information on how to allow users to see their local time when using desktops, see Change basic settings.
- A user who is an administrator on a desktop has full control over that desktop. If a desktop is a pooled desktop rather than a dedicated desktop, the user must be trusted in respect of all other users of that desktop, including future users. All users of the desktop need to be aware of the potential permanent risk to their data security posed by this situation. This consideration does not apply to dedicated desktops, which have only a single user; that user should not be an administrator on any other desktop.
- A user who is an administrator on a desktop can generally install software on that desktop, including potentially malicious software. The user can also potentially monitor or control traffic on any network connected to the desktop.

Deployment scenario security implications

Your user environment can consist either of user devices that are unmanaged by your organization and completely under the control of the user, or of user devices that are managed and administered by your organization. The security considerations for these two environments are generally different.

- **Managed user devices** - Managed user devices are under administrative control; they are either under your own control, or the control of another organization that you trust. You may configure and supply user devices directly to users; alternatively, you may provide terminals on which a single desktop runs in full-screen-only mode. You should follow the general security best practices described above for all managed user devices. This release has the advantage that minimal software is required on a user device.

A managed user device can be set up to be used in full-screen-only mode or in window mode:

- If a user device is configured to be used in full-screen-only mode, users log on to it with the usual Log On To Windows screen. The same user credentials are then used to log on automatically to this release.
- If a user device is configured so that users see their desktop in a window, users first log on to the user device, then log on to this release through a Web site supplied with the release.
- **Unmanaged user devices** - User devices that are not managed and administered by a trusted organization cannot be assumed to be under administrative control. For example, you might permit users to obtain and configure their own devices, but users might not follow the general security best practices described above. This release has the advantage that it is possible to deliver desktops securely to unmanaged user devices. These devices should still have basic antivirus protection that will defeat keylogger and similar input attacks.
- **Data storage considerations** - When using this release, you can prevent users from storing data on user devices that are under their physical control. However, you must still consider the implications of users storing data on desktops. It is not good practice for users to store data on desktops; data should be held on file servers, database servers, or other repositories where it can be appropriately protected.

Your desktop environment may consist of various types of desktops, such as pooled and dedicated desktops:

- Users should never store data on desktops that are shared amongst users, such as pooled desktops.
- If users store data on dedicated desktops, that data should be removed if the desktop is later made available to other users.

Remote PC Access

Remote PC Access implements the following security features:

- Smart card use is supported.
- When a remote session connects, the office PC's monitor appears as blank.
- Remote PC Access redirects all keyboard and mouse input to the remote session, except CTRL+ALT+DEL and USB-enabled smart cards and biometric devices.
- SmoothRoaming is supported for a single user only.
- When a user has a remote session connected to an office PC, only that user can resume local access of the office PC. To resume local access, the user presses Ctrl-Alt-Del on the local PC and then logs on with the same credentials used by the remote session. The user can also resume local access by inserting a smart card or leveraging biometrics, if your system has appropriate third-party Credential Provider integration.

This default behavior can be overridden by enabling Fast User Switching via Group Policy Objects (GPOs) or by editing the registry.

- By default, Remote PC Access supports automatic assignment of multiple users to a VDA. In XenDesktop 5.6 Feature Pack 1, administrators could override this behavior using the RemotePCAccess.ps1 PowerShell script. This release uses a registry entry to allow or prohibit multiple automatic remote PC assignments; this setting applies to the entire Site.

Caution: Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

To restrict automatic assignments to a single user:

1. Set the following registry entry on each Controller in the Site:

HKEY_LOCAL_MACHINE\Software\Citrix\DesktopServer

Name: AllowMultipleRemotePCAssignments

Type: REG_DWORD

Data: 0 = Disable multiple user assignment, 1 = (Default) Enable multiple user assignment.

2. If there are any existing user assignments, remove them using SDK commands for the VDA to subsequently be eligible for a single automatic assignment.
 - a. Remove all assigned users from the VDA: `$machine.AssociatedUserNames | % { Remove-BrokerUser-Name $_ -Machine $machine }`
 - b. Remove the VDA from the Delivery Group: `$machine | Remove-BrokerMachine -DesktopGroup $desktopGroup`
3. Restart the physical office PC.

Delegated Administration

The Delegated Administration model offers the flexibility to match how your organization wants to delegate administration activities, using role and object-based control. Delegated Administration accommodates deployments of all sizes, and allows you to configure more permission granularity as your deployment grows in complexity. Delegated Administration uses three concepts: administrators, roles, and scopes.

- **Administrators** — An administrator represents an individual person or a group of people identified by their Active Directory account. Each administrator is associated with one or more role and scope pairs.
- **Roles** — A role represents a job function, and has defined permissions associated with it. For example, the Delivery Group Administrator role has permissions such as 'Create Delivery Group' and 'Remove Desktop from Delivery Group.' An administrator can have multiple roles for a Site, so a person could be a Delivery Group Administrator and a Machine Catalog Administrator. Roles can be built-in or custom.

The built-in roles are:

Role	Permissions
Full Administrator	Can perform all tasks and operations. A Full Administrator is always combined with the All scope.
Read Only Administrator	Can see all objects in specified scopes as well as global information, but cannot change anything. For example, a Read Only Administrator with Scope=London can see all global objects (such as Configuration Logging) and any London-scoped objects (for example, London Delivery Groups). However, that administrator cannot see objects in the New York scope (assuming that the London and New York scopes do not overlap).
Help Desk Administrator	Can view Delivery Groups, and manage the sessions and machines associated with those groups. Can see the Machine Catalog and host information for the Delivery Groups being monitored, and can also perform session management and machine power management operations for the machines in those Delivery Groups.
Machine Catalog Administrator	Can create and manage Machine Catalogs and provision the machines into them. Can build Machine Catalogs from the virtualization infrastructure, Provisioning Services, and physical machines. This role can manage base images and install software, but cannot assign applications or desktops to users.
Delivery Group Administrator	Can deliver applications, desktops, and machines; can also manage the associated sessions. Can also manage application and desktop configurations such as policies and power management settings.

Host Administrator	Can manage host connections and their associated resource settings. Cannot deliver machines, applications, or desktops to users.
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In certain product editions, you can create custom roles to match the requirements of your organization, and delegate permissions with more detail. You can use custom roles to allocate permissions at the granularity of an action or task in a console.

- **Scopes** — A scope represents a collection of objects. Scopes are used to group objects in a way that is relevant to your organization (for example, the set of Delivery Groups used by the Sales team). Objects can be in more than one scope; you can think of objects being labeled with one or more scopes. There is one built-in scope: 'All,' which contains all objects. The Full Administrator role is always paired with the All scope.

Example

Company XYZ decided to manage applications and desktops based on their department (Accounts, Sales, and Warehouse) and their desktop operating system (Windows 7 or Windows 8). The administrator created five scopes, then labeled each Delivery Group with two scopes: one for the department where they are used and one for the operating system they use.

The following administrators were created:

Administrator	Roles	Scopes
domain/fred	Full Administrator	All (the Full Administrator role always has the All scope)
domain/rob	Read Only Administrator	All
domain/heidi	Read Only Administrator	All
	Help Desk Administrator	Sales
domain/warehouseadmin	Help Desk Administrator	Warehouse
domain/peter	Delivery Group Administrator	Win7
	Machine Catalog Administrator	

- Fred is a Full Administrator and can view, edit, and delete all objects in the system.
- Rob can view all objects in the Site but cannot edit or delete them.
- Heidi can view all objects and can perform help desk tasks on Delivery Groups in the Sales scope. This allows her to manage the sessions and machines associated with those groups; she cannot make changes to the Delivery Group, such as adding or removing machines.
- Anyone who is a member of the warehouseadmin Active Directory security group can view and perform help desk tasks on machines in the Warehouse scope.
- Peter is a Windows 7 specialist and can manage all Windows 7 Machine Catalogs and can deliver Windows 7 applications, desktops, and machines, regardless of which

department scope they are in. The administrator considered making Peter a Full Administrator for the Win7 scope; however, she decided against this, because a Full Administrator also has full rights over all objects that are not scoped, such as 'Site' and 'Administrator.'

How to use Delegated Administration

Generally, the number of administrators and the granularity of their permissions depends on the size and complexity of the deployment.

- In small or proof-of-concept deployments, one or a few administrators do everything; there is no delegation. In this case, create each administrator with the built-in Full Administrator role, which has the All scope.
- In larger deployments with more machines, applications, and desktops, more delegation is needed. Several administrators might have more specific functional responsibilities (roles). For example, two are Full Administrators, and others are Help Desk Administrators. Additionally, an administrator might manage only certain groups of objects (scopes), such as machine catalogs. In this case, create new scopes, plus administrators with one of the built-in roles and the appropriate scopes.
- Even larger deployments might require more (or more specific) scopes, plus different administrators with unconventional roles. In this case, edit or create additional scopes, create custom roles, and create each administrator with a built-in or custom role, plus existing and new scopes.

For flexibility and ease of configuration, you can create new scopes when you create an administrator. You can also specify scopes when creating or editing Machine Catalogs or connections.

Create and manage administrators

When you create a Site as a local administrator, your user account automatically becomes a Full Administrator with full permissions over all objects. After a Site is created, local administrators have no special privileges.

The Full Administrator role always has the All scope; you cannot change this.

By default, an administrator is enabled. Disabling an administrator might be necessary if you are creating the new administrator now, but that person will not begin administration duties until later. For existing enabled administrators, you might want to disable several of them while you are reorganizing your object/scopes, then re-enable them when you are ready to go live with the updated configuration. You cannot disable a Full Administrator if it will result in there being no enabled Full Administrator. The enable/disable check box is available when you create, copy, or edit an administrator.

When you delete a role/scope pair while copying, editing, or deleting an administrator, it deletes only the relationship between the role and the scope for that administrator; it does not delete either the role or the scope, nor does it affect any other administrator who is configured with that role/scope pair.

To manage administrators, click Configuration > Administrators in the Studio navigation pane, and then click the Administrators tab in the upper middle pane.

- To create an administrator, click Create new Administrator in the Actions pane. Type or browse to the user account name, select or create a scope, and select a role. The new administrator is enabled by default; you can change this.
- To copy an administrator, select the administrator in the middle pane and then click Copy Administrator in the Actions pane. Type or browse to the user account name. You can select and then edit or delete any of the role/scope pairs, and add new ones. The new administrator is enabled by default; you can change this.
- To edit an administrator, select the administrator in the middle pane and then click Edit Administrator in the Actions pane. You can edit or delete any of the role/scope pairs, and add new ones.
- To delete an administrator, select the administrator in the middle pane and then click Delete Administrator in the Actions pane. You cannot delete a Full Administrator if it will result in there being no enabled Full Administrator.

Create and manage roles

Role names can contain up to 64 Unicode characters; they cannot contain the following characters: \ (backslash), / (forward slash), ; (semicolon), : (colon), # (pound sign) , (comma), * (asterisk), ? (question mark), = (equal sign), < (left arrow), > (right arrow), | (pipe), [] (left or right bracket), () (left or right parenthesis), " (quotation marks), and ' (apostrophe). Descriptions can contain up to 256 Unicode characters.

You cannot edit or delete a built-in role. You cannot delete a custom role if any administrator is using it.

Note: Only certain product editions support custom roles. Editions that do not support custom roles do not have related entries in the Actions pane.

To manage roles, click Configuration > Administrators in the Studio navigation pane, and then click the Roles tab in the upper middle pane.

- To view role details, select the role in the middle pane. The lower portion of the middle pane lists the object types and associated permissions for the role. Click the Administrators tab in the lower pane to display a list of administrators who currently have this role.
- To create a custom role, click Create new Role in the Actions pane. Enter a name and description. Select the object types and permissions.
- To copy a role, select the role in the middle pane and then click Copy Role in the Actions pane. Change the name, description, object types, and permissions, as needed.
- To edit a custom role, select the role in the middle pane and then click Edit Role in the Actions pane. Change the name, description, object types, and permissions, as needed.
- To delete a custom role, select the role in the middle pane and then click Delete Role in the Actions pane. When prompted, confirm the deletion.

Create and manage scopes

When you create a Site, the only available scope is the 'All' scope, which cannot be deleted.

You can create scopes using the procedure below. You can also create scopes when you create an administrator; each administrator must be associated with at least one role and scope pair. When you are creating or editing desktops, machine catalogs, applications, or hosts, you can add them to an existing scope; if you do not add them to a scope, they remain part of the 'All' scope.

Site creation cannot be scoped, nor can Delegated Administration objects (scopes and roles). However, objects you cannot scope are included in the 'All' scope. (Full Administrators always have the All scope.) Machines, power actions, desktops, and sessions are not directly scoped; administrators can be allocated permissions over these objects through the associated machine catalogs or Delivery Groups.

Scope names can contain up to 64 Unicode characters; they cannot include the following characters: \ (backslash), / (forward slash), ; (semicolon), : (colon), # (pound sign), , (comma), * (asterisk), ? (question mark), = (equal sign), < (left arrow), > (right arrow), | (pipe), [] (left or right bracket), () (left or right parenthesis), " (quotation marks), and ' (apostrophe). Descriptions can contain up to 256 Unicode characters.

When you copy or edit a scope, keep in mind that removing objects from the scope can make those objects inaccessible to the administrator. If the edited scope is paired with one or more roles, ensure that the scope updates you make do not make any role/scope pair unusable.

To manage scopes, click Configuration > Administrators in the Studio navigation pane, and then click the Scopes tab in the upper middle pane.

- To create a scope, click Create new Scope in the Actions pane. Enter a name and description. To include all objects of a particular type (for example, Delivery Groups), select the object type. To include specific objects, expand the type and then select individual objects (for example, Delivery Groups used by the Sales team).
- To copy a scope, select the scope in the middle pane and then click Copy Scope in the Actions pane. Enter a name and description. Change the object types and objects, as needed.
- To edit a scope, select the scope in the middle pane and then click Edit Scope in the Actions pane. Change the name, description, object types, and objects, as needed.
- To delete a scope, select the scope in the middle pane and then click Delete Scope in the Actions pane. When prompted, confirm the deletion.

Create reports

You can create two types of Delegated Administration reports:

- An HTML report that lists the role/scope pairs associated with an administrator, plus the individual permissions for each type of object (for example, Delivery Groups and Machine Catalogs). You generate this report from Studio.

To create this report, click Configuration > Administrators in the navigation pane. Select an administrator in the middle pane and then click Create Report in the Actions pane.

You can also request this report when creating, copying, or editing an administrator.

- An HTML or CSV report that maps all built-in and custom roles to permissions. You generate this report by running a PowerShell script named OutputPermissionMapping.ps1.

To run this script, you must be a Full Administrator, a Read Only Administrator, or a custom administrator with permission to read roles. The script is located in: Program Files\Citrix\DelegatedAdmin\SnapIn\Citrix.DelegatedAdmin.Admin.V1\Scripts\.

Syntax:

```
OutputPermissionMapping.ps1 [-Help] [-Csv] [-Path <string>] [-AdminAddress <string>] [-Show] [<CommonParameters>]
```

Parameter	Description
-Help	Displays script help.
-Csv	Specifies CSV output. Default = HTML
-Path <string>	Where to write the output. Default = stdout
-AdminAddress <string>	IP address or host name of the Delivery Controller to connect to. Default = localhost
-Show	(Valid only when the -Path parameter is also specified) When you write the output to a file, -Show causes the output to be opened in an appropriate program, such as a web browser.
<CommonParameters>	Verbose, Debug, ErrorAction, ErrorVariable, WarningAction, WarningVariable, OutBuffer, and OutVariable. For details, see the Microsoft documentation.

The following example writes an HTML table to a file named Roles.html and opens the table in a web browser.

```
& "$env:ProgramFiles\Citrix\DelegatedAdmin\SnapIn\Citrix.DelegatedAdmin.Admin.V1\Scripts\OutputPermissionMapping.ps1" -Path Roles.html -Show
```

The following example writes a CSV table to a file named Roles.csv. The table is not displayed.

```
& "$env:ProgramFiles\Citrix\DelegatedAdmin\SnapIn\Citrix.DelegatedAdmin.Admin.V1\Scripts\OutputPermissionMapping.ps1" -CSV -Path Roles.csv
```

From a Windows command prompt, the preceding example command is:

```
powershell -command "& '%ProgramFiles%\Citrix\DelegatedAdmin\SnapIn\Citrix.DelegatedAdmin.Admin.V1\Scripts\OutputPermissionMapping.ps1' -CSV -Path Roles.csv"
```

Smart cards

Smart card authentication is supported within the guidelines described here.

Multiple smart cards and multiple readers can be used on the same user device, but if pass-through authentication is in use, only one smart card must be inserted when the user starts a virtual desktop or application. When a smart card is used within an application (for example, for digital signing or encryption functions), there might be additional prompts to insert a smart card or enter a PIN. This can occur if more than one smart card has been inserted at the same time. If users are prompted to insert a smart card when the smart card is already in the reader, they should select Cancel. If they are prompted for the PIN, they should enter the PIN again.

If you are using hosted applications running on Windows Server 2008 or 2008 R2 and with smart cards requiring the Microsoft Base Smart Card Cryptographic Service Provider, you might find that if a user runs a smart card transaction, all other users who use a smart card in the logon process are blocked. For further details and a hotfix for this issue, see <http://support.microsoft.com/kb/949538>.

Your organization might have specific security policies concerning the use of smart cards. These policies might, for example, state how smart cards are issued and how users should safeguard them. Some aspects of these policies might need to be reassessed in a XenApp or XenDesktop environment.

You can reset PINs using a card management system or vendor utility.

Smart card support also involves components available from Citrix partners. These are updated independently by the partners, and are not described in these topics. For more information, refer to the Citrix Ready program at <http://www.citrix.com/ready/>.

Requirements

Card reader support:

- ZKA (Zentraler Kredit Ausschuss or Central Credit Committee) Class 1 contact card readers that comply with the USB Chip/Smart Card Interface Devices (CCID) specification are supported. These contain a slot or swipe into which the user inserts the smart card. Other classes, including Class 2 (readers with keypads for entering PINs), contactless readers, and virtual smart cards based on the Trusted Platform Module (TPM) chip, are not supported.
- Obtain a device driver for the smart card reader and install it on the user device. Many smart card readers can use the CCID device driver supplied by Microsoft.
- Obtain a device driver and cryptographic service provider (CSP) software from your smart card vendor, and install them on both user devices and virtual desktops. The driver and CSP software must be compatible with XenApp and XenDesktop; check the vendor documentation for compatibility. Citrix recommends you:
 - Install the drivers and CSP software before installing any Citrix software on it.

- Install and test the drivers on a physical computer before installing Citrix software.
- For virtual desktops running Windows 7 using smart cards that support and use the mini driver model, smart card mini drivers should download automatically, but you can obtain them from <http://catalog.update.microsoft.com> or from your vendor. Additionally, if PKCS#11 middleware is required, obtain it from the card vendor.

Remote PC Access with smart cards:

- Smart cards are supported only for remote access to physical office PCs running Windows 7 or Windows 8; smart cards are not supported for office PCs running Windows XP.
- The following smart cards were tested with Remote PC Access:
 - Gemalto .Net 2.0 with the Gemalto .Net mini driver
 - Gemalto IDPrime .NET 510 with Gemalto .Net mini driver
 - Gemalto PIV cards with ActivIdentity ActivClient 6.2

User devices must run Citrix Receiver, appropriate middleware, and one of the following operating systems: Windows 7 or Windows 8 (including Embedded Edition), 32-bit and 64-bit.

Middleware:

- Receiver smart card support is based on Microsoft Personal Computer/Smart Card (PC/SC) standard specifications. A minimum requirement is that smart cards and smart card devices must be supported by the underlying Windows operating system and must be approved by the Microsoft Windows Hardware Quality Labs (WHQL) be used on computers running qualifying Windows operating systems. See Microsoft documentation for additional information about hardware PC/SC compliance.
- The following smart card and middleware combinations for Windows systems have been tested by Citrix as representative examples of their type. However, other smart cards and middleware can also be used. For more information about Citrix-compatible smart cards and middleware, see <http://www.citrix.com/ready>.

Middleware	Matching cards
ActivClient 6.2 (DoD CAC edition) in GSC-IS mode	DoD CAC card
ActivClient 7.0 in GSC-IS mode	DoD CAC card
ActivClient 7.0 in PIV mode	DoD CAC card, NIST PIV card
GemAlto Mini Driver for .NET card	GemAlto IDPrime .NET 510
SafeNet Authentication Client 8.x for Windows	USB eToken 5100

Before deploying smart cards:

- Ensure that your public key infrastructure (PKI) is configured appropriately. This includes ensuring that certificate-to-account mapping is correctly configured for Active Directory environment and that user certificate validation can be performed successfully.

- Configure components to use TLS 1.0 for smart card logon.
- Ensure your deployment meets the system requirements of the other Citrix components used with smart cards, including Receiver and StoreFront.
- Ensure access to the following servers in your Site:
 - The Active Directory domain controller for the user account that is associated with a login certificate on the smart card
 - Delivery Controller
 - Citrix StoreFront
 - Citrix NetScaler Gateway/Citrix Access Gateway 10.x
 - Virtual Delivery Agent
 - (Optional for remote access): Microsoft Exchange Server
- You should be familiar with smart card technology in general and the technology you selected in particular, and the SDK. You should also know how to install and maintain certificates in distributed environments.

Enable smart card use

1. Enable the product for smart card use.
 - a. Issue smart cards to the users according to your card issuance policy.
 - b. (Optional) Set up smart card to enable users for Remote PC Access.
 - c. Install and configure the Delivery Controller and StoreFront (if not already installed for smart card remoting).
2. Enable StoreFront for smart card use. For details, see *Configure smart card authentication* in the StoreFront documentation.
3. Enable NetScaler Gateway/Access Gateway for smart card use. For details, see *Configuring Authentication and Authorization* and *Configuring Smart Card Access with the Web Interface* in the NetScaler documentation.
4. Enable the Virtual Delivery Agent (VDA) for smart card use.
 - a. Ensure the Virtual Delivery Agent has the required applications and updates.
 - b. Install the middleware.
 - c. Set up smart card remoting, enabling the communication of smart card data between Receiver on a user device and a virtual desktop session.
5. Enable user devices (including domain-joined or non-domain-joined machines) for smart card use. See *Configure smart card authentication* in the StoreFront documentation for details.
 - a. Import the certificate authority root certificate and the issuing certificate authority certificate into the device's keystore.
 - b. Install your vendor's cryptographic middleware.
 - c. Install and configure Receiver for Windows, being sure to import icaclient.adm using the Group Policy Management Console and enabling smart card authentication.
 - For thin clients and computers running Desktop Lock, install Receiver for Windows Enterprise 3.4.
 - For all other devices, install Receiver for Windows 4.0.
6. Test the deployment. Ensure that the deployment is configured correctly by launching a virtual desktop with a test user's smart card. Test all possible access mechanisms (for example, accessing the desktop through Internet Explorer and Receiver).

Smart card deployments

The following types of smart card deployments are supported by this product version and by mixed environments containing this version. Other configurations might work but are not supported.

Type	StoreFront connectivity
Local domain-joined computers	Directly connected
Remote access from domain-joined computers	Connected through NetScaler Gateway
Non-domain-joined computers	Directly connected
Remote access from non-domain-joined computers	Connected through NetScaler Gateway
Non-domain-joined computers and thin clients accessing the Desktop Appliance site	Connected through Desktop Appliance sites
Domain-joined computers and thin clients accessing StoreFront through the XenApp Services URL	Connected through XenApp Services URLs

The deployment types are defined by the characteristics of the user device to which the smart card reader is connected:

- Whether the device is domain-joined or non-domain-joined.
- How the device is connected to StoreFront.
- What software is used to view virtual desktops and applications.

In addition, smart card-enabled applications such as Microsoft Word, and Microsoft Excel can be used in these deployments. Those applications allow users to digitally sign or encrypt documents.

Bimodal authentication

Where possible in each of these deployments, Receiver supports *bimodal authentication* by offering the user a choice between using a smart card and entering their user name and password. This is useful if the smart card cannot be used (for example, the user has left it at home or the logon certificate has expired).

Because users of non-domain-joined devices log on to Receiver for Windows directly, you can enable users to fall back to explicit authentication. If you configure bimodal authentication, users are initially prompted to log on using their smart cards and PINs but have the option to select explicit authentication if they experience any issues with their smart cards.

If you deploy NetScaler Gateway, users log on to their devices and are prompted by Receiver for Windows to authenticate to NetScaler Gateway. This applies to both

domain-joined and non-domain-joined devices. Users can log on to NetScaler Gateway using either their smart cards and PINs, or with explicit credentials. This enables you to provide users with bimodal authentication for NetScaler Gateway logons. Configure pass-through authentication from NetScaler Gateway to StoreFront and delegate credential validation to NetScaler Gateway for smart card users so that users are silently authenticated to StoreFront.

Multiple Active Directory forest considerations

In a Citrix environment, smart cards are supported within a single forest. Smart card logons across forests require a direct two-way forest trust to all user accounts. More complex multi-forest deployments involving smart cards (that is, where trusts are only one-way or of different types) are not supported.

You can use smart cards in a Citrix environment that includes remote desktops. This feature can be installed locally (on the user device that the smart card is connected to) or remotely (on the remote desktop that the user device connects to).

Smart card removal policy

The smart card removal policy set on the product determines what happens if you remove the smart card from the reader during a session. The smart card removal policy is configured through and handled by the Windows operating system.

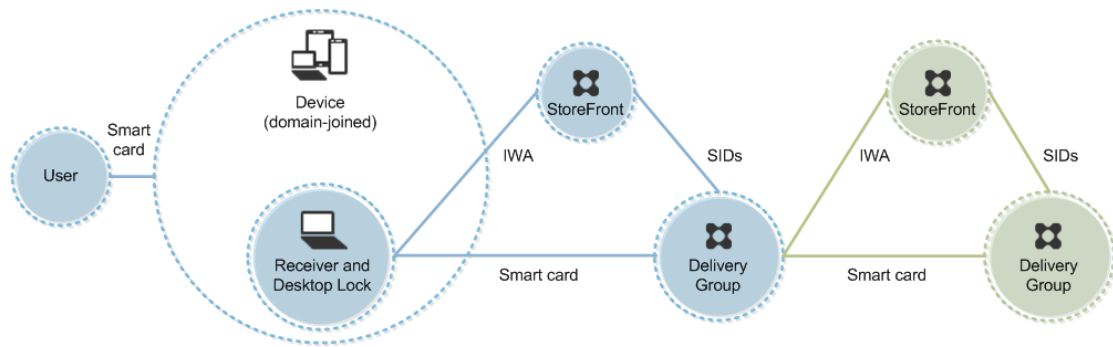
Policy setting	Desktop behavior
No action	No action.
Lock workstation	The desktop session is disconnected and the virtual desktop is locked.
Force logoff	The user is forced to log off. If the network connection is lost and this setting is enabled, the session may be logged off and the user may lose data.
Disconnect if a remote Terminal Services session	The session is disconnected and the virtual desktop is locked.

Certificate revocation checking

If certificate revocation checking is enabled and a user inserts a smart card with an invalid certificate into a card reader, the user cannot authenticate or access the desktop or application related to the certificate. For example, if the invalid certificate is used for email decryption, the email remains encrypted. If other certificates on the card, such as ones used for authentication, are still valid, those functions remain active.

Deployment example: domain-joined computers

This deployment involves domain-joined user devices that run the Desktop Viewer and connect directly to StoreFront.

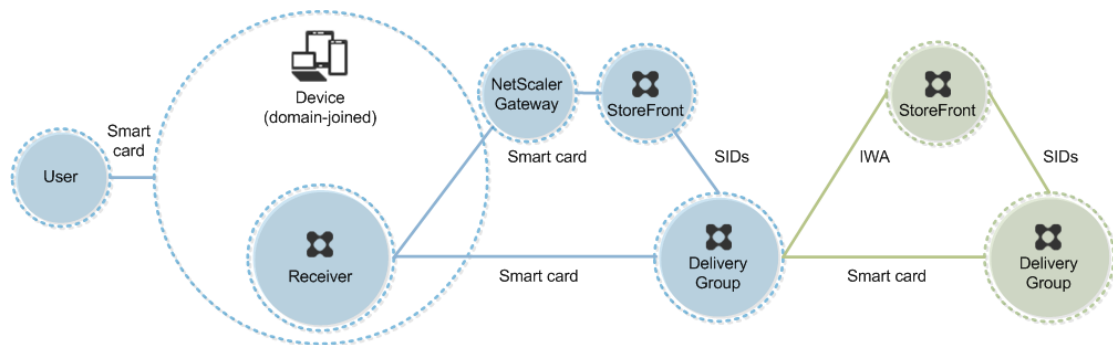


A user logs on to a device using a smart card and PIN. Receiver authenticates the user to a StoreFront server using Integrated Windows Authentication (IWA). StoreFront passes the user security identifiers (SIDs) to XenApp or XenDesktop. When the user starts a virtual desktop or application, the user is not prompted for a PIN again because the single sign-on feature is configured on Receiver.

This deployment can be extended to a double-hop with the addition of a second StoreFront server and a server hosting applications. A Receiver from the virtual desktop authenticates to the second StoreFront server. Any authentication method can be used for this second connection. The configuration shown for the first hop can be reused in the second hop or used in the second hop only.

Deployment example: remote access from domain-joined computers

This deployment involves domain-joined user devices that run the Desktop Viewer and connect to StoreFront through NetScaler Gateway/Access Gateway.



A user logs on to a device using a smart card and PIN, and then logs on again to NetScaler Gateway/Access Gateway. This second logon can be with either the smart card and PIN or a user name and password because Receiver allows bimodal authentication in this deployment.

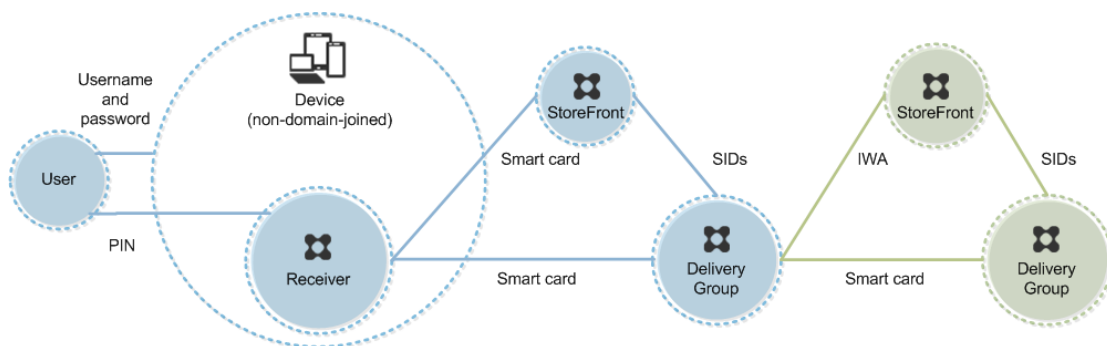
The user is automatically logged on to StoreFront, which passes the user security identifiers (SIDs) to XenApp or XenDesktop. When the user starts a virtual desktop or application, the user is not prompted again for a PIN because the single sign-on feature is configured on

Receiver.

This deployment can be extended to a double-hop with the addition of a second StoreFront server and a server hosting applications. A Receiver from the virtual desktop authenticates to the second StoreFront server. Any authentication method can be used for this second connection. The configuration shown for the first hop can be reused in the second hop or used in the second hop only.

Deployment example: non-domain-joined computers

This deployment involves non-domain-joined user devices that run the Desktop Viewer and connect directly to StoreFront.



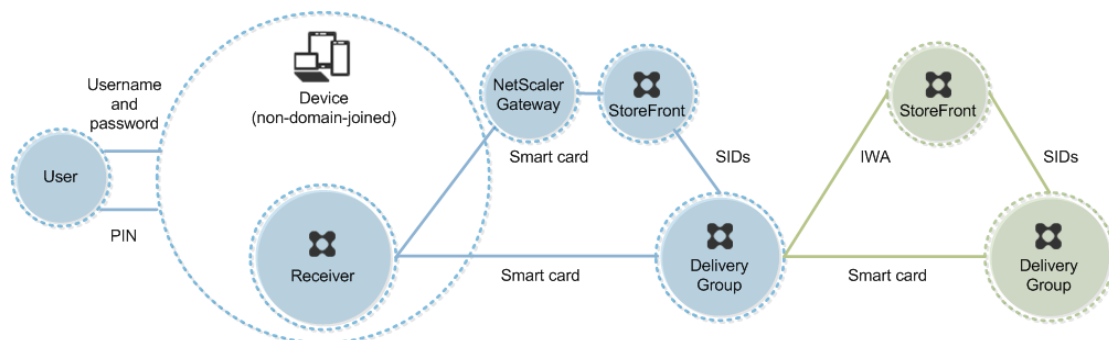
A user logs on to a device. Typically, the user enters a user name and password but, since the device is not joined to a domain, credentials for this logon are optional. Because bimodal authentication is possible in this deployment, Receiver prompts the user either for a smart card and PIN or a user name and password. Receiver then authenticates to Storefront.

StoreFront passes the user security identifiers (SIDs) to XenApp or XenDesktop. When the user starts a virtual desktop or application, the user is prompted for a PIN again because the single sign-on feature is not available in this deployment.

This deployment can be extended to a double-hop with the addition of a second StoreFront server and a server hosting applications. A Receiver from the virtual desktop authenticates to the second StoreFront server. Any authentication method can be used for this second connection. The configuration shown for the first hop can be reused in the second hop or used in the second hop only.

Deployment example: remote access from non-domain-joined computers

This deployment involves non-domain-joined user devices that run the Desktop Viewer and connect directly to StoreFront.



A user logs on to a device. Typically, the user enters a user name and password but, since the device is not joined to a domain, credentials for this logon are optional. Because bimodal authentication is possible in this deployment, Receiver prompts the user either for a smart card and PIN or a user name and password. Receiver then authenticates to Storefront.

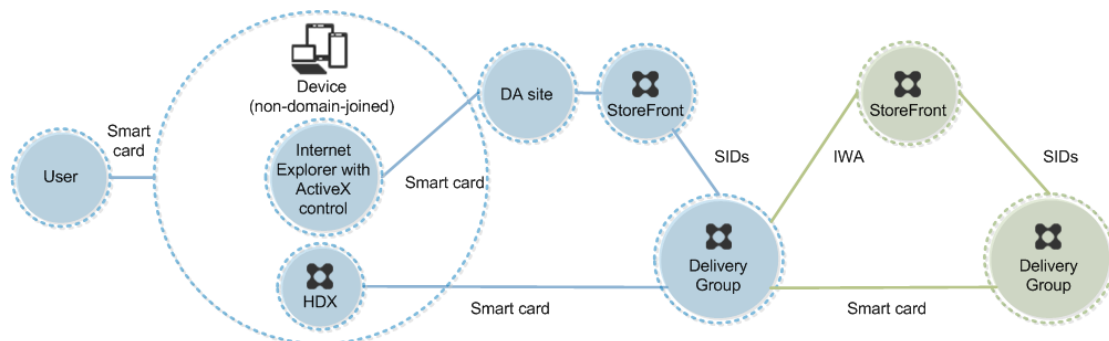
StoreFront passes the user security identifiers (SIDs) to XenApp or XenDesktop. When the user starts a virtual desktop or application, the user is prompted for a PIN again because the single sign-on feature is not available in this deployment.

This deployment can be extended to a double-hop with the addition of a second StoreFront server and a server hosting applications. A Receiver from the virtual desktop authenticates to the second StoreFront server. Any authentication method can be used for this second connection. The configuration shown for the first hop can be reused in the second hop or used in the second hop only.

Deployment example: non-domain-joined computers and thin clients accessing the Desktop Appliance site

This deployment involves non-domain-joined user devices that may run the Desktop Lock and connect to StoreFront through Desktop Appliance sites.

The Desktop Lock is a separate component that is released with XenApp, XenDesktop, and VDI-in-a-Box. It is an alternative to the Desktop Viewer and is designed mainly for repurposed Windows computers and Windows thin clients. The Desktop Lock replaces the Windows shell and Task Manager in these user devices, preventing users from accessing the underlying devices. With the Desktop Lock, users can access Windows Server Machine desktops and Windows Desktop Machine desktops. Installation of Desktop Lock is optional.



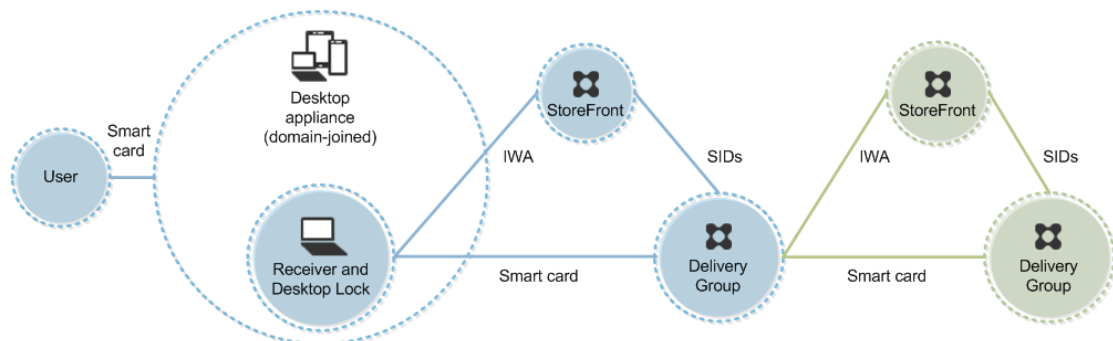
A user logs on to a device with a smart card. If Desktop Lock is running on the device, the device is configured to launch a Desktop Appliance site through Internet Explorer running in Kiosk Mode. An ActiveX control on the site prompts the user for a PIN, and sends it to StoreFront. StoreFront passes the user security identifiers (SIDs) to XenApp or XenDesktop. The first available desktop in the alphabetical list in an assigned Desktop Group starts.

This deployment can be extended to a double-hop with the addition of a second StoreFront server and a server hosting applications. A Receiver from the virtual desktop authenticates to the second StoreFront server. Any authentication method can be used for this second connection. The configuration shown for the first hop can be reused in the second hop or used in the second hop only.

Deployment example: domain-joined computers and thin clients accessing StoreFront through the XenApp Services URL

This deployment involves domain-joined user devices that run the Desktop Lock and connect to StoreFront through XenApp Services URLs.

The Desktop Lock is a separate component that is released with XenApp, XenDesktop, and VDI-in-a-Box. It is an alternative to the Desktop Viewer and is designed mainly for repurposed Windows computers and Windows thin clients. The Desktop Lock replaces the Windows shell and Task Manager in these user devices, preventing users from accessing the underlying devices. With the Desktop Lock, users can access Windows Server Machine desktops and Windows Desktop Machine desktops. Installation of Desktop Lock is optional.



A user logs on to a device using a smart card and PIN. If Desktop Lock is running on the device, it authenticates the user to a Storefront server using Integrated Windows Authentication (IWA). StoreFront passes the user security identifiers (SIDs) to XenApp or XenDesktop. When the user starts a virtual desktop, the user is not prompted for a PIN again because the single sign-on feature is configured on Receiver.

This deployment can be extended to a double-hop with the addition of a second StoreFront server and a server hosting applications. A Receiver from the virtual desktop authenticates to the second StoreFront server. Any authentication method can be used for this second connection. The configuration shown for the first hop can be reused in the second hop or

used in the second hop only.

Pass-through authentication and single sign-on with smart cards

Pass-through authentication

Pass-through authentication with smart cards to virtual desktops is supported on user devices running Windows 8 and Windows 7 SP1, Enterprise and Professional Editions.

Pass-through authentication with smart cards to hosted applications is supported on servers running Windows Server 2008 and Windows Server 2012.

To use pass-through authentication with smart cards hosted applications, ensure you enable the use of Kerberos when you configure Pass-through with smartcard as the authentication method for the site.

Note: The availability of pass-through authentication with smart cards depends on many factors including, but not limited to:

- Your organization's security policies regarding pass-through authentication.
- Middleware type and configuration.
- Smart card reader types.
- Middleware PIN caching policy.

Pass-through authentication with smart cards is configured on Citrix StoreFront. See *Configure the authentication service* in the StoreFront documentation for details.

Single sign-on

Single sign-on is a Citrix feature that implements pass-through authentication with virtual desktop and application launches. You can use this feature in domain-joined, direct-to-StoreFront and domain-joined, NetScaler-to-StoreFront smart card deployments to reduce the number of times that users enter their PIN. To use single sign-on in these deployment types, edit the following parameters in the default.ica file, which is located on the StoreFront server:

- Domain-joined, direct-to-StoreFront smart card deployments — Set `DisableCtrlAltDel` to Off
- Domain-joined, NetScaler-to-StoreFront smart card deployments — Set `UseLocalUserAndPassword` to On

For more instructions on setting these parameters, see the StoreFront or NetScaler Gateway documentation.

The availability of single sign-on functionality depends on many factors including, but not limited to:

- Your organization's security policies regarding single sign-on.
- Middleware type and configuration.
- Smart card reader types.
- Middleware PIN caching policy.

Note: When the user logs on to the Virtual Delivery Agent (VDA) on a machine with an attached smart card reader, a Windows tile may appear representing the previous successful mode of authentication, such as smart card or password. As a result, when single sign-on is enabled, the single sign-on tile may appear. To log on, the user must select Switch Users to select another tile because the single sign-on tile will not work.

SSL

Configuring a XenApp or XenDesktop Site to use the Secure Sockets Layer (SSL) security protocol includes the following procedures:

- Obtain, install, and register a server certificate on all Delivery Controllers, and configure a port with the SSL certificate. For details, see [Install SSL server certificates on Controllers](#).

Optionally, you can change the ports the Controller uses to listen for HTTP and HTTPS traffic.

- Enable SSL connections between users and Virtual Delivery Agents (VDAs) by completing the following tasks:
 - Configure SSL on the machines where the VDAs are installed. (For convenience, further references to machines where VDAs are installed are simply called "VDAs.") You can use a PowerShell script supplied by Citrix, or configure it manually. For general information, see [About SSL settings on VDAs](#). For details, see [Configure SSL on a VDA using the PowerShell script](#) and [Manually configure SSL on a VDA](#).
 - Configure SSL in the Delivery Groups containing the VDAs by running a set of PowerShell cmdlets in Studio. For details, see [Configure SSL on Delivery Groups](#).

Requirements and considerations:

- Enabling SSL connections between users and VDAs is valid only for XenApp 7.6 and XenDesktop 7.6 Sites, plus later supported releases.
- Configure SSL in the Delivery Groups and on the VDAs after you install components, create a Site, create Machine Catalogs, and create Delivery Groups.
- To configure SSL in the Delivery Groups, you must have permission to change Controller access rules; a Full Administrator has this permission.
- To configure SSL on the VDAs, you must be a Windows administrator on the machine where the VDA is installed.
- If you intend to configure SSL on VDAs that have been upgraded from earlier versions, uninstall any SSL relay software on those machines before upgrading them.
- The PowerShell script configures SSL on static VDAs; it does not configure SSL on pooled VDAs that are provisioned by Machine Creation Services or Provisioning Services, where the machine image resets on each restart.

For tasks that include working in the Windows registry:

Caution: Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

For information about enabling SSL to the Site database, see [CTX137556](#).

Install SSL server certificates on Controllers

For HTTPS, the XML Service supports SSL features through the use of server certificates, not client certificates. To obtain, install, and register a certificate on a Controller, and to configure a port with the SSL certificate:

- If the Controller has IIS installed, follow the guidance in <http://support.microsoft.com/kb/299875>.
- If the Controller does not have IIS installed, one method of configuring the certificate is:
 1. Obtain an SSL server certificate and install it on the Controller using the guidance in <http://blogs.technet.com/b/pki/archive/2009/08/05/how-to-create-a-web-server-ssl-certificate-manually.aspx>. For information on the certreq tool, see [http://technet.microsoft.com/en-us/library/cc736326\(Ws.10\).aspx](http://technet.microsoft.com/en-us/library/cc736326(Ws.10).aspx).

If you intend to use the PowerShell script to configure SSL on VDAs, and unless you intend on specifying the SSL certificate's thumbprint, make sure the certificate is located in the Local Computer > Personal > Certificates area of the certificate store. If more than one certificate resides in that location, the first one found will be used.

2. Configure a port with the certificate; see <http://msdn.microsoft.com/en-us/library/ms733791%28v=vs.110%29.aspx>.

Change HTTP or HTTPS ports

By default, the XML Service on the Controller listens on port 80 for HTTP traffic and port 443 for HTTPS traffic. Although you can use non-default ports, be aware of the security risks of exposing a Controller to untrusted networks. Deploying a standalone StoreFront server is preferable to changing the defaults.

- To change the default HTTP or HTTPS ports used by the Controller, run the following command from Studio: `BrokerService.exe -WIPORT <http-port> -WISSLPOR <https-port>`

where *<http-port>* is the port number for HTTP traffic and *<https-port>* is the port number for HTTPS traffic.

Note: After changing a port, Studio might display a message about license compatibility and upgrading. To resolve the issue, re-register service instances using the following PowerShell cmdlet sequence:

```
Get-ConfigRegisteredServiceInstance -ServiceType Broker -Binding  
XML_HTTPS | Unregister-ConfigRegisteredServiceInstance  
Get-BrokerServiceInstance | where Binding -eq "XML_HTTPS" |  
Register-ConfigServiceInstance
```

- If you want the XML Service to ignore HTTP or HTTPS traffic on the default ports, set the following registry values in `HKLM\Software\Citrix\DesktopServer\` on the Controller and restart the Broker Service.

- To ignore HTTP traffic, set XmlServicesEnableNonSsl to 0.
- To ignore HTTPS traffic, set XmlServicesEnableSsl to 0.

About SSL settings on VDAs

When you configure SSL on VDAs, it changes permissions on the installed SSL certificate, giving the ICA Service read access to the certificate's private key, and informing the ICA Service of the following:

- **Which certificate in the certificate store to use for SSL.**
- **Which TCP port number to use for SSL connections.**

The Windows Firewall (if it is enabled) must be configured to allow incoming connection on this TCP port. This configuration is done for you when you use the PowerShell script.

- **Which versions of the SSL protocol to allow.**

The supported SSL protocol versions follow a hierarchy (lowest to highest): SSL 3.0, TLS 1.0, TLS 1.1, and TLS 1.2. You specify the minimum allowed version; all protocol connections using that version or a higher version are allowed.

For example, if you specify TLS 1.1 as the minimum version, then TLS 1.1 and TLS 1.2 protocol connections are allowed. If you specify SSL 3.0 as the minimum version, then connections for all the supported versions are allowed. If you specify TLS 1.2 as the minimum version, only TLS 1.2 connections are allowed.

- **Which SSL ciphers to allow.**

A cipher suite is a list of common SSL ciphers. When a client connects and sends a list of supported SSL ciphers, the VDA matches one of the client's ciphers with one of the ciphers in its configured cipher suite and accepts the connection. If the client sends a cipher that is not in the VDA's cipher suite, the VDA rejects the connection.

Three cipher suites are supported: GOV(ernment), COM(mercial), and ALL. The ciphers in those cipher suites depend on the Windows FIPS mode; see <http://support.microsoft.com/kb/811833> for information about Windows FIPS mode. The following table lists the ciphers in each supported cipher suite.

SSL cipher suite	GOV	COM	ALL	GOV	COM	ALL
FIPS Mode	Off	Off	Off	On	On	On
RSA_KEYX	x	x	x	x	x	x
RSA_SIGN	x	x	x	x	x	x
3DES	x		x	x		x
RC4		x	x			
MD5	x	x	x			
SHA	x	x	x	x	x	x
SHA_256	x	x	x	x	x	x

SHA_384	x	x	x	x	x	x
SHA_512	x	x	x	x	x	x
AES	x	x	x	x	x	x

A Delivery Group cannot have a mixture of some VDAs with SSL configured and some VDAs without SSL configured. When you configure SSL for a Delivery Group, you should have already configured SSL for all of the VDAs in that Delivery Group.

Configure SSL on a VDA using the PowerShell script

The Enable-VdaSSL.ps1 script enables or disables the SSL listener on a VDA. This script is available in the Support >Tools > SslSupport folder on the installation media.

When you enable SSL, the script disables all existing Windows Firewall rules for the specified TCP port before adding a new rule that allows the ICA Service to accept incoming connections only on the SSL TCP port. It also disables the Windows Firewall rules for:

- Citrix ICA (default: 1494)
- Citrix CGP (default: 2598)
- Citrix WebSocket (default: 8008)

The result is that users can connect only over SSL; they cannot use raw ICA, CGP, or WebSocket to connect.

The script contains the following syntax descriptions, plus additional examples; you can use a tool such as Notepad++ to review this information.

You must specify either the -Enable or -Disable parameter; all other parameters are optional.

Syntax

Enable-VdaSSL {-Enable | -Disable} [-SSLPort <port>] [-SSLMinVersion "<min-ssl-version>"] [-SSLCipherSuite "<suite>"] [-CertificateThumbPrint "<thumbprint>"]

Parameter	Description
-Enable	Installs and enables the SSL listener on the VDA. Either this parameter or the -Disable parameter is required.
-Disable	Disables the SSL listener on the VDA. Either this parameter or the -Enable parameter is required. If you specify this parameter, no other parameters are valid.
-SSLPort <port>	SSL port. Default: 443
-SSLMinVersion "<min-ssl-version>"	Minimum SSL protocol version, enclosed in quotation marks. Valid values: "SSL_3.0", "TLS_1.0", "TLS_1.1", and "TLS_1.2". Default: "TLS_1.0"

-SSLCipherSuite "<suite>"	SSL cipher suite, enclosed in quotation marks. Valid values: "GOV", "COM", and "ALL". Default: "ALL"
-CertificateThumbPrint "<thumbprint>"	Thumbprint of the SSL certificate in the certificate store, enclosed in quotation marks. This parameter is generally used when the certificate store has multiple certificates; the script uses the thumbprint to select the certificate you want to use. Default: the first available certificate found in the Local Computer > Personal > Certificates area of the certificate store.

Examples

The following script installs and enables the SSL listener, using default values for all optional parameters.

```
Enable-VdaSSL -Enable
```

The following script installs and enables the SSL listener, and specifies SSL port 400, the GOV cipher suite, and a minimum TLS 1.2 SSL protocol value.

```
Enable-VdaSSL - Enable -SSLPort 400 'SSLMinVersion "TLS_1.2"
-SSLCipherSuite "GOV"
```

The following script disables the SSL listener on the VDA.

```
Enable-VdaSSL -Disable
```

Manually configure SSL on a VDA

When configuring SSL on a VDA manually, you grant generic read access to the SSL certificate's private key for the appropriate service on each VDA: NT SERVICE\PorticaService for a VDA for Windows Desktop OS, or NT SERVICE\TermService for a VDA for Windows Server OS. On the machine where the VDA is installed:

1. Launch the Microsoft Management Console (MMC): Start > Run > mmc.exe.
2. Add the Certificates snap-in to the MMC:
 - a. Select File > Add/Remove Snap-in.
 - b. Select Certificates and then click Add.
 - c. When prompted with "This snap-in will always manage certificates for:" choose "Computer account" and then click Next.
 - d. When prompted with "Select the computer you want this snap-in to manage" choose "Local computer" and then click Finish.
3. Under Certificates (Local Computer) > Personal > Certificates, right-click the certificate and then select All Tasks > Manage Private Keys.

4. The Access Control List Editor displays “Permissions for (*FriendlyName*) private keys” where (*FriendlyName*) is the name of your SSL certificate. Add one of the following services and give it Read access:
 - For a VDA for Windows Desktop OS, “PORTICASERVICE”
 - For a VDA for Windows Server OS, “TERMSERVICE”
5. Double-click the installed SSL certificate. In the certificate dialog, select the Details tab and then scroll to the bottom. Click Thumbprint.
6. Run regedit and go to HKLM\SYSTEM\CurrentControlSet\Control\Terminal Server\Wds\icaud.
 - a. Edit the SSL Thumbprint key and copy the value of the SSL certificate’s thumbprint into this binary value. You can safely ignore unknown items in the Edit Binary Value dialog box (such as '0000' and special characters).
 - b. Edit the SSLEnabled key and change the DWORD value to 1. (To disable SSL later, change the DWORD value to 0.)
 - c. If you want to change the default settings (optional), use the following in the same registry path:
 - SSLPort DWORD - SSL port number. Default: 443.
 - SSLMinVersion DWORD - 1 = SSL 3.0, 2 = TLS 1.0, 3 = TLS 1.1, 4 = TLS 1.2. Default: 2 (TLS 1.0).
 - SSLCipherSuite DWORD - 1 = GOV, 2 = COM, 3 = ALL. Default: 3 (ALL).
7. Ensure the SSL TCP port is open in the Windows Firewall if it is not the default 443. (When you create the inbound rule in Windows Firewall, make sure its properties have the “Allow the connection” and “Enabled” entries selected.)
8. Ensure that no other applications or services (such as IIS) are using the SSL TCP port.
9. For VDAs for Windows Server OS, restart the machine for the changes to take effect. (You do not need to restart machines containing VDAs for Windows Desktop OS.)

Configure SSL on Delivery Groups

Complete this procedure for each Delivery Group that contains VDAs you have configured for SSL connections.

1. From Studio, open the PowerShell console.
2. Run `asn Citrix.*` to load the Citrix product cmdlets.
3. Run `Get-BrokerAccessPolicyRule -DesktopGroupName '<delivery-group-name>' | Set-BrokerAccessPolicyRule -HdxSslEnabled $true.`

where *<delivery-group-name>* is the name of the Delivery Group containing VDAs.

4. Run `Set-BrokerSite -DnsResolutionEnabled $true.`

Troubleshooting

If a connection error occurs, check the VDA's system event log.

When using Receiver for Windows, if you receive a connection error (such as 1030) that indicates an SSL error, disable Desktop Viewer and then try connecting again; although the connection will still fail, an explanation of the underlying SSL issue might be provided (for example, you specified an incorrect template when requesting a certificate from the certificate authority).

Policies

Policies are a collection of settings that define how sessions, bandwidth, and security are managed for a group of users, devices, or connection types.

You can apply policy settings to physical and virtual machines or to users. You can apply settings to individual users at the local level or in security groups in Active Directory. The configurations define specific criteria and rules, and if you don't specifically assign the policies, the settings are applied to all connections.

You can apply policies on different levels of the network. Policy settings placed at the Organizational Unit GPO level take the highest precedence on the network. Policies at the Domain GPO level override policies on the Site Group Policy Object level, which override any conflicting policies on both the Microsoft and Citrix Local Policies levels.

All Citrix Local Policies are created and managed in the Citrix Studio console and stored in the Site Database; whereas, Group Policies are created and managed with the Microsoft Group Policy Management Console (GPMC) and stored in Active Directory. Microsoft Local Policies are created in the Windows Operating System and are stored in the registry.

Studio uses a Modeling Wizard to help administrators compare configuration settings within templates and policies to help eliminate conflicting and redundant settings. Administrators can set GPOs using the GPMC to configure settings and apply them to a target set of users at different levels of the network.

These GPOs are saved in Active Directory, and access to the management of these settings is generally restricted for most of IT for security.

Settings are merged according to priority and their condition. Any disabled setting overrides a lower-ranked enabled setting. Unconfigured policy settings are ignored and do not override lower-ranked settings.

Local policies can also have conflicts with group policies in the Active Directory, which could override each other depending on the situation.

All policies are processed in the following order:

1. The end user logs on to a machine using domain credentials.
2. Credentials are sent to the domain controller.
3. Active Directory applies all policies (end user, endpoint, organizational unit, and domain).
4. The end user logs on to Receiver and accesses an application or desktop.
5. Citrix and Microsoft policies are processed for the end user and machine hosting the resource.

6. Active Directory determines precedence for policy settings and applies them to the registries of the endpoint device and machine hosting the resource.
7. The end user logs off from the resource. Citrix policies for the end user and endpoint device are no longer active.
8. The end user logs off the user device, which releases the GPO user policies.
9. The end user turns off the device, which releases the GPO machine policies.

When creating policies for groups of users, devices, and machines, some members may have different requirements and would need exceptions to some policy settings. Exceptions are made by way of filters in Studio and the GPMC that determine who or what the policy affects.

Related content

- [Work with policies](#)
- [Policy templates](#)
- [Create policies](#)
- [Compare, prioritize, model, and troubleshoot policies](#)
- [Default policy settings](#)
- [Policy settings reference](#)

Work with policies

Configure Citrix policies to control user access and session environments. Citrix policies are the most efficient method of controlling connection, security, and bandwidth settings. You can create policies for specific groups of users, devices, or connection types. Each policy can contain multiple settings.

Tools for working with Citrix policies

You can use the following tools to work with Citrix policies.

- **Studio** - If you are a Citrix administrator without permission to manage group policy, use Studio to create policies for your site. Policies created using Studio are stored in the site database and updates are pushed to the virtual desktop either when that virtual desktop registers with the broker or when a user connects to that virtual desktop.
- **Local Group Policy Editor** (Microsoft Management Console snap-in) - If your network environment uses Active Directory and you have permission to manage group policy, you can use the Local Group Policy Editor to create policies for your Site. The settings you configure affect the Group Policy Objects (GPOs) you specify in the Group Policy Management Console.

Important: You must use the Local Group Policy Editor to configure some policy settings, including those related to registering VDAs with a Controller and those related to Microsoft App-V servers.

Policy processing order and precedence

Group policy settings are processed in the following order:

1. Local GPO
2. XenApp or XenDesktop Site GPO (stored in the Site database)
3. Site-level GPOs
4. Domain-level GPOs
5. Organizational Units

However, if a conflict occurs, policy settings that are processed last can overwrite those that are processed earlier. This means that policy settings take precedence in the following order:

1. Organizational Units
2. Domain-level GPOs

3. Site-level GPOs
4. XenApp or XenDesktop Site GPO (stored in the Site database)
5. Local GPO

For example, a Citrix administrator uses Studio to create a policy (Policy A) that enables client file redirection for the company's sales employees. Meanwhile, another administrator uses the Group Policy Editor to create a policy (Policy B) that disables client file redirection for sales employees. When the sales employees log on to the virtual desktops, Policy B is applied and Policy A is ignored because Policy B was processed at the domain level and Policy A was processed at the XenApp or XenDesktop Site GPO level.

However, when a user launches an ICA or Remote Desktop Protocol (RDP) session, Citrix session settings override the same settings configured in an Active Directory policy or using Remote Desktop Session Host Configuration. This includes settings that are related to typical RDP client connection settings such as Desktop wallpaper, Menu animation, and View window contents while dragging.

When using multiple policies, you can prioritize policies that contain conflicting settings; see [Compare, prioritize, model, and troubleshoot policies](#) for details.

Workflow for Citrix policies

The process for configuring policies is as follows:

1. Create the policy.
2. Configure policy settings.
3. Assign the policy to machine and user objects.
4. Prioritize the policy.
5. Verify the effective policy by running the Citrix Group Policy Modeling wizard.

Navigate Citrix policies and settings

In the Local Group Policy Editor, policies and settings appear in two categories: Computer Configuration and User Configuration. Each category has a Citrix Policies node. See the Microsoft documentation for details about navigating and using this snap-in.

In Studio, policy settings are sorted into categories based on the functionality or feature they affect. For example, the Profile management section contains policy settings for Profile management.

- Computer settings (policy settings applying to machines) define the behavior of virtual desktops and are applied when a virtual desktop starts. These settings apply even when there are no active user sessions on the virtual desktop. User settings define the user experience when connecting using ICA. User policies are applied when a user connects or reconnects using ICA. User policies are not applied if a user connects using RDP or logs on directly to the console.

To access policies, settings, or templates, select Policies in the Studio navigation pane.

- The **Policies** tab lists all policies. When you select a policy, tabs to the right display: Overview (name, priority, enabled/disabled status, and description), Settings (list of configured settings), and Assigned to (user and machine objects to which the policy is currently assigned). For more information, see [Create policies](#).
- The **Templates** tab lists Citrix-provided and custom templates you created. When you select a template, tabs to the right display: Description (why you might want to use the template) and Settings (list of configured settings). For more information, see [Policy templates](#).
- The **Comparison** tab enables you to compare the settings in a policy or template with those in other policies or templates. For example, you might want to verify setting values to ensure compliance with best practices. For more information, see [Compare, prioritize, model, and troubleshoot policies](#).
- From the **Modelling** tab, you can simulate connection scenarios with Citrix policies. For more information, see [Compare, prioritize, model, and troubleshoot policies](#).

To search for a setting in a policy or template:

1. Select the policy or template.
2. Select Edit policy or Edit Template in the Actions pane.
3. On the Settings page, begin to type the name of the setting.

You can refine your search by selecting a specific product version, selecting a category (for example, Bandwidth), or by selecting the View selected only check box or selecting to search only the settings that have been added to the selected policy. For an unfiltered search, select All Settings.

- To search for a setting within a policy :

1. Select the policy.
2. Select the Settings tab, begin to type the name of the setting.

You can refine your search by selecting a specific product version or by selecting a category. For an unfiltered search, select All Settings.

Policy templates

Policy templates allow you to configure Citrix policies that manage the end user experience in your environment. Templates contain pre-configured settings that optimize performance for specific environments or network conditions. You can use templates as:

- A source for creating other policies
- A tool for comparing existing policies
- A method for delivering or receiving policy configurations from Citrix Support or trusted third parties

You can:

- **Create new templates using existing templates or policies** - The new template has the same settings as the original template or policy, but any assignments specified in the original policy are not included in the new template.
- **Create new policies using existing templates.**
- **Import and export templates** - Although policy templates are local to the Studio machine for the Site being managed, you can transfer (import or export) policy configurations between environments, including other Sites that you manage on the Studio machine. This allows you to:
 - Implement policy configurations from servers in other Sites.
 - Create backups of your template files to aid recovery of policy configurations.
 - Provide policy configurations from your site to aid Citrix Support in troubleshooting.
 - Implement policy configurations created by Citrix Support to resolve issues.

In Studio, templates are displayed in a single list. In Group Policy Editor, Computer templates are displayed when you are working with Computer policies, and User templates are displayed when you are working with User policies. Each template display includes a description of the template's purpose and a list of configured settings, plus their current and default values.

Templates and Delegated Administration

Policy templates are local files that are stored on the machine running Studio, not in the Site database. Local files are controlled by Windows administrative permissions rather than Delegated Administration roles and scopes. This means that an administrator with read-only permission in Delegated Administration model can create new templates, for example. However, because templates are local files, no changes are actually made to your environment.

Built-in templates

Citrix provides the following built-in templates:

- High Definition User Experience templates include settings for providing high quality audio, graphics, and video to users.
- High Server Scalability templates include settings for providing an optimized user experience while hosting more users on a single server.
- Optimized Bandwidth for WAN templates include settings for providing an optimized experience to users with low bandwidth or high latency connections; for example, users working from branch offices over a shared WAN connection.
- Security and Control templates include settings for disabling access to peripheral devices, drive mapping, port redirection, and Flash acceleration on user devices.

You can use these templates as a model for creating new policies or templates. Built-in templates are created and updated by Citrix. You cannot modify or delete these templates, but you can modify or delete templates that you create or import through Studio or the Group Policy Editor.

Create a new template based on a template, using Studio

1. Select Policies in the Studio navigation pane.
2. Select the Templates tab and then select the template from which you will create the new template.
3. Select Create Template in the Actions pane.
4. Select and configure the policy settings to include in the template. Remove any existing settings that should not be included. Enter a name for the template.

After you click Finish, the new template appears on the Templates tab.

Create a new template based on a policy, using Studio

1. Select Policies in the Studio navigation pane.
2. Select the Policies tab and then select the policy from which you will create the new template.
3. Select Save asTemplate in the Actions pane.
4. Select and configure any new policy settings to include in the template. Remove any existing settings that should not be included. Enter a name and description for the template, and then click Finish.

Import a template using Studio

1. Select Policies in the Studio navigation pane.
2. Select the Templates tab and then select Import Template.
3. Select the template file to import and then click Open. If you import a template with the same name as an existing template, you can choose to overwrite the existing template or save the template with a different name that is generated automatically.

Export a template using Studio

1. Select Policies in the Studio navigation pane.
 2. Select the Templates tab and then select Export Template.
 3. Select the location where you want to save the template and then click Save.
- A .gpt file is created in the specified location.

Create and manage templates using the Group Policy Editor

From the Group Policy Editor, expand Computer Configuration or User Configuration. Expand the Policies node and then select Citrix Policies. Choose the appropriate action below.

Task	Instruction
Create a new template from an existing policy	On the Policies tab, select the policy and then select Actions > Save as Template.
Create a new policy from an existing template	On the Templates tab, select the template and then click New Policy.
Create a new template from an existing template	On the Templates tab, select the template and then click New Template.
Import a template	On the Templates tab, select Actions > Import.
Export a template	On the Templates tab, select Actions > Export.
View template settings	On the Templates tab, select the template and then click the Settings tab.
View a summary of template properties	On the Templates tab, select the template and then click the Properties tab.
View template prerequisites	On the Templates tab, select the template and then click the Prerequisites tab.

Create policies

Before creating a policy, decide which group of users or devices it should affect. You may want to create a policy based on user job function, connection type, user device, or geographic location. Alternatively, you can use the same criteria that you use for Windows Active Directory group policies.

If you already created a policy that applies to a group, consider editing that policy and configuring the appropriate settings, instead of creating another policy. Avoid creating a new policy solely to enable a specific setting or to exclude the policy from applying to certain users.

When you create a new policy, you can base it on settings in a policy template and customize settings as needed, or you can create it without using a template and add all the settings you need.

Policy settings

Policy settings can be enabled, disabled, or not configured. By default, policy settings are not configured, which means they are not added to a policy. Settings are applied only when they are added to a policy.

Some policy settings can be in one of the following states:

- Allowed or Prohibited allows or prevents the action controlled by the setting. In some cases, users are allowed or prevented from managing the setting's action in a session. For example, if the Menu animation setting is set to Allowed, users can control menu animations in their client environment.
- Enabled or Disabled turns the setting on or off. If you disable a setting, it is not enabled in lower-ranked policies.

In addition, some settings control the effectiveness of dependent settings. For example, Client drive redirection controls whether or not users are allowed to access the drives on their devices. To allow users to access their network drives, both this setting and the Client network drives setting must be added to the policy. If the Client drive redirection setting is disabled, users cannot access their network drives, even if the Client network drives setting is enabled.

In general, policy setting changes that impact machines go into effect either when the virtual desktop restarts or when a user logs on. Policy setting changes that impact users go into effect the next time users log on. If you are using Active Directory, policy settings are updated when Active Directory re-evaluates policies at 90-minute intervals and applied either when the virtual desktop restarts or when a user logs on.

For some policy settings, you can enter or select a value when you add the setting to a policy. You can limit configuration of the setting by selecting Use default value; this disables configuration of the setting and allows only the setting's default value to be used when the policy is applied, regardless of the value that was entered before selecting Use default value.

As best practice:

- Assign policies to groups rather than individual users. If you assign policies to groups, assignments are updated automatically when you add or remove users from the group.
- Do not enable conflicting or overlapping settings in Remote Desktop Session Host Configuration. In some cases, Remote Desktop Session Host Configuration provides similar functionality to Citrix policy settings. When possible, keep all settings consistent (enabled or disabled) for ease of troubleshooting.
- Disable unused policies. Policies with no settings added create unnecessary processing.

Policy assignments

When creating a policy, you assign it to certain user and machine objects; that policy is applied to connections according to specific criteria or rules. In general, you can add as many assignments as you want to a policy, based on a combination of criteria. If you specify no assignments, the policy is applied to all connections.

The following table lists the available assignments:

Assignment Name	Applies a policy based on
Access Control	<p>Access control conditions through which a client is connecting.</p> <ul style="list-style-type: none">• Connection type - Whether to apply the policy to connections made with or without NetScaler Gateway.• NetScaler Gateway farm name - Name of the NetScaler Gateway virtual server.• Access condition - Name of the end point analysis policy or session policy to use.
Citrix CloudBridge	<p>Whether or not a user session is launched through Citrix CloudBridge.</p> <p>Note: You can add only one Citrix CloudBridge assignment to a policy.</p>
Client IP Address	<p>IP address of the user device used to connect to the session.</p> <ul style="list-style-type: none">• IPv4 examples: 12.0.0.0, 12.0.0.*, 12.0.0.1-12.0.0.70, 12.0.0.1/24• IPv6 examples: 2001:0db8:3c4d:0015:0:0:abcd:ef12, 2001:0db8:3c4d:0015::/54
Client Name	Name of the user device.
Delivery Group	Delivery Group membership.
Delivery Group type	Type of desktop or application: private desktop, shared desktop, private application, or shared application.
Organizational Unit (OU)	Organizational unit.

Tag	Tags.
User or Group	User or group name.

When a user logs on, all policies that match the assignments for the connection are identified. Those policies are sorted into priority order and multiple instances of any setting are compared. Each setting is applied according to the priority ranking of the policy. Any policy setting that is disabled takes precedence over a lower-ranked setting that is enabled. Policy settings that are not configured are ignored.

Important: When configuring both Active Directory and Citrix policies using the Group Policy Management Console, assignments and settings may not be applied as expected. For more information, see [CTX127461](#)

A policy named "Unfiltered" is provided by default.

- If you use Studio to manage Citrix policies, settings you add to the Unfiltered policy are applied to all servers, desktops, and connections in a Site.
- If you use the Local Group Policy Editor to manage Citrix policies, settings you add to the Unfiltered policy are applied to all Sites and connections that are within the scope of the Group Policy Objects (GPOs) that contain the policy. For example, the Sales OU contains a GPO called Sales-US that includes all members of the US sales team. The Sales-US GPO is configured with an Unfiltered policy that includes several user policy settings. When the US Sales manager logs on to the Site, the settings in the Unfiltered policy are automatically applied to the session because the user is a member of the Sales-US GPO.

An assignment's *mode* determines if the policy is applied only to connections that match all the assignment criteria. If the mode is set to Allow (the default), the policy is applied only to connections that match the assignment criteria. If the mode is set to Deny, the policy is applied if the connection does not match the assignment criteria. The following examples illustrate how assignment modes affect Citrix policies when multiple assignments are present.

- **Example: Assignments of like type with differing modes** - In policies with two assignments of the same type, one set to Allow and one set to Deny, the assignment set to Deny takes precedence, provided the connection satisfies both assignments. For example:

Policy 1 includes the following assignments:

- Assignment A specifies the Sales group; the mode is set to Allow
 - Assignment B specifies the Sales manager's account; the mode is set to Deny
- Because the mode for Assignment B is set to Deny, the policy is not applied when the Sales manager logs on to the Site, even though the user is a member of the Sales group.

- **Example: Assignments of differing type with like modes** - In policies with two or more assignments of differing types, set to Allow, the connection must satisfy at least one assignment of each type in order for the policy to be applied. For example:

Policy 2 includes the following assignments:

- Assignment C is a User assignment that specifies the Sales group; the mode is set to Allow

- Assignment D is a Client IP Address assignment that specifies 10.8.169.* (the corporate network); the mode is set to Allow

When the Sales manager logs on to the Site from the office, the policy is applied because the connection satisfies both assignments.

Policy 3 includes the following assignments:

- Assignment E is a User assignment that specifies the Sales group; the mode is set to Allow
- Assignment F is an Access Control assignment that specifies NetScaler Gateway connection conditions; the mode is set to Allow

When the Sales manager logs on to the Site from the office, the policy is not applied because the connection does not satisfy Assignment F.

Create a new policy based on a template, using Studio

1. Select Policies in the Studio navigation pane.
2. Select the Templates tab and select a template.
3. Select Create Policy from Template in the Actions pane.
4. By default, the new policy uses all the default settings in the template (the Use template default settings radio button is selected). If you want to change settings, select the Modify defaults and add more settings radio button, and then add or remove settings.
5. Specify how to apply the policy by selecting one of the following:
 - Assign to selected user and machine objects and then select the user and machine objects to which the policy will apply.
 - Assign to all objects in a site to apply the policy to all user and machine objects in the Site.
6. Enter a name for the policy (or accept the default); consider naming the policy according to who or what it affects, for example Accounting Department or Remote Users. Optionally, add a description.

The policy is enabled by default; you can disable it. Enabling the policy allows it to be applied immediately to users logging on. Disabling prevents the policy from being applied. If you need to prioritize the policy or add settings later, consider disabling the policy until you are ready to apply it.

Create a new policy using Studio

1. Select Policies in the Studio navigation pane.
2. Select the Policies tab.
3. Select Create Policy in the Actions pane.
4. Add and configure policy settings.
5. Specify how to apply the policy by choosing one of the following:
 - Assign to selected user and machine objects and then select the user and machine objects to which the policy will apply.
 - Assign to all objects in a site to apply the policy to all user and machine objects in the Site.
6. Enter a name for the policy (or accept the default); consider naming the policy according to who or what it affects, for example Accounting Department or Remote Users. Optionally, add a description.

The policy is enabled by default; you can disable it. Enabling the policy allows it to be applied immediately to users logging on. Disabling prevents the policy from being applied. If you need to prioritize the policy or add settings later, consider disabling the policy until you are ready to apply it.

Create and manage policies using the Group Policy Editor

From the Group Policy Editor, expand Computer Configuration or User Configuration. Expand the Policies node and then select Citrix Policies. Choose the appropriate action below.

Task	Instruction
Create a new policy	On the Policies tab, click New.
Edit an existing policy	On the Policies tab, select the policy and then click Edit.
Change the priority of an existing policy	On the Policies tab, select the policy and then click either Higher or Lower.
View summary information about a policy	On the Policies tab, select the policy and then click the Summary tab.
View and amend policy settings	On the Policies tab, select the policy and then click the Settings tab.
View and amend policy filters	On the Policies tab, select the policy and then click the Filters tab.
Enable or disable a policy	On the Policies tab, select the policy and then select either Actions > Enable or Actions > Disable.

Create policies

Create a new policy from an existing template	On the Templates tab, select the template and then click New Policy.
---	--

Compare, prioritize, model, and troubleshoot policies

You can use multiple policies to customize your environment to meet users' needs based on their job functions, geographic locations, or connection types. For example, for security you may need to place restrictions on user groups who regularly work with sensitive data. You can create a policy that prevents users from saving sensitive files on their local client drives. However, if some people in the user group do need access to their local drives, you can create another policy for only those users. You then rank or prioritize the two policies to control which one takes precedence.

When using multiple policies, you must determine how to prioritize them, how to create exceptions, and how to view the effective policy when policies conflict.

In general, policies override similar settings configured for the entire Site, for specific Delivery Controllers, or on the user device. The exception to this principle is security. The highest encryption setting in your environment, including the operating system and the most restrictive shadowing setting, always overrides other settings and policies.

Citrix policies interact with policies you set in your operating system. In a Citrix environment, Citrix settings override the same settings configured in an Active Directory policy or using Remote Desktop Session Host Configuration. This includes settings that are related to typical Remote Desktop Protocol (RDP) client connection settings such as Desktop wallpaper, Menu animation, and View window contents while dragging. For some policy settings, such as Secure ICA, the settings in policies must match the settings in the operating system. If a higher priority encryption level is set elsewhere, the Secure ICA policy settings that you specify in the policy or when you are delivering application and desktops can be overridden.

For example, the encryption settings that you specify when creating Delivery Groups should be at the same level as the encryption settings you specified throughout your environment.

Compare policies and templates

You can compare settings in a policy or template with those in other policies or templates. For example, you might need to verify setting values to ensure compliance with the best practices. You might also want to compare settings in a policy or template with the default settings provided by Citrix.

1. Select Policies in the Studio navigation pane.
2. Click the Comparison tab and then click Select.
3. Choose the policies or templates to compare. To include default values in the comparison, select the Compare to default settings check box.
4. After you click Compare, the configured settings are displayed in columns.

5. To see all settings, select Show All Settings. To return to the default view, select Show Common Settings.

Prioritize policies

Prioritizing policies allows you to define the precedence of policies when they contain conflicting settings. When a user logs on, all policies that match the assignments for the connection are identified. Those policies are sorted into priority order and multiple instances of any setting are compared. Each setting is applied according to the priority ranking of the policy.

You prioritize policies by giving them different priority numbers in Studio. By default, new policies are given the lowest priority. If policy settings conflict, a policy with a higher priority (a priority number of 1 is the highest) overrides a policy with a lower priority. Settings are merged according to priority and the setting's condition; for example, whether the setting is disabled or enabled. Any disabled setting overrides a lower-ranked setting that is enabled. Policy settings that are not configured are ignored and do not override the settings of lower-ranked settings.

1. Select Policies in the Studio navigation pane. Make sure the Policies tab is selected.
2. Select a policy.
3. Select Lower Priority or Higher Priority in the Actions pane.

Exceptions

When you create policies for groups of users, user devices, or machines, you may find that some members of the group require exceptions to some policy settings. You can create exceptions by:

- Creating a policy only for those group members who need the exceptions and then ranking the policy higher than the policy for the entire group
- Using the Deny mode for an assignment added to the policy

An assignment with the mode set to Deny applies a policy only to connections that do not match the assignment criteria. For example, a policy contains the following assignments:

- Assignment A is a client IP address assignment that specifies the range 208.77.88.*; the mode is set to Allow
- Assignment B is a user assignment that specifies a particular user account; the mode is set to Deny

The policy is applied to all users who log on to the Site with IP addresses in the range specified in Assignment A. However, the policy is not applied to the user logging on to the Site with the user account specified in Assignment B, even though the user's computer is assigned an IP address in the range specified in Assignment A.

Determine which policies apply to a connection

Sometimes a connection does not respond as expected because multiple policies apply. If a higher priority policy applies to a connection, it can override the settings you configure in the original policy. You can determine how final policy settings are merged for a connection by calculating the *Resultant Set of Policy*.

You can calculate the Resultant Set of Policy in the following ways:

- Use the Citrix Group Policy Modeling Wizard to simulate a connection scenario and discern how Citrix policies might be applied. You can specify conditions for a connection scenario such as domain controller, users, Citrix policy assignment evidence values, and simulated environment settings such as slow network connection. The report that the wizard produces lists the Citrix policies that would likely take effect in the scenario. If you are logged on to the Controller as a domain user, the wizard calculates the Resultant Set of Policy using both site policy settings and Active Directory Group Policy Objects (GPOs).
- Use Group Policy Results to produce a report describing the Citrix policies in effect for a given user and controller. The Group Policy Results tool helps you evaluate the current state of GPOs in your environment and generates a report that describes how these objects, including Citrix policies, are currently being applied to a particular user and controller.

You can launch the Citrix Group Policy Modeling Wizard from the Actions pane in Studio. You can launch either tool from the Group Policy Management Console in Windows.

If you run the Citrix Group Policy Modeling Wizard or Group Policy Results tool from the Group Policy Management Console, site policy settings created using Studio are not included in the Resultant Set of Policy.

To ensure you obtain the most comprehensive Resultant Set of Policy, Citrix recommends launching the Citrix Group Policy Modeling wizard from Studio, unless you create policies using only the Group Policy Management Console.

Use the Citrix Group Policy Modeling Wizard

Open the Citrix Group Policy Modeling Wizard using one of the following:

- Select Policies in the Studio navigation pane, select the Modeling tab, and then select Launch Modeling Wizard in the Actions pane.
- Launch the Group Policy Management Console (gpmc.msc), right-click Citrix Group Policy Modeling in the tree pane, and then select Citrix Group Policy Modeling Wizard.

Follow the wizard instructions to select the domain controller, users, computers, environment settings, and Citrix assignment criteria to use in the simulation. After you click Finish, the wizard produces a report of the modeling results. In Studio, the report appears in the middle pane under the Modeling tab.

To view the report, select View Modeling Report.

Troubleshoot policies

Users, IP addresses, and other assigned objects can have multiple policies that apply simultaneously. This can result in conflicts where a policy may not behave as expected. When you run the Citrix Group Policy Modeling Wizard or the Group Policy Results tool, you might discover that no policies are applied to user connections. When this happens, users connecting to their applications and desktops under conditions that match the policy evaluation criteria are not affected by any policy settings. This occurs when:

- No policies have assignments that match the policy evaluation criteria.
- Policies that match the assignment do not have any settings configured.
- Policies that match the assignment are disabled.

If you want to apply policy settings to the connections that meet the specified criteria, make sure:

- The policies you want to apply to those connections are enabled.
- The policies you want to apply have the appropriate settings configured.

Default policy settings

The following tables list policy settings, their default, and the Virtual Delivery Agent (VDA) versions to which they apply.

ICA

Name	Default setting	VDA
Client clipboard redirection	Allowed	All VDA versions
Desktop launches	Prohibited	VDA for Server OS 7 through current VDA for Server OS
ICA listener connection timeout	120000 milliseconds	VDA 5, 5.5, 5.6 Feature Pack 1, VDA for Desktop OS 7 through current VDA for Desktop OS
ICA listener port number	1494	All VDA versions
Launching of non-published programs during client connection	Prohibited	VDA for Server OS 7 through current VDA for Server OS
Readonly clipboard	Prohibited	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Client clipboard write allowed formats	No formats are specified	VDA 7.6
Restrict client clipboard write	Prohibited	VDA 7.6
Restrict session clipboard write	Prohibited	VDA 7.6
Session clipboard write allowed formats	No formats are specified	VDA 7.6

ICA/Audio

Name	Default setting	VDA
Audio Plug N Play	Allowed	VDA for Server OS 7 through current VDA for Server OS
Audio quality	High - high definition audio	All VDA versions
Client audio redirection	Allowed	All VDA versions
Client microphone redirection	Allowed	All VDA versions

ICA/Auto Client Reconnect

Name	Default setting	VDA
Auto client reconnect	Allowed	VDA
Auto client reconnect authentication	Do not require authentication	VDA
Auto client reconnect logging	Do not log auto-reconnect events	VDA

ICA/Bandwidth

Name	Default setting	VDA
Audio redirection bandwidth limit	0 Kbps	VDA
Audio redirection bandwidth limit percent	0	VDA
Client USB device redirection bandwidth limit	0 Kbps	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Client USB device redirection bandwidth limit percent	0	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Clipboard redirection bandwidth limit	0 Kbps	All VDA versions
Clipboard redirection bandwidth limit percent	0	All VDA versions
COM port redirection bandwidth limit	0 Kbps	All VDA versions; for VDA 7.x, configure this setting using the registry.
COM port redirection bandwidth limit percent	0	All VDA versions; for VDA 7.x, configure this setting using the registry.
File redirection bandwidth limit	0 Kbps	All VDA versions
File redirection bandwidth limit percent	0	All VDA versions
HDX MediaStream Multimedia Acceleration bandwidth limit	0 Kbps	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
HDX MediaStream Multimedia Acceleration bandwidth limit percent	0	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
LPT port redirection bandwidth limit	0 Kbps	All VDA versions; for VDA 7.x, configure this setting using the registry.

Default policy settings

LPT port redirection bandwidth limit percent	0	All VDA versions; for VDA 7.x, configure this setting using the registry.
Overall session bandwidth limit	0 Kbps	All VDA versions
Printer redirection bandwidth limit	0 Kbps	All VDA versions
Printer redirection bandwidth limit percent	0	All VDA versions
TWAIN device redirection bandwidth limit	0 Kbps	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
TWAIN device redirection bandwidth limit percent	0	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS

ICA/Client Sensors

Name	Default setting	VDA
Allow applications to use the physical location of the client device	Prohibited	VDA 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS

ICA/Desktop UI

Name	Default setting	VDA
Desktop Composition Redirection	Enabled	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Desktop Composition Redirection graphics quality	Medium	VDA 5, 5.5, 5.6 Feature Pack 1, VDA for Desktop OS 7 through current VDA for Desktop OS
Desktop wallpaper	Allowed	All VDA versions
Menu animation	Allowed	All VDA versions
View window contents while dragging	Allowed	All VDA versions

ICA/End User Monitoring

Name	Default setting	VDA
ICA round trip calculation	Enabled	All VDA versions
ICA round trip calculation interval	15 seconds	All VDA versions
ICA round trip calculations for idle connections	Disabled	All VDA versions

ICA/Enhanced Desktop Experience

Name	Default setting	VDA
Enhanced Desktop Experience	Allowed	VDA for Server OS 7 through current VDA for Server OS

ICA/File Redirection

Name	Default setting	VDA
Auto connect client drives	Allowed	All VDA versions
Client drive redirection	Allowed	All VDA versions
Client fixed drives	Allowed	All VDA versions
Client floppy drives	Allowed	All VDA versions
Client network drives	Allowed	All VDA versions
Client optical drives	Allowed	All VDA versions
Client removable drives	Allowed	All VDA versions
Host to client redirection	Disabled	VDA for Server OS 7 through current VDA for Server OS
Preserve client drive letters	Disabled	VDA 5, 5.5, 5.6 Feature Pack 1, VDA for Desktop OS 7 through current VDA for Desktop OS
Read-only client drive access	Disabled	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Special folder redirection	Allowed	Web Interface deployments only; VDA for Server OS 7 through current VDA for Server OS
Use asynchronous writes	Disabled	All VDA versions

ICA/Graphics

Name	Default setting	VDA
Display memory limit	65536 Kb	VDA 5, 5.5, 5.6 Feature Pack 1, VDA for Desktop OS 7 through current VDA for Desktop OS
Display mode degrade preference	Degrade color depth first	All VDA versions
Dynamic windows preview	Enabled	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Image caching	Enabled	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Legacy graphics mode	Disabled	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Maximum allowed color depth	32 bits per pixel	All VDA versions
Notify user when display mode is degraded	Disabled	VDA for Server OS 7 through current VDA for Server OS
Queuing and tossing	Enabled	All VDA versions

ICA/Graphics/Caching

Name	Default setting	VDA
Persistent cache threshold	3000000 bps	VDA for Server OS 7 through current VDA for Server OS

ICA/Keep Alive

Name	Default setting	VDA
ICA keep alive timeout	60 seconds	All VDA versions
ICA keep alives	Do not send ICA keep alive messages	All VDA versions

ICA/Local App Access

Name	Default setting	VDA
Allow local app access	Prohibited	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
URL redirection black list	No sites are specified	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
URL redirection white list	No sites are specified	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS

ICA/Mobile Experience

Name	Default setting	VDA
Automatic keyboard display	Prohibited	VDA 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Launch touch-optimized desktop	Allowed	VDA 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Remote the combo box	Prohibited	VDA 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS

ICA/Multimedia

Name	Default setting	VDA
Limit video quality	Not configured	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Multimedia conferencing	Allowed	All VDA versions
Optimization for Windows Media multimedia redirection over WAN	Allowed	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Use GPU for optimizing Windows Media multimedia redirection over WAN	Prohibited	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Windows Media client-side content fetching	Allowed	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Windows Media Redirection	Allowed	All VDA versions
Windows Media Redirection buffer size	5 seconds	VDA 5, 5.5, and 5.6, Feature Pack 1
Windows Media Redirection buffer size use	Disabled	VDA 5, 5.5, and 5.6, Feature Pack 1

ICA/Multi-Stream Connections

Name	Default setting	VDA
Audio over UDP	Allowed	VDA for Server OS 7 through current VDA for Server OS
Audio UDP port range	16500, 16509	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Multi-Port policy	Primary port (2598) has High Priority	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Multi-Stream computer setting	Disabled	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Multi-Stream user setting	Disabled	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS

ICA/Port Redirection

Name	Default setting	VDA
Auto connect client COM ports	Disabled	All VDA versions; for VDA 7.x, configure this setting using the registry.
Auto connect client LPT ports	Disabled	All VDA versions; for VDA 7.x, configure this setting using the registry.
Client COM port redirection	Prohibited	All VDA versions; for VDA 7.x, configure this setting using the registry.
Client LPT port redirection	Prohibited	All VDA versions; for VDA 7.x, configure this setting using the registry.

ICA/Printing

Name	Default setting	VDA
Client printer redirection	Allowed	All VDA versions
Default printer	Set default printer to the client's main printer	All VDA versions
Printer assignments	User's current printer is used as the default printer for the session	All VDA versions
Printer auto-creation event log preference	Log errors and warnings	All VDA versions
Session printers	No printers are specified	All VDA versions
Wait for printers to be created (desktop)	Disabled	All VDA versions

ICA/Printing/Client Printers

Name	Default setting	VDA
Auto-create client printers	Auto-create all client printers	All VDA versions
Auto-create generic universal printer	Disabled	All VDA versions
Client printer names	Standard printer names	All VDA versions
Direct connections to print servers	Enabled	All VDA versions
Printer driver mapping and compatibility	No rules are specified	All VDA versions
Printer properties retention	Held in profile only if not saved on client	All VDA versions
Retained and restored client printers	Allowed	VDA 5, 5.5 and 5.6 Feature Pack 1

ICA/Printing/Drivers

Name	Default setting	VDA
Automatic installation of in-box printer drivers	Enabled	All VDA versions
Universal driver preference	EMF; XPS; PCL5c; PCL4; PS	All VDA versions
Universal print driver usage	Use universal printing only if requested driver is unavailable	All VDA versions

ICA/Printing/Universal Print Server

Name	Default setting	VDA
Universal Print Server enable	Disabled	All VDA versions
Universal Print Server print data stream (CGP) port	7229	All VDA versions
Universal Print Server print stream input bandwidth limit (kpbs)	0	All VDA versions
Universal Print Server web service (HTTP/SOAP) port	8080	All VDA versions

ICA/Printing/Universal Printing

Name	Default setting	VDA
Universal printing EMF processing mode	Spool directly to printer	All VDA versions
Universal printing image compression limit	Best quality (lossless compression)	All VDA versions
Universal printing optimization defaults	<p>Image Compression</p> <ul style="list-style-type: none">Desired image quality = Standard qualityEnable heavyweight compression = False <p>Image and Font Caching</p> <ul style="list-style-type: none">Allow caching of embedded images = TrueAllow caching of embedded fonts = True <p>Allow non-administrators to modify these settings = False</p>	All VDA versions
Universal printing preview preference	Do not use print preview for auto-created or generic universal printers	All VDA versions
Universal printing print quality limit	No limit	All VDA versions

ICA/Security

Name	Default setting	VDA
SecureICA minimum encryption level	Basic	VDA for Server OS 7 through current VDA for Server OS

ICA/Server Limits

Name	Default setting	VDA
Server idle timer interval	0 milliseconds	VDA for Server OS 7 through current VDA for Server OS

ICA/Session Limits

Name	Default setting	VDA
Disconnected session timer	Disabled	VDA 5, 5.5, 5.6 Feature Pack 1, VDA for Desktop OS 7 through current VDA for Desktop OS
Disconnected session timer interval	1440 minutes	VDA 5, 5.5, 5.6 Feature Pack 1, VDA for Desktop OS 7 through current VDA for Desktop OS
Session connection timer	Disabled	VDA 5, 5.5, 5.6 Feature Pack 1, VDA for Desktop OS 7 through current VDA for Desktop OS
Session connection timer interval	1440 minutes	VDA 5, 5.5, 5.6 Feature Pack 1, VDA for Desktop OS 7 through current VDA for Desktop OS
Session idle timer	Enabledf	VDA 5, 5.5, 5.6 Feature Pack 1, VDA for Desktop OS 7 through current VDA for Desktop OS
Session idle timer interval	1440 minutes	VDA 5, 5.5, 5.6 Feature Pack 1, VDA for Desktop OS 7 through current VDA for Desktop OS

ICA/Session Reliability

Name	Default setting	VDA
Session reliability connections	Allowed	All VDA versions
Session reliability port number	2598	All VDA versions
Session reliability timeout	180 seconds	All VDA versions

ICA/Time Zone Control

Name	Default setting	VDA
Estimate local time for legacy clients	Enabled	VDA for Server OS 7 through current VDA for Server OS
Use local time of client	Use server time zone	All VDA versions

ICA/TWAIN Devices

Name	Default setting	VDA
Client TWAIN device redirection	Allowed	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
TWAIN compression level	Medium	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS

ICA/USB Devices

Name	Default setting	VDA
Client USB device redirection	Prohibited	All VDA versions
Client USB device redirection rules	No rules are specified	All VDA versions
Client USB Plug and Play device redirection	Allowed	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS

ICA/Visual Display

Name	Default setting	VDA
Target frame rate	30 fps	All VDA versions
Visual quality	Medium	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS

ICA/Visual Display/Moving Images

Name	Default setting	VDA
Minimum image quality	Normal	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Moving image compression	Enabled	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Progressive compression level	None	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Progressive compression threshold value	2147483647 Kbps	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Target minimum frame rate	10 fps	VDA 5.5, 5.6 Feature Pack 1, VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS

ICA/Visual Display/Still Images

Name	Default setting	VDA
Extra color compression	Disabled	All VDA versions
Extra color compression threshold	8192 Kbps	All VDA versions
Heavyweight compression	Disabled	All VDA versions
Lossy compression level	Medium	All VDA versions
Lossy compression threshold value	2147483647 Kbps	All VDA versions

ICA/WebSockets

Name	Default setting	VDA
WebSockets connections	Prohibited	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
WebSockets port number	8008	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
WebSockets trusted origin server list	The wildcard, *, is used to trust all Receiver for Web URLs	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS

Load Management

Name	Default setting	VDA
Concurrent logon tolerance	2	VDA for Server OS 7 through current VDA for Server OS
CPU usage	Disabled	VDA for Server OS 7 through current VDA for Server OS
CPU usage excluded process priority	Below Normal or Low	VDA for Server OS 7 through current VDA for Server OS
Disk usage	Disabled	VDA for Server OS 7 through current VDA for Server OS
Maximum number of sessions	250	VDA for Server OS 7 through current VDA for Server OS
Memory usage	Disabled	VDA for Server OS 7 through current VDA for Server OS
Memory usage base load	Zero load: 768MB	VDA for Server OS 7 through current VDA for Server OS

Profile Managment/Advanced settings

Name	Default setting	VDA
Disable automatic configuration	Disabled	All VDA versions
Log off user if a problem is encountered	Disabled	All VDA versions
Number of retries when accessing locked files	5	All VDA versions
Process Internet cookie files on logoff	Disabled	All VDA versions

Profile Management/Basic settings

Name	Default setting	VDA
Active write back	Disabled	All VDA versions
Enable Profile management	Disabled	All VDA versions
Excluded groups	Disabled. Members of all user groups are processed.	All VDA versions
Offline profile support	Disabled	All VDA versions
Path to user store	Windows	All VDA versions
Process logons of local administrators	Disabled	All VDA versions
Processed groups	Disabled. Members of all user groups are processed.	All VDA versions

Profile Management/Cross-Platform Settings

Name	Default setting	VDA
Cross-platform settings user groups	Disabled. All user groups specified in Processed groups are processed	All VDA versions
Enable cross-platform settings	Disabled	All VDA versions
Path to cross-platform definitions	Disabled. No path is specified.	All VDA versions
Path to cross-platform settings store	Disabled. Windows\PM_CM is used.	All VDA versions
Source for creating cross-platform settings	Disabled	All VDA versions

Profile Management/File System/Exclusions

Name	Default setting	VDA
Exclusion list - directories	Disabled. All folders in the user profile are synchronized.	All VDA versions
Exclusion list - files	Disabled. All files in the user profile are synchronized.	All VDA versions

Profile Management/File System/Synchronization

Name	Default setting	VDA
Directories to synchronize	Disabled. Only non-excluded folders are synchronized.	All VDA versions
Files to synchronize	Disabled. Only non-excluded files are synchronized.	All VDA versions
Folders to mirror	Disabled. No folders are mirrored.	All VDA versions

Profile Management/Folder Redirection

Name	Default setting	VDA
Grant administrator access	Disabled	All VDA versions
Include domain name	Disabled	All VDA versions

Profile Management/Folder Redirection/AppData(Roaming)

Name	Default setting	VDA
AppData(Roaming) path	Disabled. No location is specified.	All VDA versions
Redirection settings for AppData(Roaming)	Contents are redirected to the UNC path specified in the AppData(Roaming) path policy settings	All VDA versions

Profile Management/Folder Redirection/Contacts

Name	Default setting	VDA
Contacts path	Disabled. No location is specified.	All VDA versions
Redirection settings for Contacts	Contents are redirected to the UNC path specified in the Contacts path policy settings	All VDA versions

Profile Management/Folder Redirection/Desktop

Name	Default setting	VDA
Desktop path	Disabled. No location is specified.	All VDA versions
Redirection settings for Desktop	Contents are redirected to the UNC path specified in the Desktop path policy settings	All VDA versions

Profile Management/Folder Redirection/Documents

Name	Default setting	VDA
Documents path	Disabled. No location is specified.	All VDA versions
Redirection settings for Documents	Contents are redirected to the UNC path specified in the Documents path policy settings	All VDA versions

Profile Management/Folder Redirection/Downloads

Name	Default setting	VDA
Downloads path	Disabled. No location is specified.	All VDA versions
Redirection settings for Downloads	Contents are redirected to the UNC path specified in the Downloads path policy settings	All VDA versions

Profile Management/Folder Redirection/Favorites

Name	Default setting	VDA
Favorites path	Disabled. No location is specified.	All VDA versions
Redirection settings for Favorites	Contents are redirected to the UNC path specified in the Favorites path policy settings	All VDA versions

Profile Management/Folder Redirection/Links

Name	Default setting	VDA
Links path	Disabled. No location is specified.	All VDA versions
Redirection settings for Links	Contents are redirected to the UNC path specified in the Links path policy settings	All VDA versions

Profile Management/Folder Redirection/Music

Name	Default setting	VDA
Music path	Disabled. No location is specified.	All VDA versions
Redirection settings for Music	Contents are redirected to the UNC path specified in the Music path policy settings	All VDA versions

Profile Management/Folder Redirection/Pictures

Name	Default setting	VDA
Pictures path	Disabled. No location is specified.	All VDA versions
Redirection settings for Pictures	Contents are redirected to the UNC path specified in the Pictures path policy settings	All VDA versions

Profile Management/Folder Redirection/Saved Games

Name	Default setting	VDA
Saved Games path	Disabled. No location is specified.	All VDA versions
Redirection settings for Saved Games	Contents are redirected to the UNC path specified in the Saved Games path policy settings	All VDA versions

Profile Management/Folder Redirection/Searches

Name	Default setting	VDA
Searches path	Disabled. No location is specified.	All VDA versions
Redirection settings for Searches	Contents are redirected to the UNC path specified in the Searches path policy settings	All VDA versions

Profile Management/Folder Redirection/Start Menu

Name	Default setting	VDA
Start Menu path	Disabled. No location is specified.	All VDA versions
Redirection settings for Start Menu	Contents are redirected to the UNC path specified in the Start Menu path policy settings	All VDA versions

Profile Management/Folder Redirection/Video

Name	Default setting	VDA
Video path	Disabled. No location is specified.	All VDA versions
Redirection settings for Video	Contents are redirected to the UNC path specified in the Video path policy settings	All VDA versions

Profile Management/Log settings

Name	Default setting	VDA
Active Directory actions	Disabled	All VDA versions
Common information	Disabled	All VDA versions
Common warnings	Disabled	All VDA versions
Enable logging	Disabled	All VDA versions
File system actions	Disabled	All VDA versions
File system notifications	Disabled	All VDA versions
Logoff	Disabled	All VDA versions
Logon	Disabled	All VDA versions
Maximum size of the log file	1048576	All VDA versions
Path to log file	Disabled. Log files are saved in the default location; %SystemRoot%\System32\Logfiles\UserProfileManager.	All VDA versions
Personalized user information	Disabled	All VDA versions
Policy values at logon and logoff	Disabled	All VDA versions
Registry actions	Disabled	All VDA versions
Registry differences at logoff	Disabled	All VDA versions

Profile Management/Profile handling

Name	Default setting	VDA
Delay before deleting cached profiles	0	All VDA versions
Delete locally cached profiles on logoff	Disabled	All VDA versions
Local profile conflict handling	Use local profile	All VDA versions
Migration of existing profiles	Local and roaming	All VDA versions
Path to the template profile	Disabled. New user profiles are created from the default user profile on the device where a user first logs on.	All VDA versions
Template profile overrides local profile	Disabled	All VDA versions
Template profile overrides roaming profile	Disabled	All VDA versions
Template profile used as a Citrix mandatory profile for all logons	Disabled	All VDA versions

Profile Management/Registry

Name	Default setting	VDA
Exclusion list	Disabled. All registry keys in the HKCU hive are processed when a user logs off.	All VDA versions
Inclusion list	Disabled. All registry keys in the HKCU hive are processed when a user logs off.	All VDA versions

Profile Management/Streamed user profiles

Name	Default setting	VDA
Always cache	Disabled	All VDA versions
Always cache size	0 Mb	All VDA versions
Profile streaming	Disabled	All VDA versions
Streamed user profile groups	Disabled. All user profiles within an OU are processed normally.	All VDA versions
Timeout for pending area lock files (days)	1 day	All VDA versions

Receiver

Name	Default setting	VDA
StoreFront accounts list	No stores are specified	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS

Virtual Delivery Agent

Name	Default setting	VDA
Controller registration IPv6 netmask	No netmask is specified	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Controller registration port	80	All VDA versions
Controller SIDs	No SIDs are specified	All VDA versions
Controllers	No controllers are specified	All VDA versions
Enable auto update of controllers	Enabled	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Only use IPv6 controller registration	Disabled	VDA for Server OS 7 and VDA for Desktop OS 7 through current VDA for Server OS and VDA for Desktop OS
Site GUID	No GUID is specified	All VDA versions

Virtual IP

Name	Default setting	VDA
Virtual IP loopback support	Disabled	VDA 7.6
Virtual IP virtual loopback programs list	None	VDA 7.6

HDX 3D Pro

Name	Default setting	VDA
Enable lossless	Enabled	VDA 5.5 and 5.6 Feature Pack 1
HDX 3D Pro quality settings		VDA 5.5 and 5.6 Feature Pack 1

Policy settings reference

Policies contain settings that are applied when the policy is enforced. Descriptions in this section also indicate if additional settings are required to enable a feature or are similar to a setting.

Quick reference

The following tables list the settings you can configure within a policy. Find the task you want to complete in the left column, then locate its corresponding setting in the right column.

Audio

For this task	Use this policy setting
Control whether to allow the use of multiple audio devices	Audio Plug N Play
Control whether to allow audio input from microphones on the user device	Client microphone redirection
Control audio quality on the user device	Audio quality
Control audio mapping to speakers on the user device	Client audio redirection

Bandwidth for user devices

To limit bandwidth used for	Use this policy setting
Client audio mapping	<ul style="list-style-type: none">• Audio redirection bandwidth limit or• Audio redirection bandwidth limit percent
Cut-and-paste using local clipboard	<ul style="list-style-type: none">• Clipboard redirection bandwidth limit or• Clipboard redirection bandwidth limit percent
Access in a session to local client drives	<ul style="list-style-type: none">• File redirection bandwidth limit or• File redirection bandwidth limit percent
HDX MediaStream Multimedia Acceleration	<ul style="list-style-type: none">• HDX MediaStream Multimedia Acceleration bandwidth limit or• HDX MediaStream Multimedia Acceleration bandwidth limit percent
Client session	Overall session bandwidth limit
Printing	<ul style="list-style-type: none">• Printer redirection bandwidth limit or• Printer redirection bandwidth limit percent
TWAIN devices (such as a camera or scanner)	<ul style="list-style-type: none">• TWAIN device redirection bandwidth limit or• TWAIN device redirection bandwidth limit percent
USB devices	<ul style="list-style-type: none">• Client USB device redirection bandwidth limit or• Client USB device redirection bandwidth limit percent

Redirection of client drives and user devices

For this task	Use this policy setting
Control whether or not drives on the user device are connected when users log on to the server	Auto connect client drives
Control cut-and-paste data transfer between the server and the local clipboard	Client clipboard redirection
Control how drives map from the user device	Client drive redirection
Control whether users' local hard drives are available in a session	<ul style="list-style-type: none">• Client fixed drives and• Client drive redirection
Control whether users' local floppy drives are available in a session	<ul style="list-style-type: none">• Client floppy drives and• Client drive redirection
Control whether users' network drives are available in a session	<ul style="list-style-type: none">• Client network drives and• Client drive redirection
Control whether users' local CD, DVD, or Blu-ray drives are available in a session	<ul style="list-style-type: none">• Client optical drives and• Client drive redirection
Control whether users' local removable drives are available in a session	<ul style="list-style-type: none">• Client removable drives and• Client drive redirection
Control whether users' TWAIN devices, such as scanners and cameras, are available in a session and control compression of image data transfers	<ul style="list-style-type: none">• Client TWAIN device redirection• TWAIN compression redirection
Control whether USB devices are available in a session	<ul style="list-style-type: none">• Client USB device redirection and• Client USB device redirection rules
Improve the speed of writing and copying files to a client disk over a WAN	Use asynchronous writes

Content redirection

For this task	Use this policy setting
Control whether to use content redirection from the server to the user device	Host to client redirection

Desktop UI

For this task	Use this policy setting
Control whether or not Desktop wallpaper is used in users' sessions	Desktop wallpaper
View window contents while a window is dragged	View window contents while dragging

Graphics and multimedia

For this task	Use this policy setting
Control the maximum number of frames per second sent to user devices from virtual desktops	Target frame rate
Control the visual quality of images displayed on the user device	Visual quality
Control whether Flash content is rendered in sessions	Flash default behavior
Control whether websites can display Flash content when accessed in sessions	<ul style="list-style-type: none">Flash server-side content fetching URL listFlash URL compatibility list

Prioritize Multi-Stream network traffic

For this task	Use this policy setting
Specify ports for ICA traffic across multiple connections and establish network priorities	Multi-Port policy
Enable support for multi-stream connections between servers and user devices	Multi-Stream (computer and user settings)

Print

For this task	Use this policy setting
Control creation of client printers on the user device	<ul style="list-style-type: none">• Auto-create client printers and• Client printer redirection
Control the location where printer properties are stored	Printer properties retention
Control whether print requests are processed by the client or the server	Direct connections to print servers
Control whether users can access printers connected to their user devices	Client printer redirection
Control installation of native Windows drivers when automatically creating client and network printers	Automatic installation of in-box printer drivers
Control when to use the Universal Printer Driver	Universal print driver usage
Choose a printer based on a roaming user's session information	Default printer

ICA policy settings

The ICA section contains policy settings related to ICA listener connections and mapping to the clipboard.

Client clipboard redirection

This setting allows or prevents the clipboard on the user device being mapped to the clipboard on the server.

By default, clipboard redirection is allowed.

To prevent cut-and-paste data transfer between a session and the local clipboard, select Prohibit. Users can still cut and paste data between applications running in sessions.

After allowing this setting, configure the maximum allowed bandwidth the clipboard can consume in a client connection using the Clipboard redirection bandwidth limit or the Clipboard redirection bandwidth limit percent settings.

Client clipboard write allowed formats

When the Restrict client clipboard write setting is Enabled, host clipboard data cannot be shared with the client endpoint but you can use this setting to allow specific data formats to be shared with the client endpoint clipboard. To use this setting, enable it and add the specific formats to be allowed.

The following clipboard formats are system defined:

- CF_TEXT
- CF_BITMAP
- CF_METAFILEPICT
- CF_SYLK
- CF_DIF
- CF_TIFF
- CF_OEMTEXT
- CF_DIB
- CF_PALETTE
- CF_PENDATA

- CF_RIFF
- CF_WAVE
- CF_UNICODETEXT
- CF_ENHMETAFILE
- CF_HDROP
- CF_LOCALE
- CF_DIBV5
- CF_OWNERDISPLAY
- CF_DSPTEXT
- CF_DSPBITMAP
- CF_DSPMETAFILEPICT
- CF_DISPENHMETAFILE

The following custom formats are predefined in XenApp and XenDesktop:

- CFX_RICHTEXT
- CFX_OfficeDrawingShape
- CFX_BIFF8

Additional custom formats can be added. The custom format name must match the formats to be registered with the system. Format names are case-sensitive.

This setting does not apply if either Client clipboard redirection or Restrict client clipboard write is set to Prohibited.

Desktop launches

This setting allows or prevents non-administrative users connecting to a desktop session on the server.

By default, non-administrative users cannot connect to these sessions.

ICA listener connection timeout

This setting specifies the maximum wait time for a connection using the ICA protocol to be completed.

By default, the maximum wait time is 120000 milliseconds, or two minutes.

ICA listener port number

This setting specifies the TCP/IP port number used by the ICA protocol on the server.

By default, the port number is set to 1494.

Valid port numbers must be in the range of 0-65535 and must not conflict with other well-known port numbers. If you change the port number, restart the server for the new value to take effect. If you change the port number on the server, you must also change it on every Receiver or plug-in that connects to the server.

Launching of non-published programs during client connection

This setting specifies whether to launch initial applications or published applications through ICA or RDP on the server.

By default, only published applications are allowed to launch.

Readonly clipboard

This setting enables or disables the copying and pasting of data from the session to the local user device.

By default, this setting is disabled and users can copy and paste data from the session to the local user device and from the local user device to the session.

When enabled, users can cut and paste data only from the local user device to the session.

When enabling this setting, make sure the Client clipboard redirection setting is present and set to Allowed. If this setting is disabled, the clipboard on the user device is not mapped to the clipboard on the server, and users cannot copy and paste data between the session and the local user device.

Restrict client clipboard write

If this setting is Allowed, host clipboard data cannot be shared with the client endpoint. You can allow specific formats by enabling the Client clipboard write allowed formats setting.

By default, this is set to Prohibited.

Restrict session clipboard write

When this setting is Allowed, client clipboard data cannot be shared within the user session. You can allow specific formats by enabling the Session clipboard write allowed formats setting.

By default, this is set to Prohibited.

Session clipboard write allowed formats

When the Restrict session clipboard write setting is Allowed, client clipboard data cannot be shared with session applications, but you can use this setting to allow specific data formats to be shared with the session clipboard.

The following clipboard formats are system defined:

- CF_TEXT
- CF_BITMAP
- CF_METAFILEPICT
- CF_SYLK
- CF_DIF
- CF_TIFF
- CF_OEMTEXT
- CF_DIB
- CF_PALETTE
- CF_PENDATA
- CF_RIFF
- CF_WAVE
- CF_UNICODETEXT
- CF_ENHMETAFILE
- CF_HDROP
- CF_LOCALE
- CF_DIBV5
- CF_OWNERDISPLAY
- CF_DSPTEXT
- CF_DSPBITMAP
- CF_DSPMETAFILEPICT
- CF_DISPENHMETAFILE

The following custom formats are predefined in XenApp and XenDesktop:

- CFX_RICHTEXT
- CFX_OfficeDrawingShape
- CFX_BIFF8

Additional custom formats can be added. The custom format name must match the formats to be registered with the system. Format names are case-sensitive.

This setting does not apply if either the Client clipboard redirection setting or Restrict session clipboard write setting is set to Prohibited.

Auto Client Reconnect policy settings

The Auto Client Reconnect section contains policy settings for controlling the automatic reconnection of sessions.

Auto client reconnect

This setting allows or prevents automatic reconnection by the same client after a connection has been interrupted.

By default, automatic reconnection is allowed.

Allowing automatic reconnection allows users to resume working where they were interrupted when a connection was broken. Automatic reconnection detects broken connections and then reconnects the users to their sessions.

However, automatic reconnection can result in a new session being launched (instead of reconnecting to an existing session) if the Receiver's cookie, which contains the key to the session ID and credentials, is not used. The cookie is not used if it has expired, for example, because of a delay in reconnection, or if credentials must be reentered. Auto client reconnect is not triggered if users intentionally disconnect.

Auto client reconnect authentication

This setting requires authentication for automatic client reconnections.

By default, authentication is not required.

When a user initially logs on, their credentials are encrypted, stored in memory, and a cookie is created containing the encryption key that is sent to Receiver. When this setting is configured, cookies are not used. Instead, a dialog box is displayed to users requesting credentials when Receiver attempts to reconnect automatically.

Auto client reconnect logging

This setting enables or disables the recording of auto client reconnections in the event log.

By default, logging is disabled.

When logging is enabled, the server's System log captures information about successful and failed automatic reconnection events. A site does not provide a combined log of reconnection events for all servers.

Audio policy settings

The Audio section contains policy settings that permit user devices to send and receive audio in sessions without reducing performance.

Audio over UDP real-time transport

This setting allows or prevents the transmission and receipt of audio between the VDA and user device over RTP using the User Datagram Protocol (UDP). When this setting is disabled, audio is sent and received over TCP.

By default, audio over UDP is allowed.

Audio Plug N Play

This setting allows or prevents the use of multiple audio devices to record and play sound.

By default, the use of multiple audio devices is allowed.

This setting applies only to Windows Server OS machines.

Audio quality

This setting specifies the quality level of sound received in user sessions.

By default, sound quality is set to High - high definition audio.

To control sound quality, choose one of the following options:

- Select Low - for low speed connections for low-bandwidth connections. Sounds sent to the user device are compressed up to 16 Kbps. This compression results in a significant decrease in the quality of the sound but allows reasonable performance for a low-bandwidth connection.
- Select Medium - optimized for speech to deliver Voice over IP (VoIP) applications, to deliver media applications in challenging network connections with lines less than 512 Kbps, or significant congestion and packet loss. This codec offers very fast encode time, making it ideal for use with softphones and Unified Communications applications when you require server-side media processing.

Audio sent to the user device is compressed up to 64 Kbps; this compression results in a moderate decrease in the quality of the audio played on the user device, while providing low latency and consuming low bandwidth. If VoIP quality is unsatisfactory, ensure that the Audio over UDP Real-time Transport policy setting is set to Allowed.

- Select High - high definition audio for connections where bandwidth is plentiful and sound quality is important. Clients can play sound at its native rate. Sounds are compressed at a high quality level maintaining up to CD quality, and using up to 112 Kbps of bandwidth. Transmitting this amount of data can result in increased CPU utilization and network congestion.

Bandwidth is consumed only while audio is recording or playing. If both occur at the same time, the bandwidth consumption is doubled.

To specify the maximum amount of bandwidth, configure the Audio redirection bandwidth limit or the Audio redirection bandwidth limit percent settings.

Client audio redirection

This setting specifies whether applications hosted on the server can play sounds through a sound device installed on the user device. This setting also specifies whether users can record audio input.

By default, audio redirection is allowed.

After allowing this setting, you can limit the bandwidth consumed by playing or recording audio. Limiting the amount of bandwidth consumed by audio can improve application performance but may also degrade audio quality. Bandwidth is consumed only while audio is recording or playing. If both occur at the same time, the bandwidth consumption doubles. To specify the maximum amount of bandwidth, configure the Audio redirection bandwidth limit or the Audio redirection bandwidth limit percent settings.

On Windows Server OS machines, ensure that the Audio Plug N Play setting is Enabled to support multiple audio devices.

Important: Prohibiting Client audio redirection disables all HDX audio functionality.

Client microphone redirection

This setting enables or disables client microphone redirection. When enabled, users can use microphones to record audio input in a session.

By default, microphone redirection is allowed.

For security, users are alerted when servers that are not trusted by their devices try to access microphones. Users can choose to accept or not accept access. Users can disable the alert on Citrix Receiver.

On Windows Server OS machines, ensure that the Audio Plug N Play setting is Enabled to support multiple audio devices.

If the Client audio redirection setting is disabled on the user device, this rule has no effect.

Bandwidth policy settings

The Bandwidth section contains policy settings to avoid performance problems related to client session bandwidth use.

Important: Using these policy settings with the Multi-Stream policy settings may produce unexpected results. If you use Multi-Stream settings in a policy, ensure these bandwidth limit policy settings are not included.

Audio redirection bandwidth limit

This setting specifies the maximum allowed bandwidth, in kilobits per second, for playing or recording audio in a user session.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the Audio redirection bandwidth limit percent setting, the most restrictive setting (with the lower value) is applied.

Audio redirection bandwidth limit percent

This setting specifies the maximum allowed bandwidth limit for playing or recording audio as a percentage of the total session bandwidth.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the Audio redirection bandwidth limit setting, the most restrictive setting (with the lower value) is applied.

If you configure this setting, you must also configure the Overall session bandwidth limit setting, which specifies the total amount of bandwidth available for client sessions.

Client USB device redirection bandwidth limit

This setting specifies the maximum allowed bandwidth, in kilobits per second, for the redirection of USB devices to and from the client.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the Client USB device redirection bandwidth limit percent setting, the most restrictive setting (with the lower value) is applied.

Client USB device redirection bandwidth limit percent

This setting specifies the maximum allowed bandwidth for the redirection of USB devices to and from the client as a percentage of the total session bandwidth.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the Client USB device redirection bandwidth limit setting, the most restrictive setting (with the lower value) is applied.

If you configure this setting, you must also configure the Overall session bandwidth limit setting, which specifies the total amount of bandwidth available for client sessions.

Clipboard redirection bandwidth limit

This setting specifies the maximum allowed bandwidth, in kilobits per second, for data transfer between a session and the local clipboard.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the Clipboard redirection bandwidth limit percent setting, the most restrictive setting (with the lower value) is applied.

Clipboard redirection bandwidth limit percent

This setting specifies the maximum allowed bandwidth for data transfer between a session and the local clipboard as a percentage of the total session bandwidth.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the Clipboard redirection bandwidth limit setting, the most restrictive setting (with the lower value) is applied.

If you configure this setting, you must also configure the Overall session bandwidth limit setting, which specifies the total amount of bandwidth available for client sessions.

COM port redirection bandwidth limit

Note: For the Virtual Delivery Agent 7.x, configure this setting using the registry; see [Configure COM Port and LPT Port Redirection settings using the registry](#).

This setting specifies the maximum allowed bandwidth in kilobits per second for accessing a COM port in a client connection. If you enter a value for this setting and a value for the COM port redirection bandwidth limit percent setting, the most restrictive setting (with the lower value) is applied.

COM port redirection bandwidth limit percent

Note: For the Virtual Delivery Agent 7.x, configure this setting using the registry; see [Configure COM Port and LPT Port Redirection settings using the registry](#).

This setting specifies the maximum allowed bandwidth for accessing COM ports in a client connection as a percentage of the total session bandwidth.

By default, no maximum (zero) is specified

If you enter a value for this setting and a value for the COM port redirection bandwidth limit setting, the most restrictive setting (with the lower value) is applied.

If you configure this setting, you must also configure the Overall session bandwidth limit setting, which specifies the total amount of bandwidth available for client sessions

File redirection bandwidth limit

This setting specifies the maximum allowed bandwidth, in kilobits per second, for accessing a client drive in a user session.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the File redirection bandwidth limit percent setting, the most restrictive setting (with the lower value) takes effect.

File redirection bandwidth limit percent

This setting specifies the maximum allowed bandwidth limit for accessing client drives as a percentage of the total session bandwidth.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the File redirection bandwidth limit setting, the most restrictive setting (with the lower value) is applied.

If you configure this setting, you must also configure the Overall session bandwidth limit setting, which specifies the total amount of bandwidth available for client sessions.

HDX MediaStream Multimedia Acceleration bandwidth limit

This setting specifies the maximum allowed bandwidth limit, in kilobits per second, for delivering streaming audio and video using HDX MediaStream Multimedia Acceleration.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the HDX MediaStream Multimedia Acceleration bandwidth limit percent setting, the most restrictive setting (with the lower

value) takes effect.

HDX MediaStream Multimedia Acceleration bandwidth limit percent

This setting specifies the maximum allowed bandwidth for delivering streaming audio and video using HDX MediaStream Multimedia Acceleration as a percentage of the total session bandwidth.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the HDX MediaStream Multimedia Acceleration bandwidth limit setting, the most restrictive setting (with the lower value) takes effect.

If you configure this setting, you must also configure the Overall session bandwidth limit setting, which specifies the total amount of bandwidth available for client sessions.

LPT port redirection bandwidth limit

Note: For the Virtual Delivery Agent 7.x, configure this setting using the registry; see [Configure COM Port and LPT Port Redirection settings using the registry](#).

This setting specifies the maximum allowed bandwidth, in kilobits per second, for print jobs using an LPT port in a single user session.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the LPT port redirection bandwidth limit percent setting, the most restrictive setting (with the lower value) is applied.

LPT port redirection bandwidth limit percent

Note: For the Virtual Delivery Agent 7.x, configure this setting using the registry; see [Configure COM Port and LPT Port Redirection settings using the registry](#).

This setting specifies the bandwidth limit for print jobs using an LPT port in a single client session as a percentage of the total session bandwidth.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the LPT port redirection bandwidth limit setting, the most restrictive setting (with the lower value) is applied.

If you configure this setting, you must also configure the Overall session bandwidth limit setting, which specifies the total amount of bandwidth available for client sessions.

Overall session bandwidth limit

This setting specifies the total amount of bandwidth available, in kilobits per second, for user sessions.

The maximum enforceable bandwidth cap is 10 Mbps (10,000 Kbps). By default, no maximum (zero) is specified.

Limiting the amount of bandwidth consumed by a client connection can improve performance when other applications outside the client connection are competing for limited bandwidth.

Printer redirection bandwidth limit

This setting specifies the maximum allowed bandwidth, in kilobits per second, for accessing client printers in a user session.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the Printer redirection bandwidth limit percent setting, the most restrictive setting (with the lower value) is applied.

Printer redirection bandwidth limit percent

This setting specifies the maximum allowed bandwidth for accessing client printers as a percentage of the total session bandwidth.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the Printer redirection bandwidth limit setting, the most restrictive setting (with the lower value) is applied.

If you configure this setting, you must also configure the Overall session bandwidth limit setting, which specifies the total amount of bandwidth available for client sessions.

TWAIN device redirection bandwidth limit

This setting specifies the maximum allowed bandwidth, in kilobits per second, for controlling TWAIN imaging devices from published applications.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the TWAIN device redirection bandwidth limit percent setting, the most restrictive setting (with the lower value) is applied.

TWAIN device redirection bandwidth limit percent

This setting specifies the maximum allowed bandwidth for controlling TWAIN imaging devices from published applications as a percentage of the total session bandwidth.

By default, no maximum (zero) is specified.

If you enter a value for this setting and a value for the TWAIN device redirection bandwidth limit setting, the most restrictive setting (with the lower value) is applied.

If you configure this setting, you must also configure the Overall session bandwidth limit setting, which specifies the total amount of bandwidth available for client sessions.

Client sensors policy settings

The Client Sensors section contains policy settings for controlling how mobile device sensor information is handled in a user session.

Allow applications to use the physical location of the client device

This setting determines whether applications running in a session on a mobile device are allowed to use the physical location of the user device.

By default, the use of location information is prohibited

When this setting is prohibited, attempts by an application to retrieve location information return a "permission denied" value.

When this setting is allowed, a user can prohibit use of location information by denying a Receiver request to access the location. Android and iOS devices prompt at the first request for location information in each session.

When developing hosted applications that use the Allow applications to use the physical location of the client device setting, consider the following:

- A location-enabled application should not rely on location information being available because:
 - A user might not allow access to location information.
 - The location might not be available or might change while the application is running.
 - A user might connect to the application session from a different device that does not support location information.
- A location-enabled application must:
 - Have the location feature off by default.
 - Provide a user option to allow or disallow the feature while the application is running.
 - Provide a user option to clear location data that is cached by the application. (Receiver does not cache location data.)
- A location-enabled application must manage the granularity of the location information so that the data acquired is appropriate to the purpose of the application and conforms to regulations in all relevant jurisdictions.
- A secure connection (for example, using SSL/TLS or a VPN) should be enforced when using location services. Citrix Receiver should connect to trusted servers.

- Consider obtaining legal advice regarding the use of location services.

Desktop UI policy settings

The Desktop UI section contains policy settings that control visual effects such as desktop wallpaper, menu animations, and drag-and-drop images, to manage the bandwidth used in client connections. You can improve application performance on a WAN by limiting bandwidth usage.

Desktop Composition Redirection

This setting specifies whether to use the processing capabilities of the graphics processing unit (GPU) or integrated graphics processor (IGP) on the user device for local DirectX graphics rendering to provide users with a more fluid Windows desktop experience. When enabled, Desktop Composition Redirection delivers a highly responsive Windows experience while maintaining high scalability on the server.

By default, Desktop Composition Redirection is enabled.

To turn off Desktop Composition Redirection and reduce the bandwidth required in user sessions, select Disabled when adding this setting to a policy.

Desktop Composition Redirection graphics quality

This setting specifies the quality of graphics used for Desktop Composition Redirection.

By default, this is set to high.

Choose from High, Medium, Low, or Lossless quality.

Desktop wallpaper

This setting allows or prevents wallpaper showing in user sessions.

By default, user sessions can show wallpaper.

To turn off desktop wallpaper and reduce the bandwidth required in user sessions, select Prohibited when adding this setting to a policy.

Menu animation

This setting allows or prevents menu animation in user sessions.

By default, menu animation is allowed.

Menu animation is a Microsoft personal preference setting that causes a menu to appear after a short delay, either by scrolling or fading in. When this policy setting is set to

Allowed, an arrow icon appears at the bottom of the menu. The menu appears when you point to that arrow.

View window contents while dragging

This setting allows or prevents the display of window contents when dragging a window across the screen.

By default, viewing window contents is allowed.

When set to Allowed, the entire window appears to move when you drag it. When set to Prohibited, only the window outline appears to move until you drop it.

End user monitoring policy settings

The End User Monitoring section contains policy settings for measuring session traffic.

ICA round trip calculation

This setting determines whether ICA round trip calculations are performed for active connections.

By default, calculations for active connections are enabled.

By default, each ICA round trip measurement initiation is delayed until some traffic occurs that indicates user interaction. This delay can be indefinite in length and is designed to prevent the ICA round trip measurement being the sole reason for ICA traffic.

ICA round trip calculation interval

This setting specifies the frequency, in seconds, at which ICA round trip calculations are performed.

By default, ICA round trip is calculated every 15 seconds.

ICA round trip calculations for idle connections

This setting determines whether ICA round trip calculations are performed for idle connections.

By default, calculations are not performed for idle connections.

By default, each ICA round trip measurement initiation is delayed until some traffic occurs that indicates user interaction. This delay can be indefinite in length and is designed to prevent the ICA round trip measurement being the sole reason for ICA traffic.

Enhanced desktop experience policy setting

The Enhanced Desktop Experience policy setting sessions running on server operating systems to look like local Windows 7 desktops, providing users with an enhanced desktop experience.

By default, this setting is allowed.

If a user profile with Windows Classic theme already exists on the virtual desktop, enabling this policy does not provide an enhanced desktop experience for that user. If a user with a Windows 7 theme user profile logs on to a virtual desktop running Windows Server 2012 for which this policy is either not configured or disabled, that user sees an error message indicating failure to apply the theme.

In both cases, resetting the user profile resolves the issue.

If the policy changes from enabled to disabled on a virtual desktop with active user sessions, the look and feel of those sessions is inconsistent with both the Windows 7 and Windows Classic desktop experience. To avoid this, ensure you restart the virtual desktop after changing this policy setting. You must also delete any roaming profiles on the virtual desktop. Citrix also recommends deleting any other user profiles on the virtual desktop to avoid inconsistencies between profiles.

If you are using roaming user profiles in your environment, ensure the Enhanced Desktop Experience feature is enabled or disabled for all virtual desktops that share a profile.

Citrix does not recommend sharing roaming profiles between virtual desktops running server operating systems and client operating systems. Profiles for client and server operating systems differ and sharing roaming profiles across both types can lead to inconsistencies in profile properties when a user moves between the two.

File Redirection policy settings

The File Redirection section contains policy settings relating to client drive mapping and client drive optimization.

Auto connect client drives

This setting allows or prevents automatic connection of client drives when users log on.

By default, automatic connection is allowed.

When adding this setting to a policy, make sure to enable the settings for the drive types you want automatically connected. For example, to allow automatic connection of users' CD-ROM drives, configure this setting and the Client optical drives setting.

The following policy settings are related:

- Client drive redirection
- Client floppy drives
- Client optical drives
- Client fixed drives
- Client network drives
- Client removable drives

Client drive redirection

This setting enables or disables file redirection to and from drives on the user device.

By default, file redirection is enabled.

When enabled, users can save files to all their client drives. When disabled, all file redirection is prevented, regardless of the state of the individual file redirection settings such as Client floppy drives and Client network drives.

The following policy settings are related:

- Client floppy drives
- Client optical drives
- Client fixed drives
- Client network drives

- Client removable drives

Client fixed drives

This setting allows or prevents users from accessing or saving files to fixed drives on the user device.

By default, accessing client fixed drives is allowed.

When adding this setting to a policy, make sure the Client drive redirection setting is present and set to Allowed. If these settings are disabled, client fixed drives are not mapped and users cannot access these drives manually, regardless of the state of the Client fixed drives setting.

To ensure fixed drives are automatically connected when users log on, configure the Auto connect client drives setting.

Client floppy drives

This setting allows or prevents users from accessing or saving files to floppy drives on the user device.

By default, accessing client floppy drives is allowed.

When adding this setting to a policy, make sure the Client drive redirection setting is present and set to Allowed. If these settings are disabled, client floppy drives are not mapped and users cannot access these drives manually, regardless of the state of the Client floppy drives setting.

To ensure floppy drives are automatically connected when users log on, configure the Auto connect client drives setting.

Client network drives

This setting allows or prevents users from accessing and saving files to network (remote) drives through the user device.

By default, accessing client network drives is allowed.

When adding this setting to a policy, make sure the Client drive redirection setting is present and set to Allowed. If these settings are disabled, client network drives are not mapped and users cannot access these drives manually, regardless of the state of the Client network drives setting.

To ensure network drives are automatically connected when users log on, configure the Auto connect client drives setting.

Client optical drives

This setting allows or prevents users from accessing or saving files to CD-ROM, DVD-ROM, and BD-ROM drives on the user device.

By default, accessing client optical drives is allowed.

When adding this setting to a policy, make sure the Client drive redirection setting is present and set to Allowed. If these settings are disabled, client optical drives are not mapped and users cannot access these drives manually, regardless of the state of the Client optical drives setting.

To ensure optical drives are automatically connected when users log on, configure the Auto connect client drives setting.

Client removable drives

This setting allows or prevents users from accessing or saving files to USB drives on the user device.

By default, accessing client removable drives is allowed.

When adding this setting to a policy, make sure the Client drive redirection setting is present and set to Allowed. If these settings are disabled, client removable drives are not mapped and users cannot access these drives manually, regardless of the state of the Client removable drives setting.

To ensure removable drives are automatically connected when users log on, configure the Auto connect client drives setting.

Host to client redirection

This setting enables or disables file type associations for URLs and some media content to be opened on the user device. When disabled, content opens on the server.

By default, file type association is disabled.

These URL types are opened locally when you enable this setting:

- Hypertext Transfer Protocol (HTTP)
- Secure Hypertext Transfer Protocol (HTTPS)
- Real Player and QuickTime (RTSP)
- Real Player and QuickTime (RTSPU)
- Legacy Real Player (PNM)
- Microsoft Media Server (MMS)

Preserve client drive letters

This setting enables or disables mapping of client drives to the same drive letter in the session.

By default, client drive letters are not preserved.

When adding this setting to a policy, make sure the Client drive redirection setting is present and set to Allowed.

Read-only client drive access

This setting allows or prevents users and applications from creating or modifying files or folders on mapped client drives.

By default, files and folders on mapped client drives can be modified.

If set to Enabled, files and folders are accessible with read-only permissions.

When adding this setting to a policy, make sure the Client drive redirection setting is present and set to Allowed.

Special folder redirection

This setting allows or prevents Citrix Receiver and Web Interface users to see their local Documents and Desktop special folders from a session.

By default, special folder redirection is allowed.

This setting prevents any objects filtered through a policy from having special folder redirection, regardless of settings that exist elsewhere. When you allow this setting, any related settings specified for the Web Interface or Citrix Receiver are ignored.

To define which users can have special folder redirection, select Allowed and include this setting in a policy filtered on the users you want to have this feature. This setting overrides all other special folder redirection settings.

Because special folder redirection must interact with the user device, policy settings that prevent users from accessing or saving files to their local hard drives also prevent special folder redirection from working.

When adding this setting to a policy, make sure the Client fixed drives setting is present and set to Allowed.

Use asynchronous writes

This setting enables or disables asynchronous disk writes.

By default, asynchronous writes are disabled.

Asynchronous disk writes can improve the speed of file transfers and writing to client disks over WANs, which are typically characterized by relatively high bandwidth and high latency. However, if there is a connection or disk fault, the client file or files being written may end in an undefined state. If this happens, a pop-up window informs the user of the files affected. The user can then take remedial action such as restarting an interrupted file transfer on reconnection or when the disk fault is corrected.

Citrix recommends enabling asynchronous disk writes only for users who need remote connectivity with good file access speed and who can easily recover files or data lost in the event of connection or disk failure.

When adding this setting to a policy, make sure that the Client drive redirection setting is present and set to Allowed. If this setting is disabled, asynchronous writes will not occur.

Flash Redirection policy settings

The Flash Redirection section contains policy settings for handling Flash content in user sessions.

Flash acceleration

This setting enables or disables Flash content rendering on user devices instead of the server. By default, client-side Flash content rendering is enabled.

Note: This setting is used for legacy Flash redirection with the Citrix online plug-in 12.1.

When enabled, this setting reduces network and server load by rendering Flash content on the user device. Additionally, the Flash URL compatibility list setting forces Flash content from specific websites to be rendered on the server.

On the user device, the Enable HDX MediaStream for Flash on the user device setting must be enabled as well.

When this setting is disabled, Flash content from all websites, regardless of URL, is rendered on the server. To allow only certain websites to render Flash content on the user device, configure the Flash URL compatibility list setting.

Flash background color list

This setting enables you to set key colors for given URLs.

By default, no key colors are specified.

Key colors appear behind client-rendered Flash and help provide visible region detection. The key color specified should be rare; otherwise, visible region detection might not work properly.

Valid entries consist of a URL (with optional wildcards at the beginning or end) followed by a 24-bit RGB color hexadecimal code. For example: `http://citrix.com 000003`

Flash backwards compatibility

This setting enables or disables the use of original, legacy Flash redirection features with older versions of Citrix Receiver (formerly the Citrix online plug-in).

By default, this setting is enabled.

On the user device, the Enable HDX MediaStream for Flash on the user device setting must also be enabled.

Second generation Flash redirection features are enabled for use with Citrix Receiver 3.0. Legacy redirection features are supported for use with the Citrix online plug-in 12.1. To ensure second generation Flash redirection features are used, both the server and the user device must have second generation Flash redirection enabled. If legacy redirection is enabled on either the server or the user device, legacy redirection features are used.

Flash default behavior

This setting establishes the default behavior for second generation Flash acceleration.

By default, Flash acceleration is enabled.

To configure this setting, choose one of the following options:

- Enable Flash acceleration — Flash Redirection is used.
- Block Flash Player — Flash Redirection and server-side rendering are not used. The user cannot view any Flash content.
- Disable Flash acceleration — Flash Redirection is not used. The user can view server-side rendered Flash content if a version of Adobe Flash Player for Windows Internet Explorer compatible with the content is installed on the server.

This setting can be overridden for individual Web pages and Flash instances based on the configuration of the Flash URL compatibility list setting. Additionally, the user device must have the Enable HDX MediaStream for Flash on the user device setting enabled.

Flash event logging

This setting enables Flash events to be recorded in the Windows application event log.

By default, logging is allowed.

On computers running Windows 7 or Windows Vista, a Flash redirection-specific log appears in the Applications and Services Log node.

Flash intelligent fallback

This setting enables or disables automatic attempts to employ server-side rendering for Flash Player instances where client-side rendering is either unnecessary or provides a poor user experience.

By default, this setting is enabled.

Flash latency threshold

This setting specifies a threshold between 0-30 milliseconds to determine where Adobe Flash content is rendered.

By default, the threshold is 30 milliseconds.

During startup, HDX MediaStream for Flash measures the current latency between the server and user device. If the latency is under the threshold, HDX MediaStream for Flash is used to render Flash content on the user device. If the latency is above the threshold, the network server renders the content if an Adobe Flash player is available there.

When enabling this setting, make sure the Flash backwards compatibility setting is also present and set to Enabled.

Note: Applies only when using HDX MediaStream Flash redirection in Legacy mode.

Flash server-side content fetching URL list

This setting specifies websites whose Flash content can be downloaded to the server and then transferred to the user device for rendering.

By default, no sites are specified.

This setting is used when the user device does not have direct access to the Internet; the server provides that connection. Additionally, the user device must have the Enable server-side content fetching setting enabled.

Second generation Flash redirection includes a fallback to server-side content fetching for Flash .swf files. If the user device is unable to fetch Flash content from a Web site, and the Web site is specified in the Flash server-side content fetching URL list, server-side content fetching occurs automatically.

When adding URLs to the list:

- Add the URL of the Flash application instead of the top-level HTML page that initiates the Flash Player.
- Use an asterisk (*) at the beginning or end of the URL as a wildcard.
- Use a trailing wildcard to allow all child URLs (<http://www.citrix.com/>).
- The prefixes <http://> and <https://> are used when present, but are not required for valid list entries.

Flash URL compatibility list

This setting specifies the rules which determine whether Flash content on certain websites is rendered on the user device, rendered on the server, or blocked from rendering.

By default, no rules are specified.

When adding URLs to the list:

- Prioritize the list with the most important URLs, actions, and rendering locations at the top.

- Use an asterisk (*) at the beginning or end of the URL as a wildcard.
- Use a trailing wildcard to refer to all child URLs (<http://www.citrix.com/>).
- The prefixes <http://> and <https://> are used when present, but are not required for valid list entries.
- Add to this list websites whose Flash content does not render correctly on the user device and select either the Render on Server or Block options.

Graphics policy settings

The Graphics section contains policy settings for controlling how images are handled in user sessions.

Display memory limit

This setting specifies the maximum video buffer size in kilobytes for the session.

By default, the display memory limit is 65536 kilobytes.

For connections requiring more color depth and higher resolution, increase the limit. Calculate the maximum memory required using the equation:

Memory depth in bytes = (color-depth-in-bits-per-pixel / 8) * (vertical-resolution-in-pixels) * (horizontal-resolution-in-pixels).

For example, with a color depth of 32, vertical resolution of 600, and a horizontal resolution of 800, the maximum memory required is $(32 / 8) * (600) * (800) = 1920000$ bytes, which yields a display memory limit of 1920 KB.

Color depths other than 32-bit are available only if the Legacy graphics mode policy setting is enabled.

HDX allocates only the amount of display memory needed for each session. So, if only some users require more than the default, there is no negative impact on scalability by increasing the display memory limit.

Display mode degrade preference

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting specifies whether color depth or resolution degrades first when the session display memory limit is reached.

By default, color depth is degraded first.

When the session memory limit is reached, you can reduce the quality of displayed images by choosing whether color depth or resolution is degraded first. When color depth is degraded first, displayed images use fewer colors. When resolution is degraded first, displayed images use fewer pixels per inch.

To notify users when either color depth or resolution are degraded, configure the Notify user when display mode is degraded setting.

Dynamic windows preview

This setting enables or disables the display of seamless windows in Flip, Flip 3D, Taskbar Preview, and Peek window preview modes.

Windows Aero preview option	Description
Taskbar Preview	When the user hovers over a window's taskbar icon, an image of that window appears above the taskbar.
Windows Peek	When the user hovers over a taskbar preview image, a full-sized image of the window appears on the screen.
Flip	When the user presses ALT+TAB, small preview icons are shown for each open window.
Flip 3D	When the user presses TAB+Windows logo key, large images of the open windows cascade across the screen.

By default, this setting is enabled.

Image caching

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting enables or disables caching of images in sessions. When needed, the images are retrieved in sections to make scrolling smoother.

By default, image caching is enabled.

Legacy graphics mode

This setting disables the rich graphics experience, providing fallback to the legacy graphics experience to improve scalability over a WAN or mobile connection.

By default, this setting is disabled and users are provided with the rich graphics experience.

Maximum allowed color depth

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting specifies the maximum color depth allowed for a session.

By default, the maximum allowed color depth is 32 bits per pixel.

Setting a high color depth requires more memory. To degrade color depth when the memory limit is reached, configure the Display mode degrade preference setting. When color depth is degraded, displayed images use fewer colors.

Notify user when display mode is degraded

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting displays a brief explanation to the user when the color depth or resolution is degraded.

By default, notifying users is disabled.

Queuing and tossing

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting discards queued images that are replaced by another image.

By default, queuing and tossing is enabled.

This improves response when graphics are sent to the user device. Configuring this setting can cause animations to become choppy because of dropped frames.

Caching policy settings

The Caching section contains policy settings that enable caching image data on user devices when client connections are limited in bandwidth.

Persistent cache threshold

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting caches bitmaps on the hard drive of the user device. This enables re-use of large, frequently-used images from previous sessions.

By default, the threshold is 3000000 bits per second.

The threshold value represents the point below which the Persistent Cache feature will take effect. For example, using the default value, bitmaps are cached on the hard drive of the user device when bandwidth falls below 3000000 bps.

Keep alive policy settings

The Keep Alive section contains policy settings for managing ICA keep-alive messages.

ICA keep alive timeout

This setting specifies the number of seconds between successive ICA keep-alive messages.

By default, the interval between keep-alive messages is 60 seconds.

Specify an interval between 1-3600 seconds in which to send ICA keep-alive messages. Do not configure this setting if your network monitoring software is responsible for closing inactive connections.

ICA keep alives

This setting enables or disables sending ICA keep-alive messages periodically.

By default, keep-alive messages are not sent.

Enabling this setting prevents broken connections from being disconnected. If the server detects no activity, this setting prevents Remote Desktop Services (RDS) from disconnecting the session. The server sends keep-alive messages every few seconds to detect if the session is active. If the session is no longer active, the server marks the session as disconnected.

ICA keep-alive does not work if you are using session reliability. Configure ICA keep-alive only for connections that are not using Session Reliability.

Related policy settings: Session reliability connections.

Local App Access policy settings

The Local App Access section contains policy settings that manage the integration of users' locally-installed applications with hosted applications in a hosted desktop environment.

Allow local app access

This setting allows or prevents the integration of users' locally-installed applications with hosted applications within a hosted desktop environment.

When a user launches a locally-installed application, that application appears to run within their virtual desktop, even though it is actually running locally.

By default, local app access is prohibited.

URL redirection black list

This setting specifies websites that are redirected to and launched in the local Web browser. This might include websites requiring locale information, such as msn.com or newsgoogle.com, or websites containing rich media content that are better rendered on the user device.

By default, no sites are specified.

URL redirection white list

This setting specifies websites that are rendered in the environment in which they are launched.

By default, no sites are specified.

Mobile experience policy settings

The Mobile Experience section contains policy settings for handling the Citrix Mobility Pack.

Automatic keyboard display

This setting enables or disables the automatic display of the keyboard on mobile device screens.

By default, the automatic display of the keyboard is disabled.

Launch touch-optimized desktop

This setting determines the overall Receiver interface behavior by allowing or prohibiting a touch-friendly interface that is optimized for tablet devices.

By default, a touch-friendly interface is used.

To use only the Windows interface, set this policy setting to Prohibited.

Remote the combo box

This setting determines the types of combo boxes you can display in sessions on mobile devices. To display the device-native combo box control, set this policy setting to Allowed. When this setting is allowed, a user can change a Receiver for iOS session setting to use the Windows combo box.

By default, the Remote the combo box feature is prohibited.

Multimedia policy settings

The Multimedia section contains policy settings for managing streaming audio and video in user sessions.

Limit video quality

This setting specifies the maximum video quality level allowed for an HDX connection. When configured, maximum video quality is limited to the specified value, ensuring that multimedia Quality of Service (QoS) is maintained within an environment.

By default, this setting is not configured.

To limit the maximum video quality level allowed, choose one of the following options:

- 1080p/8.5mbps
- 720p/4.0mbps
- 480p/720kbps
- 380p/400kbps
- 240p/200kbps

Note: Playing multiple videos simultaneously on the same server consumes large amounts of resources and may impact server scalability.

Multimedia conferencing

This setting allows or prevents support for video conferencing applications.

By default, video conferencing support is allowed.

When adding this setting to a policy, make sure the Windows Media Redirection setting is present and set to Allowed.

When using multimedia conferencing, make sure the following conditions are met:

- Manufacturer-supplied drivers for the web cam used for multimedia conferencing must be installed.
- The web cam must be connected to the user device before initiating a video conferencing session. The server uses only one installed web cam at any given time. If multiple web cams are installed on the user device, the server attempts to use each web cam in succession until a video conferencing session is created successfully.

Optimization for Windows Media multimedia redirection over WAN

This setting enables real-time multimedia transcoding, allowing audio and video media streaming to mobile devices, and enhancing the user experience by improving how Windows Media content is delivered over a WAN.

By default, the delivery of Windows Media content over the WAN is optimized.

When adding this setting to a policy, make sure the Windows Media Redirection setting is present and set to Allowed.

When this setting is enabled, real-time multimedia transcoding is deployed automatically as needed to enable media streaming, providing a seamless user experience even in extreme network conditions.

Use GPU for optimizing Windows Media multimedia redirection over WAN

This setting enables real-time multimedia transcoding to be done in the Graphics Processing Unit (GPU) on the Virtual Delivery Agent (VDA), to improve server scalability. GPU transcoding is available only if the VDA has a supported GPU for hardware acceleration. Otherwise, transcoding falls back to the CPU.

Note: GPU transcoding is supported only on NVIDIA GPUs.

By default, using the GPU on the VDA to optimize the delivery of Windows Media content over the WAN is prohibited.

When adding this setting to a policy, make sure the Windows Media Redirection and Optimization for Windows Media multimedia redirection over WAN settings are present and set to Allowed.

Windows Media client-side content fetching

This setting enables a user device to stream multimedia files directly from the source provider on the Internet or Intranet, rather than through the host server.

By default, the streaming of multimedia files to the user device direct from the source provider is allowed.

Allowing this setting improves network utilization and server scalability by moving any processing on the media from the host server to the user device. It also removes the requirement that an advanced multimedia framework such as Microsoft DirectShow or Media Foundation be installed on the user device; the user device requires only the ability to play a file from a URL.

When adding this setting to a policy, make sure the Windows Media Redirection setting is present and set to Allowed. If this setting is disabled, the streaming of multimedia files to the user device direct from the source provider is also disabled.

Windows Media Redirection

This setting controls and optimizes the way servers deliver streaming audio and video to users.

By default, the delivery of streaming audio and video to users is allowed.

Allowing this setting increases the quality of audio and video rendered from the server to a level that compares with audio and video played locally on a user device. The server streams multimedia to the client in the original, compressed form and allows the user device to decompress and render the media.

Windows Media redirection optimizes multimedia files that are encoded with codecs that adhere to Microsoft DirectShow, DirectX Media Objects (DMO), and Media Foundation standards. To play back a given multimedia file, a codec compatible with the encoding format of the multimedia file must be present on the user device.

By default, audio is disabled on Citrix Receiver. To allow users to run multimedia applications in ICA sessions, turn on audio or give users permission to turn on audio in their Receiver interface.

Select Prohibited only if playing media using Windows Media redirection appears worse than when rendered using basic ICA compression and regular audio. This is rare but can happen under low bandwidth conditions, for example, with media with a very low frequency of key frames.

Windows Media Redirection buffer size

This setting specifies a buffer size from 1 to 10 seconds for multimedia acceleration.

By default, the buffer size is 5 seconds.

Windows Media Redirection buffer size use

This setting enables or disables using the buffer size specified in the Windows Media Redirection buffer size setting.

By default, the buffer size specified is not used.

If this setting is disabled or if the Windows Media Redirection buffer size setting is not configured, the server uses the default buffer size value (5 seconds).

Multi-stream connections policy settings

The Multi-Stream Connections section contains policy settings for managing Quality of Service (QoS) prioritization for multiple ICA connections in a session.

Audio over UDP

This setting allows or prevents audio over UDP on the server.

By default, audio over UDP is allowed on the server.

When enabled, this setting opens a UDP port on the server to support all connections configured to use Audio over UDP Realtime Transport.

Audio UDP port range

This setting specifies the range of port numbers (in the form *lowest port number, highest port number*) used by the Virtual Delivery Agent (VDA) to exchange audio packet data with the user device. The VDA attempts to use each UDP port pair to exchange data with the user device, starting with the lowest and incrementing by two for each subsequent attempt. Each port handles both inbound and outbound traffic.

By default, this is set to 16500,16509.

Multi-Port policy

This setting specifies the TCP ports to be used for ICA traffic and establishes the network priority for each port.

By default, the primary port (2598) has a High priority.

When you configure ports, you can assign the following priorities:

- Very High - for real-time activities, such as webcam conferences
- High - for interactive elements, such as screen, keyboard, and mouse
- Medium - for bulk processes, such as client drive mapping
- Low - for background activities, such as printing

Each port must have a unique priority. For example, you cannot assign a Very High priority to both CGP port 1 and CGP port 3.

To remove a port from prioritization, set the port number to 0. You cannot remove the primary port and you cannot modify its priority level.

When configuring this setting, restart the server. This setting takes effect only when the Multi-Stream computer setting policy setting is enabled.

Multi-Stream computer setting

This setting enables or disables Multi-Stream on the server.

By default, Multi-Stream is disabled.

If you use Citrix Cloudbridge with Multi-Stream support in your environment, you do not need to configure this setting. Configure this policy setting when using third-party routers or legacy Branch Repeaters to achieve the desired Quality of Service (QoS).

When configuring this setting, reboot the server to ensure changes take effect.

Important: Using this policy setting in conjunction with bandwidth limit policy settings such as Overall session bandwidth limit may produce unexpected results. When including this setting in a policy, ensure that bandwidth limit settings are not included.

Multi-Stream user setting

This setting enables or disables Multi-Stream on the user device.

By default, Multi-Stream is disabled for all users.

This setting takes effect only on hosts where the Multi-Stream computer setting policy setting is enabled.

Important: Using this policy setting with bandwidth limit policy settings such as Overall session bandwidth limit may produce unexpected results. When including this setting in a policy, ensure that bandwidth limit settings are not included.

Port redirection policy settings

The Port Redirection section contains policy settings for client LPT and COM port mapping.

Note: For the Virtual Delivery Agent 7.x, configure these settings using the registry; see [Configure COM Port and LPT Port Redirection settings using the registry](#).

Auto connect client COM ports

This setting enables or disables automatic connection of COM ports on user devices when users log on to a site.

By default, client COM ports are not automatically connected.

Auto connect client LPT ports

This setting enables or disables automatic connection of LPT ports on user devices when users log on to a site.

By default, client LPT ports are not connected automatically.

Client COM port redirection

This setting allows or prevents access to COM ports on the user device.

By default, COM port redirection is prohibited.

The following policy settings are related:

- COM port redirection bandwidth limit
- COM port redirection bandwidth limit percent

Client LPT port redirection

This setting allows or prevents access to LPT ports on the user device.

By default, LPT port redirection is prohibited.

LPT ports are used only by legacy applications that send print jobs to the LPT ports and not to the print objects on the user device. Most applications today can send print jobs to printer objects. This policy setting is necessary only for servers that host legacy applications that print to LPT ports.

The following policy settings are related:

- LPT port redirection bandwidth limit
- LPT port redirection bandwidth limit percent

Printing policy settings

The Printing section contains policy settings for managing client printing.

Client printer redirection

This setting controls whether client printers are mapped to a server when a user logs on to a session.

By default, client printer mapping is allowed. If this setting is disabled, the PDF printer for the session is not auto-created.

Related policy settings: auto-create client printers

Default printer

This setting specifies how the default printer on the user device is established in a session.

By default, the user's current printer is used as the default printer for the session.

To use the current Remote Desktop Services or Windows user profile setting for the default printer, select Do not adjust the user's default printer. If you choose this option, the default printer is not saved in the profile and it does not change according to other session or client properties. The default printer in a session will be the first printer auto-created in the session, which is either:

- The first printer added locally to the Windows server in Control Panel > Devices and Printers.
- The first auto-created printer, if there are no printers added locally to the server.

You can use this option to present users with the nearest printer through profile settings (known as proximity printing).

Printer assignments

This setting provides an alternative to the Default printer and Session printers settings. Use the individual Default printer and Session printers settings to configure behaviors for a site, large group, or organizational unit. Use the Printer assignments setting to assign a large group of printers to multiple users.

This setting specifies how the default printer on the listed user devices is established in a session.

By default, the user's current printer is used as the default printer for the session.

It also specifies the network printers to be auto-created in a session for each user device. By default, no printers are specified.

- When setting the default printer value:

To use the current default printer for the user device, select Do not adjust.

To use the current Remote Desktop Services or Windows user profile setting for the default printer, select Do not adjust. If you choose this option, the default printer is not saved in the profile and it does not change according to other session or client properties. The default printer in a session will be the first printer auto-created in the session, which is either:

- The first printer added locally to the Windows server in Control Panel > Devices and Printers.
- The first auto-created printer, if there are no printers added locally to the server.
- When setting the session printers value: to add printers, type the UNC path of the printer you want to auto-create. After adding the printer, you can apply customized settings for the current session at every logon.

Printer auto-creation event log preference

This setting specifies the events that are logged during the printer auto-creation process. You can choose to log no errors or warnings, only errors, or errors and warnings.

By default, errors and warnings are logged.

An example of a warning is an event in which a printer's native driver could not be installed and the Universal print driver is installed instead. To use the Universal print driver in this scenario, configure the Universal print driver usage setting to Use universal printing only or Use universal printing only if requested driver is unavailable.

Session printers

This setting specifies the network printers to be auto-created in a session.

By default, no printers are specified.

To add printers, type the UNC path of the printer you want to auto-create. After adding the printer, you can apply customized settings for the current session at every logon.

Wait for printers to be created (desktop)

This setting allows or prevents a delay in connecting to a session so that desktop printers can be auto-created.

By default, a connection delay does not occur.

Client printers policy settings

The Client Printers section contains policy settings for client printers, including settings to autcreate client printers, retain printer properties, and connect to print servers.

Auto-create client printers

This setting specifies the client printers that are auto-created. This setting overrides default client printer auto-creation settings.

By default, all client printers are auto-created.

This setting takes effect only if the Client printer redirection setting is present and set to Allowed.

When adding this setting to a policy, select an option:

- Auto-create all client printers automatically creates all printers on a user device.
- Auto-create the client's default printer only automatically creates only the printer selected as the default printer on the user device.
- Auto-create local (non-network) client printers only automatically creates only printers directly connected to the user device through an LPT, COM, USB, TCP/IP, or other local port.
- Do not auto-create client printers turns off autocreation for all client printers when users log on. This causes the Remote Desktop Services (RDS) settings for autocreating client printers to override this setting in lower priority policies.

Auto-create generic universal printer

This setting enables or disables autocreation of the generic Citrix Universal Printer object for sessions where a user device compatible with Universal Printing is in use.

By default, the generic Universal Printer object is not autocreated.

The following policy settings are related:

- Universal print driver usage
- Universal driver preference

Client printer names

This setting selects the naming convention for auto-created client printers.

By default, standard printer names are used.

Select Standard printer names to use printer names which are similar to those created by native Remote Desktop Services, such as “HPLaserJet 4 from clientname in session 3.”

Select Legacy printer names to use old-style client printer names and preserve backward compatibility for users or groups using MetaFrame Presentation Server 3.0 or earlier. An example of a legacy printer name is “Client/clientname#/HPLaserJet 4.” This option is less secure.

Note: This option is provided only for backwards compatibility with legacy versions of XenApp and XenDesktop.

Direct connections to print servers

This setting enables or disables direct connections from the virtual desktop or server hosting applications to a print server for client printers hosted on an accessible network share.

By default, direct connections are enabled.

Enable direct connections if the network print server is not across a WAN from the virtual desktop or server hosting applications. Direct communication results in faster printing if the network print server and the virtual desktop or server hosting applications are on the same LAN.

Disable direct connections if the network is across a WAN or has substantial latency or limited bandwidth. Print jobs are routed through the user device where they are redirected to the network print server. Data sent to the user device is compressed, so less bandwidth is consumed as the data travels across the WAN.

If two network printers have the same name, the printer on the same network as the user device is used.

Printer driver mapping and compatibility

This setting specifies the driver substitution rules for auto-created client printers.

By default, no rules are specified.

When you define driver substitution rules, you can allow or prevent printers to be created with the specified driver. Additionally, you can allow created printers to use only universal print drivers. Driver substitution overrides or maps printer driver names the user device provides, substituting an equivalent driver on the server. This gives server applications access to client printers that have the same drivers as the server, but different driver names.

You can add a driver mapping, edit an existing mapping, override custom settings for a mapping, remove a mapping, or change the order of driver entries in the list. When adding a mapping, enter the client printer driver name and then select the server driver you want to substitute.

Printer properties retention

This setting specifies whether or not to store printer properties and where to store them.

By default, the system determines if printer properties are stored on the user device, if available, or in the user profile.

When adding this setting to a policy, select an option:

- Saved on the client device only is for user devices that have a mandatory or roaming profile that is not saved. Choose this option only if all the servers in your farm are running XenApp 5 and above and your users are using Citrix online plug-in versions 9 through 12.x, or Citrix Receiver 3.x.
- Retained in user profile only is for user devices constrained by bandwidth (this option reduces network traffic) and logon speed or for users with legacy plug-ins. This option stores printer properties in the user profile on the server and prevents any properties exchange with the user device. Use this option with MetaFrame Presentation Server 3.0 or earlier and MetaFrame Presentation Server Client 8.x or earlier. Note that this is applicable only if a Remote Desktop Services (RDS) roaming profile is used.
- Held in profile only if not saved on client allows the system to determine where printer properties are stored. Printer properties are stored either on the user device, if available, or in the user profile. Although this option is the most flexible, it can also slow logon time and use extra bandwidth for system-checking.
- Do not retain printer properties prevents storing printer properties.

Retained and restored client printers

This setting enables or disables the retention and re-creation of printers on the user device. By default, client printers are auto-retained and auto-restored.

Retained printers are user-created printers that are created again, or remembered, at the start of the next session. When XenApp recreates a retained printer, it considers all policy settings except the Auto-create client printers setting.

Restored printers are printers fully customized by an administrator, with a saved state that is permanently attached to a client port.

Drivers policy settings

The Drivers section contains policy settings related to printer drivers.

Automatic installation of in-box printer drivers

This setting enables or disables the automatic installation of printer drivers from the Windows in-box driver set or from driver packages staged on the host using pnputil.exe /a.

By default, these drivers are installed as needed.

Universal driver preference

This setting specifies the order in which universal printer drivers are used, beginning with the first entry in the list.

By default, the preference order is:

- EMF
- XPS
- PCL5c
- PCL4
- PS

You can add, edit, or remove drivers, and change the order of drivers in the list.

Universal print driver usage

This setting specifies when to use universal printing.

By default, universal printing is used only if the requested driver is unavailable.

Universal printing employs generic printer drivers instead of standard model-specific drivers, potentially simplifying the burden of driver management on host computers. The availability of universal print drivers depends on the capabilities of the user device, host, and print server software. In certain configurations, universal printing might not be available.

When adding this setting to a policy, select an option:

- Use only printer model specific drivers specifies that the client printer uses only the standard model-specific drivers that are auto-created at logon. If the requested driver

is unavailable, the client printer cannot be auto-created.

- Use universal printing only specifies that no standard model-specific drivers are used. Only universal print drivers are used to create printers.
- Use universal printing only if requested driver is unavailable uses standard model-specific drivers for printer creation if they are available. If the driver is not available on the server, the client printer is created automatically with the appropriate universal driver.
- Use printer model specific drivers only if universal printing is unavailable uses the universal print driver if it is available. If the driver is not available on the server, the client printer is created automatically with the appropriate model-specific printer driver.

Universal Print Server policy settings

The Universal Print Server section contains policy settings for handling the Universal Print Server.

Universal Print Server enable

This setting enables or disables the Universal Print Server feature on the virtual desktop or the server hosting applications. Apply this policy setting to Organizational Units (OUs) containing the virtual desktop or server hosting applications.

By default, the Universal Print Server is disabled.

When adding this setting to a policy, select one of the following options:

- **Enabled with fallback to Windows native remote printing.** Network printer connections are serviced by the Universal Print Server, if possible. If the Universal Print Server is not available, the Windows Print Provider is used. The Windows Print Provider continues to handle all printers previously created with the Windows Print Provider.
- **Enabled with no fallback to Windows native remote printing.** Network printer connections are serviced by the Universal Print Server exclusively. If the Universal Print Server is unavailable, the network printer connection fails. This setting effectively disables network printing through the Windows Print Provider. Printers previously created with the Windows Print Provider are not created while a policy containing this setting is active.
- **Disabled.** The Universal Print Server feature is disabled. No attempt is made to connect with the Universal Print Server when connecting to a network printer with a UNC name. Connections to remote printers continue to use the Windows native remote printing facility.

Universal Print Server print data stream (CGP) port

This setting specifies the TCP port number used by the Universal Print Server print data stream Common Gateway Protocol (CGP) listener. Apply this policy setting only to OUs containing the print server.

By default, the port number is set to 7229.

Valid port numbers must be in the range of 1 to 65535.

Universal Print Server print stream input bandwidth limit (kpbs)

This setting specifies the upper boundary (in kilobits per second) for the transfer rate of print data delivered from each print job to the Universal Print Server using CGP. Apply this policy setting to OUs containing the virtual desktop or server hosting applications.

By default, the value is 0, which specifies no upper boundary.

Universal Print Server web service (HTTP/SOAP) port

This setting specifies the TCP port number used by the Universal Print Server Web service listener for incoming HTTP/SOAP requests. Ensure that the value specified for this setting is identical for both the OU containing the print server and the OU containing the virtual desktop or server hosting applications.

By default, the port number is set to 8080.

Valid port numbers must be in the range of 0 to 65535.

Universal printing policy settings

The Universal Printing section contains policy settings for managing universal printing.

Universal printing EMF processing mode

This setting controls the method of processing the EMF spool file on the Windows user device.

By default, EMF records are spooled directly to the printer.

When adding this setting to a policy, select an option:

- Reprocess EMFs for printer forces the EMF spool file to be reprocessed and sent through the GDI subsystem on the user device. You can use this setting for drivers that require EMF reprocessing but that might not be selected automatically in a session.
- Spool directly to printer, when used with the Citrix Universal print driver, ensures the EMF records are spooled and delivered to the user device for processing. Typically, these EMF spool files are injected directly to the client's spool queue. For printers and drivers that are compatible with the EMF format, this is the fastest printing method.

Universal printing image compression limit

This setting specifies the maximum quality and the minimum compression level available for images printed with the Citrix Universal print driver.

By default, the image compression limit is set to Best quality (lossless compression).

If No Compression is selected, compression is disabled for EMF printing only.

When adding this setting to a policy, select an option:

- No compression
- Best quality (lossless compression)
- High quality
- Standard quality
- Reduced quality (maximum compression)

When adding this setting to a policy that includes the Universal printing optimization defaults setting, be aware of the following:

- If the compression level in the Universal printing image compression limit setting is lower than the level defined in the Universal printing optimization defaults setting,

images are compressed at the level defined in the Universal printing image compression limits setting.

- If compression is disabled, the Desired image quality and Enable heavyweight compression options of the Universal printing optimization defaults setting have no effect in the policy.

Universal printing optimization defaults

This setting specifies the default values for printing optimization when the universal print driver is created for a session.

- Desired image quality specifies the default image compression limit applied to universal printing. By default, Standard Quality is enabled, meaning that users can only print images using standard or reduced quality compression.
- Enable heavyweight compression enables or disables reducing bandwidth beyond the compression level set by Desired image quality, without losing image quality. By default, heavyweight compression is disabled.
- Image and Font Caching settings specify whether or not to cache images and fonts that appear multiple times in the print stream, ensuring each unique image or font is sent to the printer only once. By default, embedded images and fonts are cached. Note that these settings apply only if the user device supports this behavior.
- Allow non-administrators to modify these settings specifies whether or not users can change the default print optimization settings within a session. By default, users are not allowed to change the default print optimization settings.

Note: All of these options are supported for EMF printing. For XPS printing, only the Desired image quality option is supported.

When adding this setting to a policy that includes the Universal printing image compression limit setting, be aware of the following:

- If the compression level in the Universal printing image compression limit setting is lower than the level defined in the Universal printing optimization defaults setting, images are compressed at the level defined in the Universal printing image compression limits setting.
- If compression is disabled, the Desired image quality and Enable heavyweight compression options of the Universal printing optimization defaults setting have no effect in the policy.

Universal printing preview preference

This setting specifies whether or not to use the print preview function for auto-created or generic universal printers.

By default, print preview is not used for auto-created or generic universal printers.

When adding this setting to a policy, select an option:

- Do not use print preview for auto-created or generic universal printers
- Use print preview for auto-created printers only
- Use print preview for generic universal printers only
- Use print preview for both auto-created and generic universal printers

Universal printing print quality limit

This setting specifies the maximum dots per inch (dpi) available for generating printed output in a session.

By default, No Limit is enabled, meaning users can select the maximum print quality allowed by the printer to which they connect.

If this setting is configured, it limits the maximum print quality available to users in terms of output resolution. Both the print quality itself and the print quality capabilities of the printer to which the user connects are restricted to the configured setting. For example, if configured to Medium Resolution (600 DPI), users are restricted to printing output with a maximum quality of 600 DPI and the Print Quality setting on the Advanced tab of the Universal Printer dialog box shows resolution settings only up to and including Medium Quality (600 DPI).

When adding this setting to a policy, select an option:

- Draft (150 DPI)
- Low Resolution (300 DPI)
- Medium Resolution (600 DPI)
- High Resolution (1200 DPI)
- No Limit

Security policy settings

The Security section contains the policy setting for configuring session encryption.

SecureICA minimum encryption level

This setting specifies the minimum level at which to encrypt session data sent between the server and a user device.

When adding this setting to a policy, select an option:

- Basic encrypts the client connection using a non-RC5 algorithm. It protects the data stream from being read directly, but it can be decrypted. By default, the server uses Basic encryption for client-server traffic.
- RC5 (128 bit) logon only encrypts the logon data with RC5 128-bit encryption and the client connection using Basic encryption.
- RC5 (40 bit) encrypts the client connection with RC5 40-bit encryption.
- RC5 (56 bit) encrypts the client connection with RC5 56-bit encryption.
- RC5 (128 bit) encrypts the client connection with RC5 128-bit encryption.

Important: The Virtual Delivery Agent 7.x supports only RC5 (128 bit) encryption. Other settings are provided only for backwards compatibility with legacy versions of XenApp and XenDesktop.

The settings you specify for client-server encryption can interact with any other encryption settings in your environment and your Windows operating system. If a higher priority encryption level is set on either a server or user device, settings you specify for published resources can be overridden.

You can raise encryption levels to further secure communications and message integrity for certain users. If a policy requires a higher encryption level, Receivers using a lower encryption level are denied connection.

SecureICA does not perform authentication or check data integrity. To provide end-to-end encryption for your site, use SecureICA with SSL/TLS encryption.

SecureICA does not use FIPS-compliant algorithms. If this is an issue, configure the server and Receivers to avoid using SecureICA.

Server limits policy settings

The Server Limits section contains the policy setting for controlling idle connections.

Server idle timer interval

This setting determines, in milliseconds, how long an uninterrupted user session is maintained if there is no input from the user.

By default, idle connections are not disconnected (server idle timer interval = 0).

Session limits policy settings

The Session Limits section contains policy settings that control how long sessions remain connected before they are forced to log off.

Disconnected session timer

This setting enables or disables a timer that specifies how long a disconnected, locked desktop can remain locked before the session is logged off.

By default, disconnected sessions are not logged off.

Disconnected session timer interval

This setting specifies how many minutes a disconnected, locked desktop can remain locked before the session is logged off.

By default, the time period is 1440 minutes (24 hours).

Session connection timer

This setting enables or disables a timer that specifies the maximum duration of an uninterrupted connection between a user device and a desktop.

By default, this timer is disabled.

Session connection timer interval

This setting specifies the maximum number of minutes for an uninterrupted connection between a user device and a desktop.

By default, the maximum duration is 1440 minutes (24 hours).

Session idle timer

This setting enables or disables a timer that specifies how long an uninterrupted user device connection to a desktop will be maintained if there is no input from the user.

By default, this timer is enabled.

Session idle timer interval

This setting specifies how many minutes an uninterrupted user device connection to a desktop will be maintained if there is no input from the user.

By default, idle connections are maintained for 1440 minutes (24 hours).

Session reliability policy settings

The Session Reliability section contains policy settings for managing session reliability connections.

Session reliability connections

This setting allows or prevents sessions to remain open during a loss of network connectivity.

By default, session reliability is allowed.

Session reliability keeps sessions active and on the user's screen when network connectivity is interrupted. Users continue to see the application they are using until network connectivity resumes.

With session reliability, the session remains active on the server. To indicate that connectivity is lost, the user's display freezes and the cursor changes to a spinning hourglass until connectivity is restored. The user continues to access the display during the interruption and can resume interacting with the application when the network connection is restored. Session reliability reconnects users without reauthentication prompts. If you do not want users to be able to reconnect to interrupted sessions without having to reauthenticate, configure the Auto client reconnect authentication setting to require authentication. Users are then prompted to reauthenticate when reconnecting to interrupted sessions.

If you use both session reliability and auto client reconnect, the two features work in sequence. Session reliability closes (or disconnects) the user session after the amount of time specified in the Session reliability timeout setting. After that, the auto client reconnect settings take effect, attempting to reconnect the user to the disconnected session.

Session reliability port number

This setting specifies the TCP port number for incoming session reliability connections.

By default, the port number is set to 2598.

Session reliability timeout

This setting specifies the length of time, in seconds, the session reliability proxy waits for a user to reconnect before allowing the session to be disconnected.

By default, this is set to 180 seconds, or three minutes.

Although you can extend the amount of time a session is kept open, this feature is designed to be convenient to the user and it does not prompt the user for reauthentication. As you extend the amount of time a session is kept open, chances increase that a user may get distracted and walk away from the user device, potentially leaving the session accessible to unauthorized users.

Time zone control policy settings

The Time Zone Control section contains policy settings related to using local time in sessions.

Estimate local time for legacy clients

This setting enables or disables estimating the local time zone of user devices that send inaccurate time zone information to the server.

By default, the server estimates the local time zone when necessary.

Use local time of client

This setting determines the time zone setting of the user session. This can be either the time zone of the user session or the time zone of the user device.

By default, the time zone of the user session is used.

For this setting to take effect, enable the Allow time zone redirection setting in the Group Policy Editor (User Configuration > Administrative Templates > Windows Components > Remote Desktop Services > Remote Desktop Session Host > Device and Resource Redirection).

TWAIN devices policy settings

The TWAIN devices section contains policy settings related to mapping client TWAIN devices, such as digital cameras or scanners, and optimizing image transfers from server to client.

Client TWAIN device redirection

This setting allows or prevents users from accessing TWAIN devices on the user device from image processing applications hosted on servers. By default, TWAIN device redirection is allowed.

The following policy settings are related:

- TWAIN compression level
- TWAIN device redirection bandwidth limit
- TWAIN device redirection bandwidth limit percent

TWAIN compression level

This setting specifies the level of compression of image transfers from client to server. Use Low for best image quality, Medium for good image quality, or High for low image quality. By default, medium compression is applied.

USB devices policy settings

The USB devices section contains policy settings for managing file redirection for USB devices.

Client USB device redirection

This setting allows or prevents redirection of USB devices to and from the user device.

By default, USB devices are not redirected.

Client USB device redirection rules

This setting specifies redirection rules for USB devices.

By default, no rules are specified.

When a user plugs in a USB device, the host device checks it against each policy rule in turn until a match is found. The first match for any device is considered definitive. If the first match is an Allow rule, the device is remoted to the virtual desktop. If the first match is a Deny rule, the device is available only to the local desktop. If no match is found, default rules are used.

Policy rules take the format {Allow:|Deny:} followed by a set of tag= value expressions separated by whitespace. The following tags are supported:

Tag Name	Description
VID	Vendor ID from the device descriptor
PID	Product ID from the device descriptor
REL	Release ID from the device descriptor
Class	Class from either the device descriptor or an interface descriptor
SubClass	Subclass from either the device descriptor or an interface descriptor
Prot	Protocol from either the device descriptor or an interface descriptor

When creating new policy rules, remember:

- Rules are case-insensitive.
- Rules may have an optional comment at the end, introduced by #.
- Blank and pure comment lines are ignored.
- Tags must use the matching operator = (for example, VID=1230_).

- Each rule must start on a new line or form part of a semicolon-separated list.
- Refer to the USB class codes available from the USB Implementers Forum, Inc. web site.

Examples of administrator-defined USB policy rules:

- Allow: VID=1230 PID=0007 # ANOther Industries, ANOther Flash Drive
- Deny: Class=08 subclass=05 # Mass Storage
- To create a rule that denies all USB devices, use “DENY:” with no other tags.

Client USB plug and play device redirection

This setting allows or prevents plug-and-play devices such as cameras or point-of-sale (POS) devices to be used in a client session.

By default, plug-and-play device redirection is allowed. When set to Allowed, all plug-and-play devices for a specific user or group are redirected. When set to Prohibited, no devices are redirected.

Visual display policy settings

The Visual Display section contains policy settings for controlling the quality of images sent from virtual desktops to the user device.

Target frame rate

This setting specifies the maximum number of frames per second sent from the virtual desktop to the user device.

By default, the maximum is 30 frames per second.

Setting a high number of frames per second (for example, 30) improves the user experience, but requires more bandwidth. Decreasing the number of frames per second (for example, 10) maximizes server scalability at the expense of user experience. For user devices with slower CPUs, specify a lower value to improve the user experience.

Visual quality

This setting specifies the desired visual quality for images displayed on the user device.

By default, this is set to Medium.

To specify the quality of images, choose one of the following options:

- Low
- Medium - Offers the best performance and bandwidth efficiency in most use cases
- High - Recommended if you require visually lossless image quality
- Build to lossless - Sends lossy images to the user device during periods of high network activity and lossless images after network activity reduces; this setting improves performance over bandwidth-constrained network connections
- Always lossless - In cases where preserving image data is vital (for example, when displaying X-ray images where no loss of quality is acceptable), select Always lossless to ensure lossy data is never sent to the user device.

Note: If the Legacy graphics mode setting is enabled, the Visual quality setting has no effect in the policy.

Moving images policy settings

The Moving Images section contains settings that enable you to remove or alter compression for dynamic images.

Minimum image quality

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting specifies the minimum acceptable image quality for Adaptive Display. The less compression used, the higher the quality of images displayed. Choose from Ultra High, Very High, High, Normal, or Low compression.

By default, this is set to Normal.

Moving image compression

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting specifies whether or not Adaptive Display is enabled. Adaptive Display automatically adjusts the image quality of videos and transitional slides in slide shows based on available bandwidth. With Adaptive Display enabled, users should see smooth-running presentations with no reduction in quality.

By default, Adaptive Display is enabled.

Progressive compression level

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting provides a less detailed but faster initial display of images.

By default, no progressive compression is applied.

The more detailed image, defined by the normal lossy compression setting, appears when it becomes available. Use Very High or Ultra High compression for improved viewing of bandwidth-intensive graphics such as photographs.

For progressive compression to be effective, its compression level must be higher than the Lossy compression level setting.

Note: The increased level of compression associated with progressive compression also enhances the interactivity of dynamic images over client connections. The quality of a dynamic image, such as a rotating three-dimensional model, is temporarily decreased

until the image stops moving, at which time the normal lossy compression setting is applied.

The following policy settings are related:

- Progressive compression threshold value
- Progressive heavyweight compression

Progressive compression threshold value

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting represents the maximum bandwidth in kilobits per second for a connection to which progressive compression is applied. This is applied only to client connections under this bandwidth.

By default, the threshold value is 2147483647 kilobits per second.

The following policy settings are related:

- Progressive compression threshold value
- Progressive heavyweight compression

Target minimum frame rate

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting specifies the minimum frame rate per second the system attempts to maintain, for dynamic images, under low bandwidth conditions.

By default, this is set to 10fps.

Still images policy settings

The Still Images section contains settings that enable you to remove or alter compression for static images.

Extra color compression

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting enables or disables the use of extra color compression on images delivered over client connections that are limited in bandwidth, improving responsiveness by reducing the quality of displayed images.

By default, extra color compression is disabled.

When enabled, extra color compression is applied only when the client connection bandwidth is below the Extra color compression threshold value. When the client connection bandwidth is above the threshold value or Disabled is selected, extra color compression is not applied.

Extra color compression threshold

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting represents the maximum bandwidth in kilobits per second for a connection below which extra color compression is applied. If the client connection bandwidth drops below the set value, extra color compression, if enabled, is applied.

By default, the threshold value is 8192 kilobits per second.

Heavyweight compression

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting enables or disables reducing bandwidth beyond progressive compression without losing image quality by using a more advanced, but more CPU-intensive, graphical algorithm.

By default, heavyweight compression is disabled.

If enabled, heavyweight compression applies to all lossy compression settings. It is supported on Citrix Receiver but has no effect on other plug-ins.

The following policy settings are related:

- Progressive compression level
- Progressive compression threshold value

Lossy compression level

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting controls the degree of lossy compression used on images delivered over client connections that are limited in bandwidth. In such cases, displaying images without compression can be slow.

By default, medium compression is selected.

For improved responsiveness with bandwidth-intensive images, use high compression. Where preserving image data is vital; for example, when displaying X-ray images where no loss of quality is acceptable, you may not want to use lossy compression.

Related policy setting: Lossy compression threshold value

Lossy compression threshold value

Note: For the Virtual Delivery Agent 7.x, this policy setting applies only when the Legacy graphics mode policy setting is enabled.

This setting represents the maximum bandwidth in kilobits per second for a connection to which lossy compression is applied.

By default, the threshold value is 2147483647 kilobits per second.

Adding the Lossy compression level setting to a policy and including no specified threshold can improve the display speed of high-detail bitmaps, such as photographs, over a LAN.

Related policy setting: Lossy compression level

WebSockets policy settings

The WebSockets section contains policy settings for accessing virtual desktops and hosted applications with Receiver for HTML5. The WebSockets feature increases security and reduces overhead by conducting two-way communication between browser-based applications and servers without opening multiple HTTP connections.

WebSockets connections

This setting allows or prohibits WebSockets connections.

By default, WebSocket connections are prohibited.

WebSockets port number

This setting identifies the port for incoming WebSocket connections.

By default, the value is 8008.

WebSockets trusted origin server list

This setting provides a comma-separated list of trusted origin servers, usually Receiver for Web, expressed as URLs. Only WebSockets connections originating from one of these addresses is accepted by the server.

By default, the wildcard * is used to trust all Receiver for Web URLs.

If you choose to type an address in the list, use this syntax:

<protocol>://<Fully qualified domain name of host>:[port]

The protocol should be HTTP or HTTPS. If the port is not specified, port 80 is used for HTTP and port 443 is used for HTTPS.

The wildcard * can be used within the URL, except as part of an IP address (10.105.*.*).

Load management policy settings

The Load Management section contains policy settings for enabling and configuring load management between servers delivering Windows Server OS machines.

Concurrent logon tolerance

This setting specifies the maximum number of concurrent logons a server can accept.

By default, this is set to 2.

CPU usage

This setting specifies the level of CPU usage, as a percentage, at which the server reports a full load. When enabled, the default value at which the server reports a full load is 90%.

By default, this setting is disabled and CPU usage is excluded from load calculations.

CPU usage excluded process priority

This setting specifies the priority level at which a process' CPU usage is excluded from the CPU Usage load index.

By default, this is set to Below Normal or Low.

Disk usage

This setting specifies the disk queue length at which the server reports a 75% full load. When enabled, the default value for disk queue length is 8.

By default, this setting is disabled and disk usage is excluded from load calculations.

Maximum number of sessions

This setting specifies the maximum number of sessions a server can host. When enabled, the default setting for maximum number of sessions a server can host is 250.

By default, this setting is enabled.

Memory usage

This setting specifies the level of memory usage, as a percentage, at which the server reports a full load. When enabled, the default value at which the server reports a full load is 90%.

By default, this setting is disabled and memory usage is excluded from load calculations.

Memory usage base load

This setting specifies an approximation of the base operating system's memory usage and defines, in MB, the memory usage below which a server is considered to have zero load.

By default, this is set to 768 MB.

Profile management policy settings

The Profile Management section contains policy settings for enabling profile management and specifying which groups to include in and exclude from profile management processing.

Other information (such as the names of the equivalent .ini file settings and which version of profile management is required for a policy setting) is available in [Profile Management Policies](#).

Advanced policy settings

The Advanced settings section contains policy settings relating to the advanced configuration of Profile management.

Disable automatic configuration

This setting enables profile management to examine your environment, for example, to check for the presence of Personal vDisks and configure Group Policy accordingly. Only Profile management policies in the Not Configured state are adjusted, so any customizations made previously are preserved. This feature speeds up deployment and simplifies optimization. No configuration of the feature is necessary, but you can disable automatic configuration when upgrading (to retain settings from earlier versions) or when troubleshooting. Automatic configuration does not work in XenApp or other environments.

By default, automatic configuration is allowed.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, automatic configuration is turned on so Profile management settings might change if your environment changes.

Log off user if a problem is encountered

This setting enables Profile management to log a user off if a problem is encountered; for example, if the user store is unavailable. When enabled, an error message is displayed to the user before they are logged off. When disabled, users are given a temporary profile.

By default, this setting is disabled and users are given a temporary profile if a problem is encountered.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, a temporary profile is provided.

Number of retries when accessing locked files

This setting specifies the number of attempts Profile management makes to access locked files.

By default, this is set to five retries.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, the default value is used.

Process Internet cookie files on logoff

This setting enables Profile management to process index.dat on logoff to remove Internet cookies left in the file system after sustained browsing that can lead to profile bloat. Enabling this setting increases logoff times, so only enable it if you experience this issue.

By default, this setting is disabled and Profile management does not process index.dat on logoff.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, no processing of Index.dat takes place.

Basic policy settings

The Basic settings section contains policy settings relating to the basic configuration of Profile management.

Active write back

This setting enables modified files and folders (but not registry settings) to be synchronized to the user store during a session, before logoff.

By default, synchronization to the user store during a session is disabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, it is enabled.

Enable Profile management

This setting enables Profile management to process logons and logoffs.

By default, this setting is disabled to facilitate deployment.

Important: Citrix recommends enabling Profile management only after carrying out all other setup tasks and testing how Citrix user profiles perform in your environment.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, Profile management does not process Windows user profiles in any way.

Excluded groups

This setting specifies which computer local groups and domain groups (local, global, and universal) are excluded from Profile management processing.

When enabled, Profile management does not process members of the specified user groups.

By default, this setting is disabled and members of all user groups are processed.

Specify domain groups in the form <DOMAIN NAME>\<GROUP NAME>.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, members of all user groups are processed.

Offline profile support

This setting enables offline profile support, allowing profiles to synchronize with the user store at the earliest opportunity after a network disconnection.

By default, support for offline profiles is disabled.

This setting is applicable to laptop or mobile users who roam. When a network disconnection occurs, profiles remain intact on the laptop or device even after restarting or hibernating. As mobile users work, their profiles are updated locally and are synchronized with the user store when the network connection is re-established.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, support for offline profiles is disabled.

Path to user store

This setting specifies the path to the directory (user store) in which user settings, such as registry settings and synchronized files, are saved.

By default, the Windows directory on the home drive is used.

If this setting is disabled, user settings are saved in the Windows subdirectory of the home directory.

The path can be:

- **A relative path.** This must be relative to the home directory, typically configured as the #homeDirectory# attribute for a user in Active Directory.
- **An absolute UNC path.** This typically specifies a server share or a DFS namespace.
- **Disabled or unconfigured.** In this case, a value of #homeDirectory#\Windows is assumed.

Use the following types of variables when configuring this policy setting:

- System environment variables enclosed in percent signs (for example, %ProfVer%). Note that system environment variables generally require additional setup.
- Attributes of the Active Directory user object enclosed in hashes (for example, #sAMAccountName#).
- Profile management variables. For more information, see the Profile management documentation.

You can also use the %username% and %userdomain% user environment variables and create custom attributes to fully define organizational variables such as location or users. Attributes are case-sensitive.

Examples:

- `\\server\share\#sAMAccountName#` stores the user settings to the UNC path `\\server\share\JohnSmith` (if `#sAMAccountName#` resolves to `JohnSmith` for the current user)
- `\\server\profiles$\%USERNAME%.%USERDOMAIN%\!CTX_PROFILEVER!!CTX_OSBITNESS!` might expand to `\\server\profiles$\JohnSmith.DOMAINCONTROLLER1\v2x64`

Important: Whichever attributes or variables you use, check that this setting expands to the folder one level higher than the folder containing `NTUSER.DAT`. For example, if this file is contained in `\\server\profiles$\JohnSmith.Finance\v2x64\UPM_Profile`, set the path to the user store as `\\server\profiles$\JohnSmith.Finance\v2x64`, not the `\UPM_Profile` subfolder.

If this setting is not configured here, the value from the `.ini` file is used.

If this setting is not configured here or in the `.ini` file, the Windows directory on the home drive is used.

Process logons of local administrators

This setting specifies whether or not logons of members of the `BUILTIN\Administrators` group are processed. This allows domain users with local administrator rights, typically users with assigned virtual desktops, to bypass processing, log on, and troubleshoot a desktop experiencing problems with Profile management.

If this setting is disabled or not configured on server operating systems, Profile management assumes that logons by domain users, but not local administrators, must be processed. On desktop operating systems, local administrator logons are processed.

By default this setting is disabled, and local administrator logons are not processed.

If this setting is not configured here, the value from the `.ini` file is used.

If this setting is not configured here or in the `.ini` file, local administrator logons are not processed.

Processed groups

This setting specifies which computer local groups and domain groups (local, global, and universal) are included in Profile management processing.

When enabled, Profile management processes only members of the specified user groups.

By default, this setting is disabled and members of all user groups are processed.

Specify domain groups in the form `<DOMAIN NAME>\<GROUP NAME>`.

If this setting is not configured here, the value from the `.ini` file is used.

If this setting is not configured here or in the `.ini` file, members of all user groups are processed.

Cross-platform policy settings

The Cross-Platform section contains policy settings relating to configuring the Profile management cross-platform settings feature.

Cross-platform settings user groups

This setting specifies the Windows user groups whose profiles are processed when the cross-platform settings feature is enabled.

By default, this setting is disabled and all user groups specified in the Processed Group policy setting are processed.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, all user groups are processed.

Enable cross-platform settings

This setting enables or disables the cross-platforms settings feature, that allows you to migrate users' profiles and roam them when a user connects to the same application running on multiple operating systems.

By default the cross-platform settings feature is disabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, no cross-platform settings are applied.

Path to cross-platform definitions

This setting specifies the network location, as a UNC path, of the definition files copied from the download package.

Note: Users must have read access, and administrators write access, to this location and it must be either a Server Message Block (SMB) or Common Internet File System (CIFS) file share.

By default, no path is specified.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, no cross-platform settings are applied.

Path to cross-platform settings store

This setting specifies the path to the cross-settings store, the folder in which users' cross-platform settings are saved. This path can be either a UNC path or a path relative to the home directory.

Note: Users must have write access to the cross-settings store.

By default, this setting is disabled and the path `Windows\PM_CP` is used.

If this setting is not configured here, the value from the `.ini` file is used.

If this setting is not configured here or in the `.ini` file, the default value is used.

Source for creating cross-platform settings

This setting specifies a platform as the *base platform* if this setting is enabled for that platform's OU. Data from the base platform's profiles is migrated to the cross-platform settings store.

Each platform's own set of profiles are stored in a separate OU. This means you must decide which platform's profile data to use to seed the cross-platform settings store. This is referred to as the base platform.

When enabled, Profile management migrates the data from the single-platform profile to the store if the cross-platform settings store contains a definition file with no data, or if the cached data in a single-platform profile is newer than the definition's data in the store.

Important: If this setting is enabled in multiple OUs, or multiple user or machine objects, the platform that the first user logs on to becomes the base profile.

By default, this setting is disabled and Profile management does not migrate the data from the single-platform profile to the store.

File system policy settings

The File System section contains policy settings for configuring which files and directories in a users profile are synchronized between the system where the profile is installed and the user store.

Exclusions policy settings

The Exclusions section contains policy settings for configuring which files and directories in a users profile are excluded from the synchronization process.

Exclusion list - directories

This setting specifies a list of folders in the user profile that are ignored during synchronization.

Specify folder names as paths relative to the user profile (%USERPROFILE%).

By default, this setting is disabled and all folders in the user profile are synchronized.

Example: Desktop ignores the Desktop folder in the user profile

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, all folders in the user profile are synchronized.

Exclusion list - files

This setting specifies a list of files in the user profile that are ignored during synchronization.

By default, this setting is disabled and all files in the user profile are synchronized.

Specify file names as paths relative to the user profile (%USERPROFILE%). Note that wildcards are allowed and are applied recursively.

Example: Desktop\Desktop.ini ignores the file Desktop.ini in the Desktop folder

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, all files in the user profile are synchronized.

Synchronization policy settings

The Synchronization section contains policy settings for specifying which files and folders in a users profile are synchronized between the system on which the profile is installed and the user store.

Directories to synchronize

This setting specifies any files you want Profile management to include in the synchronization process that are located in excluded folders. By default, Profile management synchronizes everything in the user profile. It is not necessary to include subfolders of the user profile by adding them to this list. For more information, see [Include and exclude items](#).

Paths on this list must be relative to the user profile.

Example: Desktop\exclude\include ensures that the subfolder called include is synchronized even if the folder called Desktop\exclude is not

By default, this setting is disabled and no folders are specified.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, only non-excluded folders in the user profile are synchronized.

Files to synchronize

This setting specifies any files you want Profile management to include in the synchronization process that are located in excluded folders. By default, Profile management synchronizes everything in the user profile. It is not necessary to include files in the user profile by adding them to this list. For more information, see [Include and exclude items](#).

Paths on this list must be relative to the user profile. Relative paths are interpreted as being relative to the user profile. Wildcards can be used but are allowed only for file names. Wildcards cannot be nested and are applied recursively.

Examples:

- AppData\Local\Microsoft\Office\Access.qat specifies a file below a folder that is excluded in the default configuration
- AppData\Local\MyApp*.cfg specifies all files with the extension .cfg in the profile folder AppData\Local\MyApp and its subfolders

By default, this setting is disabled and no files are specified.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, only non-excluded files in the user profile are synchronized.

Folders to mirror

This setting specifies which folders relative to a user's profile root folder to mirror. Configuring this policy setting can help solve issues involving any transactional folder (also known as a referential folder), that is a folder containing interdependent files, where one file references others.

Mirroring folders allows Profile management to process a transactional folder and its contents as a single entity, avoiding profile bloat. Be aware that, in these situations the "last write wins" so files in mirrored folders that have been modified in more than one session will be overwritten by the last update, resulting in loss of profile changes.

For example, you can mirror the Internet Explorer cookies folder so that Index.dat is synchronized with the cookies that it indexes.

If a user has two Internet Explorer sessions, each on a different server, and they visit different sites in each session, cookies from each site are added to the appropriate server. When the user logs off from the first session (or in the middle of a session, if the active write back feature is configured), the cookies from the second session should replace those from the first session. However, instead they are merged, and the references to the cookies in Index.dat become out of date. Further browsing in new sessions results in repeated merging and a bloated cookie folder.

Mirroring the cookie folder solves the issue by overwriting the cookies with those from the last session each time the user logs off so Index.dat stays up to date.

By default, this setting is disabled and no folders are mirrored.

If this setting is not configured here, the value from the .ini file is used.

If this policy is not configured here or in the .ini file, no folders are mirrored.

Folder redirection policy settings

The Folder Redirection section contains policy settings that specify whether to redirect folders that commonly appear in profiles to a shared network location.

Grant administrator access

This setting enables an administrator to access the contents of a user's redirected folders.

By default, this setting is disabled and users are granted exclusive access to the contents of their redirected folders.

Include domain name

This setting enables the inclusion of the %userdomain% environment variable as part of the UNC path specified for redirected folders.

By default, this setting is disabled and the %userdomain% environment variable is not included as part of the UNC path specified for redirected folders.

AppData(Roaming) policy settings

The AppData(Roaming) section contains policy settings for specifying whether to redirect the contents the AppData(Roaming) folder to a shared network location.

AppData(Roaming) path

This setting specifies the network location to which the contents of the AppData(Roaming) folder are redirected.

By default, this setting is disabled and no location is specified.

If this setting is not configured here, Profile management does not redirect the specified folder.

Redirection settings for AppData(Roaming)

This setting specifies how to redirect the contents of the AppData(Roaming) folder.

By default, contents are redirected to a UNC path.

If this setting is not configured here, Profile management does not redirect the specified folder.

Contacts policy settings

The Contacts section contains policy settings for specifying whether to redirect the contents the Contacts folder to a shared network location.

Contacts path

This setting specifies the network location to which the contents of the Contacts folder are redirected.

By default, this setting is disabled and no location is specified.

If this setting is not configured here, Profile management does not redirect the specified folder.

Redirection settings for Contacts

This setting specifies how to redirect the contents of the Contacts folder.

By default, contents are redirected to a UNC path.

If this setting is not configured here, Profile management does not redirect the specified folder.

Desktop policy settings

The Desktop section contains policy settings for specifying whether to redirect the contents the Desktop folder to a shared network location.

Desktop path

This setting specifies the network location to which the contents of the Desktop folder are redirected.

By default, this setting is disabled and no location is specified.

If this setting is not configured here, Profile management does not redirect the specified folder.

Redirection settings for Desktop

This setting specifies how to redirect the contents of the Desktop folder.

By default, contents are redirected to a UNC path.

If this setting is not configured here, Profile management does not redirect the specified folder.

Documents policy settings

The Documents section contains policy settings for specifying whether to redirect the contents the Documents folder to a shared network location.

Documents path

This setting specifies the network location to which files in the Documents folder are redirected.

By default, this setting is disabled and no location is specified.

If this setting is not configured here, Profile management does not redirect the specified folder.

Redirection settings for Documents

This setting specifies how to redirect the contents of the Documents folder.

By default, contents are redirected to a UNC path.

To control how to redirect the contents of the Documents folder, choose one of the following options:

- Redirect to the following UNC path. Redirects content to the UNC path specified in the Documents path policy setting.
- Redirect to the users home directory. Redirects content to the users home directory, typically configured as the #homeDirectory# attribute for a user in Active Directory.

If this setting is not configured here, Profile management does not redirect the specified folder.

Downloads policy settings

The Downloads section contains policy settings that specify whether to redirect the contents the Downloads folder to a shared network location.

Downloads path

This setting specifies the network location to which files in the Downloads folder are redirected.

By default, this setting is disabled and no location is specified.

If this setting is not configured here, Profile management does not redirect the specified folder.

Redirection settings for Downloads

This setting specifies how to redirect the contents of the Downloads folder.

By default, contents are redirected to a UNC path.

If this setting is not configured here, Profile management does not redirect the specified folder.

Favorites policy settings

The Favorites section contains policy settings that specify whether to redirect the contents the Favorites folder to a shared network location.

Favorites path

This setting specifies the network location to which the contents of the Favorites folder are redirected.

By default, this setting is disabled and no location is specified.

If this setting is not configured here, Profile management does not redirect the specified folder.

Redirection settings for Favorites

This setting specifies how to redirect the contents of the Favorites folder.

By default, contents are redirected to a UNC path.

If this setting is not configured here, Profile management does not redirect the specified folder.

Links policy settings

The Links section contains policy settings that specify whether to redirect the contents the Links folder to a shared network location.

Links path

This setting specifies the network location to which the contents of the Links folder are redirected.

By default, this setting is disabled and no location is specified.

If this setting is not configured here, Profile management does not redirect the specified folder.

Redirection settings for Links

This setting specifies how to redirect the contents of the Links folder.

By default, contents are redirected to a UNC path.

If this setting is not configured here, Profile management does not redirect the specified folder.

Music policy settings

The Music section contains policy settings that specify whether to redirect the contents the Music folder to a shared network location.

Music path

This setting specifies the network location to which the contents of the Music folder are redirected.

By default, this setting is disabled and no location is specified.

If this setting is not configured here, Profile management does not redirect the specified folder.

Redirection settings for Music

This setting specifies how to redirect the contents of the Music folder.

By default, contents are redirected to a UNC path.

To control how to redirect the contents of the Music folder, choose one of the following options:

- Redirect to the following UNC path. Redirects content to the UNC path specified in the Music path policy setting.
- Redirect relative to Documents folder. Redirects content to a folder relative to the Documents folder.

If this setting is not configured here, Profile management does not redirect the specified folder.

Pictures policy settings

The Pictures section contains policy settings that specify whether to redirect the contents the Pictures folder to a shared network location.

Pictures path

This setting specifies the network location to which the contents of the Pictures folder are redirected.

By default, this setting is disabled and no location is specified.

If this setting is not configured here, Profile management does not redirect the specified folder.

Redirection settings for Pictures

This setting specifies how to redirect the contents of the Pictures folder.

By default, contents are redirected to a UNC path.

To control how to redirect the contents of the Pictures folder, choose one of the following options:

- Redirect to the following UNC path. Redirects content to the UNC path specified in the Pictures path policy setting.
- Redirect relative to Documents folder. Redirects content to a folder relative to the Documents folder.

If this setting is not configured here, Profile management does not redirect the specified folder.

Saved Games policy settings

The Saved Games section contains policy settings that specify whether to redirect the contents the Saved Games folder to a shared network location.

Redirection settings for Saved Games

This setting specifies how to redirect the contents of the Saved Games folder.

By default, contents are redirected to a UNC path.

If this setting is not configured here, Profile management does not redirect the specified folder.

Saved Games path

This setting specifies the network location to which the contents of the Saved Games folder are redirected.

By default, this setting is disabled and no location is specified.

If this setting is not configured here, Profile management does not redirect the specified folder.

Searches policy settings

The Searches section contains policy settings that specify whether to redirect the contents the Searches folder to a shared network location.

Redirection settings for Searches

This setting specifies how to redirect the contents of the Searches folder.

By default, contents are redirected to a UNC path.

If this setting is not configured here, Profile management does not redirect the specified folder.

Searches path

This setting specifies the network location to which the contents of the Searches folder are redirected.

By default, this setting is disabled and no location is specified.

If this setting is not configured here, Profile management does not redirect the specified folder.

Start menu policy settings

The Start Menu section contains policy settings that specify whether to redirect the contents the Start Menu folder to a shared network location.

Redirection settings for Start Menu

This setting specifies how to redirect the contents of the Start Menu folder.

By default, contents are redirected to a UNC path.

If this setting is not configured here, Profile management does not redirect the specified folder.

Start Menu path

This setting specifies the network location to which the contents of the Start Menu folder are redirected.

By default, this setting is disabled and no location is specified.

If this setting is not configured here, Profile management does not redirect the specified folder.

Video policy settings

The Video section contains policy settings that specify whether to redirect the contents the Video folder to a shared network location.

Redirection settings for Video

This setting specifies how to redirect the contents of the Video folder.

By default, contents are redirected to a UNC path.

To control how to redirect the contents of the Video folder, choose one of the following options:

- Redirect to the following UNC path. Redirects content to the UNC path specified in the Video path policy setting.
- Redirect relative to Documents folder. Redirects content to a folder relative to the Documents folder.

If this setting is not configured here, Profile management does not redirect the specified folder.

Video path

This setting specifies the network location to which the contents of the Video folder are redirected.

By default, this setting is disabled and no location is specified.

If this setting is not configured here, Profile management does not redirect the specified folder.

Log policy settings

The Log section contains policy settings that configure Profile management logging.

Active Directory actions

This setting enables or disables verbose logging of actions performed in Active Directory.

By default, this setting is disabled.

When enabling this setting, make sure the Enable logging setting is also enabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, errors and general information are logged.

Common information

This setting enables or disables verbose logging of common information.

By default, this setting is disabled.

When enabling this setting, make sure the Enable logging setting is also enabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, errors and general information are logged.

Common warnings

This setting enables or disables verbose logging of common warnings.

By default, this setting is disabled.

When enabling this setting, make sure the Enable logging setting is also enabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, errors and general information are logged.

Enable logging

This settings enables or disables Profile management logging in debug (verbose logging) mode. In debug mode, extensive status information is logged in the log files located in "%SystemRoot%\System32\Logfiles\UserProfileManager".

By default, this setting is disabled and only errors are logged.

Citrix recommends enabling this setting only if you are troubleshooting Profile management.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, only errors are logged.

File system actions

This setting enables or disables verbose logging of actions performed in the file system.

By default, this setting is disabled.

When enabling this setting, make sure the Enable logging setting is also enabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, errors and general information are logged.

File system notifications

This setting enables or disables verbose logging of file systems notifications.

By default, this setting is disabled.

When enabling this setting, make sure the Enable logging setting is also enabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, errors and general information are logged.

Logoff

This setting enables or disables verbose logging of user logoffs.

By default, this setting is disabled.

When enabling this setting, make sure the Enable logging setting is also enabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, errors and general information are logged.

Logon

This setting enables or disables verbose logging of user logons.

By default, this setting is disabled.

When enabling this setting, make sure the Enable logging setting is also enabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, errors and general information are logged.

Maximum size of the log file

This setting specifies the maximum permitted size for the Profile management log file, in bytes.

By default, this is set to 1048576 bytes (1MB).

Citrix recommends increasing the size of this file to 5 MB or more, if you have sufficient disk space. If the log file grows beyond the maximum size, an existing backup of the file (.bak) is deleted, the log file is renamed to .bak, and a new log file is created.

The log file is created in %SystemRoot%\System32\Logfiles\UserProfileManager.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, the default value is used.

Path to log file

This setting specifies an alternative path to save the Profile management log file.

By default, this setting is disabled and log files are saved in the default location: %SystemRoot%\System32\Logfiles\UserProfileManager.

The path can point to a local drive or a remote network-based drive (UNC path). Remote paths can be useful in large distributed environments but they may create significant network traffic, which may be inappropriate for log files. For provisioned, virtual machines with a persistent hard drive, set a local path to that drive. This ensures log files are preserved when the machine restarts. For virtual machines without a persistent hard drive, setting a UNC path allows you to retain the log files, but the system account for the machines must have write access to the UNC share. Use a local path for any laptops managed by the offline profiles feature.

If a UNC path is used for log files, Citrix recommends that an appropriate access control list is applied to the log file folder to ensure that only authorized user or computer accounts

can access the stored files.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, the default location %SystemRoot%\System32\Logfiles\UserProfileManager is used.

Personalized user information

This setting enables or disables verbose logging of personalized user information.

By default, this setting is disabled.

When enabling this setting, make sure the Enable logging setting is also enabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, errors and general information are logged.

Policy values at logon and logoff

This setting enables or disables verbose logging of policy values when a user logs on and off.

By default, this setting is disabled.

When enabling this setting, make sure the Enable logging setting is also enabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, errors and general information are logged.

Registry actions

This setting enables or disables verbose logging of actions performed in the registry.

By default, this setting is disabled.

When enabling this setting, make sure the Enable logging setting is also enabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, errors and general information are logged.

Registry differences at logoff

This setting enables or disables verbose logging of any differences in the registry when a user logs off.

By default, this setting is disabled.

When enabling this setting, make sure the Enable logging setting is also enabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, errors and general information are logged.

Profile handling policy settings

The Profile handling section contains policy settings that specify how Profile management handles user profiles.

Delay before deleting cached profiles

This setting specifies an optional extension to the delay, in minutes, before Profile management deletes locally cached profiles at logoff.

A value of 0 deletes the profiles immediately at the end of the logoff process. Profile management checks for logoffs every minute, so a value of 60 ensures that profiles are deleted between one and two minutes after users log off (depending on when the last check occurred). Extending the delay is useful if you know that a process keeps files or the user registry hive open during logoff. With large profiles, this can also speed up logoff.

By default, this is set to 0 and Profile management deletes locally cached profiles immediately.

When enabling this setting, ensure the Delete locally cached profiles on logoff is also enabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, profiles are deleted immediately.

Delete locally cached profiles on logoff

This setting specifies whether locally cached profiles are deleted after a user logs off.

When this setting is enabled, a user's local profile cache is deleted after they have logged off. Citrix recommends enabling this setting for terminal servers.

By default, this setting is disabled and a user's local profile cache is retained after they log off.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, cached profiles are not deleted.

Local profile conflict handling

This setting configures how Profile management behaves if a user profile exists both in the user store and as a local Windows user profile (not a Citrix user profile).

By default, Profile management uses the local Windows profile, but does not change it in any way.

To control how Profile management behaves, choose one of the following options:

- Use local profile. Profile management uses the local profile, but does not change it in any way.
- Delete local profile. Profile management deletes the local Windows user profile, and then imports the Citrix user profile from the user store.
- Rename local profile. Profile management renames the local Windows user profile (for backup purposes) and then imports the Citrix user profile from the user store.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, existing local profiles are used.

Migration of existing profiles

This setting specifies the types of profile migrated to the user store during logon if a user has no current profile in the user store.

Profile management can migrate existing profiles "on the fly" during logon if a user has no profile in the user store. After this, the user store profile is used by Profile management in both the current session and any other session configured with the path to the same user store.

By default, both local and roaming profiles are migrated to the user store during logon.

To specifies the types of profile migrated to the user store during logon, choose one of the following options:

- Local and roaming profiles
- Local
- Roaming
- None (Disabled)

If you select None, the system uses the existing Windows mechanism to create new profiles, as if in a environment where Profile management is not installed.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, existing local and roaming profiles are migrated.

Path to the template profile

This setting specifies the path to the profile you want Profile management to use as a template to create new user profiles.

The specified path must be the full path to the folder containing the NTUSER.DAT registry file and any other folders and files required for the template profile.

Note: Do not include NTUSER.DAT in the path. For example, with the file \\myservername\myprofiles\template\ntuser.dat, set the location as \\myservername\myprofiles\template.

Use absolute paths, which can be either UNC paths or paths on the local machine. Use the latter, for example, to specify a template profile permanently on a Citrix Provisioning Services image. Relative paths are not supported.

Note: This setting does not support expansion of Active Directory attributes, system environment variables, or the %USERNAME% and %USERDOMAIN% variables.

By default, this setting is disabled and new user profiles are created from the default user profile on the device where a user first logs on.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, no template is used.

Template profile overrides local profile

This setting enables the template profile to override the local profile when creating new user profiles.

If a user has no Citrix user profile, but a local Windows user profile exists, by default the local profile is used (and migrated to the user store, if this is not disabled). Enabling this policy setting allows the template profile to override the local profile used when creating new user profiles.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, no template is used.

Template profile overrides roaming profile

This setting enables the template profile to override a roaming profile when creating new user profiles.

If a user has no Citrix user profile, but a roaming Windows user profile exists, by default the roaming profile is used (and migrated to the user store, if this is not disabled). Enabling this policy setting allows the template profile to override the roaming profile used when creating new user profiles.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, no template is used.

Template profile used as a Citrix mandatory profile for all logons

This setting enables Profile management to use the template profile as the default profile for creating all new user profiles.

By default, this setting is disabled and new user profiles are created from the default user profile on the device where a user first logs on.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, no template is used.

Registry policy settings

The Registry section contains policy settings that specify which registry keys are included or excluded from Profile management processing.

Exclusion list

This setting specifies the list of registry keys in the HKCU hive excluded from Profile management processing when a user logs off.

When enabled, keys specified in this list are excluded from processing when a user logs off.

By default, this setting is disabled, and all registry keys in the HKCU hive are processed when a user logs off.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, no registry keys are excluded from processing.

Inclusion list

This setting specifies the list of registry keys in the HKCU hive included in Profile management processing when a user logs off.

When enabled, only keys specified in this list are processed when a user logs off.

By default, this setting is disabled, and all registry keys in the HKCU hive are processed when a user logs off.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, all of HKCU is processed .

Streamed user profiles policy settings

The Streamed user profiles section contains policy settings that specify how Profile management processes streamed user profiles.

Always cache

This setting specifies whether or not Profile management caches streamed files as soon as possible after a user logs on. Caching files after a user logs on saves network bandwidth, enhancing the user experience.

Use this setting with the Profile streaming setting.

By default, this setting is disabled and streamed files are not cached as soon as possible after a user logs on.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, it is disabled.

Always cache size

This setting specifies a lower limit, in megabytes, on the size of files that are streamed. Profile management caches any files this size or larger as soon as possible after a user logs on.

By default, this is set to 0 (zero) and the *cache entire profile* feature is used. When the cache entire profile feature is enabled, Profile management fetches all profile contents in the user store, after a user logs on, as a background task.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, it is disabled.

Profile streaming

This setting enables and disables the Citrix streamed user profiles feature. When enabled, files and folders contained in a profile are fetched from the user store to the local computer only when they are accessed by users after they have logged on. Registry entries and files in the pending area are fetched immediately.

By default, profile streaming is disabled.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, it is disabled.

Streamed user profile groups

This setting specifies which user profiles within an OU are streamed, based on Windows user groups.

When enabled, only user profiles within the specified user groups are streamed. All other user profiles are processed normally.

By default, this setting is disabled and all user profiles within an OU are processed normally.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, all user profiles are processed.

Timeout for pending area lock files

This setting specifies the number of days after which users' files are written back to the user store from the pending area, in the event that the user store remains locked when a server becomes unresponsive. This prevents bloat in the pending area and ensures the user store always contains the most up-to-date files.

By default, this is set to 1 (one) day.

If this setting is not configured here, the value from the .ini file is used.

If this setting is not configured here or in the .ini file, the default value is used.

Receiver policy settings

The Receiver section contains policy settings that specify a list of StoreFront addresses to push to Receiver for Windows running on the virtual desktop.

StoreFront accounts list

This settings specifies a list of StoreFront stores administrators can choose to push to Receiver for Windows running on the virtual desktop. When creating a Delivery Group, administrators can select which stores to push to Receiver for Windows running on virtual desktops within that group.

By default, no stores are specified.

For each store, specify the following information as a semicolon-delimited entry:

- Store name. The name displayed to users of the store.
- Store URL. The URL for the store.
- Store enabled state. Whether or not the store is available to users. This is either On or Off.
- Store description. The description displayed to users of the store.

For example: Sales Store;https://sales.mycompany.com/Citrix/Store/discovery;On;Store for Sales staff

Virtual Delivery Agent policy settings

The Virtual Delivery Agent (VDA) section contains policy settings that control communication between the VDA and controllers for a site.

Important: The VDA requires information provided by these settings to register with a Delivery Controller, if you are not using the auto-update feature. Because this information is required for registration, you must configure the following settings using the Group Policy Editor, unless you provide this information during the VDA installation:

- Controller registration IPv6 netmask
- Controller registration port
- Controller SIDs
- Controllers
- Only use IPv6 controller registration
- Site GUID

Controller registration IPv6 netmask

This policy setting allows administrators to restrict the VDA to only a preferred subnet (rather than a global IP, if one is registered). This setting specifies the IPv6 address and network where the VDA will register. The VDA will register only on the first address that matches the specified netmask. This setting is valid only if the Only use IPv6 controller registration policy setting is enabled.

By default this setting is blank.

Controller registration port

Use this setting only if the Enable auto update of controllers setting is disabled.

This setting specifies the TCP/IP port number the VDA uses to register with a Controller when using registry-based registration.

By default, the port number is set to 80.

Controller SIDs

Use this setting only if the Enable auto update of controllers setting is disabled.

This setting specifies a space-separated list of controller Security Identifiers (SIDs) the VDA uses to register with a Controller when using registry-based registration. This is an optional

setting which may be used with the Controllers setting to restrict the list of Controllers used for registration.

By default, this setting is blank.

Controllers

Use this setting only if the Enable auto update of controllers setting is disabled.

This setting specifies a space-separated list of controller Fully Qualified Domain Names (FQDNs) the VDA uses to register with a Controller when using registry-based registration. This is an optional setting that may be used with the Controller SIDs setting.

By default, this setting is blank.

Enable auto update of controllers

This setting enables the VDA to register with a Controller automatically after installation.

After the VDA registers, the Controller with which it registered sends a list of the current controller FQDNs and SIDs to the VDA. The VDA writes this list to persistent storage. Each Controller also checks the Site database every 90 minutes for Controller information; if a Controller has been added or removed since the last check, or if a policy change has occurred, the Controller sends updated lists to its registered VDAs. The VDA will accept connections from all the Controllers in the most recent list it received.

By default, this setting is enabled.

Only use IPv6 controller registration

This setting controls which form of address the VDA uses to register with the Controller:

- When enabled, the VDA registers with the Controller using the machine's IPv6 address. When the VDA communicates with the Controller, it uses the following address order: global IP address, Unique Local Address (ULA), link-local address (if no other IPv6 addresses are available).
- When disabled, the VDA registers and communicates with the Controller using the machine's IPv4 address.

By default, this is setting is disabled.

Site GUID

Use this setting only if the Enable auto update of controllers setting is disabled.

This setting specifies the Globally Unique Identifier (GUID) of the site the VDA uses to register with a Controller when using Active Directory-based registration.

By default, this setting is blank.

HDX 3D Pro policy settings

The HDX 3D Pro section contains policy settings for enabling and configuring the image quality configuration tool for users. The tool enables users to optimize use of available bandwidth by adjusting in real time the balance between image quality and responsiveness.

Enable lossless

This setting specifies whether or not users can enable and disable lossless compression using the image quality configuration tool. By default, users are not given the option to enable lossless compression.

When a user enables lossless compression, the image quality is automatically set to the maximum value available in the image configuration tool. By default, either GPU or CPU-based compression can be used, according to the capabilities of the user device and the host computer.

HDX 3D Pro quality settings

This setting specifies the minimum and maximum values that define the range of image quality adjustment available to users in the image quality configuration tool.

Specify image quality values of between 0 and 100, inclusive. The maximum value must be greater than or equal to the minimum value.

Virtual IP policy settings

The Virtual IP section contains policy settings that control whether sessions have their own virtual loopback address.

Virtual IP loopback support

When this setting is enabled, each session has its own virtual loopback address. When disabled, sessions do not have individual loopback addresses.

By default, this setting is disabled.

Virtual IP virtual loopback programs list

This setting specifies the application executables that can use virtual loopback addresses. When adding programs to the list, specify only the executable name; you do not need to specify the entire path.

By default, no executables are specified.

Configure COM Port and LPT Port Redirection settings using the registry

Policy settings for COM Port and LPT Port Redirection are located under HKLM\Software\Citrix\GroupPolicy\Defaults\Deprecated on the VDA image or machine.

To enable COM port and LPT port redirection, add new registry keys of type REG_DWORD, as follows:

Caution: Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

Registry key	Description	Permitted values
AllowComPortRedirection	Allow or prohibit COM port redirection	1 (Allow) or 0 (Prohibit)
LimitComBw	Bandwidth limit for COM port redirection channel	Numeric value
LimitComBWPercent	Bandwidth limit for COM port redirection channel as a percentage of total session bandwidth	Numeric value between 0 and 100
AutoConnectClientComPorts	Automatically connect COM ports from the user device	1 (Allow) or 0 (Prohibit)
AllowLptPortRedirection	Allow or prohibit LPT port redirection	1 (Allow) or 0 (Prohibit)
LimitLptBw	Bandwidth limit for LPT port redirection channel	Numeric value
LimitLptBwPercent	Bandwidth limit for LPT port redirection channel as a percentage of total session bandwidth	Numeric value between 0 and 100
AutoConnectClientLptPorts	Automatically connect LPT ports from the user device	1 (Allow) or 0 (Prohibit)

After configuring these settings, modify your machine catalogs to use the new master image or updated physical machine. Desktops are updated with the new settings the next time users log off.

Connector for Configuration Manager 2012 policy settings

The Connector for Configuration Manager 2012 section contains policy settings for configuring the Citrix Connector 7.5 agent.

Important: Warning, logoff, and reboot message policies apply only to deployments to Server OS machine catalogs that are managed manually or by Provisioning Services. For those machine catalogs, the Connector service alerts users when there are pending application installs or software updates.

For catalogs managed by MCS, use Studio to notify users. For manually managed Desktop OS catalogs, use Configuration Manager to notify users. For Desktop OS catalogs managed by Provisioning Services, use Provisioning Services to notify users.

Advance warning frequency interval

This setting defines the interval between appearances of the advance warning message to users.

Intervals are set using the format *ddd.hh:mm:ss*, where:

- *ddd* is days, an optional parameter, with a range of 0 to 999.
- *hh* is hours with a range of 0 to 23.
- *mm* is minutes with a range of 0 to 59.
- *ss* is seconds with a range of 0 to 59.

By default, the interval setting is 1 hour (01:00:00).

Advance warning message box body text

This setting contains the editable text of the message to users notifying them of upcoming software updates or maintenance that requires them to log off.

By default, the message is: {TIMESTAMP} Please save your work. The server will go offline for maintenance in {TIMELEFT}

Advance warning message box title

This setting contains the editable text of the title bar of the advance warning message to users.

By default, the title is: Upcoming Maintenance

Advance warning time period

This setting defines how far before maintenance the advance warning message first appears.

The time is set using the format *ddd.hh:mm:ss*, where:

- *ddd* is days, an optional parameter, with a range of 0 to 999.
- *hh* is hours with a range of 0 to 23.
- *mm* is minutes with a range of 0 to 59.
- *ss* is seconds with a range of 0 to 59.

By default, the setting is 16 hours (16:00:00), indicating that the first advance warning message appears approximately 16 hours before maintenance.

Final force logoff message box body text

This setting contains the editable text of the message alerting users that a forced logoff has begun.

By default, the message is: The server is currently going offline for maintenance

Final force logoff message box title

This setting contains the editable text of the title bar of the final force logoff message.

By default, the title is: Notification From IT Staff

Force logoff grace period

This setting defines the period of time between notifying users to log off and the implementation of the forced logoff to process the pending maintenance.

The time is set using the format *ddd.hh:mm:ss*, where:

- *ddd* is days, an optional parameter, with a range of 0 to 999.
- *hh* is hours with a range of 0 to 23.
- *mm* is minutes with a range of 0 to 59.
- *ss* is seconds with a range of 0 to 59.

By default, the force logoff grace period setting is 5 minutes (00:05:00).

Force logoff message box body text

This setting contains the editable text of the message telling users to save their work and log off prior to the start of a forced logoff.

By default, the message contains the following: {TIMESTAMP} Please save your work and log off. The server will go offline for maintenance in {TIMELEFT}

Force logoff message box title

This setting contains the editable text of the title bar of the force logoff message.

By default, the title is: Notification From IT Staff

Image-managed mode

The Connector agent automatically detects if it is running on a machine clone managed by Provisioning Services or MCS. The agent blocks Configuration Manager updates on image-managed clones and automatically installs the updates on the master image of the catalog.

After a master image is updated, use Studio to orchestrate the reboot of MCS catalog clones. The Connector Agent automatically orchestrates the reboot of PVS catalog clones during Configuration Manager maintenance windows. To override this behavior so that software is installed on catalog clones by Configuration Manager, change Image-managed mode to Disabled.

Reboot message box body text

This setting contains the editable text of the message notifying users when the server is about to be restarted.

By default, the message is: The server is currently going offline for maintenance

Regular time interval at which the agent task is to run

This setting determines how frequently the Citrix Connector agent task runs.

The time is set using the format *ddd.hh:mm:ss*, where:

- *ddd* is days, an optional parameter, with a range of 0 to 999.
- *hh* is hours with a range of 0 to 23.
- *mm* is minutes with a range of 0 to 59.
- *ss* is seconds with a range of 0 to 59.

By default, the regular time interval setting is 5 minutes (00:05:00).

Printing

Managing printers in your environment is a multistage process:

1. Become familiar with printing concepts, if you are not already.
2. Plan your printing architecture. This includes analyzing your business needs, your existing printing infrastructure, how your users and applications interact with printing today, and which printing management model best applies to your environment.
3. Configure your printing environment by selecting a printer provisioning method and then creating policies to deploy your printing design. Update policies when new employees or servers are added.
4. Test a pilot printing configuration before deploying it to users.
5. Maintain your Citrix printing environment by managing printer drivers and optimizing printing performance.
6. Troubleshoot issues that may arise.

Printing concepts

Before you begin planning your deployment, make sure that you understand these core concepts for printing:

- The types of printer provisioning available
- How print jobs are routed
- The basics of printer driver management

Printing concepts build on Windows printing concepts. To configure and successfully manage printing in your environment, you must understand how Windows network and client printing works and how this translates into printing behavior in this environment.

Print process

In this environment, all printing is initiated (by the user) on machines hosting applications. Print jobs are redirected through the network print server or user device to the printing device.

There is no persistent workspace for users of virtual desktops and applications. When a session ends the user's workspace is deleted, thus all settings need to be rebuilt at the beginning of each session. As a result, each time a user starts a new session, the system must rebuild the user's workspace.

When a user prints:

- Determines what printers to provide to the user. This is known as *printer provisioning*.
- Restores the user's printing preferences.
- Determines which printer is the default for the session.

You can customize how to perform these tasks by configuring options for printer provisioning, print job routing, printer property retention, and driver management. Be sure to evaluate how the various option settings might change the performance of printing in your environment and the user experience.

Printer provisioning

The process that makes printers available in a session is known as *provisioning*. Printer provisioning is typically handled dynamically. That is, the printers that appear in a session are not predetermined and stored. Instead, the printers are assembled, based on policies, as the session is built during log on and reconnection. As a result, the printers can change according to policy, user location, and network changes, provided they are reflected in policies. Thus, users who roam to a different location might see changes to their workspace.

The system also monitors client-side printers and dynamically adjusts in-session auto-created printers based on additions, deletions, and changes to the client-side printers. This dynamic printer discovery benefits mobile users as they connect from various devices.

The most common methods of printer provisioning are:

- **Universal Print Server** - The Citrix Universal Print Server provides universal printing support for network printers. The Universal Print Server uses the Universal print driver. This solution enables you to use a single driver on a Server OS machine to allow network printing from any device.

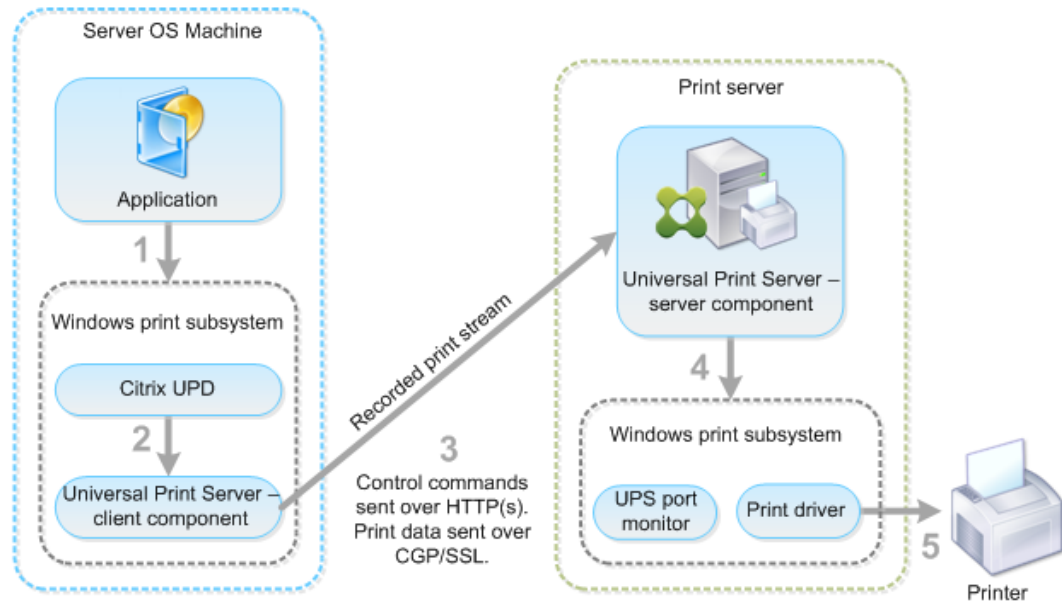
Citrix recommends the Citrix Universal Print Server for remote print server scenarios. The Universal Print Server transfers the print job over the network in an optimized and compressed format, thus minimizing network use and improving the user experience.

The Universal Print Server feature comprises:

- A client component, UPClient - Enable the UPClient on each Server OS machine that provisions session network printers and uses the Universal print driver.
- A server component, UPServer - Install UPServer on each print server that provisions session network printers and uses the Universal print driver for the session printers (whether or not the session printers are centrally provisioned).

For Universal Print Server requirements and setup details, refer to the system requirements and installation topics.

Note: The Universal Print Server is also supported for VDI-in-a-Box 5.3. For information about installing Universal Print Server with VDI-in-a-Box, refer to the VDI-in-a-Box documentation.



The following illustration shows the typical workflow for a network based printer in an environment that uses Universal Print Server.

When you enable the Citrix Universal Print Server, all connected network printers leverage it automatically through auto-discovery.

- **Autocreation** - *Autocreation* refers to printers automatically created at the beginning of each session. Both remote network printers and locally attached client printers can be auto-created. Consider auto-creating only the default client printer for environments with a large number of printers per user. Auto-creating a smaller number of printers uses less overhead (memory and CPU) on Server OS machines. Minimizing auto-created printers can also reduce user logon times.

Auto-created printers are based on:

- The printers installed on the user device.
- Any policies that apply to the session.

Autocreation policy settings enable you to limit the number or type of printers that are auto-created. By default, the printers are available in sessions when configuring all printers on the user device automatically, including locally attached and network printers.

After the user ends the session, the printers for that session are deleted.

Client and network printer autocreation has associated maintenance. For example, adding a printer requires that you:

- Update the Session printers policy setting.
- Add the driver to all Server OS machines using the Printer driver mapping and compatibility policy setting.

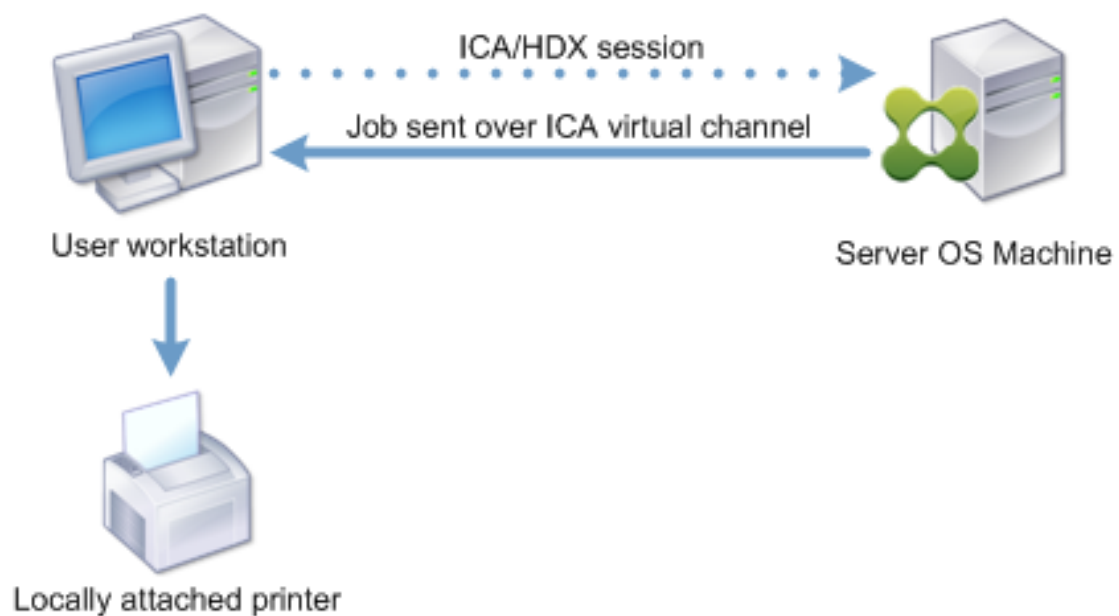
Print job routing

The term *printing pathway* encompasses both the path by which print jobs are routed and the location where print jobs are spooled. Both aspects of this concept are important. Routing affects network traffic. Spooling affects utilization of local resources on the device that processes the job.

In this environment, print jobs can take two paths to a printing device: through the client or through a network print server. Those paths are referred to as the client printing pathway and the network printing pathway. Which path is chosen by default depends on the kind of printer used.

Locally attached printers

The system routes jobs to locally attached printers from the Server OS machine, through the client, and then to the print device. The ICA protocol optimizes and compresses the print job traffic. When a printing device is attached locally to the user device, print jobs are routed over the ICA virtual channel.



Network-based printers

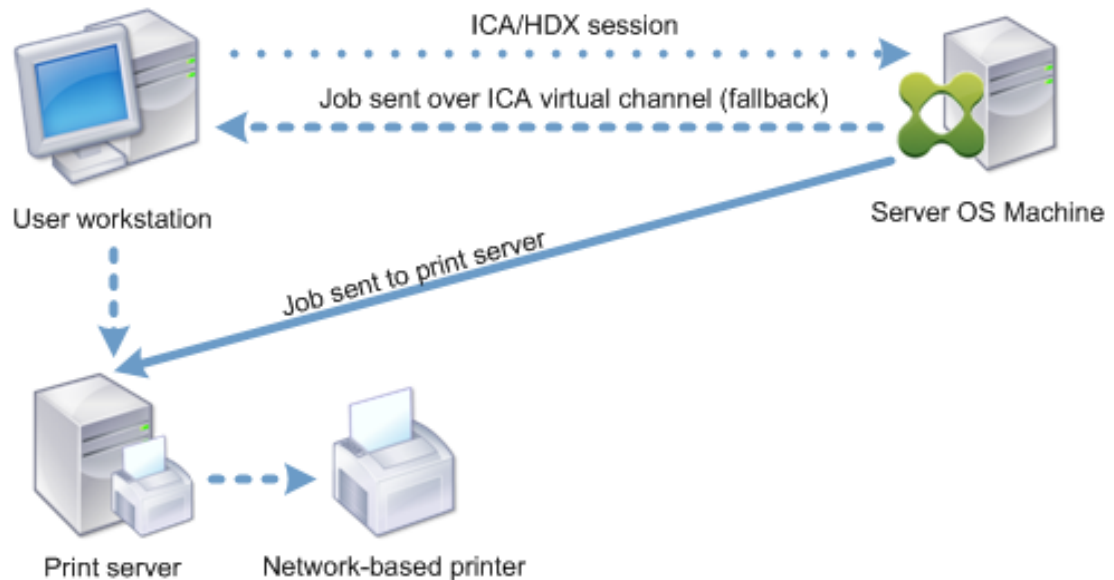
By default, all print jobs destined for network printers route from the Server OS machine, across the network, and directly to the print server. However, print jobs are automatically routed over the ICA connection in the following situations:

- If the virtual desktop or application cannot contact the print server.
- If the native printer driver is not available on the Server OS machine.

If the Universal Print Server is not enabled, configuring the client printing pathway for network printing is useful for low bandwidth connections, such as wide area networks, that

can benefit from the optimization and traffic compression that results from sending jobs over the ICA connection.

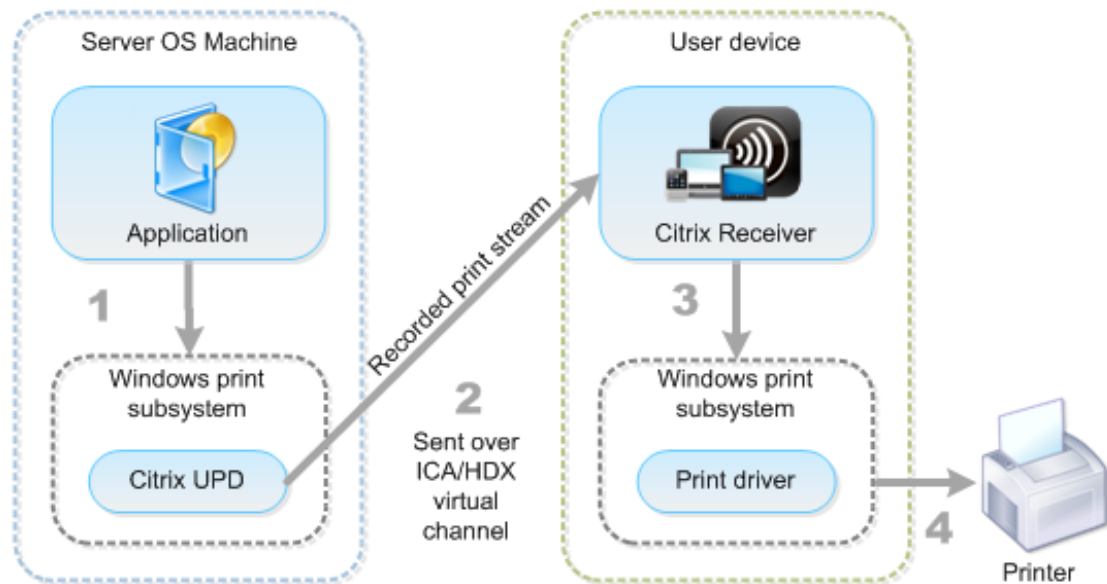
The client printing pathway also lets you limit traffic or restrict bandwidth allocated for print jobs. If routing jobs through the user device is not possible, such as for thin clients without printing capabilities, Quality of Service should be configured to prioritize ICA/HDX traffic and ensure a good in-session user experience.



Print driver management

To simplify printing in this environment, Citrix recommends using Citrix Universal print driver. The Universal print driver is a device-independent driver that supports any print device and thus simplifies administration by reducing the number of drivers required. The Universal print driver supports advanced printer functionality, such as stapling and sorting, and does not limit color depth.

The following illustration shows the Universal print driver components and a typical workflow for a printer locally attached to a device.

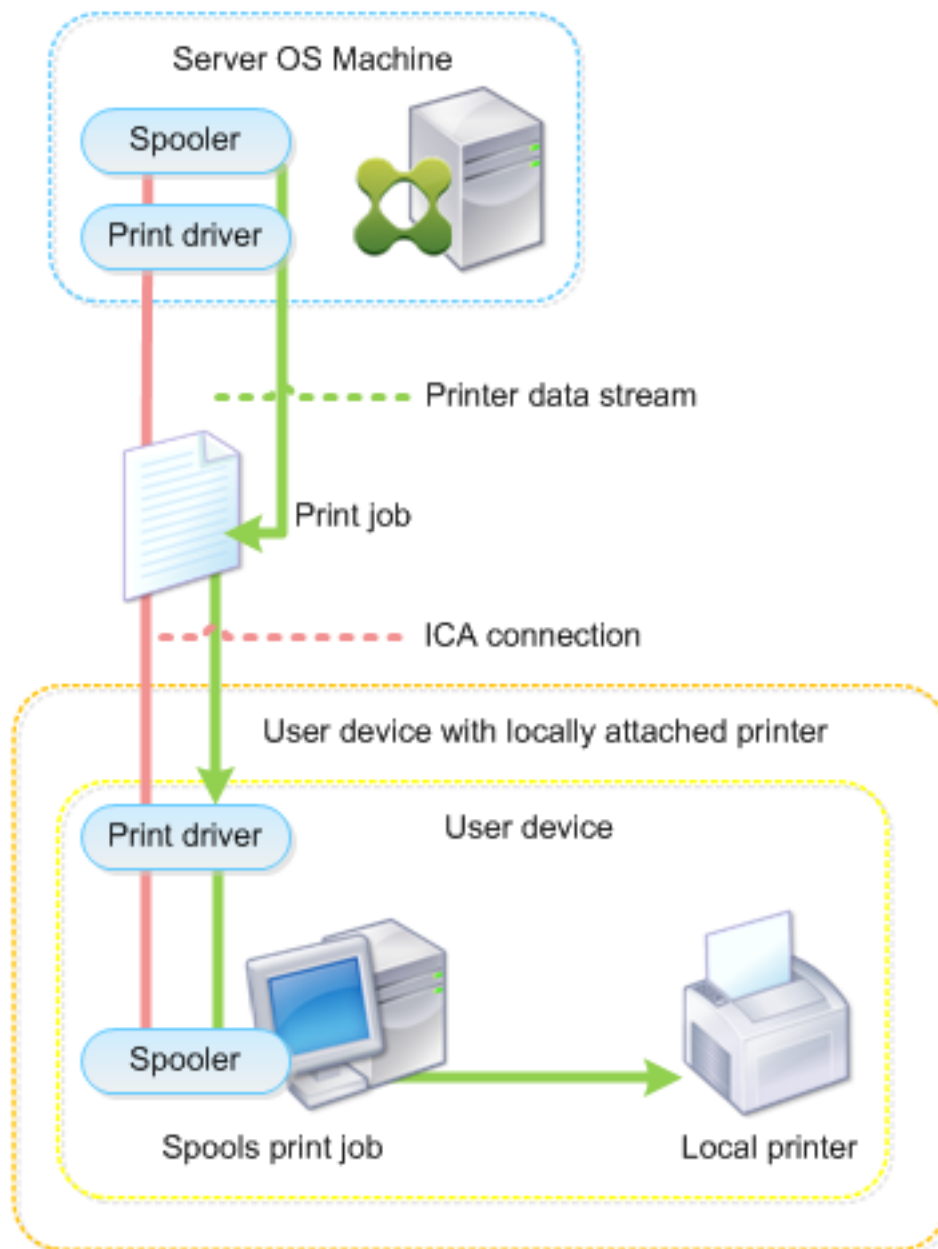


When planning your driver management strategy, determine if you will support the Universal print driver, device-specific drivers, or both. If you support standard drivers, you need to determine:

- The types of drivers to support.
- Whether to install printer drivers automatically when they are missing from Server OS machines.
- Whether to create driver compatibility lists.

During printer autocreation, if the system detects a new local printer connected to a user device, it checks the Server OS machine for the required printer driver. By default, if a Windows-native driver is not available, the system uses the Universal print driver.

The printer driver on the Server OS machine and the driver on the user device must match for printing to succeed. The illustration that follows shows how a printer driver is used in two places for client printing.



Related content

- [Printing configuration example](#)
- [Best practices, security considerations, and default operations](#)
- [Print policies and preferences](#)
- [Provision printers](#)
- [Maintain the printing environment](#)

Printing configuration example

Choosing the most appropriate printing configuration options for your needs and environment can simplify administration. Although the default print configuration enables users to print in most environments, the defaults might not provide the expected user experience or the optimum network usage and management overhead for your environment.

Your printing configuration depends upon:

- Your business needs and your existing printing infrastructure.

Design your printing configuration around the needs of your organization. Your existing printing implementation (whether users can add printers, which users have access to what printers, and so on) might be a useful guide when defining your printing configuration.

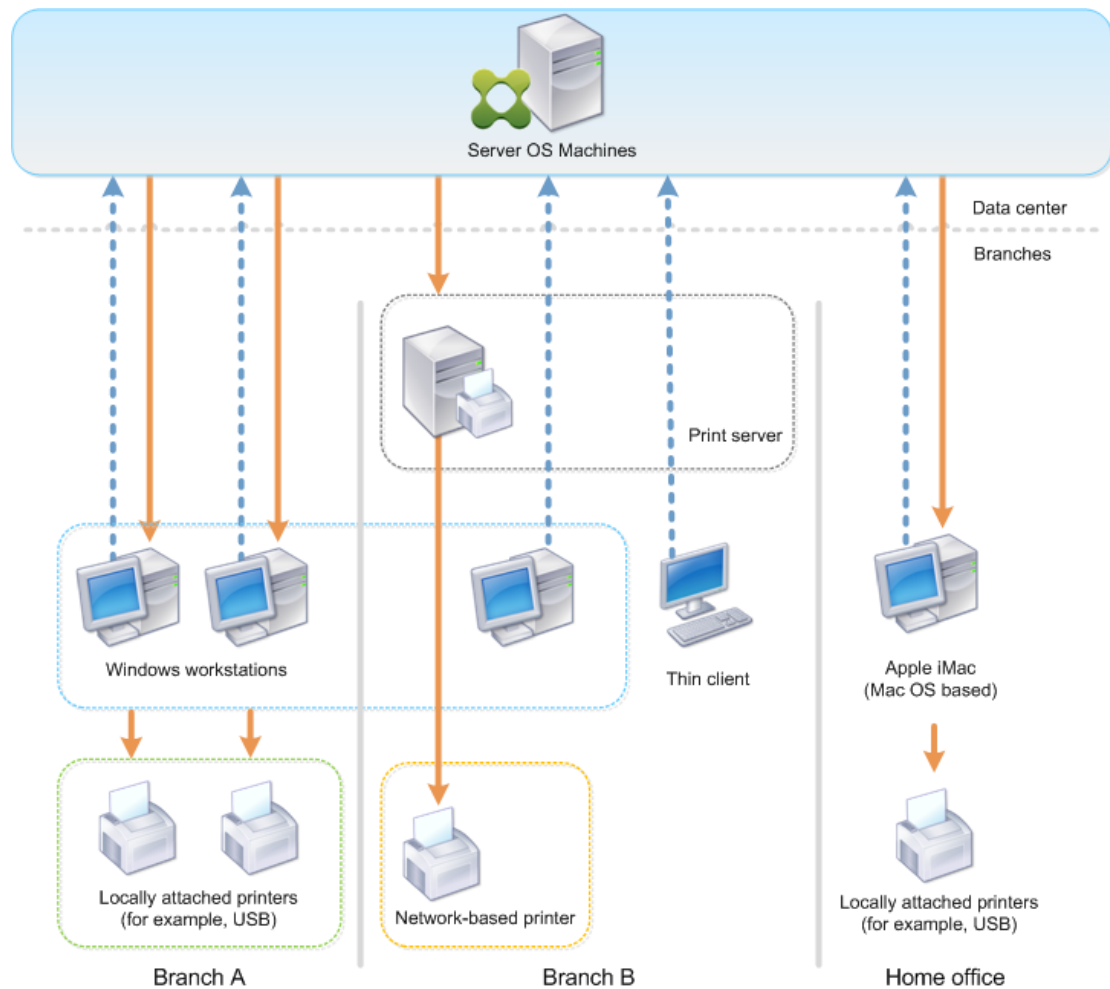
- Whether your organization has security policies that reserve printers for certain users (for example, printers for Human Resources or payroll).
- Whether users need to print while away from their primary work location, such as workers who move between workstations or travel on business.

When designing your printing configuration, try to give users the same experience in a session as they have when printing from local user devices.

Example print deployment

The following illustration shows the print deployment for these use cases:

- **Branch A** - A small overseas branch office with a few Windows workstations. Every user workstation has a locally attached, private printer.
- **Branch B** - A large branch office with thin clients and Windows-based workstations. For increased efficiency, the users of this branch share network-based printers (one per floor). Windows-based print servers located within the branch manage the print queues.
- **Home office** - A home office with a Mac OS-based user device that accesses the company's Citrix infrastructure. The user device has a locally attached printer.



The following sections describe the configurations which minimize the complexity of the environment and simplify its management.

Auto-created client printers and Citrix Universal printer driver

In Branch A, all users work on Windows-based workstations, therefore auto-created client printers and the Universal printer driver are used. Those technologies provide these benefits:

- Performance - Print jobs are delivered over the ICA printing channel, thus the print data can be compressed to save bandwidth.

To ensure that a single user printing a large document cannot degrade the session performance of other users, a Citrix policy is configured to specify the maximum printing bandwidth.

An alternative solution is to leverage a multi-stream ICA connection, in which the print traffic is transferred within a separate low priority TCP connection. Multi-stream ICA is

an option when Quality of Service (QoS) is not implemented on the WAN connection.

- Flexibility - Use of the Citrix Universal printer driver ensures that all printers connected to a client can also be used from a virtual desktop or application session without integrating a new printer driver in the data center.

Citrix Universal Print Server

In Branch B, all printers are network-based and their queues are managed on a Windows print server, thus the Citrix Universal Print Server is the most efficient configuration.

All required printer drivers are installed and managed on the print server by local administrators. Mapping the printers into the virtual desktop or application session works as follows:

- For Windows-based workstations - The local IT team helps users connect the appropriate network-based printer to their Windows workstations. This enables users to print from locally-installed applications.

During a virtual desktop or application session, the printers configured locally are enumerated through autcreation. The virtual desktop or application then connects to the print server as a direct network connection if possible.

The Citrix Universal Print Server components are installed and enabled, thus native printer drivers are not required. If a driver is updated or a printer queue is modified, no additional configuration is required in the data center.

- For thin clients - For thin client users, printers must be connected within the virtual desktop or application session. To provide users with the simplest printing experience, administrators configure a single Citrix Session Printer policy per floor to connect a floor's printer as the default printer.

To ensure the correct printer is connected even if users roam between floors, the policies are filtered based on the subnet or the name of the thin client. That configuration, referred to as proximity printing, allows for local printer driver maintenance (according to the delegated administration model).

If a printer queue needs to be modified or added, Citrix administrators must modify the respective Session printer policy within the environment.

Because the network printing traffic will be sent outside the ICA virtual channel, QoS is implemented. Inbound and outbound network traffic on ports used by ICA/HDX traffic are prioritized over all other network traffic. That configuration ensures that user sessions are not impacted by large print jobs.

Auto-created client printers and Citrix Universal printer driver

For home offices where users work on non-standard workstations and use non-managed print devices, the simplest approach is to use auto-created client printers and the Universal printer driver.

Deployment summary

In summary, the sample deployment is configured as follows:

- No printer drivers are installed on Server OS machines. Only the Citrix Universal printer driver is used. Fallback to native printing and the automatic installation of printer drivers are disabled.
- A policy is configured to auto-create all client printers for all users. Server OS machines will directly connect to the print servers by default. The only configuration required is to enable the Universal Print Server components.
- A session printer policy is configured for every floor of Branch B and applied to all thin clients of the respective floor.
- QoS is implemented for Branch B to ensure excellent user experience.

Best practices, security considerations, and default operations

Best practices

Many factors determine the best printing solution for a particular environment. Some of these best practices might not apply to your Site.

- Use the Citrix Universal Print Server.
- Use the Universal printer driver or Windows-native drivers.
- Minimize the number of printer drivers installed on Server OS machines.
- Use driver mapping to native drivers.
- Never install untested printer drivers on a production site.
- Avoid updating a driver. Always attempt to uninstall a driver, restart the print server, and then install the replacement driver.
- Uninstall unused drivers or use the Printer driver mapping and compatibility policy to prevent printers from being created with the driver.
- Try to avoid using version 2 kernel-mode drivers.
- To determine if a printer model is supported, contact the manufacturer or see the Citrix Ready product guide at www.citrix.com/ready.

In general, all of the Microsoft-supplied printer drivers are tested with Terminal Services and guaranteed to work with Citrix. However, before using a third-party printer driver, consult your printer driver vendor to ensure the driver is certified for Terminal Services by the Windows Hardware Quality Labs (WHQL) program. Citrix does not certify printer drivers.

Security considerations

Citrix printing solutions are secure by design.

- The Citrix Print Manager Service constantly monitors and responds to session events such as logon and logoff, disconnect, reconnect, and session termination. It handles service requests by impersonating the actual session user.
- Citrix printing assigns each printer a unique namespace in a session.
- Citrix printing sets the default security descriptor for auto-created printers to ensure that client printers auto-created in one session are inaccessible to users running in

other sessions. By default, administrative users cannot accidentally print to another session's client printer, even though they can see and manually adjust permissions for any client printer.

Default print operations

By default, if you do not configure any policy rules, printing behavior is as follows:

- The Universal Print Server is disabled.
- All printers configured on the user device are created automatically at the beginning of each session.

This behavior is equivalent to configuring the Citrix policy setting Auto-create client printers with the Auto-create all client printers option.

- The system routes all print jobs queued to printers locally attached to user devices as client print jobs (that is, over the ICA channel and through the user device).
- The system routes all print jobs queued to network printers directly from Server OS machines. If the system cannot route the jobs over the network, it will route them through the user device as a redirected client print job.

This behavior is equivalent to disabling the Citrix policy setting Direct connection to print servers.

- The system attempts to store printing properties, a combination of the user's printing preferences and printing device-specific settings, on the user device. If the client does not support this operation, the system stores printing properties in user profiles on the Server OS machine.

This behavior is equivalent to configuring the Citrix policy setting Printer properties retention with the Held in profile only if not saved on client option.

- The system uses the Windows version of the printer driver if it is available on the Server OS machine. If the printer driver is not available, the system attempts to install the driver from the Windows operating system. If the driver is not available in Windows, it uses a Citrix Universal print driver.

This behavior is equivalent to enabling the Citrix policy setting Automatic installation of in-box printer drivers and configuring the Universal printing setting with the Use universal printing only if requested driver is unavailable.

Enabling Automatic installation of in-box printer drivers might result in the installation of a large number of native printer drivers.

Note: If you are unsure about what the shipping defaults are for printing, display them by creating a new policy and setting all printing policy rules to Enabled. The option that appears is the default.

Print policies and preferences

When users access printers from published applications, you can configure Citrix policies to specify:

- How printers are provisioned (or added to sessions)
- How print jobs are routed
- How printer drivers are managed

You can have different printing configurations for different user devices, users, or any other objects on which policies are filtered.

Most printing functions are configured through the Citrix Printing policies. Printing settings follow standard Citrix policy behavior.

The system can write printer settings to the printer object at the end of a session or to a client printing device, provided the user's network account has sufficient permissions. By default, Receiver uses the settings stored in the printer object in the session, before looking in other locations for settings and preferences.

By default, the system stores, or retains, printer properties on the user device (if supported by the device) or in the user profile on the Server OS machine. When a user changes printer properties during a session, those changes are updated in the user profile on the machine. The next time the user logs on or reconnects, the user device inherits those retained settings. That is, printer property changes on the user device do not impact the current session until after the user logs off and then logs on again.

Printing preference locations

In Windows printing environments, changes made to printing preferences can be stored on the local computer or in a document. In this environment, when users modify printing settings, the settings are stored in these locations:

- **On the user device itself** - Windows users can change device settings on the user device by right-clicking the printer in the Control Panel and selecting Printing Preferences. For example, if Landscape is selected as page orientation, landscape is saved as the default page orientation preference for that printer.
- **Inside of a document** - In word-processing and desktop-publishing programs, document settings, such as page orientation, are often stored inside documents. For example, when you queue a document to print, Microsoft Word typically stores the printing preferences you specified, such as page orientation and the printer name, inside the document. These settings appear by default the next time you print that document.
- **From changes a user made during a session** - The system keeps only changes to the printing settings of an auto-created printer if the change was made in the Control Panel in the session; that is, on the Server OS machine.

- **On the Server OS machine** - These are the default settings associated with a particular printer driver on the machine.

The settings preserved in any Windows-based environment vary according to where the user made the changes. This also means that the printing settings that appear in one place, such as in a spreadsheet program, can be different than those in others, such as documents. As result, printing settings applied to a specific printer can change throughout a session.

Hierarchy of user printing preferences

Because printing preferences can be stored in multiple places, the system processes them according to a specific priority. Also, it is important to note that device settings are treated distinctly from, and usually take precedence over, document settings.

By default, the system always applies any printing settings a user modified during a session (that is, the retained settings) before considering any other settings. When the user prints, the system merges and applies the default printer settings stored on the Server OS machine with any retained or client printer settings.

Saving user printing preferences

Citrix recommends that you do not change where the printer properties are stored. The default setting, which saves the printer properties on the user device, is the easiest way to ensure consistent printing properties. If the system is unable to save properties on the user device, it automatically falls back to the user profile on the Server OS machine.

Review the Printer properties retention policy setting if these scenarios apply:

- If you use legacy plug-ins that do not allow users to store printer properties on a user device.
- If you use mandatory profiles on your Windows network and want to retain the user's printer properties.

Provision printers

There are three printer provisioning methods:

- Citrix Universal Print Server
- Auto-created client printers
- Administrator-assigned session printers

Citrix Universal Print Server

When determining the best print solution for your environment, consider the following:

- The Universal Print Server provides features not available for the Windows Print Provider: Image and font caching, advanced compression, optimization, and QoS support.
- The Universal print driver supports the public device-independent settings defined by Microsoft. If users need access to device settings that are specific to a print driver manufacturer, the Universal Print Server paired with a Windows-native driver might be the best solution. With that configuration, you retain the benefits of the Universal Print Server while providing users access to specialized printer functionality. A trade-off to consider is that Windows-native drivers require maintenance.
- The Citrix Universal Print Server provides universal printing support for network printers. The Universal Print Server uses the Universal print driver, a single driver on the Server OS machine that allows local or network printing from any device, including thin clients and tablets.

To use the Universal Print Server with a Windows-native driver, enable the Universal Print Server. By default, if the Windows-native driver is available, it is used. Otherwise, the Universal print driver is used. To specify changes to that behavior, such as to use only the Windows-native driver or only the Universal print driver, update the Universal print driver usage policy setting.

The Universal Print Server and the Universal print driver are installed. To use the Universal Print Server, install it on your print servers, as described in the installation topics, and configure it.

Configure the Universal Print Server - Use the following Citrix policy settings to configure the Universal Print Server. For more information, refer to the on-screen policy settings help.

- Universal Print Server enable. Universal Print Server is disabled by default. When you enable Universal Print Server, you choose whether to use the Windows Print Provider if the Universal Print Server is unavailable. After you enable the Universal Print Server, a user can add and enumerate network printers through the Windows Print Provider and Citrix Provider interfaces.

- Universal Print Server print data stream (CGP) port. Specifies the TCP port number used by the Universal Print Server print data stream CGP (Common Gateway Protocol) listener. Defaults to 7229.
- Universal Print Server web service (HTTP/SOAP) port. Specifies the TCP port number used by the Universal Print Server listener for incoming HTTP/SOAP requests. Defaults to 8080.
- Universal Print Server print stream input bandwidth limit (kbps). Specifies the upper bound (in kilobits-per-second) for the transfer rate of print data delivered from each print job to the Universal Print Server using CGP. Defaults to 0 (unlimited).

Interactions with other policy settings - The Universal Print Server honors other Citrix printing policy settings and interacts with them as noted in the following table. The information provided assumes that the Universal Print Server policy setting is enabled, the Universal Print Server components are installed, and the policy settings are applied.

Policy setting	Interaction
Client printer redirection, Auto-create client printers	After the Universal Print Server is enabled, client network printers are created using the Universal print driver instead of the native drivers. Users see the same printer name as before.
Session printers	When you use the Citrix Universal Print Server solution, Universal print driver policy settings are honored.
Direct connections to print server	When the Universal Print Server is enabled and the Universal print driver usage policy setting is configured to use universal printing only, a direct network printer can be created to the print server, using the Universal print driver.
UPD preference	Supports EMF and XPS drivers.

Effects on user interfaces - The Citrix Universal print driver used by the Universal Print Server disables the following user interface controls:

- In the Printer Properties dialog box, the Local Printer Settings button
- In the Document Properties dialog box, the Local Printer Settings and Preview on client buttons

When using the Universal Print Server, the Add Printer Wizard for the Citrix Print Provider is the same as the Add Printer Wizard for the Windows Print Provider, with the following exceptions:

- When adding a printer by name or address, you can provide an HTTP/SOAP port number for the print server. That port number becomes a part of the printer name and appears in displays.
- If the Citrix Universal print driver usage policy setting specifies that universal printing must be used, the Universal print driver name appears when selecting a printer. The Windows Print Provider cannot use the Universal print driver.

The Citrix Print Provider does not support client-side rendering.

Auto-created client printers

These universal printing solutions are provided for client printers:

- **Citrix Universal Printer** - A generic printer created at the beginning of sessions that is not tied to a printing device. The Citrix Universal Printer is not required to enumerate the available client printers during logon, which can greatly reduce resource usage and decrease user logon times. The Universal Printer can print to any client-side printing device.

The Citrix Universal Printer might not work for all user devices or Receivers in your environment. The Citrix Universal Printer requires a Windows environment and does not support the Citrix Offline Plug-in or applications that are streamed to the client. Consider using auto-created client printers and the Universal print driver for such environments.

To use a universal printing solution for non-Windows Receivers, use one of the other Universal print drivers that are based on postscript/PCL and installed automatically.

- **Citrix Universal print drivers** - A device-independent printer driver that supports advanced printer functionality, such as stapling and sorting. If you configure a Citrix Universal print driver, the system uses the EMF-based Universal print driver by default.

The Citrix Universal print driver might create smaller print jobs than older or less advanced printer drivers. However, a device-specific driver might be needed to optimize print jobs for a specialized printer.

Configure universal printing - Use the following Citrix policy settings to configure universal printing. For more information, refer to the on-screen policy settings help.

- **Universal print driver usage.** Specifies when to use universal printing.
- **Auto-create generic universal printer.** Enables or disables auto-creation of the generic Citrix Universal Printer object for sessions when a user device compatible with Universal Printing is in use. By default, the generic Universal Printer object is not auto-created.
- **Universal driver preference.** Specifies the order in which the system attempts to use Universal print drivers, beginning with the first entry in the list. You can add, edit, or remove drivers and change the order of the drivers in the list.
- **Universal printing preview preference.** Specifies whether to use the print preview function for auto-created or generic universal printers.
- **Universal printing EMF processing mode.** Controls the method of processing the EMF spool file on the Windows user device. By default, EMF records are spooled directly to the printer. Spooling directly to the printer allows the spooler to process the records faster and uses fewer CPU resources.

For more policies, see [Optimize printing performance](#). To change the defaults for settings such as paper size, print quality, color, duplex, and the number of copies, see [CTX113148](#).

Auto-create printers from the user device - At the start of a session, the system auto-creates all printers on the user device by default. You can control what, if any, types of printers are provisioned to users and prevent autocreation.

Use the Citrix policy setting Auto-create client printers to control autocreation. You can specify that:

- All printers visible to the user device, including network and locally attached printers, are created automatically at the start of each session (default)
- All local printers physically attached to the user device is created automatically
- Only the default printer for the user device is created automatically
- Autocreation is disabled for all client printers

The Auto-create client printers setting requires that the Client printer redirection setting is Allowed (the default).

Assign network printers to users

By default, network printers on the user device are created automatically at the beginning of sessions. the system enables you to reduce the number of network printers that are enumerated and mapped by specifying the network printers to be created within each session. Such printers are referred to as *session printers*.

You can filter session printer policies by IP address to provide *proximity printing*. Proximity printing enables users within a specified IP address range to automatically access the network printing devices that exist within that same range. Proximity printing is provided by the Citrix Universal Print Server and does not require the configuration described in this section.

Proximity printing might involve the following scenario:

- The internal company network operates with a DHCP server which automatically designates IP addresses to users.
- All departments within the company have unique designated IP address ranges.
- Network printers exist within each department's IP address range.

When proximity printing is configured and an employee travels from one department to another, no additional printing device configuration is required. Once the user device is recognized within the new department's IP address range, it will have access to all network printers within that range.

Configure specific printers to be redirected in sessions - To create administrator-assigned printers, configure the Citrix policy setting Session printers. Add a network printer to that policy using one of the following methods:

- Enter the printer UNC path using the format `\\servername\printername`.
- Browse to a printer location on the network.
- Browse for printers on a specific server. Enter the server name using the format `\\servername` and click Browse.

Important: The server merges all enabled session printer settings for all applied policies, starting from the highest to lowest priorities. When a printer is configured in multiple policy objects, custom default settings are taken from only the highest priority policy object in which that printer is configured.

Network printers created with the Session printers setting can vary according to where the session was initiated by filtering on objects such as subnets.

Specify a default network printer for a session - By default, the user's main printer is used as the default printer for the session. Use the Citrix policy setting Default printer to change how the default printer on the user device is established in a session.

1. On the Default printer settings page, select a setting for Choose client's default printer:
 - *Network printer name* . Printers added with the Session printers policy setting appear in this menu. Select the network printer to use as the default for this policy.
 - Do not adjust the user's default printer. Uses the current Terminal Services or Windows user profile setting for the default printer. For more information, refer to the on-screen policy settings help.
2. Apply the policy to the group of users (or other filtered objects) you want to affect.

Configure proximity printing - Proximity printing is also provided by the Citrix Universal Print Server, which does not require the configuration described here.

1. Create a separate policy for each subnet (or to correspond with printer location).
2. In each policy, add the printers in that subnet's geographic location to the Session printers setting.
3. Set the Default printer setting to Do not adjust the user's default printer.
4. Filter the policies by client IP address. Be sure to update these policies to reflect changes to the DHCP IP address ranges.

Maintain the printing environment

Maintaining the printing environment includes:

- Managing printer drivers
- Optimizing printing performance
- Displaying printer and managing print queues

Manage printer drivers

To minimize administrative overhead and the potential for print driver issues, Citrix recommends use of the Citrix Universal print driver.

If auto-creation fails, by default, the system installs a Windows-native printer driver provided with Windows. If a driver is not available, the system falls back to the Universal print driver. For more information about printer driver defaults, refer to [Best practices, security considerations, and default operations](#).

If the Citrix Universal print driver is not an option for all scenarios, map printer drivers to minimize the amount of drivers installed on Server OS machines. In addition, mapping printer drivers enables you to:

- Allow specified printers to use only the Citrix Universal print driver
- Allow or prevent printers to be created with a specified driver
- Substitute good printer drivers for outdated or corrupted drivers
- Substitute a driver that is available on Windows server for a client driver name

Prevent the automatic installation of printer drivers - The automatic installation of print drivers should be disabled to ensure consistency across Server OS machines. This can be achieved through Citrix policies, Microsoft policies, or both. To prevent the automatic installation of Windows-native printer drivers, disable the Citrix policy setting Automatic installation of in-box printer drivers.

Map client printer drivers - Each client provides information about client-side printers during logon, including the printer driver name. During client printer autocreation, Windows server printer driver names are selected that correspond to the printer model names provided by the client. The autocreation process then uses the identified, available printer drivers to construct redirected client print queues.

Here is the general process for defining driver substitution rules and editing print settings for mapped client printer drivers:

1. To specify driver substitution rules for auto-created client printers, configure the Citrix policy setting Printer driver mapping and compatibility by adding the client printer driver name and selecting the server driver that you want to substitute for the client

printer driver from the Find printer driver menu. You can use wildcards in this setting. For example, to force all HP printers to use a specific driver, specify HP* in the policy setting.

2. To ban a printer driver, select the driver name and choose the Do not create setting.
3. As needed, edit an existing mapping, remove a mapping, or change the order of driver entries in the list.
4. To edit the printing settings for mapped client printer drivers, select the printer driver, click Settings, and specify settings such as print quality, orientation, and color. If you specify a printing option that the printer driver does not support, that option has no effect. This setting overrides retained printer settings the user set during a previous session.
5. Citrix recommends testing the behavior of the printers in detail after mapping drivers, since some printer functionality can be available only with a specific driver.

When users log on the system checks the client printer driver compatibility list before it sets up the client printers.

Optimize printing performance

To optimize printing performance, use the Universal Print Server and Universal print driver. The following policies control printing optimization and compression:

- Universal printing optimization defaults. Specifies default settings for the Universal Printer when it is created for a session:
 - Desired image quality specifies the default image compression limit applied to universal printing. By default, Standard Quality is enabled, meaning that users can only print images using standard or reduced quality compression.
 - Enable heavyweight compression enables or disables reducing bandwidth beyond the compression level set by Desired image quality, without losing image quality. By default, heavyweight compression is disabled.
 - Image and Font Caching settings specify whether or not to cache images and fonts that appear multiple times in the print stream, ensuring each unique image or font is sent to the printer only once. By default, embedded images and fonts are cached.
 - Allow non-administrators to modify these settings specifies whether or not users can change the default print optimization settings within a session. By default, users are not allowed to change the default print optimization settings.
- Universal printing image compression limit. Defines the maximum quality and the minimum compression level available for images printed with the Universal print driver. By default, the image compression limit is set to Best Quality (lossless compression).
- Universal printing print quality limit. Specifies the maximum dots per inch (dpi) available for generating printed output in the session. By default, no limit is specified.

By default, all print jobs destined for network printers route from the Server OS machine, across the network, and directly to the print server. Consider routing print jobs over the

ICA connection if the network has substantial latency or limited bandwidth. To do that, disable the Citrix policy setting Direct connections to print servers. Data sent over the ICA connection is compressed, so less bandwidth is consumed as the data travels across the WAN.

Improve session performance by limiting printing bandwidth - While printing files from Server OS machines to user printers, other virtual channels (such as video) may experience decreased performance due to competition for bandwidth especially if users access servers through slower networks. To prevent such degradation, you can limit the bandwidth used by user printing. By limiting the data transmission rate for printing, you make more bandwidth available in the HDX data stream for transmission of video, keystrokes, and mouse data.

Important: The printer bandwidth limit is always enforced, even when no other channels are in use.

Use the following Citrix policy Bandwidth printer settings to configure printing bandwidth session limits. To set the limits for the site, perform this task using Studio. To set the limits for individual servers, perform this task using the Group Policy Management Console in Windows locally on each Server OS machine.

- The Printer redirection bandwidth limit setting specifies the bandwidth available for printing in kilobits per second (kbps).
- The Printer redirection bandwidth limit percent setting limits the bandwidth available for printing to a percentage of the overall bandwidth available.

Note: To specify bandwidth as a percentage using the Printer redirection bandwidth limit percent setting, enable the Overall session bandwidth limit as well.

If you enter values for both settings, the most restrictive setting (the lower value) is applied.

To obtain real-time information about printing bandwidth, use Citrix Director.

Display printers and manage print queues

The following table summarizes where you can display printers and manage print queues in your environment.

	Printing Pathway	UAC Enabled?	Location
Client printers (Printers attached to the user device)	Client printing pathway	On	Print Management snap-in located in the Microsoft Management Console
		Off	Pre-Windows 8: Control Panel Windows 8: Print Management snap-in
Network printers (Printers on a network print server)	Network printing pathway	On	Print Server > Print Management snap-in located in the Microsoft Management Console
		Off	Print Server > Control Panel

Maintain the printing environment

Network printers (Printers on a network print server)	Client printing pathway	On	Print Server > Print Management snap-in located in the Microsoft Management Console
		Off	Pre-Windows 8: Control Panel Windows 8: Print Management snap-in
Local network server printers (Printers from a network print server that are added to a Server OS machine)	Network printing pathway	On	Print Server > Control Panel
		Off	Print Server > Control Panel

Note: Print queues for network printers that use the network printing pathway are private and cannot be managed through the system.

Managing

Managing XenApp and XenDesktop involves day-to-day operations, such as checking license usage and requirements, tuning the environment for optimal performance, and maintaining session activity.

Related content

Licensing	Search
Connections and resources	IPv6
Connection leasing	Client folder redirection
Virtual IP and virtual loopback	Personal vDisks
Secondary database locations	User profiles
Delivery Controller environment	HDX
Sessions	

Note: For information on managing machine catalogs and Delivery groups, see [Manage machine catalogs](#), [Delivery groups](#), and related topics.

Licensing

From Studio, you can manage and track licensing, if the license server is in the same domain as Studio or in a trusted domain. For information about other licensing tasks, see *Licensing Your Product*.

You must be a full license administrator to complete the tasks described below, except for viewing license information. To view license information in Studio, an administrator must have at least the Read Licensing Delegated Administration permission; the built-in Full Administrator and Read-Only Administrator roles have that permission.

The following table lists the supported editions and license models:

Products	Editions	License models
XenApp	<ul style="list-style-type: none">• Platinum• Enterprise• Advanced	Concurrent
XenDesktop	<ul style="list-style-type: none">• Platinum• Enterprise• App• VDI	<ul style="list-style-type: none">• User/Device• Concurrent

To view license information, in the Studio navigation pane, select Configuration and then Licensing. A summary of license usage and settings for the site is displayed with a list of all the licenses currently installed on the specified license server.

To manage licensing, in the Studio navigation pane, select Configuration and then Licensing. Then:

- To download a license from Citrix:
 1. In the Actions pane, select Allocate Licenses.
 2. Type the License Access Code, which is supplied in an email from Citrix.
 3. Select a product and click Allocate Licenses. All the licenses available for that product are allocated and downloaded. After you allocate and download all the licenses for a specific License Access Code, you cannot use that License Access Code again. To perform additional transactions with that code, log on to My Account.
- To add licenses that are stored on your local computer or on the network:
 1. In the Actions pane, select Add Licenses.
 2. Browse to a license file and add it to the license server.
- To change the license server:

1. In the Actions pane, select Change License Server.
 2. Type the address of the license server in the form *name:port*, where name is a DNS, NetBIOS, or IP address. If you do not specify a port number, the default port (27000) is used.
- To select the type of license to use:
 - When configuring the Site, after you specify the license server, you are prompted to select the type of license to use. If there are no licenses on the server, the option to use the product for a 30-day trial period without a license is automatically selected.
 - If there are licenses on the server, their details are displayed and you can select one of them. Or, you can add a license file to the server and then select that one.
 - To change the product edition and licensing model:
 1. In the Actions pane, select Edit Product Edition.
 2. Update the appropriate options.
 - To access the License Administration Console, in the Actions pane, select License Administration Console. The console either appears immediately, or if the dashboard is configured as password-protected, you are prompted for License Administration Console credentials. For details about how to use the console, see *Licensing Your Product*.
 - To add a licensing administrator:
 1. In the middle pane, choose the Licensing Administrators tab.
 2. In the Actions pane, select Add licensing administrator.
 3. Browse to the user you want to add as an administrator and choose permissions.
 - To edit or delete a licensing administrator, When you select an administrator, the options to Edit licensing administrator (to change the administrator permissions for that administrator) and Delete licensing administrator appear in the Actions pane.
 1. In the middle pane, choose the Licensing Administrators tab and select the administrator you want to delete or edit.
 2. In the Actions pane, select either Edit licensing administrator or Delete licensing administrator.
 - To add a licensing administrator group:
 1. In the middle pane, choose the Licensing Administrators tab.
 2. In the Actions pane, select Add licensing administrator group.
 3. Browse to the group you want to act as licensing administrators and choose permissions. Adding an Active Directory Group gives licensing administrator permissions to the users within that group.
 - To edit or delete a licensing administrator group:
 1. In the middle pane, choose the Licensing Administrators tab and select the administrator group you want to delete or edit. When you select a licensing administrator group, the options to Edit licensing administrator group (to change the administrator permissions for that group) and Delete licensing administrator

group appear in the Actions pane..

2. In the Actions pane, select either Edit licensing administrator group or Delete licensing administrator group.

Connections and resources

You create your first connection to hosting resources when you create a Site. Later, you can change that connection and create new ones. Read Only Administrators can view connection and resource details; you must be a Full Administrator to perform connection and resource management tasks.

Create a connection and resources

The hosting resources must be available before you create a connection.

1. Select Configuration > Hosting in the Studio navigation pane.
2. Select Add Connections and Resources in the Actions pane.
3. Select Create a new Connection.
4. On the Connection page:
 - Select the connection type and enter a connection name - choose a name that will help administrators identify the host type and deployment address. Additional required information depends on the selected connection type.

Connection type	Information needed
Citrix XenServer, Microsoft System Center Virtual Machine Manager, VMware vSphere, or Microsoft Configuration Manager Wake On LAN	<p>Enter the connection URL, user name, and password.</p> <ul style="list-style-type: none">• For XenServer, Citrix recommends using HTTPS to secure communications. To use HTTPS, you must replace the default SSL certificate installed with XenServer with one from a trusted certificate authority; see CTX128656.• For XenServer, you can edit the new connection and select the high availability hypervisors to be used, if high availability is enabled on XenServer.
Citrix CloudPlatform or Amazon Web Services (AWS)	<p>Enter the connection URL, API key and Secret key.</p> <ul style="list-style-type: none">• You can browse to an import keys file provided by your cloud administrator to fill in the API key and Secret key.• The credentials file for the root AWS account (retrieved from the AWS console) is not formatted the same as credentials files downloaded for standard AWS users. Therefore, Studio cannot use the file to populate the API key and Secret key fields. Ensure that you are using AWS IAM credentials files when using Studio in an AWS environment.

- Choose the tools you will use to create virtual machines. For hypervisors that provide GPU resources, choose Studio Tools.
- 5. On the Storage page, select storage types and devices. When using Machine Creation Services, select the network and storage resources for the new virtual machines. If you use shared storage on XenServer connections, you can enable IntelliCache to reduce load on the storage device. For information about using IntelliCache, see below.
- 6. If the Connection has GPU capabilities, select the option to use graphics virtualization and then select a GPU type and group.
- 7. Enter a name for the resources.

Create a connection and resources from an existing connection

1. Select Configuration > Hosting in the Studio navigation pane.
2. Select Add Connection and Resources in the Actions pane.
3. Select Use an existing Connection and then choose the relevant connection.
4. Choose the tools you will use to create virtual machines. For hypervisors that provide GPU resources, choose Studio Tools. If the Connection has GPU capabilities, select the option to use graphics virtualization and then select a GPU type and group.
5. Enter a name for the resources.

Add storage

1. Select Configuration > Hosting in the Studio navigation pane.
2. Select a connection and then select Add Storage in the Actions pane.
3. Select the storage to add.

Edit storage

1. Select Configuration > Hosting in the Studio navigation pane.
2. Select a resources entry under a connection and then select Edit Storage in the Actions pane.
3. On the Standard Storage page, select or clear the check boxes for the storage locations that will store virtual machines. If you clear a storage location that was accepting new machines, it will no longer accept new machines. Existing machines will continue using that location (and write data to it); so it is possible for a storage location to become full even after it stops accepting new machines.

If PvD storage is used, select or clear the check boxes on the PvD Storage page, too.

Edit a connection

Do not use this procedure to rename a connection or to create a new connection. Those are different operations.

1. Select Configuration > Hosting in the Studio navigation pane.
2. Select the connection and then select Edit Connection in the Actions pane.
 - To change the connection address and credentials, on the Connection Properties page, click Edit settings and then enter the new information.

You cannot change the GPU settings for a connection, because machine catalogs accessing this resource must use an appropriate GPU-specific master image. Create a new connection.
 - To specify the high-availability servers for a XenServer connection, on the Connection Properties page, click Edit HA servers. Citrix recommends that you select all servers in the pool to allow communication with XenServer if the pool master fails.
 - For a Microsoft System Center Configuration Manager (ConfMgr) Wake on LAN connection, on the Advanced page, enter ConfMgr Wake Proxy, magic packets, and packet transmission information.
 - To configure throttling based on thresholds of simultaneous actions on the connection, which can help when power management settings allow too many or too few machines to start at the same time.
 - On the Advanced page, for Simultaneous actions (all types) and Simultaneous Personal Storage inventory updates, specify two values: the maximum absolute number that can occur simultaneously on this connection, and a percentage of all machines using this connection. You must specify both absolute and percentage values, but the actual limit applied is the lower of the configured values.

For example, in a deployment with 34 machines, if Simultaneous actions (all types) is set to an absolute value of 10 and a percentage value of 10, the actual limit applied is 3 (that is, 10 percent of 34 rounded to the nearest whole number, which is less than the absolute value of 10 machines).
 - Specify the maximum number of new actions per minute. This is an absolute number.

Note: Enter information in the Connection options field on the Advanced page only under the guidance of a Citrix Support representative.

Turn maintenance mode on or off for a connection

Turning on maintenance mode for a connection prevents any new power action from affecting any machine stored on the connection. Users cannot connect to a machine when it is in maintenance mode. If users are already connected, maintenance mode takes effect when they log off.

1. Select Configuration > Hosting in the Studio navigation pane.
2. Select the connection. To turn maintenance mode on, select Turn On Maintenance Mode in the Actions pane. To turn maintenance mode off, select Turn Off Maintenance Mode.

You can also turn maintenance mode on or off for individual machines; see below.

Delete a connection

Caution: Deleting a connection can result in the deletion of large numbers of machines and loss of data. Ensure that user data on affected machines is backed up or no longer required.

Before you delete a Connection, ensure that:

- All users are logged off from the machines stored on the connection.
- No disconnected user sessions are running.
- Maintenance mode is turned on for pooled and dedicated machines.
- All machines in machine catalogs are powered off.

1. Select Configuration > Hosting in the Studio navigation pane.
2. Select the connection and then select Delete Connection in the Actions pane.
3. If this connection has machines stored on it, you are asked whether the machines should be deleted. If they are to be deleted, specify what should be done with the associated Active Directory computer accounts.

A machine catalog becomes unusable when you delete a connection that is referenced by that catalog. If this connection is referenced by a catalog, you have the option to delete the catalog. Before you delete a catalog, make sure it is not used by other connections.

Rename a connection

1. Select Configuration > Hosting in the Studio navigation pane.
2. Select the connection and then select Rename Connection in the Actions pane.

View machine details on a connection

1. Select Configuration > Hosting in the Studio navigation pane.
2. Select the connection and then select View Machines in the Actions pane.

The upper pane lists the machines accessed through the connection. Select a machine to view its details in the lower pane. Session details are also provided for open sessions.

Use the search feature to find machines quickly. Either select a saved search from the list at the top of the window, or create a new search. You can either search by typing all or part of the machine name, or you can build an expression to use for an advanced search. To build an expression, click **Unfold**, and then select from the lists of properties and operators.

Manage machines on a connection

1. Select **Configuration > Hosting** in the Studio navigation pane.
2. Select a connection and then select **View Machines** in the Action pane.
3. Select one of the following in the Actions pane. Some actions may not be available, depending on the machine state and the connection host type.

- **Start** - Starts the machine if it is powered off or suspended.
- **Suspend** - Pauses the machine without shutting it down, and refreshes the list of machines.
- **Shut down** - Requests the operating system to shut down.
- **Force shut down** - Forcibly powers off the machine, and refreshes the list of machines.
- **Restart** - requests the operating system to shut down and then start the machine again. If the operating system cannot comply, the desktop remains in its current state.
- **Enable maintenance mode** - To temporarily stop connections to a machine, put it into maintenance mode. Users cannot connect to a machine in this state. If users are connected, maintenance mode takes effect when they log off.

To turn maintenance mode on or off for all machines accessed through a connection, see above.

- **Remove from Delivery Group** - Removing a machine from a Delivery Group does not delete it from the machine catalog that the Delivery Group uses. You can remove a machine only when no user is connected to it (turn on maintenance mode to temporarily prevent users from connecting while you are removing the machine).
- **Delete** - When you delete a machine, users no longer have access to it, and the machine is deleted from the machine catalog. Before deleting a machine, ensure that all user data is backed up or no longer required. You can delete a machine only when no user is connected to it (turn on maintenance mode to temporarily stop users from connecting while you are deleting the machine).

For actions that involve machine shutdown, if the machine does not shut down within 10 minutes, it is powered off. If Windows attempts to install updates during shutdown, there is a risk that the machine will be powered off before the updates are complete.

Delete, rename, or test resources

1. Select Configuration > Hosting in the Studio navigation pane.
2. Select the resource and then select the appropriate entry in the Actions pane: Delete Resources, Rename Resources, or Test Resources.

Use IntelliCache for XenServer connections

Using IntelliCache, hosted VDI deployments are more cost-effective because you can use a combination of shared storage and local storage. This enhances performance and reduces network traffic. The local storage caches the master image from the shared storage, which reduces the amount of reads on the shared storage. For shared desktops, writes to the differencing disks are written to local storage on the host and not to shared storage.

- Shared storage must be NFS when using IntelliCache.
- Citrix recommends that you use a high performance local storage device to ensure the fastest possible data transfer.

To use IntelliCache, you must enable it in both this product and XenServer.

- When installing XenServer, select Enable thin provisioning (Optimized storage for XenDesktop). Citrix does not support mixed pools of servers that have IntelliCache enabled and servers that do not. For more information, see the XenServer documentation.
- In XenApp and XenDesktop, IntelliCache is disabled by default. You can change the setting only when creating a XenServer connection; you cannot disable IntelliCache later. When you add a XenServer connection from Studio:
 - Select Shared as the storage type.
 - Select the Use IntelliCache check box.

Connection timers

You can use policy settings to configure three connection timers:

- A maximum connection timer. This setting determines the maximum duration of an uninterrupted connection between a user device and a virtual desktop. Use the Session connection timer and Session connection timer interval policy settings.
- A connection idle timer. This setting determines how long an uninterrupted user device connection to a virtual desktop will be maintained if there is no input from the user. Use the Session idle timer and Session idle timer interval policy settings.
- A disconnect timer. This setting determines how long a disconnected, locked virtual desktop can remain locked before the session is logged off. Use the Disconnected session timer and Disconnected session timer interval policy settings.

When you update any of these settings, ensure they are consistent across your deployment.

Connection leasing

To ensure that the Site database is always available, Citrix recommends starting with a fault-tolerant SQL Server deployment by following high availability best practices from Microsoft. However, network issues and interruptions may prevent Delivery Controllers from accessing the database, resulting in users not being able to connect to their applications or desktop.

The connection leasing feature supplements the SQL Server high availability best practices by enabling users to connect and reconnect to their most recently used applications and desktops, even when the Site database is not available.

Although users may have a large number of published resources available, they often use only a few of them regularly. When you enable connection leasing, each Controller caches user connections to those recently used applications and desktops during normal operations (when the database is available).

The leases generated on each Controller are uploaded to the Site database for periodic synchronization to other Controllers on the Site. In addition to leases, each Controller's cache holds application, desktop, icon, and worker information. The lease and related information is stored on each Controller's local disk. If the database becomes unavailable, the Controller enters leased connection mode and "replays" the cached operations when a user attempts to connect or reconnect to a recently used application or desktop from StoreFront.

Connections are cached for a lease period; the default is two weeks. So, if the database becomes unavailable, the desktops and applications that the user launched in the previous two weeks remain accessible to that user through StoreFront. However, desktops and applications that have not been launched during the previous two-week lease period are not accessible when the database is unavailable. For example, if a user last launched an application three weeks ago, its lease has expired, and that user cannot launch that application if the database becomes unavailable now. Leases for long-running active or disconnected application or desktop sessions are extended so that they are not considered expired.

By default, connection leasing affects the entire Site; however, you can revoke all leases for specific users, which prevents them from accessing any applications or desktops when the Controller is in leased connection mode. Several other registry settings apply on a Controller basis.

Considerations and limitations

While connection leasing can improve connection resiliency and user productivity, there are considerations related to the availability, operation, and performance of other features.

Connection leasing is supported for server-hosted applications and desktops, and static (assigned) desktops; it is not supported for pooled VDI desktops or for users who have not been assigned a desktop when the database becomes unavailable.

When the Controller is in leased connection mode:

- Administrators cannot use Studio, Director, or the PowerShell console.
- Workspace Control is not available. When a user logs on to Receiver, sessions do not automatically reconnect; the user must relaunch the application.
- If a new lease is created immediately before the database becomes unavailable, but the lease information has not yet been synchronized across all Controllers, the user might not be able to launch that resource after the database becomes unavailable.
- Server-hosted application and desktop users may use more sessions than their configured session limits. For example:
 - A session may not roam when a user launches it from one device (connecting externally through NetScaler Gateway) when the Controller is not in leased connection mode and then connects from another device on the LAN when the Controller is in leased connection mode.
 - Session reconnection may fail if an application launches just before the database becomes unavailable; in such cases, a new session and application instance are launched.
- Static (assigned) desktops are not power-managed. VDAs that are powered off when the Controller enters leased connection mode remain unavailable until the database connection is restored, unless the administrator manually powers them on.
- If session prelaunch and session linger are enabled, new prelaunch sessions are not started. Prelaunched and lingering sessions will not be ended according to configured thresholds while the database is unavailable.
- Load management within the Site may be affected. Server-based connections are routed to the most recently used VDA. Load evaluators (and especially, session count rules) may be exceeded.
- The Controller will not enter leased connection mode if you use SQL Server Management Studio to take the database offline. Instead, use one of the following Transact-SQL statements:
 - ALTER DATABASE <database-name> SET OFFLINE WITH ROLLBACK IMMEDIATE
 - ALTER DATABASE <database-name> SET OFFLINE WITH ROLLBACK AFTER <seconds>Either statement cancels any pending transactions and causes the Controller to lose its connection with the database. The Controller then enters leased connection mode.

When connection leasing is enabled, there are two brief intervals during which users cannot connect or reconnect: (1) from the time the database becomes unavailable to when the Controller enters leased connection mode, and (2) from the time the Controller changes from leased connection mode to when database access is fully restored and the VDAs have re-registered.

Configure and deploy

When configuring your deployment to accommodate connection leasing:

- VDAs must be at minimum version 7.6, and the machine catalogs and Delivery Groups that use those machines must be at that minimum level (or a later supported version).

- The Site database size requirements will increase.
- Each Controller needs additional disk space for the cached lease files.

Connection leasing is enabled by default.

You can turn connection leasing off or on from the PowerShell SDK or the Windows registry. From the PowerShell SDK, you can also remove current leases. The following PowerShell cmdlets affect connection leasing; see the cmdlet help for details.

- `Set-BrokerSite -ConnectionLeasingEnabled $true|$false` - Turns connection leasing on or off. Default = `$true`
- `Get-BrokerServiceAddedCapability` - Outputs “ConnectionLeasing” for the local Controller.
- `Get-BrokerLease` - Retrieves either all or a filtered set of current leases.
- `Remove-BrokerLease` - Marks either one or a filtered set of leases for deletion.
- `Update-BrokerLocalLeaseCache` - Updates the connection leasing cache on the local Controller. The data is resynchronized during the next synchronization.

Virtual IP and virtual loopback

Note: These features are valid only for Windows Server 2008 R2 and Windows Server 2012 R2 machines. They do not apply to Windows Desktop OS machines.

The Microsoft virtual IP address feature provides a published application with a unique dynamically-assigned IP address for each session. The Citrix virtual loopback feature allows you to configure applications that depend on communications with localhost (127.0.0.1 by default) to use a unique virtual loopback address in the localhost range (127.*).

Certain applications, such as CRM and Computer Telephony Integration (CTI), use an IP address for addressing, licensing, identification, or other purposes and thus require a unique IP address or a loopback address in sessions. Other applications may bind to a static port, so attempts to launch additional instances of an application in a multiuser environment will fail because the port is already in use. For such applications to function correctly in a XenApp environment, a unique IP address is required for each device.

Virtual IP and virtual loopback are independent features. You can use either or both.

Administrator action synopsis:

- To use Microsoft virtual IP, enable and configure it on the Windows server.
- To use Citrix virtual loopback, configure two settings in a Citrix policy.

Virtual IP

When virtual IP is enabled and configured on the Windows server, each configured application running in a session appears to have a unique address. Users access these applications on a XenApp server in the same way they access any other published application. A process requires virtual IP in either of the following cases:

- The process uses a hard-coded TCP port number
- The process uses Windows sockets and requires a unique IP address or a specified TCP port number

To determine if an application needs to use virtual IP addresses:

1. Obtain the TCPView tool from Microsoft. This tool lists all applications that bind specific IP addresses and ports.
2. Disable the Resolve IP Addresses feature so that you see the addresses instead of host names.
3. Launch the application and use TCPView to see which IP addresses and ports are opened by the application and which process names are opening these ports.
4. Configure any processes that open the IP address of the server, 0.0.0.0, or 127.0.0.1.

5. To ensure that an application does not open the same IP address on a different port, launch an additional instance of the application.

How Microsoft Remote Desktop (RD) IP virtualization works

- Virtual IP addressing must be enabled on the Microsoft server.

For example, in a Windows Server 2008 R2 environment, from Server Manager, expand Remote Desktop Services > RD Session Host Connections to enable the RD IP Virtualization feature and configure the settings to dynamically assign IP addresses using the Dynamic Host Configuration Protocol (DHCP) server on a per-session or per-program basis. See the Microsoft documentation for instructions.

- After the feature is enabled, at session start-up, the server requests dynamically-assigned IP addresses from the DHCP server.
- The RD IP Virtualization feature assigns IP addresses to remote desktop connections per-session or per-program. If you assign IP addresses for multiple programs, they share a per-session IP address.
- After an address is assigned to a session, the session uses the virtual address rather than the primary IP address for the system whenever the following calls are made: `bind`, `closesocket`, `connect`, `WSAConnect`, `WSAAccept`, `getpeername`, `getsockname`, `sendto`, `WSASendTo`, `WSASocketW`, `gethostbyaddr`, `getnameinfo`, `getaddrinfo`

When using the Microsoft IP virtualization feature within the Remote Desktop session hosting configuration, applications are bound to specific IP addresses by inserting a “filter” component between the application and Winsock function calls. The application then sees only the IP address it should use. Any attempt by the application to listen for TCP or UDP communications is bound to its allocated virtual IP address (or loopback address) automatically, and any originating connections opened by the application originate from the IP address bound to the application.

In functions that return an address (such as `GetAddrInfo()`, which is controlled by a Windows policy), if the local host IP address is requested, virtual IP looks at the returned IP address and changes it to the virtual IP address of the session. Applications that attempt to get the IP address of the local server through such name functions see only the unique virtual IP address assigned to that session. This IP address is often used in subsequent socket calls, such as `bind` or `connect`.

Often, an application requests to bind to a port for listening on the address 0.0.0.0. When an application does this and uses a static port, you cannot launch more than one instance of the application. The virtual IP address feature also looks for 0.0.0.0 in these call types and changes the call to listen on the specific virtual IP address, which enables more than one application to listen on the same port on the same computer because they are all listening on different addresses. The call is changed only if it is in an ICA session and the virtual IP address feature is enabled. For example, if two instances of an application running in different sessions both try to bind to all interfaces (0.0.0.0) and a specific port (such as 9000), they are bound to `VIPAddress1:9000` and `VIPAddress2:9000` and there is no conflict.

Virtual loopback

Enabling the Citrix virtual IP loopback policy settings allows each session to have its own loopback address for communication. When an application uses the localhost address (default = 127.0.0.1) in a Winsock call, the virtual loopback feature simply replaces 127.0.0.1 with 127.X.X.X, where X.X.X is a representation of the session ID + 1. For example, a session ID of 7 is 127.0.0.8. In the unlikely event that the session ID exceeds the fourth octet (more than 255), the address rolls over to the next octet (127.0.1.0), to the maximum of 127.255.255.255.

A process requires virtual loopback in either of the following cases:

- The process uses the Windows socket loopback (localhost) address (127.0.0.1)
- The process uses a hard-coded TCP port number

Use the [virtual loopback policy settings](#) for applications that use a loopback address for interprocess communication. No additional configuration is required. Virtual loopback has no dependency on Virtual IP, so you do not have to configure the Microsoft server.

- Virtual IP loopback support. When enabled, this policy setting allows each session to have its own virtual loopback address. This setting is disabled by default. The feature applies only to applications specified with the Virtual IP virtual loopback programs list policy setting.
- Virtual IP virtual loopback programs list. This policy setting specifies the applications that use the virtual IP loopback feature. This setting applies only when the Virtual IP loopback support policy setting is enabled.

Related feature

You can use the following registry settings to ensure that virtual loopback is given preference over virtual IP; this is called *preferred loopback*. However, proceed with caution:

- Use preferred loopback only if both Virtual IP and virtual loopback are enabled; otherwise, you may have unintended results.
- Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

Run regedit on the servers where the applications reside.

- HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Citrix\VIP
(HKEY_LOCAL_MACHINE\SOFTWARE\Citrix\VIP for 32-bit machines)
- Name: PreferLoopback, Type: REG_DWORD, Data: 1
- Name: PreferLoopbackProcesses, Type: REG_MULTI_SZ, Data: <list of processes>

Change secondary database locations

By default, the Configuration Logging and Monitoring databases (the *secondary* databases) are located on the same server as the Site Configuration database. Initially, all three databases have the same name. Citrix recommends that you change the location of the secondary databases after you create a Site. You can host the Configuration Logging and Monitoring databases on the same server or on different servers. The backup strategy for each database may differ.

When you change the location of the Configuration Logging or Monitoring database:

- The data in the previous database is not imported to the new database.
- Logs cannot be aggregated from both databases when retrieving logs.
- The first log entry in the new database indicates that a database change occurred, but it does not identify the previous database.

Before you change the location of the Configuration Logging or Monitoring database, install a supported version of Microsoft SQL Server on the server where the database will reside. Set up mirror, cluster, or other supported redundancy infrastructures, as needed.

You cannot change the location of the Configuration Logging database when mandatory logging is enabled.

Note: You cannot use this method to change the location of the Site Configuration database.

1. Select Configuration in the Studio navigation pane. The names and addresses of the three databases are listed, plus mirror server addresses, if configured.
2. Select the database for which you want to specify a new location and then select Change Database in the Actions pane.
3. Specify the location of the server containing the new SQL Server installation (using one of the forms in the following table) and the database name.

Database type	What to enter	With this database configuration
Standalone or mirror	<i>servername</i>	The default instance is used and SQL Server uses the default port.
	<i>Servername\INSTANCENAME</i>	A named instance is used and SQL Server uses the default port.
	<i>servername,port-number</i>	The default instance is used and SQL Server uses a custom port. (The comma is required.)
Other	<i>cluster-name</i>	A clustered database.
	<i>availability-group-listener</i>	An Always-On database.

4. If you want Studio to create the database, click OK. When prompted, click OK, and Studio will create the database automatically. Studio attempts to access the database using the current Studio user's credentials; if that fails, you are prompted for the database user's credentials. Studio then uploads the database schema to the database. (The credentials are retained only for the database creation time frame.)
5. If you want to create the database manually, click Generate script. The generated scripts includes instructions for manually creating the database and a mirror database, if needed. Ensure that the database is empty and that at least one user has permission to access and change the database before uploading the schema.

Delivery Controller environment

In a deployment, the Delivery Controller is the server-side component that is responsible for managing user access, plus brokering and optimizing connections. Controllers also provide the Machine Creation Services that create desktop and server images.

A Site must have at least one Delivery Controller. After you install the initial Controller and create a Site, you can add additional Controllers. There are two primary benefits from having more than one Controller in a Site.

- **Redundancy** — As best practice, a production Site should always have at least two Controllers on different physical servers. If one Controller fails, the others can manage connections and administer the Site.
- **Scalability** — As Site activity grows, so does CPU utilization on the Controller and SQL Server database activity. Additional Controllers provide the ability to handle more users and more applications and desktop requests, and can improve overall responsiveness.

How Virtual Delivery Agents (VDAs) discover Controllers

Before a VDA can be used, it must register (establish communication) with a Controller on the Site. The VDA finds a Controller by checking a list of Controllers called the *ListOfDDCs*. The *ListOfDDCs* comprises one or more DNS entries or IP addresses that point the VDA to Controllers on the Site. For load balancing, the VDA automatically distributes connections across all Controllers in the list.

In addition to the *ListOfDDCs*, the *ListOfSIDs* indicates which machine Security IDs (SIDs) the VDA allows to contact it as a Controller. The *ListOfSIDs* can be used to decrease the load on Active Directory or to avoid possible security threats from a compromised DNS server.

It is important to ensure that the *ListOfDDCs* and *ListOfSIDs* on all VDAs contain current information as Controllers are added and removed in the Site. If the lists are not updated, a VDA might reject session launches that were brokered by an unlisted Controller. Invalid entries can delay the startup of the virtual desktop system software. To keep the lists current, you can:

- Use the *auto-update* feature, which automatically updates the *ListOfDDCs* and *ListOfSIDs* as Controllers are added or removed. By default, auto-update is enabled.
- *Self-manage* - that is, manually update policy or registry settings that identify Controllers.

Information in the *ListOfDDCs* and *ListOfSIDs* can come from several places in a deployment. The VDA checks the following locations, in order, stopping at the first place it finds the lists:

1. A persistent storage location maintained for the auto-update feature. This location contains Controller information when auto-update is enabled and after the VDA

successfully registers for the first time after installation. (This storage also holds machine policy information, which ensures that policy settings are retained across restarts.)

For its initial registration after installation, or when auto-update is disabled, the VDA checks the following locations.

2. Policy settings (Controllers, Controller SIDs).
3. The Controller information under the Virtual Desktop Agent key in the registry. The VDA installer initially populates these values, based on Controller information you specify when installing the VDA.
4. OU-based Controller discovery. This is a legacy method maintained for backward compatibility.
5. The Personality.ini file created by Machine Creation Services.

If a ListOfDDCs specifies more than one Controller, the VDA attempts to connect to them in random order. The ListOfDDCs can also contain Controller groups, which are designated by brackets surrounding two or more Controller entries. The VDA attempts to connect to each Controller in a group before moving to other entries in the ListOfDDCs.

For XenDesktop users who have upgraded from versions earlier than 7.0, the auto-update feature replaces the CNAME function from the earlier version. You can manually re-enable the CNAME function, if desired; however, for DNS aliasing to work consistently, you cannot use both the auto-update feature and the CNAME function. See [CTX137960](#) for information about re-enabling the CNAME functionality.

Considerations for choosing auto-update or self-manage

The policy setting that enables/disables auto-update is enabled by default.

The following types of deployments cannot use auto-update, and must self-manage.

- Deployments that use Controller groups.
- Deployments that use ListOfSIDs for security reasons. (Deployments that use ListOfSIDs to decrease the Active Directory load can use auto-update.)
- Deployments that use Provisioning Services without a write-back disk.
- Deployments that use the Controllers or Controller SIDs policy setting.

Use auto-update

The auto-update policy setting is located in the Virtual Delivery Agent category.

- To enable auto-update, enable the Enable auto update of Controllers policy setting. This setting is enabled by default.

- To disable auto-update, disable the Enable auto update of Controllers policy setting.

When auto-update is enabled and you install a VDA, the VDA attempts to register with one of the Controller values you specified when you installed the VDA. The installer writes the Controller information you specify during VDA installation to the ListOfDDCs registry value.

After the VDA registers, the Controller with which it registered sends a list of the current Controller Fully Qualified Domain Names (FQDNs) and Security IDs (SIDs) to the VDA. The VDA writes this list to the auto-update persistent storage. Each Controller also checks the Site Configuration Database every 90 minutes for Controller information - if a Controller has been added or removed since the last check, or if a policy change has occurred, the Controller sends updated lists to its registered VDAs. The VDA will accept connections from all the Controllers in the most recent list it received.

If a VDA receives a list that does not include the Controller it is registered with (in other words, that Controller was removed from the Site), the VDA re-registers, choosing among the Controllers in the list. After a VDA registers or re-registers, it receives an updated list.

For example:

1. A deployment has three Controllers: A, B, and C. A VDA is installed and registers with Controller B (which was specified during VDA installation).
2. Two Controllers (D and E) are added to the Site. Within 90 minutes, VDAs receive updated lists and will accept connections from Controllers A, B, C, D, and E. (The load will not be spread equally to all Controllers until the VDAs are restarted.)
3. Controller B is removed from the Site. Within 90 minutes, VDAs receive updated lists because there has been a Controller change since the last check. The VDA installed in step 1 is registered with Controller B, which is no longer on the list, so that VDA re-registers, choosing among the Controllers in the current list (A, C, D, and E).

Self-manage

If you do not use auto-update, you must update the Citrix policy setting or registry values for each Virtual Delivery Agent (VDA) in the site (or the VDA image) after you add, move, or remove Delivery Controllers in the Site. Registry changes can also be updated using Group Policy Object.

To self-manage using Citrix policy settings:

1. Update the FQDN values specified in the Controllers policy setting. This policy setting is located in the Virtual Delivery Agent category.
2. If you also use ListOfSIDs in your deployment, update the SID values specified in the Controller SIDs policy setting.

To self-manage using the registry:

Caution: Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

1. Update the ListOfDDCs registry key, which lists the FQDNs of all the Controllers in the Site. (This key is the equivalent of the Active Directory Site OU.) Separate multiple values with spaces. Surround Controller groups with brackets.

HKEY_LOCAL_MACHINE\Software\Citrix\VirtualDesktopAgent\ListOfDDCs (REG_SZ)

If the HKEY_LOCAL_MACHINE\Software\Citrix\VirtualDesktopAgent registry location contains both the ListOfDDCs and FarmGUID keys, ListOfDDCs is used for Controller discovery; FarmGUID is present if a site OU was specified during VDA installation.

2. Optionally, update the ListOfSIDs registry key:

HKEY_LOCAL_MACHINE\Software\Citrix\VirtualDesktopAgent\ListOfSIDs (REG_SZ)

Add, remove, or move Controllers, or move a VDA

To add, remove, or move a Delivery Controller, you need the following roles or permissions:

Operation	Purpose	Server role	Database role
Database creation	Create suitable empty database	dbcreator	
Schema creation	Create all service-specific schemas and add first Controller to Site	securityadmin *	db_owner
Add Controller	Add Controller (other than the first) to the Site	securityadmin *	db_owner
Add Controller (mirror server)	Add Controller login to the database server currently in the mirror role of a mirrored database	securityadmin *	
Remove Controller	Remove Controller from the Site		db_owner
Schema update	Apply schema updates or hotfixes		db_owner
<p>* While technically more restrictive, in practice, the securityadmin server role should be treated as equivalent to the sysadmin server role.</p> <p>When using Studio to perform these operations, the user account must explicitly be a member of the sysadmin server role.</p>			

If your deployment uses database mirroring:

- Before adding, removing, or moving a Controller, ensure that the principal and mirrored databases are both running. In addition, if you are using scripts with SQL Server Management Studio, enable SQLCMD mode before executing the scripts.
- To verify mirroring after adding, removing, or moving a Controller, run the `get-configdbconnection` PowerShell cmdlet to ensure that the Failover Partner has been set in the connection string to the mirror.

After you add, remove, or move a Controller:

- If auto-update is enabled, the Virtual Delivery Agents (VDAs) will receive an updated list of Controllers within 90 minutes.

- If auto-update is not enabled, ensure that the Controller policy setting or ListOfDDCs registry key are updated for all VDAs. After moving a Controller to another Site, update the policy setting or registry key on both Sites.

Add a Controller

You cannot add servers installed with an earlier version of this software to a Site that was created with this version.

1. On the server you want to add, run the installer and select the Delivery Controller and any other core components you want to install.
2. In Studio, click Join existing deployment and enter the Site address.

Remove a Controller

Removing a Controller does not uninstall the Citrix software or any other component; it removes the Controller from the Database so that it can no longer be used to broker connections and perform other tasks. If you remove a Controller, you can later add it back to the same Site or to another Site. A Site requires at least one Controller, so you cannot remove the last one listed in Studio.

Note: Make sure that the Controller is powered on so that Studio loads in less than one hour. Once Studio loads the Controller you want to remove, power off the Controller when prompted to do so.

When you remove a Controller from a Site, the Controller logon to the database server is not removed. This avoids potentially removing a logon that is used by other products' services on the same machine. The logon must be removed manually if it is no longer required; the securityadmin server role permission is needed to remove the logon.

Do not remove the Controller from Active Directory until after you remove it from the Site.

1. Select Configuration > Controllers in the Studio navigation pane, then select the Controller you want to remove.
2. Select Remove Controller in the Actions pane. If you do not have the correct database roles and permissions, you are offered the option of generating a script that allows your database administrator to remove the Controller for you.
3. You might need to remove the Controller's machine account from the database server. Before doing this, check that another service is not using the account.

After using Studio to remove a Controller, traffic to that Controller might linger for a short amount of time to ensure proper completion of current tasks. If you want to force the removal of a Controller in a very short time, Citrix recommends you shut down the server where it was installed, or remove that server from Active Directory. Then, restart the other Controllers on the Site to ensure no further communication with the removed Controller.

Move a Controller to another Site

You cannot move a Controller to a Site that was created with an earlier version of this software.

1. On the Site where the Controller is currently located (the old Site), select Configuration > Controllers in the Studio navigation pane, then select the Controller you want to move.
2. Select Remove Controller in the Actions pane. If you do not have the correct database roles and permissions, you are offered the option of generating a script that allows your database administrator to remove the Controller for you. A Site requires at least one Controller, so you cannot remove the last one listed in Studio.
3. On the Controller you are moving, open Studio, reset the services when prompted, select Join existing site, and enter the address of the new Site.

Move a VDA

You can move a VDA to another Site (from Site 1 to Site 2) when upgrading, or when moving a VDA image that was created in a test Site to a production Site. There are two ways to do this: using the installer or Citrix policies.

- Installer: Run the installer and add a Controller, specifying the FQDN (DNS entry) of a Controller in Site 2.

Important: Specify Controllers in the installer only when the Controllers policy setting is not used.

- Group Policy Editor: The following example moves multiple VDAs between Sites.
 1. Create a policy in Site 1 that contains the following settings, then filter the policy to the Delivery Group level to initiate a staged VDA migration between the Sites.
 - Controllers - containing FQDNs (DNS entries) of one or more Controllers in Site 2.
 - Enable auto update of Controllers - set to disabled.
 2. Each VDA in the Delivery Group is alerted within 90 minutes of the new policy. The VDA ignores the list of Controllers it receives (because auto-update is disabled); it selects one of the Controllers specified in the policy, which lists the Controllers in Site 2.
 3. When the VDA successfully registers with a Controller in Site 2, it receives the Site 2 ListOfDDCs and policy information, which has auto-update enabled by default. Since the Controller with which the VDA was registered in Site 1 is not on the list sent by the Controller in Site 2, the VDA re-registers, choosing among the Controllers in the Site 2 list. From then on, the VDA is automatically updated with information from Site 2.

Active Directory OU-based Controller discovery

This Delivery Controller discovery method is supported primarily for backward compatibility, and is valid only for Virtual Delivery Agents (VDAs) for Windows Desktop OS, not VDAs for Windows Server OS. Active Directory-based discovery requires that all computers in a Site are members of a domain, with mutual trusting relationships between the domain used by the Controller and the domain(s) used by desktops. If you use this method, you must configure the GUID of the OU in each desktop registry.

To perform an OU-based Controller discovery, run the `Set-ADControllerDiscovery.ps1` PowerShell script on the Controller (each Controller contains this script in the folder `$Env:ProgramFiles\Citrix\Broker\Service\Setup Scripts`). To run the script, you must have `CreateChild` permissions on a parent OU, plus full administration rights.

When you create a Site, a corresponding Organizational Unit (OU) must be created in Active Directory if you want desktops to discover the Controllers in the Site through Active Directory. The OU can be created in any domain in the forest that contains your computers. As best practice, the OU should also contain the Controllers in the Site, but this is not enforced or required. A domain administrator with appropriate privileges can create the OU as an empty container, then delegate administrative authority over the OU to a Citrix administrator.

The script creates several essential objects. Only standard Active Directory objects are created and used. It is not necessary to extend the schema.

- A Controllers security group. The computer account of all Controllers in the Site must be a member of this security group. Desktops in a Site accept data from Controllers only if they are members of this security group.

Ensure that all Controllers have the 'Access this computer from the network' privilege on all virtual desktops running the VDA. You can do this by giving the Controllers security group this privilege. If Controllers do not have this privilege, VDAs will not register.

- A Service Connection Point (SCP) object that contains information about the Site, such as the Site name. If you use the Active Directory Users and Computers administrative tool to inspect a Site OU, you might need to enable Advanced Features in the View menu to see SCP objects.
- A container called `RegistrationServices`, which is created in the Site OU. This contains one SCP object for each Controller in the Site. Each time the Controller starts, it validates the contents of its SCP and updates it, if necessary.

If multiple administrators are likely to add and remove Controllers after the initial installation, they need permissions to create and delete children on the `RegistrationServices` container, and Write properties on the Controllers security group; these permissions are granted automatically to the administrator who runs the `Set-ADControllerDiscovery.ps1` script. The domain administrator or the original installing administrator can grant these permissions, and Citrix recommends setting up a security

group to do this.

When you are using a Site OU:

- Information is written to Active Directory only when installing or uninstalling this software, or when a Controller starts and needs to update the information in its SCP (for example, because the Controller was renamed or because the communication port was changed). By default, the Set-ADControllerDiscovery.ps1 script sets up permissions on the objects in the Site OU appropriately, giving each Controller Write access to its SCP. The contents of the objects in the Site OU are used to establish trust between desktops and Controllers. Ensure that:
 - Only authorized administrators can add or remove computers from the Controllers security group, using the security group's access control list (ACL).
 - Only authorized administrators and the respective Controller can change the information in the controller's SCP.
- If your deployment uses replication, be aware of potential delays; see the Microsoft documentation for details. This is particularly important if you create the Site OU in a domain that has domain controllers in multiple Active Directory sites. Depending on the location of desktops, Controllers, and domain controllers, changes that are made to Active Directory when you are initially creating the Site OU, installing or uninstalling Controllers, or changing Controller names or communication ports might not be visible to desktops until that information is replicated to the appropriate domain controller. The symptoms of such replication delay include desktops that cannot establish contact with Controllers and are therefore not available for user connections.
- This software uses several standard computer object attributes in Active Directory to manage desktops. Depending on your deployment, the machine object's fully qualified domain name, as stored in the desktop's Active Directory record, can be included as part of the connection settings that are returned to the user to make a connection. Ensure that this information is consistent with information in your DNS environment.

To move a Controller to another Site using OU-based Controller discovery

Follow the directions in Move a Controller to another Site. After you remove the Controller from the old Site (step 2), run the PowerShell script Set-ADControllerDiscover -sync.

This script synchronizes the OU with the current set of Controllers. After joining the existing Site (step 3), run the same script on any Controller in the new Site.

Sessions

Maintaining session activity is critical to providing the best user experience. Losing connectivity due to unreliable networks, highly variable network latency, and range limitations of wireless devices can lead to user frustration. Being able to move quickly between workstations and access the same set of applications each time they log on is a priority for many mobile workers such as health-care workers in a hospital.

Use the following features to optimize the reliability of sessions, reduce inconvenience, downtime, and loss of productivity; using these features, mobile users can roam quickly and easily between devices.

- Session reliability
- Auto Client Reconnect
- ICA Keep-Alive
- Workspace control

Session reliability

Session Reliability keeps sessions active and on the user's screen when network connectivity is interrupted. Users continue to see the application they are using until network connectivity resumes.

This feature is especially useful for mobile users with wireless connections. For example, a user with a wireless connection enters a railroad tunnel and momentarily loses connectivity. Ordinarily, the session is disconnected and disappears from the user's screen, and the user has to reconnect to the disconnected session. With Session Reliability, the session remains active on the machine. To indicate that connectivity is lost, the user's display freezes and the cursor changes to a spinning hourglass until connectivity resumes on the other side of the tunnel. The user continues to access the display during the interruption and can resume interacting with the application when the network connection is restored. Session Reliability reconnects users without reauthentication prompts.

Citrix Receiver users cannot override the Controller setting.

You can use Session Reliability with Secure Sockets Layer (SSL). SSL encrypts only the data sent between the user device and NetScaler Gateway.

Enable and configure Session Reliability with the following policy settings:

- The Session reliability connections policy setting allows or prevents session reliability.
- The Session reliability timeout policy setting has a default of 180 seconds, or three minutes. Although you can extend the amount of time Session Reliability keeps a session open, this feature is designed for user convenience and therefore does not prompt the user for reauthentication. As you extend the amount of time a session is kept open, chances increase that a user may get distracted and walk away from the

user device, potentially leaving the session accessible to unauthorized users.

- Incoming session reliability connections use port 2598, unless you change the port number in the Session reliability port number policy setting.
- If you do not want users to be able to reconnect to interrupted sessions without having to reauthenticate, use the Auto Client Reconnect feature. You can configure the Auto client reconnect authentication policy setting to prompt users to reauthenticate when reconnecting to interrupted sessions.

If you use both Session Reliability and Auto Client Reconnect, the two features work in sequence. Session Reliability closes, or disconnects, the user session after the amount of time you specify in the Session reliability timeout policy setting. After that, the Auto Client Reconnect policy settings take effect, attempting to reconnect the user to the disconnected session.

Auto Client Reconnect

With the Auto Client Reconnect feature, Receiver can detect unintended disconnections of ICA sessions and reconnect users to the affected sessions automatically. When this feature is enabled on the server, users do not have to reconnect manually to continue working. Receiver attempts to reconnect to the session until there is a successful reconnection or the user cancels the reconnection attempts.

Enable and configure Auto Client Reconnect with the following policy settings:

- Auto client reconnect. Enables or disables automatic reconnection by Receiver after a connection has been interrupted.
- Auto client reconnect authentication. Enables or disables the requirement for user authentication after automatic reconnection.
- Auto client reconnect logging. Enables or disables logging of reconnection events in the event log. Logging is disabled by default. When enabled, the server's system log captures information about successful and failed automatic reconnection events. Each server stores information about reconnection events in its own system log; the site does not provide a combined log of reconnection events for all servers.

Auto Client Reconnect incorporates an authentication mechanism based on encrypted user credentials. When a user initially logs on, the server encrypts and stores the user credentials in memory, and creates and sends a cookie containing the encryption key to Receiver. Receiver submits the key to the server for reconnection. The server decrypts the credentials and submits them to Windows logon for authentication. When cookies expire, users must reauthenticate to reconnect to sessions.

Cookies are not used if you enable the Auto client reconnection authentication setting. Instead, users are presented with a dialog box to users requesting credentials when Receiver attempts to reconnect automatically.

For maximum protection of user credentials and sessions, use SSL encryption for all communication between clients and the Site.

Disable Auto Client Reconnect on Citrix Receiver for Windows by using the `icaclient.adm` file. For more information, see the documentation for your Receiver for Windows version.

Settings for connections also affect Auto Client Reconnect:

- By default, Auto Client Reconnect is enabled through policy settings at the Site level, as described above. User reauthentication is not required. However, if a server's ICA TCP connection is configured to reset sessions with a broken communication link, automatic reconnection does not occur. Auto Client Reconnect works only if the server disconnects sessions when there is a broken or timed out connection. In this context, the *ICA TCP connection* refers to a server's virtual port (rather than an actual network connection) that is used for sessions on TCP/IP networks.
- By default, the ICA TCP connection on a server is set to disconnect sessions with broken or timed out connections. Disconnected sessions remain intact in system memory and are available for reconnection by Receiver.
- The connection can be configured to *reset* or *log off* sessions with broken or timed-out connections. When a session is reset, attempting to reconnect initiates a new session; rather than restoring a user to the same place in the application in use, the application is restarted.
- If the server is configured to reset sessions, Auto Client Reconnect creates a new session. This process requires users to enter their credentials to log on to the server.
- Automatic reconnection can fail if Receiver or the plug-in submits incorrect authentication information, which might occur during an attack or the server determines that too much time has elapsed since it detected the broken connection.

ICA Keep-Alive

Enabling the ICA Keep-Alive feature prevents broken connections from being disconnected. When enabled, if the server detects no activity (for example, no clock change, no mouse movement, no screen updates), this feature prevents Remote Desktop Services from disconnecting that session. The server sends keep-alive packets every few seconds to detect if the session is active. If the session is no longer active, the server marks the session as disconnected.

Note: ICA Keep-Alive works only if you are not using Session Reliability. Session Reliability has its own mechanisms to prevent broken connections from being disconnected. Configure ICA Keep-Alive only for connections that do not use Session Reliability.

ICA Keep-Alive settings override keep-alive settings that are configured in Microsoft Windows Group Policy.

Enable and configure ICA Keep-Alive with the following policy settings:

- ICA keep alive timeout. Specifies the interval (1-3600 seconds) used to send ICA keep-alive messages. Do not configure this option if you want your network monitoring software to close inactive connections in environments where broken connections are so infrequent that allowing users to reconnect to sessions is not a concern.

The default interval is 60 seconds: ICA Keep-Alive packets are sent to user devices every 60 seconds. If a user device does not respond in 60 seconds, the status of the ICA sessions changes to disconnected.

- ICA keep alives. Sends or prevents sending ICA keep-alive messages.

Workspace control

Workspace control lets desktops and applications follow a user from one device to another. This ability to roam enables a user to access all desktops or open applications from anywhere simply by logging on, without having to restart the desktops or applications on each device. For example, workspace control can assist health-care workers in a hospital who need to move quickly among different workstations and access the same set of applications each time they log on. If you configure workspace control options to allow it, these workers can disconnect from multiple applications at one client device and then reconnect to open the same applications at a different client device.

Workspace control affects the following activities:

- **Logging on** - By default, workspace control enables users to reconnect automatically to all running desktops and applications when logging on, bypassing the need to reopen them manually. Through workspace control, users can open disconnected desktops or applications, as well as any that are active on another client device. Disconnecting from a desktop or application leaves it running on the server. If you have roaming users who need to keep some desktops or applications running on one client device while they reconnect to a subset of their desktops or applications on another client device, you can configure the logon reconnection behavior to open only the desktops or applications that the user disconnected from previously.
- **Reconnecting** - After logging on to the server, users can reconnect to all of their desktops or applications at any time by clicking Reconnect. By default, Reconnect opens desktops or applications that are disconnected, plus any that are currently running on another client device. You can configure Reconnect to open only those desktops or applications that the user disconnected from previously.
- **Logging off** - For users opening desktops or applications through StoreFront, you can configure the Log Off command to log the user off from StoreFront and all active sessions together, or log off from StoreFront only.
- **Disconnecting** - Users can disconnect from all running desktops and applications at once, without needing to disconnect from each individually.

Workspace control is available only for Receiver users who access desktops and applications through a Citrix StoreFront connection. By default, workspace control is disabled for virtual desktop sessions, but is enabled for hosted applications. Session sharing does not occur by default between published desktops and any published applications running inside those desktops.

User policies, client drive mappings, and printer configurations change appropriately when a user moves to a new client device. Policies and mappings are applied according to the client device where the user is currently logged on to the session. For example, if a health care worker logs off from a client device in the emergency room of a hospital and then logs on to a workstation in the hospital's X-ray laboratory, the policies, printer mappings, and client drive mappings appropriate for the session in the X-ray laboratory go into effect at the session startup.

You can customize which printers appear to users when they change locations. You can also control whether users can print to local printers, how much bandwidth is consumed when users connect remotely, and other aspects of their printing experiences.

For information about enabling and configuring workspace control for users, see the StoreFront documentation.

Find machines, sessions, machine catalogs, applications, and Delivery Groups

Use the Search feature to view information about specific machines, sessions, machine catalogs, applications, or Delivery Groups.

1. Select Search in the Studio navigation pane.

Note: You cannot search within the machine catalogs or Delivery Groups tabs using the Search box. Use the Search node in the navigation pane.

To display additional search criteria in the display, click the plus sign next to the Search drop-down fields. Remove search criteria by clicking the minus button.

2. Enter the name or use the drop-down list to select another search option for the item you want to find.
3. Optionally, save your search by selecting Save as. The search appears in the Saved searches list.

Alternatively, click the Expand Search icon (dual downward angle brackets) to display a drop-down list of search properties; you can perform an advanced search by building an expression from the properties in the drop-down list.

Tips to enhance a search:

- To display additional characteristics to include in the display on which you can search and sort, right click any column and select Select columns.
- To locate a user device connected to a machine, use Client (IP) and Is, and enter the device IP address.
- To locate active sessions, use Session State, Is, and Connected.
- To list all of the machines in a Delivery Group, select Delivery Groups in the navigation pane, then select the group, and then select View Machines in the Actions pane.

IPv6

This release supports pure IPv4, pure IPv6, and dual-stack deployments that use overlapping IPv4 and IPv6 networks.

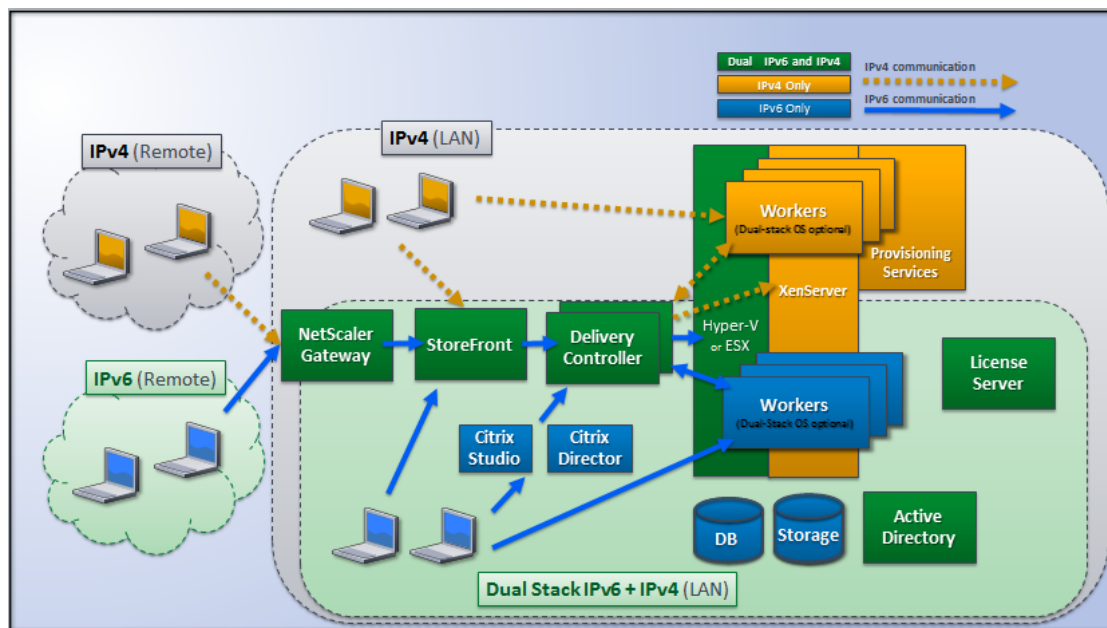
IPv6 communications are controlled with two Virtual Delivery Agent (VDA) connection-related Citrix policy settings:

- A primary setting that enforces the use of IPv6: Only use IPv6 Controller registration.
- A dependent setting that defines an IPv6 netmask: Controller registration IPv6 netmask.

When the Only use IPv6 Controller registration policy setting is enabled, VDAs register with a Delivery Controller for incoming connections using an IPv6 address.

Dual-stack IPv4/IPv6 deployment

The following figure illustrates a dual-stack IPv4/IPv6 deployment. In this scenario, a worker is a VDA installed on a hypervisor or on a physical system, and is used primarily to enable connections for applications and desktops. Components that support dual IPv6 and IPv4 are running on operating systems that use tunneling or dual protocol software.



These Citrix products, components, and features support only IPv4:

- Provisioning Services
- XenServer Version 6.x
- VDAs not controlled by the Only use IPv6 Controller registration policy setting

- XenApp versions earlier than 7.5, XenDesktop versions earlier than 7, and EdgeSight

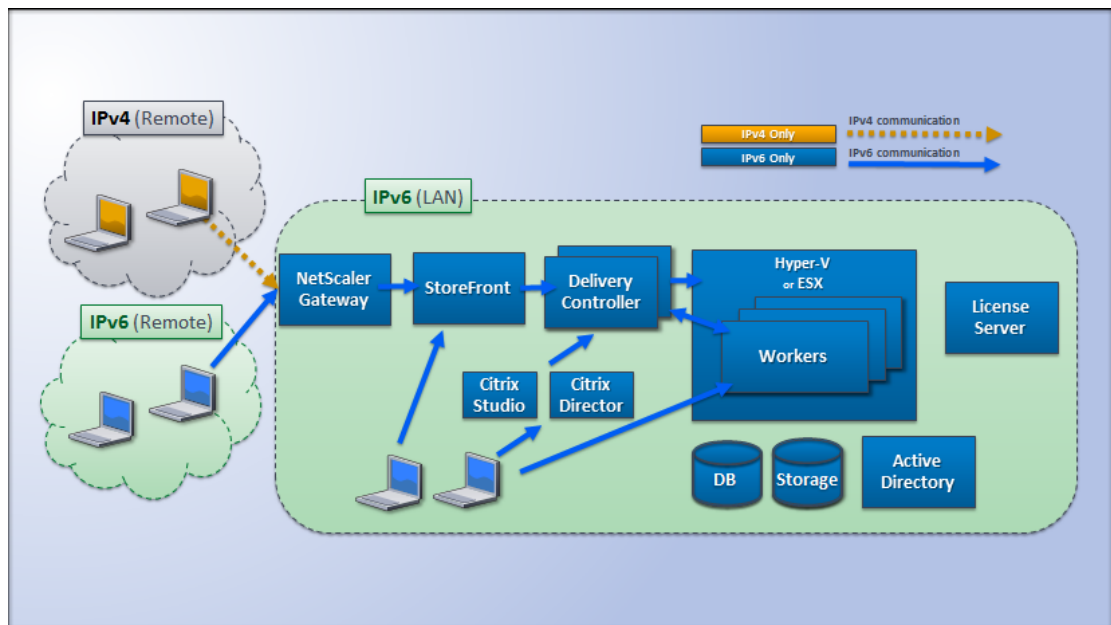
In this deployment:

- If a team frequently uses an IPv6 network and the administrator wants them to use IPv6 traffic, the administrator will publish IPv6 desktops and applications for those users based on a worker image or Organizational Unit (OU) that has the primary IPv6 policy setting turned on (that is, Only use IPv6 Controller registration is enabled).
- If a team frequently uses an IPv4 network, the administrator will publish IPv4 desktops and applications for those users based on a worker image or OU that has the primary IPv6 policy setting turned off (that is, Only use IPv6 Controller registration is disabled), which is the default.

Pure IPv6 deployment

The following figure illustrates a pure IPv6 deployment. In this scenario:

- The components are running on operating systems configured to support an IPv6 network.
- The primary Citrix policy setting (Only use IPv6 Controller registration) is enabled for all VDAs; they must register with the Controller using an IPv6 address.



Policy settings for IPv6

Two Citrix policy settings affect support for a pure IPv6 or dual stack IPv4/IPv6 implementation. Configure the following connection-related policy settings:

- Only use IPv6 Controller registration – Controls which form of address the Virtual Delivery Agent (VDA) uses to register with the Delivery Controller. Default = Disabled

- When the VDA communicates with the Controller, it uses a single IPv6 address chosen in the following precedence: global IP address, Unique Local Address (ULA), link-local address (only if no other IPv6 addresses are available).
- When disabled, the VDA registers and communicates with the Controller using the machine's IPv4 address.
- Controller registration IPv6 netmask – A machine can have multiple IPv6 addresses; this policy setting allows administrators to restrict the VDA to only a preferred subnet (rather than a global IP, if one is registered). This setting specifies the network where the VDA will register: the VDA registers only on the first address that matches the specified netmask. This setting is valid only if the Only use IPv6 Controller registration policy setting is enabled. Default = Empty string

Important: Important: Use of IPv4 or IPv6 by a VDA is determined solely by these policy settings. In other words, to use IPv6 addressing, the VDA must be controlled by a Citrix policy with the Only use IPv6 Controller registration setting enabled.

Deployment considerations

If your environment contains both IPv4 and IPv6 networks, you will need separate Delivery Group configurations for the IPv4-only clients and for the clients who can access the IPv6 network. Consider using naming, manual Active Directory group assignment, or Smart Access filters to differentiate users.

Reconnection to a session may fail if the connection is initiated on an IPv6 network, and then attempts are made to connect again from an internal client that has only IPv4 access.

Client folder redirection

Client folder redirection changes the way client-side files are accessible on the host-side session. When you enable only client drive mapping on the server, client-side full volumes are automatically mapped to the sessions as Universal Naming Convention (UNC) links. When you enable client folder redirection on the server and the user configures it on the user device, the portion of the local volume specified by the user is redirected.

Only the user-specified folders appear as UNC links inside sessions instead of the complete file system on the user device. If you disable UNC links through the registry, client folders appear as mapped drives inside the session.

Client folder redirection is supported on Windows Desktop OS machines only.

Enable client folder direction on the server. Then, on the client device, specify which folders to redirect (the application you use to specify the client folder options is included with the Citrix Receiver supplied with this release.

Caution: Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

1. On the server:
 - a. Create a key: HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Citrix\Client Folder Redirection.
 - b. Create a REG_DWORD value.
 - Name: CFROnlyModeAvailable
 - Type: REG_DWORD
 - Data: Set to 1
2. On the user device:
 - a. Ensure the latest version of Receiver is installed.
 - b. From the Receiver installation directory, start CtxCFRUI.exe.
 - c. Select the Custom radio button and add, edit, or remove folders.
 - d. Disconnect and reconnect your sessions for the setting to take effect.

Personal vDisks

The Personal vDisk feature retains the single image management of pooled and streamed desktops while allowing people to install applications and change their desktop settings.

Unlike traditional Virtual Desktop Infrastructure (VDI) deployments involving pooled desktops, where users lose their customizations and personal applications when the administrator alters the base virtual machine (VM), deployments using Personal vDisks retain those changes. This means administrators can easily and centrally manage their base VMs while providing users with a customized and personalized desktop experience.

Personal vDisks provide this separation by redirecting all changes made on the user's VM to a separate disk (the Personal vDisk) attached to the user's VM. The content of the Personal vDisk is blended at runtime with the content from the base VM to provide a unified experience. In this way, users can still access applications provisioned by their administrator in the base VM.

Personal vDisks have two parts, which are by default equally sized:

- One part comprises C:\Users (in Windows 7) or C:\Documents and Settings (in Windows XP). This contains user data, documents, and the user profile. By default this uses drive P: but you can choose a different drive letter when you use Studio to create a machine catalog with Personal vDisks.
- The other part comprises a Virtual Hard Disk file (a .vhd file). This contains all other items, for example applications installed in C:\Program Files. This part is hidden from users; it is not displayed in Windows Explorer.

Personal vDisks support the provisioning of department-level applications, as well as applications downloaded and installed by users, including those that require drivers, databases, and PC management software. If a user's change conflicts with an administrator's change, a Personal vDisk provides a simple and automatic way to reconcile the changes.

In addition, locally administered applications (such as those provisioned and managed by local IT departments) can also be provisioned into the user's environment. The user experiences no difference in usability; Personal vDisks ensure all changes made and all applications installed are stored on the vDisk. Where an application on a Personal vDisk exactly matches one on a master image, the copy on the Personal vDisk is discarded to save space without the user losing access to the application.

An algorithm automatically adjusts the relative sizes of the two parts of the vDisk depending on how the vDisk is used. For example, if a user installs several big applications on the Personal vDisk so space becomes limited, the application space is increased relative to the space for user data. The overall size of the Personal vDisk does not change. You can configure this resizing feature.

Physically, you store Personal vDisks on the hypervisor but they do not have to be in the same location as other disks attached to the virtual desktop. This can make Personal vDisk storage cheaper.

For procedures below that include editing the registry:

Caution: Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

Storage for hosts with Personal vDisks

When you create a host, you define storage locations for disks that are used by virtual machines. You can separate the Personal vDisks, which store the user profiles and user-installed applications, from the disks used for the machines' operating system. Each virtual machine must have access to a storage location for both disks. If you use local storage for both, they must be accessible from the same hypervisor. To ensure this requirement is met, Studio offers you only compatible storage locations when you create the host.

Back up Personal vDisks regularly using any preferred method. The vDisks are standard volumes in a hypervisor's storage tier, so you can back them up just like any other volume.

Add Personal vDisks to existing hosts

You add Personal vDisks to new hosts when you configure a site. You can also add Personal vDisks and storage for them to existing hosts (but not machine catalogs).

1. Select Configuration > Hosting in the Studio navigation pane and then select a host.
2. Select Add Personal vDisk storage in the Actions pane and specify the storage location.

Run the inventory when updating master images

You enable the Personal vDisk feature for use with a master image when you install the Virtual Delivery Agent. During the installation procedure and after any update to the image after installation, it is important that the disk's inventory is refreshed and a new snapshot is created. This procedure describes the required steps.

Because administrators, not users, manage master images, if you install an application that places binary files in the administrator's user profile, the application is not available to users of shared virtual desktops (including those based on pooled machine catalogs and pooled with Personal vDisk machine catalogs). Users must install such applications themselves.

It is best practice to take a snapshot of the image after each step in this procedure.

1. Update the master image by installing any applications or operating system updates, and performing any system configuration on the machine.

For master images based on Windows XP that you plan to deploy with Personal vDisks, check that no dialog boxes are open (for example, messages confirming software installations or prompts to use unsigned drivers). Open dialog boxes on master images in this environment prevent the VDA from registering with the Delivery Controller. You can prevent prompts for unsigned drivers using the Control Panel. For example, on Windows XP click System > Hardware > Driver Signing, and select the option to ignore warnings.

2. Shut down the machine. For Windows 7 machines, click Cancel when Citrix Personal vDisk blocks the shutdown.
3. In the Citrix Personal vDisk dialog box, click Update Inventory. This step may take several minutes to complete.

Important: If you interrupt the following shutdown (even to make a minor update to the image), the Personal vDisk's inventory no longer matches the master image. This causes the Personal vDisk feature to stop working. If you interrupt the shutdown, you must restart the machine, shut it down, and when prompted click Update Inventory again.

4. When the inventory operation shuts down the machine, take a snapshot of the master image.

Adjust the space available for applications

You can manually adjust the automatic resizing algorithm that determines the size of the VHD relative to the P: drive. Typically, there is no need to make this adjustment because the product manages the split dynamically on its own. But if, for example, you know users will install a number of applications that are too big to fit on the VHD even after it is resized by the algorithm, you could increase the initial size of the application space to accommodate the user-installed applications. You adjust the space by editing the initial size of the VHD in the registry.

Preferably, you make this adjustment on a machine catalog's master image (that is, before the desktops in the machine catalog are released to users). Alternatively, you can adjust the size of the VHD on a virtual desktop, when a user finds that they do not have the space to install an application, but you must repeat this operation individually on each affected virtual desktop; you cannot adjust the size in a machine catalog that is already in use.

1. On the master image or desktop, locate the registry keys located in `HKEY_LOCAL_MACHINE\SOFTWARE\Citrix\personal vDisk\Config`. You use several of these keys in the rest of this procedure.
2. Set `MinimumVHDSIZEMB` to the desired new initial size of the VHD (in megabytes). The new size must be greater than the existing size but less than the size of the physical disk minus `PvDReservedSpaceMB`.
3. Ensure that `PercentOfPvDForApps` is set to 50. This sets the default allocation of space on the personal vDisk to 50%. If any other value is used, the dynamic resizing algorithm is disabled.
4. Enable the algorithm by setting `EnableDynamicResizeOfAppContainer` to 1.
5. If you are using a profile management solution (such as Citrix Profile management), check that `EnableUserProfileRedirection` is set to 0. This value ensures that all of the space on P: is allocated to applications.

Important: Changes to the `EnableUserProfileRedirection` registry key are not honored when you perform an image update. Set the key's value when you first create the catalogs from which the profiles will originate. You cannot modify the redirection behavior later.

If you are carrying out this operation on a virtual desktop rather than a machine catalog, resizing takes place when the desktop is restarted.

Disable automatic resizing

On the master image or desktop, set `EnableDynamicResizeOfAppContainer` to 0. This registry key is located in `HKEY_LOCAL_MACHINE\SOFTWARE\Citrix\personal vDisk\Config`.

Antivirus products

If antivirus products are installed on your desktops, ensure the VHD is big enough to store antivirus definition files, which are typically large.

The presence of antivirus products can affect how long it takes to run the inventory or perform an update. Performance can improve if you add `CtxPvD.exe` and `CtxPvDSvc.exe` to the exclusion list of your antivirus product. These files are located in `C:\Program Files\Citrix\personal vDisk\bin`.

Change the assignment of Personal vDisks

In Provisioning Services, you can change the desktop that a Personal vDisk is assigned to in a machine catalog. When you do this, you must first put the desktop into maintenance mode in Studio, make the reassignment in Provisioning Services, and then wait for the desktop to re-register with the Controller before taking it out of maintenance mode. For instructions, see the Provisioning Services documentation.

Back up and restore Personal vDisks

Two PowerShell scripts supplied on the product installation media (in the `Support\Tools\Scripts` folder) allow you to back up and restore Personal vDisks.

- `migration-backup.ps1` captures the mapping between each user and their Personal vDisk in a machine catalog and stores this information in an .xml file.
- `migration-restore.ps1` uses the .xml file to re-create a user's desktop in a machine catalog.

Before backing up and restoring, note the following:

- The scripts work with the hypervisor API so the hypervisor's PowerShell snap-in must be installed on the Controller where the scripts are executed
- Run the scripts from a location that has access to the Controller where the machine catalog was created
- The scripts are supported on the following hypervisor platforms: Citrix XenServer, Microsoft Hyper-V, and VMware ESX

Back up a machine catalog

You should perform a backup when a change is made to a machine catalog. You can perform a backup while the machines in the machine catalog are active.

Use `migration-backup.ps1` to back up any machine catalog containing Personal vDisks. The script asks for the name of the machine catalog and connection information for the hypervisor. It then iterates through all of the user-assigned machines in the machine catalog and, for each machine, stores the mapping between the Personal vDisk storage and the assigned user. This information is located in an `.xml` file, which has the following structure:

```
<PvDMigration>
  <hypervisor>
    <type></type>
  </hypervisor>
  <PVD>
    <DiskId></DiskId>
    <DiskName></DiskName>
    <SRName></SRName>
    <SRID></SRID>
    <UserName></UserName>
    <UserSid></UserSid>
    <State></State>
  </PVD>
</PvDMigration>
```

- `PvDMigration.hypervisor.Type` supports VMware ESX, Citrix XenServer, and Microsoft Hyper-V.
- `PvDMigration.PVD` stores information on where the Personal vDisk is stored and the user associated with it.
- `PvDMigration.PVD.DiskId` is the unique identifier of the vDisk on the hypervisor on which the backup was taken.
- `PvDMigration.PVD.DiskName` is the name of the `.vhd` or `.vmdk` file.
- `PvDMigration.PVD.SRName` is the name of the storage provider when the backup was taken.
- `PvDMigration.PVD.SRID` is the unique identifier of the storage provider on the hypervisor on which the backup was taken.
- `PvDMigration.PVD.UserName` is the name of the user associated with this vDisk.
- `PvDMigration.PVD.UserSid` is the SID of the user associated with this vDisk.
- `PvDMigration.PVD.State` indicates the state of this vDisk. This can be either "backed up" or "processed." It is "backed up" after the initial backup; the state changes to "processed" after the `.xml` file is used for restoring from the backup.

Restore a machine catalog

Before restoring, note the following:

- You can only restore a machine catalog that shares the same master image as that of the backed-up machine catalog
- You must create a new master image by updating the inventory of the master image that the backed-up machine catalog was created from.

Use `migration-restore.ps1` to restore any machine catalog containing Personal vDisks. The script takes the following inputs:

- The .xml file created during the backup process.
- The name of the machine catalog to restore.
- The name of the location where the unattached Personal vDisks are stored. This is listed in the .xml file.
- Hypervisor connection information.

The `migration-restore.ps1` script finds any unassigned machines in the machine catalog and assigns users to them. It also attaches users' Personal vDisks to the machines.

Restore scenarios

Depending on the number of users, you restore their vDisks differently. Here are some examples:

Scenario 1 - Restore a machine catalog and its Personal vDisks using new machine names

In this scenario, an entire machine catalog and the Personal vDisks attached to the machines in it are restored. The machines are given new names. This scenario might occur when your hypervisor or a storage host has failed, or when you migrate users to a new infrastructure.

1. Run `migration-backup.ps1` to capture the user-to-Personal-vDisk mapping in the .xml file.
2. Using a backup solution, move or capture the Personal vDisks from the original machine catalog on to a disk:
 - VMware ESX or Microsoft Hyper-V: Personal vDisks are located on the storage specified by the Controller, in a folder containing the name of the machine to which the vDisk is attached.
 - Citrix XenServer: Personal vDisks are located in the root of the storage specified by the Controller. The name of each vDisk is a GUID.
3. Restore the Personal vDisks from the original machine catalog using a storage backup solution:

- ESX or Hyper-V: Locate the vDisks in a new folder of the new storage resource. Alternatively, leave the vDisks in the original path on the new storage resource.
 - XenServer: Locate the vDisks in the root of the new storage resource.
4. Create a Provisioning Services vDisk or a Machine Creation Services snapshot from the master image, which you used to create the failed machine catalog.
 5. Run Update Inventory from the Start menu on the vDisk or snapshot.
 6. Re-create the machine catalog in Studio using a different naming convention as the failed (original) machine catalog. This generates a catalog of new machines, each with a new Personal vDisk, that the site database recognizes.
 7. Verify that the re-created machine catalog is assigned to the correct Delivery Group.
 8. Verify that the Delivery Group is in maintenance mode and the machines in it are shut down.
 9. Edit the .xml file generated by the backup script:
 - ESX or Hyper-V: If you restored the vDisks to a new folder on the new storage resource in Step 3, for every `PVD` section in the file, replace the folder name in `DiskName` with the location of the restored vDisks. If you restored the vDisks to the original path on the new storage, skip this step.
 - XenServer: Skip this step.
 10. On the Controller, run `migration-restore.ps1`, specifying the name of the .xml file and the location where the backed-up vDisks are stored.

Scenario 2 - Restore a machine catalog and its Personal vDisks reusing existing machine names

In this scenario, an entire machine catalog and the Personal vDisks attached to the machines in it are restored. Existing (failed) machine names are reused. This scenario might occur when your hypervisor or a storage host has failed.

1. Run `migration-backup.ps1` to capture the user-to-Personal-vDisk mapping.
2. Using a backup solution, move or capture the Personal vDisks from the original machine catalog on to a disk:
 - ESX or Hyper-V: Personal vDisks are located on the storage specified by the Controller, in a folder containing the name of the machine to which the vDisk is attached.
 - XenServer: Personal vDisks are located in the root of the storage specified by the Controller. The name of each vDisk is a GUID.
3. Restore the Personal vDisks from the original machine catalog using a storage backup solution:
 - ESX or Hyper-V: Locate the vDisks in a new folder of the new storage resource.
 - XenServer: Locate the vDisks in the root of the new storage resource.
4. Create a Provisioning Services vDisk or a Machine Creation Services snapshot from the master image that you used to create the failed machine catalog.

5. Run Update Inventory from the Start menu on the vDisk or snapshot.
6. Re-create the machine catalog in Studio using the same naming convention as the failed machine catalog. This generates a catalog of new machines, each with a new Personal vDisk, that the site database recognizes.
7. Verify that the re-created machine catalog is assigned to the correct Delivery Group.
8. Verify that the Desktop Group is in maintenance mode and the machines in it are shut down.
9. Edit the .xml file generated by the backup script:
 - ESX or Hyper-V: For every `PVD` section in the file, replace the folder name in `DiskName` with the location of the restored vDisks.
 - XenServer: Skip this step.
10. Run the migration-restore.ps1 script on the Controller with the modified .xml file as an input. The script attaches the vDisks without moving them.
11. Verify the users' data has been successfully restored.

Scenario 3 - Restore a subset of Personal vDisks in a machine catalog

In this scenario, some, but not all, of the Personal vDisks in a machine catalog have failed and are restored. The virtual machines in the catalog have not failed.

1. Run migration-backup.ps1 to capture the user-to-Personal-vDisk mapping in the .xml file.
2. The .xml file has a PVD section for each user in the machine catalog. For any users whose Personal vDisks do not need restoring, remove the users and their associated sections from the file.
3. Restore the Personal vDisks from the original machine catalog using a backup solution, as described in the one of the other scenarios:
 - To use new machine names, follow Scenario 1.
 - To preserve machine names, follow Scenario 2.
4. Ensure there are enough unassigned machines in the catalog. Add machines if necessary. You need one new machine for each user whose vDisk you want to restore.
5. Verify that the Desktop Group is in maintenance mode and the machines in it are shut down.
6. On the Controller, run migration-restore.ps1 with the modified .xml file as an input.
7. Verify the users' data has been successfully restored.

User profiles

By default, Citrix Profile management is installed silently on master images when you install the Virtual Delivery Agent, but you do not have to use Profile management as a profile solution.

To suit your users' varying needs, you can use XenApp and XenDesktop policies to apply different profile behavior to the machines in each Delivery Group. For example, one Delivery Group might require Citrix mandatory profiles, whose template is stored in one network location, while another Delivery Group requires Citrix roaming profiles stored in another location with several redirected folders.

- If other administrators in your organization are responsible for XenApp and XenDesktop policies, work with them to ensure that they set any profile-related policies across your Delivery Groups.
- Profile management policies can also be set in Group Policy, in the Profile management .ini file, and locally on individual virtual machines. These multiple ways of defining profile behavior are read in the following order:

1. Group Policy (.adm or .admx files)
2. XenApp and XenDesktop policies in the Policy node
3. Local policies on the virtual machine that the user connects to
4. Profile management .ini file

For example, if you configure the same policy in both Group Policy and the Policy node, the system reads the policy setting in Group Policy and ignores the XenApp and XenDesktop policy setting.

Whichever profile solution you choose, Director administrators can access diagnostic information and troubleshoot user profiles. For more information, see the Director documentation.

If you use the Personal vDisk feature, Citrix user profiles are stored on virtual desktops' Personal vDisks by default. Do not delete the copy of a profile in the user store while a copy remains on the Personal vDisk. Doing so creates a Profile management error, and causes a temporary profile to be used for logons to the virtual desktop.

Automatic configuration

The desktop type is automatically detected, based on the Virtual Delivery Agent installation and, in addition to the configuration choices you make in Studio, sets Profile management defaults accordingly.

The policies that Profile management adjusts are shown in the table below. Any non-default policy settings are preserved and are not overwritten by this feature. Consult the Profile management documentation for information about each policy. The types of machines that create profiles affect the policies that are adjusted. The primary factors are

whether machines are persistent or provisioned, and whether they are shared by multiple users or dedicated to just one user.

Persistent systems have some type of local storage, the contents of which can be expected to persist when the system turns off. Persistent systems may employ storage technology such as storage area networks (SANs) to provide local disk mimicking. In contrast, provisioned systems are created "on the fly" from a base disk and some type of identity disk. Local storage is usually mimicked by a *RAM disk* or *network disk*, the latter often provided by a SAN with a high speed link. The provisioning technology is generally Provisioning Services or Machine Creation Services (or a third-party equivalent). Sometimes provisioned systems have persistent local storage, which may be provided by Personal vDisks; these are classed as persistent.

Together, these two factors define the following machine types:

- **Both persistent and dedicated** -- Examples are Desktop OS machines with a static assignment and a Personal vDisk that are created with Machine Creation Services, desktops with Personal vDisks that are created with VDI-in-a-Box, physical workstations, and laptops
- **Both persistent and shared** -- Examples are Server OS machines that are created with Machine Creation Services
- **Both provisioned and dedicated** -- Examples are Desktop OS machines with a static assignment but without a Personal vDisk that are created with Provisioning Services
- **Both provisioned and shared** -- Examples are Desktop OS machines with a random assignment that are created with Provisioning Services and desktops without Personal vDisks that are created with VDI-in-a-Box

The following Profile management policy settings are suggested guidelines for the different machine types. They work well in most cases, but you may want to deviate from these as your deployment requires.

Important: Delete locally cached profiles on logoff, Profile streaming, and Always cache are enforced by the auto-configuration feature. Adjust the other policies manually.

Policy	Both persistent and dedicated	Both persistent and shared	Both provisioned and dedicated	Both provisioned and shared
Delete locally cached profiles on logoff	Disabled	Enabled	Disabled (note 5)	Enabled
Profile streaming	Disabled	Enabled	Enabled	Enabled
Always cache	Enabled (note 1)	Disabled (note 2)	Disabled (note 6)	Disabled
Active write back	Disabled	Disabled (note 3)	Enabled	Enabled
Process logons of local administrators	Enabled	Disabled (note 4)	Enabled	Enabled (note 7)

1. Because Profile streaming is disabled for this machine type, the Always cache setting is always ignored.
2. Disable Always cache. However, you can ensure that large files are loaded into profiles as soon as possible after logon by enabling this policy and using it to define a file size limit (in MB). Any file this size or larger is cached locally as soon as possible.
3. Disable Active write back except to save changes in profiles of users who roam between XenApp servers. In this case, enable this policy.
4. Disable Process logons of local administrators except for Hosted Shared Desktops. In this case, enable this policy.
5. Disable Delete locally cached profiles on logoff. This retains locally cached profiles. Because the machines are reset at logoff but are assigned to individual users, logons are faster if their profiles are cached.
6. Disable Always cache. However, you can ensure that large files are loaded into profiles as soon as possible after logon by enabling this policy and using it to define a file size limit (in MB). Any file this size or larger is cached locally as soon as possible.
7. Enable Process logons of local administrators except for profiles of users who roam between XenApp and XenDesktop servers. In this case, disable this policy.

Folder redirection

Folder redirection lets you store user data on network shares other than the location where the profiles are stored. This reduces profile size and load time but it might impact network bandwidth. Folder redirection does not require that Citrix user profiles are employed. You can choose to manage user profiles on your own, and still redirect folders.

Configure folder redirection using Citrix policies in Studio.

- Ensure that the network locations used to store the contents of redirected folders are available and have the correct permissions. The location properties are validated.
- Redirected folders are set up on the network and their contents populated from users' virtual desktops at logon.

Note: Configure folder redirection using only Citrix Policies or Active Directory Group Policy Objects, not both. Configuring folder redirection using both policy engines may result in unpredictable behavior.

Advanced folder redirection

In deployments with multiple operating systems (OSs), you might want some of a user's profile to be shared by each OS. The rest of the profile is not shared and is used only by one OS. To ensure a consistent user experience across the OSs, you need a different configuration for each OS. This is *advanced folder redirection*. For example, different versions of an application running on two OSs might need to read or edit a shared file, so you decide to redirect it to a single network location where both versions can access it. Alternatively, because the Start Menu folder contents are structured differently in two OSs, you decide to redirect only one folder, not both. This separates the Start Menu folder and its contents on each OS, ensuring a consistent experience for users.

If your deployment requires advanced folder redirection, you must understand the structure of your users' profile data and determine which parts of it can be shared between OSs. This is important because unpredictable behavior can result unless folder redirection is used correctly.

To redirect folders in advanced deployments:

- Use a separate Delivery Group for each OS.
- Understand where your virtual applications, including those on virtual desktops, store user data and settings, and understand how the data is structured.
- For shared profile data that can safely roam (because it is structured identically in each OS), redirect the containing folders in each Delivery Group.
- For non-shared profile data that cannot roam, redirect the containing folder in only one of the Desktop Groups, typically the one with the most used OS or the one where the data is most relevant. Alternatively, for non-shared data that cannot roam between OSs, redirect the containing folders on both systems to separate network locations.

Example advanced deployment - This deployment has applications, including versions of Microsoft Outlook and Internet Explorer, running on Windows 8 desktops and applications, including other versions of Outlook and Internet Explorer, delivered by Windows Server 2008. To achieve this, you have already set up two Delivery Groups for the two OSs. Users want to access the same set of Contacts and Favorites in both versions of those two applications.

Important: The following decisions and advice are valid for the OSs and deployment described. In your organization, the folders you choose to redirect and whether you decide to share them depend on a number of factors that are unique to your specific deployment.

- Using policies applied to the Delivery Groups, you choose the following folders to redirect.

Folder	Redirected in Windows 8?	Redirected in Windows Server 2008?
My Documents	Yes	Yes
Application Data	No	No
Contacts	Yes	Yes

Desktop	Yes	No
Downloads	No	No
Favorites	Yes	Yes
Links	Yes	No
My Music	Yes	Yes
My Pictures	Yes	Yes
My Videos	Yes	Yes
Searches	Yes	No
Saved Games	No	No
Start Menu	Yes	No

- For the shared, redirected folders:
 - After analyzing the structure of the data saved by the different versions of Outlook and Internet Explorer, you decide it is safe to share the Contacts and Favorites folders
 - You know the structure of the My Documents, My Music, My Pictures, and My Videos folders is standard across OSs, so it is safe to store these in the same network location for each Delivery Group
- For the non-shared, redirected folders:
 - You do not redirect the Desktop, Links, Searches, or Start Menu folders folder in the Windows Server Delivery Group because data in these folders is organized differently in the two OSs. It therefore cannot be shared.
 - To ensure predictable behavior of this non-shared data, you redirect it only in the Windows 8 Delivery Group. You choose this, rather than the Windows Server Delivery Group, because Windows 8 will be used more often by users in their day-to-day work; they will only occasionally access the applications delivered by the server. Also, in this case the non-shared data is more relevant to a desktop environment rather than an application environment. For example, desktop shortcuts are stored in the Desktop folder and might be useful if they originate from a Windows 8 machine but not from a Windows Server machine.
- For the non-redirected folders:
 - You do not want to clutter your servers with users' downloaded files, so you choose not to redirect the Downloads folder
 - Data from individual applications can cause compatibility and performance issues, so you decide not to redirect the Application Data folder

For more information on folder redirection, see

<http://technet.microsoft.com/en-us/library/cc766489%28v=ws.10%29.aspx>.

Folder redirection and exclusions

In Citrix Profile management (but not in Studio), a performance enhancement allows you to prevent folders from being processed using *exclusions*. If you use this feature, do not exclude any redirected folders. The folder redirection and exclusion features work together, so ensuring no redirected folders are excluded allows Profile management to move them back into the profile folder structure again, while preserving data integrity, if you later decide not to redirect them.

HDX

Citrix HDX includes a broad set of technologies that provide a high-definition user experience.

At the device	HDX leverages the computing capacity of user devices to enhance and optimize the user experience. HDX MediaStream technology ensures users receive a smooth, seamless experience with multimedia content in their virtual desktops or applications. Workspace control enables users to pause virtual desktops and applications and resume working from a different device at the point where they left off.
On the network	<p>HDX incorporates advanced optimization and acceleration capabilities to deliver the best performance over any network, including low-bandwidth and high-latency WAN connections.</p> <p>HDX features adapt to changes in the environment, balancing performance and bandwidth by applying the best technologies for each unique user scenario, whether the desktop or application is accessed locally on the corporate network or remotely from outside the corporate firewall.</p>
In the datacenter	<p>HDX leverages the processing power and scalability of servers to deliver advanced graphical performance, regardless of the capabilities of the client device. Compressed multimedia information is sent directly to the user device in its native format.</p> <p>HDX channel monitoring provided by Citrix Director displays the status of connected HDX channels on user devices.</p> <p>HDX Insight, the integration of EdgeSight Network Inspector and EdgeSight Performance management with Director, captures data about ICA traffic and provides a dashboard view of real-time and historical details such as client-side and server-side ICA session latency, bandwidth use of ICA channels, and the ICA round trip time value of each session.</p>

To experience HDX capabilities from your virtual desktop:

- See how HDX delivers rich video content to virtual desktops: View a video on a web site containing high definition videos, such as <http://www.microsoft.com/silverlight/iis-smooth-streaming/demo/>.
- See how Flash Redirection accelerates delivery of Flash multimedia content:
 1. Download Adobe Flash player (<http://get.adobe.com/flashplayer/>) and install it on both the virtual desktop and the user device.
 2. On the Desktop Viewer toolbar, click Preferences. In the Desktop Viewer Preferences dialog box, click the Flash tab and select Optimize content.

3. To experience how Flash Redirection accelerates the delivery of Flash multimedia content to virtual desktops, view a video on your desktop from a web site containing Flash videos, such as YouTube. Flash Redirection is designed to be seamless so that users do not know when it is running. You can check to see whether Flash Redirection is being used by looking for a block of color that appears momentarily before the Flash player starts.

- See how HDX delivers high definition audio:

1. Configure your Citrix client for maximum audio quality; see the Receiver documentation for details.

2. Play music files with a digital audio player (such as iTunes) on your desktop.

HDX provides a superior graphics and video experience for most users by default, with no configuration required. Citrix policy settings that provide the best out-of-the-box experience for the majority of use cases are enabled by default.

- HDX automatically selects the best delivery method based on the client, platform, application, and network bandwidth, and then self-tunes based on changing conditions.
- HDX optimizes the performance of 2D and 3D graphics and video.
- HDX delivers a Windows Aero experience to virtual desktop users on any client.
- HDX enables user devices to stream multimedia files directly from the source provider on the Internet or Intranet, rather than through the host server. If the requirements for this client-side content fetching are not met, media delivery falls back to Windows Media redirection to play media run-time files on user devices rather than the host server. In most cases, no adjustments to the Windows Media feature policies are needed.

Good to know:

- For support and requirements information for HDX features, see [System requirements for XenApp 7.6 and XenDesktop 7.6](#). Except where otherwise noted, HDX features are available for supported Windows Server OS and Windows Desktop OS machines, plus Remote PC Access desktops.
- This content describes how to further optimize the user experience, improve server scalability, or reduce bandwidth requirements. For information about working with Citrix policies and policy settings, see the *Citrix policies* topics for this release.
- For instructions that include working with the registry, use caution: editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

Reduce the bandwidth needed for Windows desktops

By default, HDX delivers a highly responsive Windows Aero or Windows 8 desktop experience to virtual desktops accessed from supported Windows user devices. To do that, HDX leverages the graphics processing unit (GPU) or integrated graphics processor (IGP) on the user devices for local DirectX graphics rendering. This feature, named desktop composition redirection, maintains high scalability on the server. For details, see What to do with all these choices in <http://blogs.citrix.com/2013/11/06/go-supersonic-with-xendesktop-7-x-bandwidth-supercodecs/>.

To reduce the bandwidth required in user sessions, consider adjusting the following Citrix policy settings. Keep in mind that changing these settings can reduce the quality of the user experience.

- Desktop Composition Redirection - Applies only to Windows Desktop OS machines accessed from Windows user devices and applies only to the composition of the Windows desktop. Application windows are rendered on the server unless the Citrix policy setting Allow local app access is Allowed.
- Desktop Composition Redirection graphics quality - Uses high-quality graphics for desktop composition unless seamless applications or Local App Access are enabled. To reduce bandwidth requirements, lower the graphics quality.
- Dynamic windows preview - Controls the display of seamless windows in Flip, Flip 3D, taskbar preview, and peek window preview modes. To reduce bandwidth requirements, disable this policy setting.

Improve the image quality sent to user devices

The following visual display policy settings control the quality of images sent from virtual desktops to user devices.

- Visual quality - Controls the visual quality of images displayed on the user device: medium, high, always lossless, build to lossless (default = medium).
- Target frame rate - Specifies the maximum number of frames per second that are sent from the virtual desktop to the user device (default = 30). In many circumstances, you can improve the user experience by specifying a higher value. For devices with slower CPUs, specifying a lower value can improve the user experience.
- Display memory limit - Specifies the maximum video buffer size for the session in kilobytes (default = 65536 KB). For connections requiring more color depth and higher resolution, increase the limit. You can calculate the maximum memory required. Color depths other than 32-bit are available only if the Legacy graphics mode policy setting is enabled.

Improve video conference performance

HDX webcam video compression improves bandwidth efficiency and latency tolerance for webcams during video conferencing in a session. This technology streams webcam traffic over a dedicated multimedia virtual channel; this uses significantly less bandwidth compared to the isochronous HDX Plug-n-Play support, and works well over WAN connections.

Receiver users can override the default behavior by choosing the Desktop Viewer Mic & Webcam setting Don't use my microphone or webcam. To prevent users from switching from HDX webcam video compression, disable USB device redirection with the policy settings under ICA policy settings > USB Devices policy settings.

HDX webcam video compression is enabled by default on Receiver for Windows but must be configured on Receiver for Linux. For more information, refer to the Receiver documentation. HDX webcam video compression requires that the following policy settings be enabled (all are enabled by default).

- Client audio redirection
- Client microphone redirection
- Multimedia conferencing
- Windows Media Redirection

If a webcam supports H.264 hardware encoding, HDX video compression uses the hardware encoding by default. Hardware encoding uses additional bandwidth and is not suitable for a low bandwidth network. To force software compression over low bandwidth networks, add the following DWORD key value to the registry key: HKCU\Software\Citrix\HdxRealTime: DeepCompress_ForceSWEncode=1.

Choose server scalability over user experience

For deployments where server scalability is of greater concern than user experience, you can use the legacy graphics system by adding the Legacy graphics mode policy setting and configuring the individual legacy graphics policy settings. Use of the legacy graphics system affects the user experience over WAN and mobile connections.

Flash Redirection

Flash Redirection offloads the processing of most Adobe Flash content (including animations, videos, and applications) to users' LAN- and WAN-connected Windows devices, which reduces server and network load. This results in greater scalability while ensuring a high definition user experience. Configuring Flash Redirection requires both server-side and client-side settings.

Caution: Flash Redirection involves significant interaction between the user device and server components. Use this feature only in environments where security separation between the user device and server is not required. Additionally, configure user devices to use this feature only with trusted servers. Because Flash Redirection requires the Flash Player to be installed on the user device, enable this feature only if the Flash Player itself is secured.

The legacy and second generation versions of Flash Redirection are independent solutions and run in separate virtual channels.

- Legacy Flash Redirection features are supported on the client side only. If an earlier version of the Flash Player is installed on the user device, or if the Flash Player cannot be installed, Flash content renders on the server.
- Second generation Flash Redirection is supported on both clients and servers. If the client supports second generation Flash Redirection, Flash content renders on the client. Second generation Flash Redirection features include support for user connections over WAN, intelligent fallback, and a URL compatibility list; see below for details.

Flash Redirection uses Windows event logging on the server to log Flash events. The event log indicates whether Flash Redirection is being used and provides details about issues. The following are common to all events logged by Flash Redirection:

- Flash Redirection reports events to the Application log.
- On Windows 8 and Windows 7 systems, a Flash Redirection-specific log appears in the Applications and Services Logs node.
- The Source value is Flash.
- The Category value is None.

Configure Flash Redirection on the server

To configure Flash Redirection on the server, use the following Citrix policy settings. For details, see [Flash Redirection policy settings](#).

- Flash default behavior establishes the default behavior of Flash acceleration. By default, Flash Redirection is enabled. To override this default behavior for individual web pages and Flash instances, use the Flash URL compatibility list setting.

- Flash intelligent fallback - detects instances of small Flash movies (such as those frequently used to play advertisements) and renders them on the server instead of redirecting them for rendering on the user device. It does not cause any interruption or failure in the loading of the web page or the Flash application. By default, Flash intelligent fallback is enabled. To redirect all instances of Flash content for rendering on the user device, disable this policy setting.
- Flash server-side content fetching URL list allows you to specify websites whose Flash content can be downloaded to the server and then transferred to the user device for rendering. (By default, Flash Redirection downloads Flash content to the user device, where it is played.) This setting works with (and requires) the Enable server-side content fetching setting on the user device and is intended for use with Intranet sites and internal Flash applications; see below for details. It also works with most Internet sites and can be used when the user device does not have direct access to the Internet (for example, when the XenApp or XenDesktop server provides that connection).

Note: Server-side content fetching does not support Flash applications using Real Time Messaging Protocols (RTMP); instead, server-side rendering is used, which supports HTTP and HTTPS.

- Flash URL compatibility list - specifies where Flash content from listed websites is rendered: on the user device, on the server, or blocked.
- Flash background color list - enables you to match the colors of web pages and Flash instances, which improves the appearance of the web page when using Flash Redirection.

Configure Flash Redirection on the user device

Install Citrix Receiver and Adobe Flash Player on the user device. No further configuration is required on the user device.

You can change the default settings using Active Directory Group Policy Objects. Import and add the HDX MediaStream Flash Redirection - Client administrative template (HdxFlashClient.adm), which is available in the following folders:

- For 32-bit computers: %Program Files%\Citrix\ICA Client\Configuration\language
- For 64-bit computers: %Program Files (x86)%\Citrix\ICA Client\Configuration\language

The policy settings appear under Administrative Templates > Classic Administrative Templates (ADM) > HDX MediaStream Flash Redirection - Client. See the Microsoft Active Directory documentation for details about GPOs and templates.

Change when Flash Redirection is used

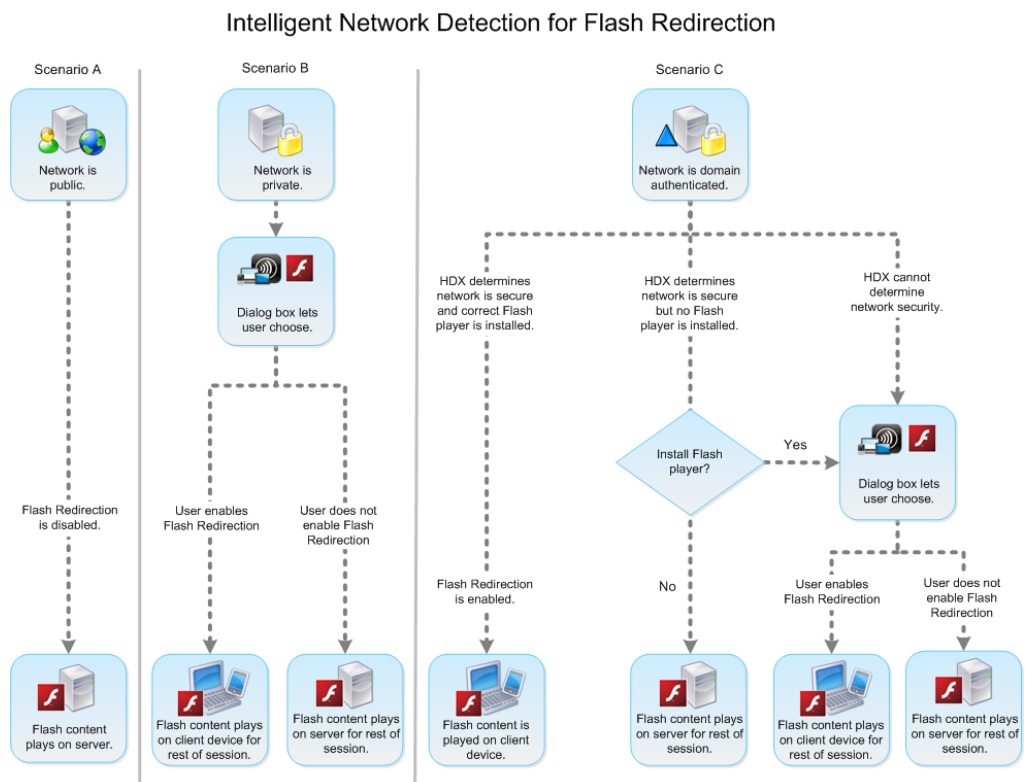
Together with server-side settings, the Enable HDX MediaStream Flash Redirection on the user device policy setting controls whether Adobe Flash content is redirected to the user device for local rendering. By default, Flash Redirection is enabled and uses intelligent network detection to determine when to play Flash content on the user device.

If no configuration is set and Desktop Lock is used, Flash Redirection is enabled on the user device by default.

To change when Flash Redirection is used or to disable Flash Redirection on the user device:

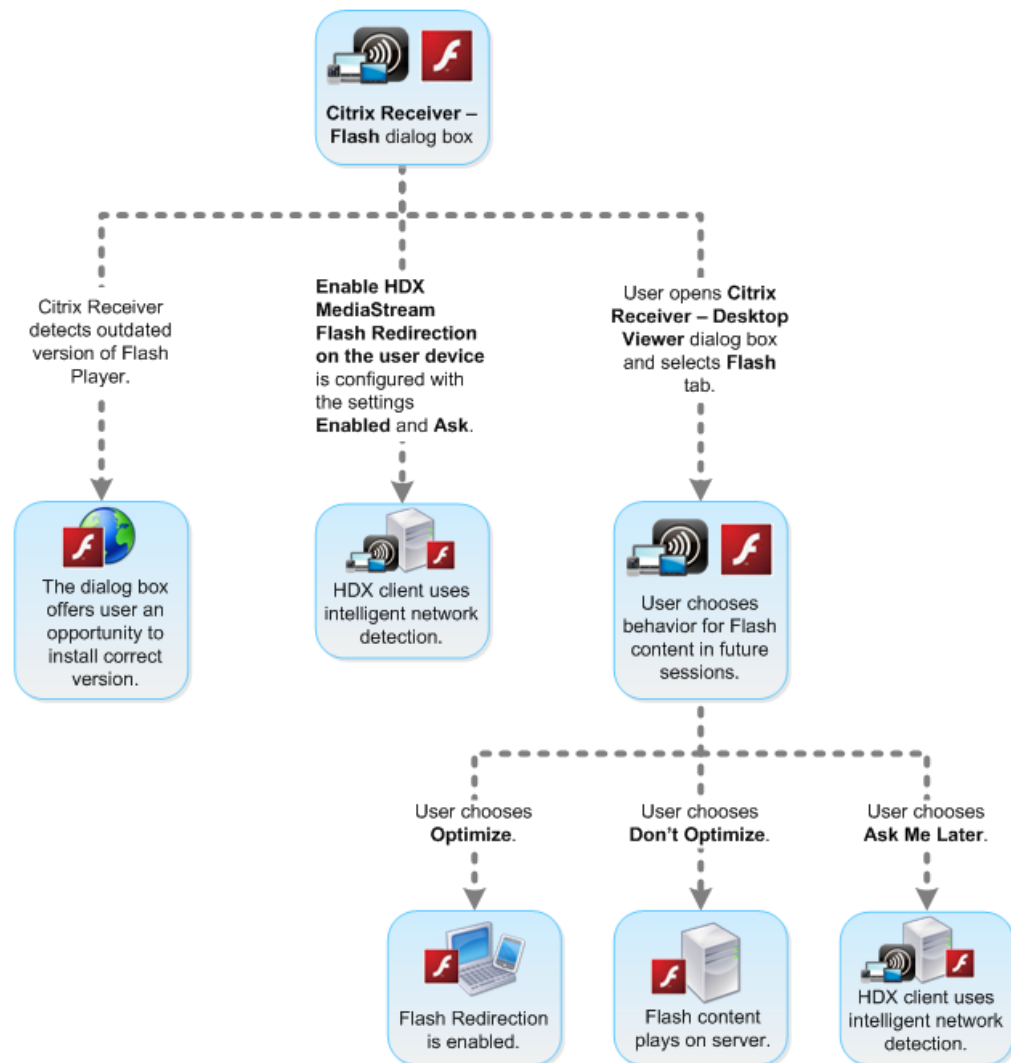
1. From the Setting list, select Enable HDX MediaStream Flash Redirection on the user device and click policy setting.
2. Select Not Configured, Enabled (the default), or Disabled.
3. If you select Enabled, choose an option from the Use HDX MediaStream Flash Redirection list:
 - To use the latest Flash Redirection functionality when the required configuration is present, and revert to server-side rendering when it is not, select Only with Second Generation.
 - To always use Flash Redirection, select Always. Flash content plays on the user device.
 - To never use Flash Redirection, select Never. Flash content plays on the server.
 - To use intelligent network detection to assess the security level of the client-side network to determine when using Flash Redirection is appropriate, select Ask (the default). If the security of the network cannot be determined, the user is asked whether to use Flash Redirection. If the network security level cannot be determined, the user is prompted to choose whether to use Flash Redirection.

The following illustration indicates how Flash Redirection is handled for various network types.



Users can override intelligent network detection from the Citrix Receiver - Desktop Viewer Preferences dialog box by selecting Optimize or Don't Optimize in the Flash tab. The choices available vary depending on how Flash Redirection is configured on the user device, as shown in the following illustration.

User control of Flash redirection



Synchronize client-side HTTP cookies with the server-side

Synchronization of the client-side HTTP cookies with the server-side is disabled by default. Enable synchronization to download HTTP cookies from the server; those HTTP cookies are then used for client-side content fetching and are available as needed by sites containing Flash content.

Note: Client-side cookies are not replaced during the synchronization; they remain available even if the synchronization policy is later disabled.

1. From the Setting list, select Enable synchronization of the client-side HTTP cookies with the server-side and click policy setting.

2. Select Not Configured, Enabled, or Disabled (the default).

Enable server-side content fetching

By default, Flash Redirection downloads Adobe Flash content to the user device, where it is played. Enabling server-side content fetching causes the Flash content to download to the server and then be sent to the user device. Unless there is an overriding policy (such as a site blocked with the Flash URL compatibility list policy setting), the Flash content plays on the user device.

Server-side content fetching is frequently used when the user device connects to internal sites through NetScaler Gateway and when the user device does not have direct access to the Internet.

Note: Server-side content fetching does not support Flash applications using Real Time Messaging Protocols (RTMP). Instead, server-side rendering is used for such sites.

Second generation Flash Redirection supports three enabling options for server-side content fetching. Two of these options include the ability to cache server-side content on the user device, which improves performance because content that is reused is already available on the user device for rendering. The contents of this cache are stored separately from other HTTP content cached on the user device.

With second generation Flash redirection, fallback to server-side content fetching begins automatically when any of the enabling options is selected and client-side fetching of .swf files fails.

Enabling server-side content fetching requires settings on both the client device and the server.

1. From the Setting list, select Enable server-side content fetching and click policy setting.
2. Select Not Configured, Enabled, or Disabled (the default). If you enable this setting, choose an option from the Server-side content fetching state list:

Option	Description
Disabled	Disables server-side content fetching, overriding the Flash server-side content fetching URL list setting on the server. Server-side content fetching fallback is also disabled.
Enabled	Enables server-side content fetching for web pages and Flash applications identified in the Flash server-side content fetching URL list. Server-side content fetching fallback is available, but Flash content is not cached.
Enabled (persistent caching)	Enables server-side content fetching for web pages and Flash applications identified in the Flash server-side content fetching URL list. Server-side content fetching fallback is available. Content obtained through server-side fetching is cached on the user device and stored from session to session.

Enabled (temporary caching)	Enables server-side content fetching for web pages and Flash applications identified in the Flash server-side content fetching URL list. Server-side content fetching fallback is available. Content obtained through server-side fetching is cached on the user device and deleted at the end of the session.
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3. On the server, enable the Flash server-side content fetching URL list policy setting and populate it with target URLs.

Redirect user devices to other servers for client-side content fetching

To redirect an attempt to obtain Flash content, use the URL rewriting rules for client-side content fetching setting, which is a second generation Flash Redirection feature. When configuring this feature, you provide two URL patterns; when the user device attempts to fetch content from a website matching the first pattern (the URL match pattern), it is redirected to the website specified by the second pattern (the rewritten URL format).

You can use this setting to compensate for content delivery networks (CDN). Some websites delivering Flash content use CDN redirection to enable the user to obtain the content from the nearest of a group of servers containing the same content. When using Flash Redirection client-side content fetching, the Flash content is requested from the user device, while the rest of the web page on which the Flash content resides is requested by the server. If CDN is in use, the server request is redirected to the nearest server, and the user device request follows to the same location. This may not be the location closest to the user device; depending on distance, there could be a noticeable delay between the loading of the web page and the playing of the Flash content.

1. From the Setting list, select URL rewriting rules for client-side content fetching and click policy setting.
2. Select Not Configured, Enabled, or Disabled. Not Configured is the default; Disabled causes any URL rewriting rules specified in the next step to be ignored.
3. If you enable the setting, click Show. Using Perl regular expression syntax, type the URL match pattern in the Value name box and the rewritten URL format in the Value box.

HDX 3D Pro

HDX 3D Pro enables you to deliver desktops and applications that perform best with a graphics processing unit (GPU) for hardware acceleration, including 3D professional graphics applications based on OpenGL and DirectX. (The standard VDA supports GPU acceleration of DirectX only.)

Examples of 3D professional applications include:

- Computer-aided design, manufacturing, and engineering (CAD/CAM/CAE) applications
- Geographical Information System (GIS) software
- Picture Archiving Communication System (PACS) for medical imaging
- Applications using the latest OpenGL, DirectX, NVidia CUDA, and OpenCL versions
- Computationally-intensive non-graphical applications that use NVIDIA Compute Unified Device Architecture (CUDA) GPUs for parallel computing

HDX 3D Pro provides the best user experience over any bandwidth:

- On wide area network (WAN) connections: Deliver an interactive user experience over WAN connections with bandwidths as low as 1.5 Mbps.
- On local area network (LAN) connections: Deliver a user experience equivalent to that of a local desktop on LAN connections with bandwidths of 100 Mbps.

You can replace complex and expensive workstations with simpler user devices by moving the graphics processing into the data center for centralized management.

HDX 3D Pro provides GPU acceleration for Windows Desktop OS machines and Windows Server OS machines. When used with Citrix XenServer and NVIDIA GRID GPUs, HDX 3D Pro provides Virtual GPU (vGPU) acceleration for Windows Desktop OS machines. For the supported XenServer versions, see [Citrix Virtual GPU Solution](#).

Use the HDX Monitor tool (which replaces the Health Check tool) to validate the operation and configuration of HDX visualization technologies and to diagnose and troubleshoot HDX issues. To download the tool and learn more about it, see <https://taas.citrix.com/hdx/download/>.

GPU acceleration for Windows Desktop OS

With HDX 3D Pro you can deliver graphically intensive applications as part of hosted desktops or applications on Desktop OS machines. HDX 3D Pro supports physical host computers (including desktop, blade, and rack workstations) and XenServer VMs with GPU Passthrough and XenServer VMs with Virtual GPU (vGPU).

Using XenServer GPU Passthrough, you can create VMs with exclusive access to dedicated graphics processing hardware. You can install multiple GPUs on the hypervisor and assign VMs to each of these GPUs on a one-to-one basis.

Using XenServer vGPU, multiple virtual machines can directly access the graphics processing power of a single physical GPU. The true hardware GPU sharing provides full Windows 7 or Windows 2008 R2 SP1 desktops suitable for users with complex and demanding design requirements. Supported for NVIDIA GRID K1 and K2 cards, the GPU sharing uses the same NVIDIA graphics drivers that are deployed on non-virtualized operating systems.

HDX 3D Pro offers the following features:

- Adaptive H.264-based deep compression for optimal WAN and wireless performance — HDX 3D Pro uses CPU-based deep compression as the default compression technique for encoding. This provides optimal compression that dynamically adapts to network conditions.

The H.264-based deep compression codec no longer competes with graphics rendering for CUDA cores on the NVIDIA GPU. The deep compression codec runs on the CPU and provides bandwidth efficiency.

- Lossless compression option for specialized use cases — HDX 3D Pro also offers a CPU-based lossless codec to support applications where pixel-perfect graphics are required, such as medical imaging. Lossless compression is recommended only for specialized use cases because it consumes significantly more network and processing resources.

When using lossless compression:

- The lossless indicator, a system tray icon, notifies the user if the screen displayed is a lossy frame or a lossless frame. This helps when the Visual Quality policy setting specifies Build to lossless. The lossless indicator turns green when the frames sent are lossless.
- The lossless switch enables the user to change to Always Lossless mode anytime within the session. To select or deselect Lossless anytime within a session, right-click the icon or use the shortcut ALT+SHIFT+1.

For lossless compression: HDX 3D Pro uses the lossless codec for compression regardless of the codec selected through policy.

For lossy compression: HDX 3D Pro uses the original codec, either the default or the one selected through policy.

Lossless switch settings are not retained for subsequent sessions. To use lossless codec for every connection, select Always lossless in the Visual quality policy setting.

- Multiple and high resolution monitor support — For Windows 7 and Windows 8 desktops, HDX 3D Pro supports user devices with up to four monitors. Users can arrange their monitors in any configuration and can mix monitors with different resolutions and orientations. The number of monitors is limited by the capabilities of the host computer GPU, the user device, and the available bandwidth. HDX 3D Pro supports all monitor resolutions and is limited only by the capabilities of the GPU on the host computer.

HDX 3D Pro also provides limited support for dual-monitor access to Windows XP desktops. For more information about this, see VDAs on machines running Windows XP or Windows Vista.

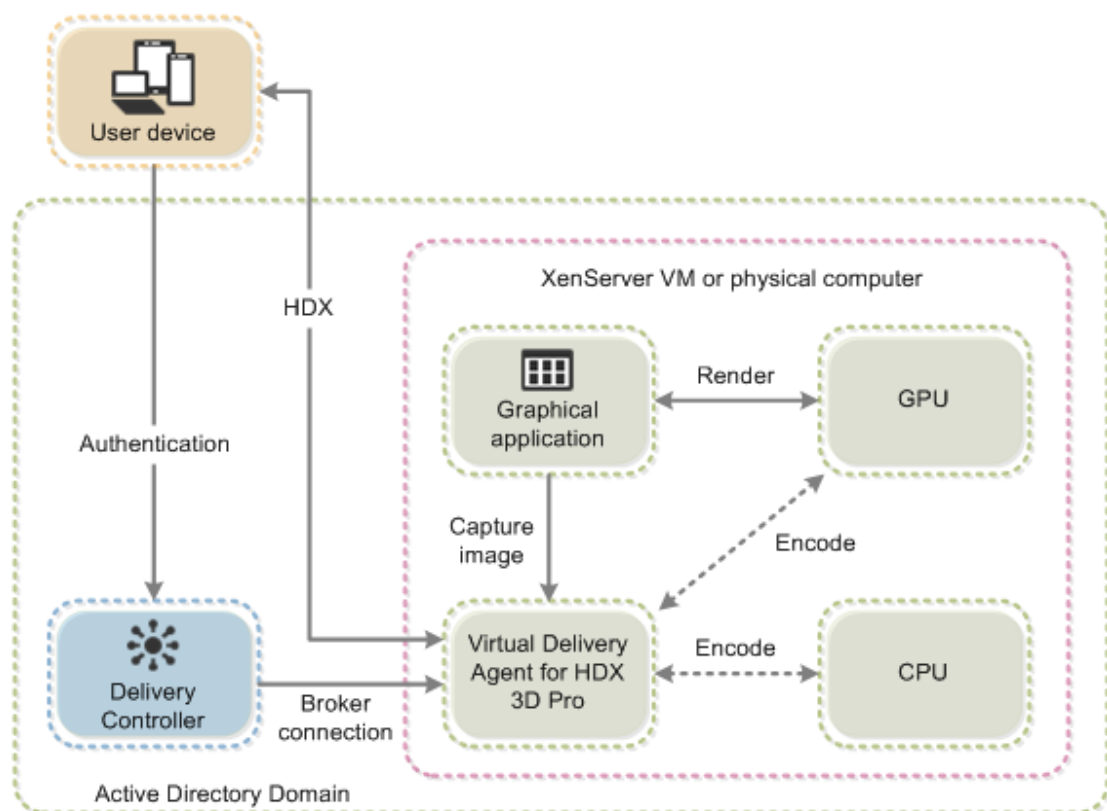
- Dynamic resolution — You can resize the virtual desktop or application window to any resolution.
- Support for NVIDIA Kepler architecture — HDX 3D Pro supports NVIDIA GRID K1 and K2 cards for GPU passthrough and GPU sharing. NVIDIA GRID vGPU enables multiple VMs to have simultaneous, direct access to a single physical GPU, using the same NVIDIA graphics drivers that are deployed on non-virtualized operating systems.
- Support for VMware vSphere and VMware ESX using Virtual Direct Graphics Acceleration (vDGA) — You can use HDX 3D Pro with vDGA for both RDS and VDI workloads. When using HDX 3D Pro with Virtual Shared Graphics Acceleration (vSGA), support is limited to one monitor. Using vSGA with large 3D models can result in performance issues due to its use of API intercept technology. For more information, see [VMware vSphere 5.1 - Citrix Known Issues](#).

As shown in the following figure:

- The host computer must reside within the same Active Directory domain as the Delivery Controller.
- When a user logs on to Citrix Receiver and accesses the virtual application or desktop, the Controller authenticates the user and contacts the VDA for HDX 3D Pro to broker a connection to the computer hosting the graphical application.

The VDA for HDX 3D Pro uses the appropriate hardware on the host to compress views of the complete desktop or of just the graphical application.

- The desktop or application views and the user interactions with them are transmitted between the host computer and the user device through a direct HDX connection between Citrix Receiver and the VDA for HDX 3D Pro.



Install the VDA for HDX 3D Pro

When you use the installer's graphical interface to install a VDA for Windows Desktop OS, simply select Yes on the HDX 3D Pro page. When using the command line interface, include the `/enable_hdx_3d_pro` option with the `XenDesktop VdaSetup.exe` command.

To upgrade HDX 3D Pro, uninstall both the separate HDX 3D for Professional Graphics component and the VDA before installing the VDA for HDX 3D Pro. Similarly, to switch from the standard VDA for Windows Desktop OS to the HDX 3D Pro VDA, uninstall the standard VDA and then install the VDA for HDX 3D Pro.

Install and upgrade NVIDIA drivers

The NVIDIA GRID API provides direct access to the frame buffer of the GPU, providing the fastest possible frame rate for a smooth and interactive user experience. If you install NVIDIA drivers before you install a VDA with HDX 3D Pro, NVIDIA GRID is enabled by default.

To enable NVIDIA GRID on a VM, disable Microsoft Basic Display Adapter from the Device Manager. Run the following command and then restart the VDA: `Montereyenable.exe -enable -noreset`

If you install NVIDIA drivers after you install a VDA with HDX 3D Pro, NVIDIA GRID is disabled. Enable NVIDIA GRID by using the `Montereyenable` tool provided by NVIDIA.

To disable NVIDIA GRID, run the following command and then restart the VDA:
`Montereyenable.exe -disable -noreset`

Optimize the HDX 3D Pro user experience

To use HDX 3D Pro with multiple monitors, ensure that the host computer is configured with at least as many monitors as are attached to user devices. The monitors attached to the host computer can be either physical or virtual.

Do not attach a monitor (either physical or virtual) to a host computer while a user is connected to the virtual desktop or application providing the graphical application. Doing so can cause instability for the duration of a user's session.

Let your users know that changes to the desktop resolution (by them or an application) are not supported while a graphical application session is running. After closing the application session, a user can change the resolution of the Desktop Viewer window in the Citrix Receiver - Desktop Viewer Preferences.

When multiple users share a connection with limited bandwidth (for example, at a branch office), Citrix recommends that you use the Overall session bandwidth limit policy setting to limit the bandwidth available to each user. This ensures that the available bandwidth does not fluctuate widely as users log on and off. Because HDX 3D Pro automatically adjusts to make use of all the available bandwidth, large variations in the available bandwidth over the course of user sessions can negatively impact performance.

For example, if 20 users share a 60 Mbps connection, the bandwidth available to each user can vary between 3 Mbps and 60 Mbps, depending on the number of concurrent users. To optimize the user experience in this scenario, determine the bandwidth required per user at peak periods and limit users to this amount at all times.

For users of a 3D mouse, Citrix recommends that you increase the priority of the Generic USB Redirection virtual channel to 0. For information about changing the virtual channel priority, see [CTX128190](#).

GPU acceleration for Windows Server OS

HDX 3D Pro allows graphics-heavy applications running in Windows Server OS sessions to render on the server's graphics processing unit (GPU). By moving OpenGL, DirectX, Direct3D, and Windows Presentation Foundation (WPF) rendering to the server's GPU, the server's CPU is not slowed by graphics rendering. Additionally, the server is able to process more graphics because the workload is split between the CPU and GPU.

When using HDX 3D Pro, multiple users can share graphics cards. When HDX 3D Pro is used with XenServer GPU Passthrough, a single server hosts multiple graphics cards, one per virtual machine.

For procedures that involve editing the registry, use caution: Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

GPU sharing

GPU Sharing enables GPU hardware rendering of OpenGL and DirectX applications in remote desktop sessions; it has the following characteristics:

- Can be used on bare metal or virtual machines to increase application scalability and performance.
- Enables multiple concurrent sessions to share GPU resources (most users do not require the rendering performance of a dedicated GPU).
- Requires no special settings.

For DirectX applications, only one GPU is used by default. That GPU is shared by multiple users. The allocation of sessions across multiple GPUs with DirectX is experimental and requires registry changes. Contact Citrix Support for more information.

You can install multiple GPUs on a hypervisor and assign VMs to each of these GPUs on a one-to-one basis: either install a graphics card with more than one GPU, or install multiple graphics cards with one or more GPUs each. Mixing heterogeneous graphics cards on a server is not recommended.

Virtual machines require direct passthrough access to a GPU, which is available with Citrix XenServer or VMware vSphere. When HDX 3D Pro is used with GPU Passthrough, each GPU in the server supports one multi-user virtual machine.

GPU Sharing does not depend on any specific graphics card.

- When running on a hypervisor, select a hardware platform and graphics cards that are compatible with your hypervisor's GPU Passthrough implementation. The list of hardware that has passed certification testing with XenServer GPU Passthrough is available at [GPU Passthrough Devices](#).

- When running on bare metal, the system distributes the user sessions across eligible GPUs. To guarantee that all installed GPUs are eligible, use identical GPUs.

Scalability using GPU Sharing depends on several factors:

- The applications being run
- The amount of video RAM they consume
- The graphics card's processing power

For example, scalability figures in the range of 8-10 users have been reported on NVIDIA Q6000 and M2070Q cards running applications such as ESRI ArcGIS. These cards offer 6 GB of video RAM. Newer NVIDIA GRID cards offer 8 GB of video RAM and significantly higher processing power (more CUDA cores). With the NVIDIA GRID K2 cards, good performance has been observed with up to 20 users per GRID K2 card. Other applications may scale much higher, achieving 32 concurrent users on a high-end GPU.

Some applications handle video RAM shortages better than others. If the hardware becomes extremely overloaded, this could cause instability or a crash of the graphics card driver. Limit the number of concurrent users to avoid such issues.

To confirm that GPU acceleration is occurring, use a third-party tool such as GPU-Z. GPU-Z is available at <http://www.techpowerup.com/gpuz/>.

DirectX, Direct3D, and WPF rendering

DirectX, Direct3D, and WPF rendering is only available on servers with a GPU that supports a display driver interface (DDI) version of 9ex, 10, or 11.

- On Windows Server 2008 R2, DirectX and Direct3D require no special settings to use a single GPU.
- On Windows Server 2012, Remote Desktop Services (RDS) sessions on the RD Session Host server use the Microsoft Basic Render Driver as the default adapter. To use the GPU in RDS sessions on Windows Server 2012, enable the Use the hardware default graphics adapter for all Remote Desktop Services sessions setting in the group policy Local Computer Policy > Computer Configuration > Administrative Templates > Windows Components > Remote Desktop Services > Remote Desktop Session Host > Remote Session Environment.
- On Windows Server 2008 R2 and Windows Server 2012, all DirectX and Direct3D applications running in all sessions use the same single GPU by default. To enable experimental support for distributing user sessions across all eligible GPUs for DirectX and Direct3D apps, create the following settings in the registry of the server running Windows Server OS sessions:
 - [HKEY_LOCAL_MACHINE\SOFTWARE\Citrix\CtxHook\Applnit_Dlls\Graphics Helper] "DirectX"=dword:00000000
 - [HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Citrix\CtxHook\Applnit_Dlls\Graphics Helper] "DirectX"=dword:00000001
- To enable WPF applications to render using the server's GPU, create the following settings in the registry of the server running Windows Server OS sessions:

- [HKEY_LOCAL_MACHINE\SOFTWARE\Citrix\CtxHook\Applnit_Dlls\ Multiple Monitor Hook] "EnableWPFHook"=dword:00000001
- [HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Citrix\CtxHook\Applnit_Dlls\ Multiple Monitor Hook] "EnableWPFHook"=dword:00000001

Experimental GPU acceleration for CUDA or OpenCL applications

Experimental support is provided for GPU acceleration of CUDA and OpenCL applications running in a user session. This support is disabled by default, but you can enable it for testing and evaluation purposes.

To use the experimental CUDA acceleration features, enable the following registry settings:

- [HKEY_LOCAL_MACHINE\SOFTWARE\Citrix\CtxHook\Applnit_Dlls\Graphics Helper] "CUDA"=dword:00000001
- [HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Citrix\CtxHook\Applnit_Dlls\Graphics Helper] "CUDA"=dword:00000001

To use the experimental OpenCL acceleration features, enable the following registry settings:

- [HKEY_LOCAL_MACHINE\SOFTWARE\Citrix\CtxHook\Applnit_Dlls\Graphics Helper] "OpenCL"=dword:00000001
- [HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Citrix\CtxHook\Applnit_Dlls\Graphics Helper] "OpenCL"=dword:00000001

OpenGL Software Accelerator

The OpenGL Software Accelerator is a software rasterizer for OpenGL applications such as ArcGIS, Google Earth, Nehe, Maya, Blender, Voxler, CAD, and CAM. In some cases, the OpenGL Software Accelerator can eliminate the need to use graphics cards to deliver a good user experience with OpenGL applications.

Important: The OpenGL Software Accelerator is provided "as is" and must be tested with all applications. It might not work with some applications and is intended as a solution to try if the Windows OpenGL rasterizer does not provide adequate performance. If the OpenGL Software Accelerator works with your applications, it can be used as a way to avoid the cost of GPU hardware.

The OpenGL Software Accelerator is provided in the Support folder on the installation media, and is supported on all valid VDA platforms.

When should you try the OpenGL Software Accelerator?

- If the performance of OpenGL applications running in virtual machines on XenServer or other hypervisors is an issue, try using OpenGL Accelerator. For some applications, the OpenGL Accelerator outperforms the Microsoft OpenGL software rasterizer that is included with Windows because the OpenGL Accelerator leverages SSE4.1 and AVX. OpenGL Accelerator also supports applications using OpenGL versions up to 2.1.
- For applications running on a workstation, first try the default version of OpenGL support provided by the workstation's graphics adapter. If the graphics card is the latest version, in most cases it will deliver the best performance. If the graphics card is an earlier version or does not deliver satisfactory performance, then try the OpenGL Software Accelerator.
- 3D OpenGL applications that are not adequately delivered using CPU-based software rasterization may benefit from OpenGL GPU hardware acceleration. This feature can be used on bare metal or virtual machines.

Audio features

You can configure and add the following Citrix policy settings to a policy that optimizes HDX audio features. For usage details plus relationships and dependencies with other policy settings, see [Audio policy settings](#) and [Bandwidth policy settings](#) and [Multi-stream connections policy settings](#).

Important: Most audio features are transported using the ICA stream and are secured in the same way as other ICA traffic. User Datagram Protocol (UDP) audio uses a separate, unsecured, transport mechanism.

Audio quality

In general, higher sound quality consumes more bandwidth and server CPU utilization by sending more audio data to user devices. Sound compression allows you to balance sound quality against overall session performance; use Citrix policy settings to configure the compression levels to apply to sound files.

By default, the Audio quality policy setting is set to High - high definition audio. This setting provides high fidelity stereo audio, but consumes more bandwidth than other quality settings. Do not use this audio quality for non-optimized voice chat or video chat applications (such as softphones), because it may introduce latency into the audio path that is not suitable for real-time communications.

Consider creating separate policies for groups of dial-up users and for those who connect over a LAN or WAN. Over dial-up connections, where bandwidth typically is limited, download speed is often more important to users than sound quality. Therefore, you may want to create one policy for dial-up connections that applies high compression levels to sound, and another for LAN or WAN connections that applies lower compression levels.

For setting details, see [Audio policy settings](#). Remember to enable Client audio settings on the user device; see Audio setting policies for user devices.

Client audio redirection

To allow users to receive audio from an application on a server through speakers or other sound devices (such as headphones) on the user device, add the Client audio redirection setting, which is Allowed by default.

Client audio mapping may cause a heavy load on the servers and the network; however, prohibiting client audio redirection disables all HDX audio functionality.

For setting details see [Audio policy settings](#). Remember to enable client audio settings on the user device; see Audio setting policies for user devices.

Client microphone redirection

To allow users to record audio using input devices such as microphones on the user device add the Client microphone redirection setting, which is Allowed by default.

For security, users are alerted when servers that are not trusted by their user devices try to access microphones, and can choose to accept or reject access prior to using the microphone. Users can disable this alert on Citrix Receiver.

For setting details, see [Audio policy settings](#). Remember to enable Client audio settings on the user device; see Audio setting policies for user devices.

Audio Plug N Play

The Audio Plug N Play policy setting allows or prevents the use of multiple audio devices to record and play sound. This setting is Enabled by default.

This setting applies only to Windows Server OS machines.

For setting details, see [Audio policy settings](#).

Audio redirection bandwidth limit and Audio redirection bandwidth limit percent

The Audio redirection bandwidth limit policy setting specifies the maximum bandwidth (in kilobits per second) for a playing and recording audio in a session. The Audio redirection bandwidth limit percent setting specifies the maximum bandwidth for audio redirection as a percentage of the total available bandwidth. By default, zero (no maximum) is specified for both settings. If both settings are configured, the one with the lowest bandwidth limit is used.

For setting details, see [Bandwidth policy settings](#). Remember to enable Client audio settings on the user device; see Audio setting policies for user devices.

Audio over UDP Real-time Transport and Audio UDP port range

By default, Audio over UDP Real-time Transport is allowed, opening up a UDP port on the server for connections that use Audio over UDP Real-time Transport. Citrix recommends configuring UDP/RTP for audio, to ensure the best possible user experience in the event of network congestion or packet loss.

Important: Audio data transmitted with UDP is not encrypted.

The Audio UDP port range specifies the range of port numbers that the Virtual Delivery Agent (VDA) uses to exchange audio packet data with the user device.

By default, the range is 16500 - 16509.

For setting details about Audio over UDP Real-time Transport, see [Audio policy settings](#); for details about Audio UDP port range, see [Multi-stream connections policy settings](#). Remember to enable Client audio settings on the user device; see Audio setting policies for user devices.

Audio setting policies for user devices

1. In the Group Policy Editor, expand Administrative Templates > Classic Administrative Templates (ADM) > Citrix Components > Citrix Receiver > User Experience.
2. For Client audio settings, select Not Configured, Enabled, or Disabled.
3. If you select Enabled, choose a sound quality. For UDP audio, use Medium (the default).
4. For UDP audio only, select Enable Real-Time Transport and then set the range of incoming ports to open in the local Windows firewall.

Avoid echo during multimedia conferences

Users in audio or video conferences may hear an echo. Echoes usually occur when speakers and microphones are too close to each other. For that reason, Citrix recommends the use of headsets for audio and video conferences.

HDX provides an echo cancellation option (enabled by default) that minimizes echo. The effectiveness of echo cancellation is sensitive to the distance between the speakers and the microphone; devices should not be too close or too far away from each other.

You can change a registry setting to disable echo cancellation. When working in the registry, use caution: editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

1. Using the Registry Editor on the user device, navigate to one of the following:
 - 32-bit computers: HKEY_LOCAL_MACHINE\SOFTWARE\Citrix\ICA Client\Engine\Configuration\Advanced\Modules\ClientAudio\EchoCancellation
 - 64-bit computers: HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\Citrix\ICA Client\Engine\Configuration\Advanced\Modules\ClientAudio\EchoCancellation
2. Change the Value data field to FALSE.

Network traffic priorities

Priorities are assigned to network traffic across multiple connections for a session with quality of service (QoS)-supported routers. Four TCP/IP streams (real-time, interactive, background, and bulk) and one UDP/RTP stream (for voice) are available to carry ICA traffic between the user device and the server. Each virtual channel is associated with a specific priority and transported in the corresponding connection. You can set the channels independently, based on the TCP port number used for the connection.

Multiple channel streaming connections are supported for Virtual Delivery Agents (VDAs) installed on Windows 8 and Windows 7 machines. Work with your network administrator to ensure the Common Gateway Protocol (CGP) ports configured in the Multi-Port Policy setting are assigned correctly on the network routers.

Quality of service (QoS) is supported only when multiple session reliability ports, or the CGP ports, are configured.

Caution: Use transport security when using this feature. Citrix recommends using Internet Protocol Security (IPsec) or Secure Sockets Layer (SSL). SSL connections are supported only when the connections traverse a NetScaler Gateway that supports multi-stream. On an internal corporate network, multi-stream connections with SSL are not supported.

To set quality of service for multiple streaming connections, add the following Citrix policy settings to a policy (see [Multi-stream connections policy settings](#) for details):

- Multi-Port policy - This setting specifies ports for ICA traffic across multiple connections, and establishes network priorities.
 - Select a priority from the CGP default port priority list; by default, the primary port (2598) has a High priority.
 - Enter additional CGP ports in CGP port1, CGP port2, and CGP port3 as needed, and identify priorities for each. Each port must have a unique priority.

Explicitly configure the firewalls on VDAs to allow the additional TCP traffic.

- Multi-Stream computer setting - This setting is disabled by default. If you use Citrix Cloudbridge with Multi-Stream support in your environment, you do not need to configure this setting. Configure this policy setting when using third-party routers or legacy Branch Repeaters to achieve the desired Quality of Service (QoS).
- Multi-Stream user setting - This setting is disabled by default.

For policies containing these settings to take effect, users must log off and then log on to the network.

USB and client drive considerations

Using HDX USB device redirection, a user can connect a flash drive to a local computer and access it remotely from within a virtual desktop or a desktop hosted application. During a session, users can use plug and play devices, including Picture Transfer Protocol (PTP) devices such as digital cameras, Media Transfer Protocol (MTP) devices such as digital audio players or portable media players, and point-of-sale (POS) devices.

Double-hop USB is not supported for desktop hosted application sessions.

USB redirection is available for the Receiver for Windows and the Receiver for Linux.

By default, USB redirection is allowed for certain classes of USB devices, and denied for others; see the Receiver documentation for details. You can restrict the types of USB devices made available to a virtual desktop by updating the list of USB devices supported for redirection.

Important: In environments where security separation between the user device and server is needed, provide guidance to users about the types of USB devices to avoid.

Optimized virtual channels are available to redirect most popular USB devices, and provide performance and bandwidth efficiency over a WAN. The level of support provided depends on the Receiver installed on the user device. Optimized virtual channels are usually the best option, especially in high latency environments.

For USB redirection purposes, the product handles a SMART board the same as a mouse.

The product supports optimized virtual channels with USB 3.0 devices and USB 3.0 ports, such as a CDM virtual channel used to view files on a camera or to provide audio to a headset). The product also supports Generic USB Redirection of USB 3.0 devices connected to a USB 2.0 port.

Specialty devices for which there is no optimized virtual channel are supported by falling back to a Generic USB virtual channel that provides raw USB redirection. For information on USB devices tested with XenDesktop, see [CTX123569](#).

Some advanced device-specific features, such as Human Interface Device (HID) buttons on a webcam, may not work as expected with the optimized virtual channel; if this is an issue, use the Generic USB virtual channel.

Certain devices are not redirected by default, and are available only to the local session. For example, it would not be appropriate to redirect a network interface card that is attached to the user device's system board by internal USB.

The following Citrix policy settings control USB support:

- Client USB device redirection – The default is Prohibited.
- Client USB device redirection rules – Rules only apply to devices using Generic USB redirection; therefore, the rules do not apply to devices using specialized or optimized redirection, such as CDM.

- Client USB Plug and Play device redirection — The default is Allowed, to permit plug-and-play of PTP, MTP, and POS devices in a user session.
- Client USB device redirection bandwidth limit — The default is 0 (no maximum).
- Client USB device redirection bandwidth limit percent — The default is 0 (no maximum).

About USB Generic Redirection

The latest release of XenApp (Version 7.6) provides support for Generic USB Redirection for specialty USB devices for which there is no optimized virtual channel. This functionality redirects arbitrary USB devices from client machines to XenDesktop virtual desktops; with this feature, end users have the ability to interact with a wide selection of generic USB devices in the XenDesktop session as if devices were physically attached. With Generic USB Redirection:

- users do not need to install device drivers on the user device.
- USB client drivers are installed on the host.

For more information on configuring Generic USB Redirection, see [CTX137939](#).

Important: This feature requires Windows Server 2012 R2, and functions with existing Windows Receiver versions for published desktop sessions hosted on RDS hosts in single-hop scenarios. Using this feature, USB client drivers are installed on the host, so these drivers must be compatible with RDSH for Windows 2012 R2 platforms.

Enable USB support

1. Add the Client USB device redirection setting to a policy and set its value to Allowed.
2. (Optional) To update the list of USB devices available for remoting, add the Client USB device redirection rules setting to a policy and specify the USB policy rules.
3. Enable USB support when you install Receiver on user devices. If you specified USB policy rules for the Virtual Delivery Agent in the previous step, specify those same policy rules for Receiver. For thin clients, consult the manufacturer for details of USB support and any required configuration.

Update the list of USB devices available for remoting (Receiver for Windows 4.2)

USB devices are automatically redirected when USB support is enabled and the USB user preference settings are set to automatically connect USB devices. USB devices are also automatically redirected when operating in Desktop Appliance mode and the connection bar is not present. In some instances, however, you might not want to automatically redirect all USB devices. For more information, see [CTX123015](#).

Users can explicitly redirect devices that are not automatically redirected by selecting them from the USB device list. To prevent USB devices from ever being listed or redirected, you can specify device rules on the client and the VDA, as explained below.

You can update the range of USB devices available for remoting by specifying USB device redirection rules for both Receiver and the VDA to override the default USB policy rules.

- Edit the user device registry. An Administrative template (ADM file) is included on the installation media so you can change the user device through Active Directory Group Policy: dvd root \os\lang\Support\Configuration\icaclient_usb.adm.
- Edit the administrator override rules in the VDA registry on the Server OS machines. An ADM file is included on the installation media so you can change the VDA through Active Directory Group Policy: dvd root \os\lang\Support\Configuration\vda_usb.adm.

Caution: Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

The product default rules are stored in HKLM\SOFTWARE\Citrix\PortICA\GenericUSB\DeviceRules. Do not edit these product default rules. Instead, use them as a guide for creating administrator override rules as explained below. The GPO overrides are evaluated before the product default rules.

The administrator override rules are stored in HKLM\SOFTWARE\Policies\Citrix\PortICA\GenericUSB\DeviceRules. GPO policy rules take the format {Allow:|Deny:} followed by a set of *tag=value* expressions separated by white space. The following tags are supported:

Tag	Description
VID	Vendor ID from the device descriptor
PID	Product ID from the device descriptor
REL	Release ID from the device descriptor
Class	Class from either the device descriptor or an interface descriptor; see the USB Web site at http://www.usb.org/ for available USB Class Codes
SubClass	Subclass from either the device descriptor or an interface descriptor
Prot	Protocol from either the device descriptor or an interface descriptor

When creating new policy rules, note the following:

- Rules are case-insensitive.
- Rules may have an optional comment at the end, introduced by #. A delimiter is not required, and the comment is ignored for matching purposes.
- Blank and pure comment lines are ignored.
- White space is used as a separator, but cannot appear in the middle of a number or identifier. For example, Deny: Class = 08 SubClass=05 is a valid rule, but Deny: Class=0 Sub Class=05 is not.
- Tags must use the matching operator =. For example, VID=1230.

- Each rule must start on a new line or form part of a semicolon-separated list.

Important: If you are using the ADM template file, you must create rules on a single line, as a semicolon-separated list.

When working with optimized devices such as mass storage, you usually redirect the device using the specialized CDM channel rather than with policy rules. However, if either of the following conditions exist, the optimized device is available in the device list in the desktop viewer for Generic USB redirection:

- Auto redirection for storage device is set (for example, `AutoRedirectStorage = 1`); for more information, see [CTX123015](#).
- Simplify device connections for me is not selected; for more information, see [CTX136716](#).

Examples:

- The following example shows an administrator-defined USB policy rule for vendor and product identifiers:

```
Allow: VID=046D PID=C626 # Allow Logitech SpaceNavigator 3D Mouse
Deny: VID=046D # Deny all Logitech products
```

- The following example shows an administrator-defined USB policy rule for a defined class, sub-class, and protocol:

```
Deny: Class=EF SubClass=01 Prot=01 # Deny MS Active Sync devices
Allow: Class=EF SubClass=01 # Allow Sync devices
Allow: Class=EF # Allow all USB-Miscellaneous devices
```

Update the list of USB devices available for remoting

By default, USB devices are automatically redirected when USB support is enabled and the USB user preference settings are set to automatically connect USB devices. USB devices are also automatically redirected for Desktop Appliance sites or desktop hosted applications. In some instances, however, you might not want to automatically redirect all USB devices. For more information, see [CTX123015](#).

Desktop Viewer users can redirect devices that are not automatically redirected by selecting them from the USB device list. To prevent USB devices from being listed or redirected, specify device rules on the user device and the VDA.

You can update the range of USB devices available for remoting by specifying USB device redirection rules for both Receiver and the VDA to override the default USB policy rules. Device rules are enforced for both Receiver and the VDA. Be sure to change both so that device remoting works as you intend.

- Edit the user device registry (or the .ini files in the case of the Receiver for Linux). An Administrative template (ADM file) is included on the installation media so you can change the user device through Active Directory Group Policy: dvd root

\os\lang\Support\Configuration\icaclient_usb.adm.

- Edit the administrator override rules in the VDA registry on the Server OS machines. An ADM file is included on the installation media so you can change the VDA through Active Directory Group Policy: dvd root \os\lang\Support\Configuration\vda_usb.adm.

Caution: Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

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Tag	Description
VID	Vendor ID from the device descriptor
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When creating new policy rules, note the following:

- Rules are case-insensitive.
- Rules may have an optional comment at the end, introduced by #. A delimiter is not required, and the comment is ignored for matching purposes.
- Blank and pure comment lines are ignored.
- White space is used as a separator, but cannot appear in the middle of a number or identifier. For example, Deny: Class = 08 SubClass=05 is a valid rule, but Deny: Class=0 Sub Class=05 is not.
- Tags must use the matching operator =. For example, VID=1230.
- Each rule must start on a new line or form part of a semicolon-separated list.

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- Auto redirection for storage device is set (for example, `AutoRedirectStorage = 1`); for more information, see [CTX123015](#).
- Simplify device connections for me is not selected; for more information, see [CTX136716](#).

Examples:

- The following example shows an administrator-defined USB policy rule for vendor and product identifiers:

```
Allow: VID=046D PID=C626 # Allow Logitech SpaceNavigator 3D Mouse
Deny: VID=046D # Deny all Logitech products
```

- The following example shows an administrator-defined USB policy rule for a defined class, sub-class, and protocol:

```
Deny: Class=EF SubClass=01 Prot=01 # Deny MS Active Sync devices
Allow: Class=EF SubClass=01 # Allow Sync devices
Allow: Class=EF # Allow all USB-Miscellaneous devices
```

Use and remove USB devices

Users can connect a USB device before or after starting a virtual session.

When using Receiver for Windows, the following apply:

- Devices connected after a session starts appear immediately in the USB menu of the Desktop Viewer.
- If a USB device is not redirecting properly, you can try to resolve the problem by waiting to connect the device until after the virtual session starts.
- To avoid data loss, use the Windows "Safely Remove Hardware" icon before removing the USB device.

USB mass storage devices

For mass storage devices only, remote access is also available through client drive mapping, where the drives on the user device are automatically mapped to drive letters on the virtual desktop when users log on. The drives are displayed as shared folders with mapped drive letters. To configure client drive mapping, use the Client removable drives setting in the File Redirection Policy Settings section of the ICA Policy Settings.

The main differences between the two types of remoting policy are:

Feature	Client drive mapping	Generic USB redirection
Enabled by default	Yes	No

Read-only access configurable	Yes	No
Safe to remove device during a session	No	Yes, provided users follow operating system recommendations for safe removal

If both Generic USB and the client drive mapping policies are enabled and a mass storage device is inserted either before or after a session starts, it will be redirected using client drive mapping. When both Generic USB and the client drive mapping policies are enabled and a device is configured for automatic redirection (see <http://support.citrix.com/article/CTX123015>) and a mass storage device is inserted either before or after a session starts, it will be redirected using Generic USB.

File access for mapped client drives

You can control whether users can copy files from their virtual environments to their user devices. By default, files and folders on mapped client-drives are available in read/write mode from within the session.

To prevent users from adding or modifying files and folders on mapped client-devices, enable the Read-only client drive access policy setting. When adding this setting to a policy, make sure the Client drive redirection setting is set to Allowed and is also added to the policy.

Monitoring

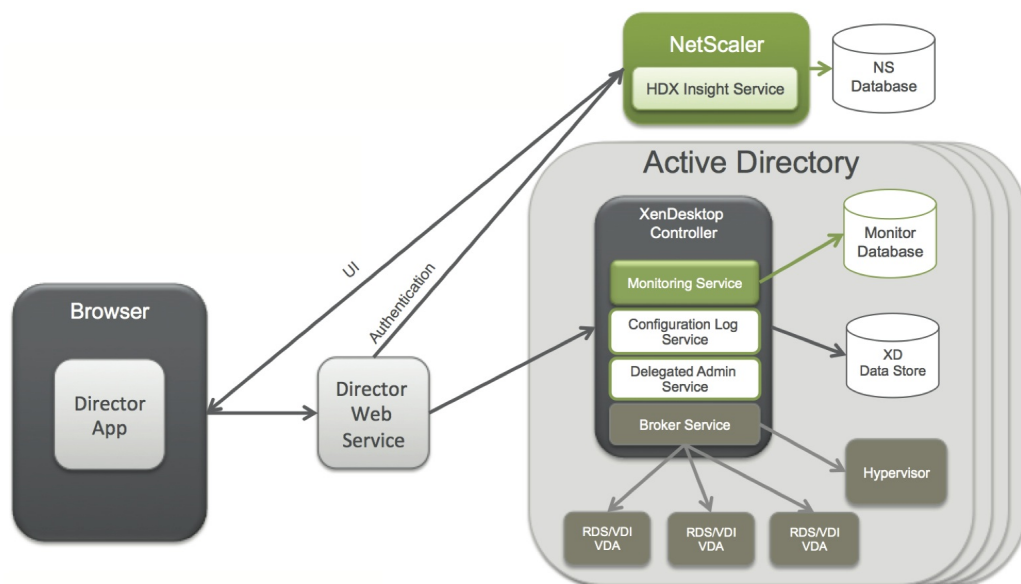
Administrators and help-desk personnel can monitor XenApp and XenDesktop Sites with Director, where administrators can access the Configuration Logging database, or by using the Site's Monitor Service's API using the OData protocol.

Administrators can monitor:

- Session usage
- Logon performance
- Connection and machine failure
- Load evaluation
- Historical trends
- Infrastructure
- User sessions
- Machines

Director

Director is a real-time web tool that allows administrators to monitor, troubleshoot, and perform support tasks for end users.



Director can access:

- Real-time data from the Broker Agent using a unified console integrated with EdgeSight features, Performance Manager, and Network Inspector.
 - EdgeSight features include performance management for health and capacity assurance, and historical trending and network analysis, powered by NetScaler HDX Insight, to identify bottlenecks due to the network in your XenApp or XenDesktop environment.
- Historical data stored in the Monitor database to access the Configuration Logging database.
- ICA data from the NetScaler Gateway using HDX Insight.
 - Gain visibility into end-user experience for virtual applications, desktops, and users for XenApp or XenDesktop.
 - Correlate network data with application data and real-time metrics for effective troubleshooting.
 - Integrate with XenDesktop 7 Director monitoring tool.
- Personal vDisk Data that allows for runtime monitoring showing base allocation and gives help-desk IT the ability to reset the Personal vDisk (to be used only as a last resort).
 - The command line tool CtxPvdDiag.exe is used to gather the user log information into one file for troubleshooting.

Director uses a troubleshooting dashboard that provides real-time health monitoring of the XenApp or XenDesktop site. This feature allows administrators to see failures in real time, providing a better idea of what the end user is experiencing.

Configuration Logging

Configuration Logging is a feature that allows administrators to keep track of administrative changes to a XenApp or XenDesktop Site. Configuration Logging can help administrators diagnose and troubleshoot problems after configuration changes are made, assist change management and track configurations, and report administration activity.

Configuration Logging can be viewed in Director with the Trend View interface to provide notifications of configuration changes to administrators who do not have access to XenDesktop Citrix Studio.

Trends View gives historical data of configuration changes over a period of time so administrators can assess what changes were made to the Sites, when they were made, and who made them to find the cause of an issue. This view breaks down configuration information in three categories.

- Connection Failures
- Failed Desktop Machines
- Failed Server Machines

OData API

Administrators can use the Site's Monitor Service's API to search historical data using the OData protocol. This allows IT to analyze historical trends for planning purposes, to perform detailed troubleshooting of connection and machine failures, and extract information for feeding into other tools and processes.

The Monitor Service schema provides the following types of data:

- Data relating to connection failures
- Machines in a failure state
- Session usage
- Logon duration
- Load balancing data

Related content

- [Director](#)
- [Monitor Personal vDisks](#)
- [Configuration Logging](#)
- [Monitor Service OData API](#)

Director

None

Director provides different *views* of the interface tailored to particular administrators. Product permissions determine what is displayed and the commands available.

For example, help desk administrators see an interface tailored to help desk tasks. Director allows help desk administrators to search for the user reporting an issue and display activity associated with that user, such as the status of the user's applications and processes. They can resolve issues quickly by performing actions such as ending an unresponsive application or process, shadowing operations on the user's machine, restarting the machine, or resetting the user profile.

In contrast, full administrators see and manage the entire site and can perform commands for multiple users and machines. The Dashboard provides an overview of the key aspects of a deployment, such as the status of sessions, user logons, and the site infrastructure. Information is updated every minute. If issues occur, details appear automatically about the number and type of failures that have occurred.

Deploy and configure Director

Director is installed by default as a website on the Delivery Controller. For prerequisites and other details, see the [System requirements](#) topic for this release.

This release of Director is not compatible with XenApp deployments earlier than 6.5 or XenDesktop deployments earlier than 7.

When Director is used in an environment containing more than one Site, be sure to synchronize the system clocks on all the servers where Controllers, Director, and other core components are installed. Otherwise, the Sites might not display correctly in Director.

Tip: If you intend to monitor XenApp 6.5 in addition to XenApp 7.5 or XenDesktop 7.x Sites, Citrix recommends installing Director on a separate server from the Director console that is used to monitor XenApp 6.5 sites.

Important: To protect the security of user names and passwords sent using plain text through the network, Citrix strongly recommends that you allow Director connections using only HTTPS, and not HTTP. Certain tools are able to read plain text user names and passwords in HTTP (unencrypted) network packets, which creates a security risk for users.

To configure permissions

To log on to Director, administrators with permissions for Director must be Active Directory domain users and must have the following rights:

- Read rights in all Active Directory forests to be searched (see [Advanced configuration](#)).
- Configured Delegated Administrator roles (see [Delegated Administration and Director](#)).

- To shadow users, administrators must be configured using a Microsoft group policy for Windows Remote Assistance. In addition:
 - When installing VDAs, ensure the Windows Remote Assistance feature is enabled on all user devices (selected by default).
 - When you install Director on a server, ensure that Windows Remote Assistance is installed (selected by default). However, it is disabled on the server by default. The feature does not need to be enabled for Director to provide assistance to end users. Citrix recommends leaving the feature disabled to improve security on the server.
 - To enable administrators to initiate Windows Remote Assistance, grant them the required permissions by using the appropriate Microsoft Group Policy settings for Remote Assistance. For information, see [CTX127388: How to Enable Remote Assistance for Desktop Director](#).
- For user devices with VDAs earlier than 7, additional configuration is required. See [Configure permissions for VDAs earlier than XenDesktop 7](#).

To install Director

Install Director using the installer, which checks for prerequisites, installs any missing components, sets up the Director website, and performs basic configuration. The default configuration provided by the installer handles typical deployments. If Director was not included during installation, use the installer to add Director. To add any additional components, rerun the installer and select the components to install. For information on using the installer, see the Installation topics. Citrix recommends that you install using the product installer only, not the .MSI file.

When Director is installed on the Controller, it is automatically configured with localhost as the server address, and Director communicates with the local controller by default.

To install Director on a dedicated server that is remote from a Controller, you are prompted to enter the FQDN or IP address of a Controller. Director communicates with that specified Controller by default. Specify only one Controller address for each Site that you will monitor. Director automatically discovers all other Controllers in the same Site and falls back to those other Controllers if the Controller you specified fails.

Note: Director does not load balance between Controllers.

To secure the communications between the browser and the Web server, Citrix recommends that you implement SSL on the IIS website hosting Director. Refer to the Microsoft IIS documentation for instructions. Director configuration is not required to enable SSL.

To log on to Director

The Director website is located at https or http://<Server_FQDN>/Director.

If one of the Sites in a multi-site deployment is down, the logon for Director takes a little longer while it attempts to connect to the Site that is down.

To install Director for XenApp 6.5

If Director is already installed for XenDesktop, complete the configuration for XenApp as follows:

- Use the IIS Manager Console on each Director server to update the list of XenApp server addresses in the application settings as described in the "To add sites to Director" section in [Advanced configuration](#). Supply the server address of one controller per XenApp farm: Any of the other controllers in a XenApp farm are then used automatically for failover. Director does not load balance between controllers.
- Configure each XenApp worker server to accept WinRM queries as described in [Configure permissions](#).
- Configure a firewall exception for port 2513, used for communication between Director and XenApp.

To install Director for XenApp 6.5 for the first time

To install Director for XenApp 6.5 for the first time, follow these steps. Typically, Director is installed on a separate computer from the XenApp controllers.

1. Install Director from the XenApp 7.6 installation media.
2. Use the IIS Manager Console on each Director server to update the list of XenApp server addresses in the application settings as described in the "To add sites to Director" section in [Advanced configuration](#).

Supply the server address of one controller per XenApp site: any of the other controllers in a XenApp site are then used automatically for failover. Director does not load balance between controllers.

Important: For XenApp addresses, be sure to use the setting `Service.AutoDiscoveryAddressesXA`, not the default setting `Service.AutoDiscoveryAddresses`.

3. The Director WMI provider installer is at `Support\DirectorWMIProvider` folder on the DVD. Install it on all appropriate XenApp servers (controllers and workers where sessions are running).

If winrm is not configured, run the winrm qc command.

4. Configure each XenApp worker server to accept WinRM queries as described in [Configure permissions](#).
5. Configure a firewall exception for port 2513, used for communication between Director and XenApp.
6. To secure the communications between the browser and the web server, Citrix recommends that you implement SSL on the IIS web site hosting Director.

Refer to the Microsoft IIS documentation for instructions. No Director configuration is required to enable SSL.

Delegated Administration and Director

Delegated Administration uses three concepts: administrators, roles, and scopes. Permissions are based on an administrator's role and the scope of this role. For example, an administrator might be assigned a Help Desk administrator role where the scope involves responsibility for end-users at one site only.

For information about creating delegated administrators, see the main Delegated Administration topic.

Administrative permissions determine the Director interface presented to administrators and the tasks they can perform. Permissions determine:

- The views the administrator can access, collectively referred to as a view.
- The desktops, machines, and sessions that the administrator can view and interact with.
- The commands the administrator can perform, such as shadowing a user's session or enabling maintenance mode.

The built-in roles and permissions also determine how administrators use Director:

Administrator Role	Permissions in Director
Full Administrator	Full access to all views and can perform all commands, including shadowing a user's session, enabling maintenance mode, and exporting trends data.
Delivery Group Administrator	Full access to all views and can perform all commands, including shadowing a user's session, enabling maintenance mode, and exporting trends data.
Read Only Administrator	<p>Can access all views and see all objects in specified scopes as well as global information. Can download reports from HDX channels and can export Trends data using the Export option in the Trends view.</p> <p>Cannot perform any other commands or change anything in the views.</p>
Help Desk Administrator	<p>Can access only the Help Desk and User Details views and can view only objects that the administrator is delegated to manage. Can shadow a user's session and perform commands for that user. Can perform maintenance mode operations. Can use power control options for Desktop OS Machines.</p> <p>Cannot access the Dashboard, Trends, or Filters views. Cannot use power control options for Server OS machines.</p>
Machine Catalog Administrator	No access. This administrator is not supported for Director and cannot view data. This user can access the Machine Details page (Machine-based search).

Host Administrator	No access. This administrator is not supported for Director and cannot view data.
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To configure custom roles for Director administrators

In Studio, you can also configure Director-specific, custom roles to more closely match the requirements of your organization and delegate permissions more flexibly. For example, you can restrict the built-in Help Desk administrator role so that this administrator cannot log off sessions.

If you create a custom role with Director permissions, you must also give that role other generic permissions:

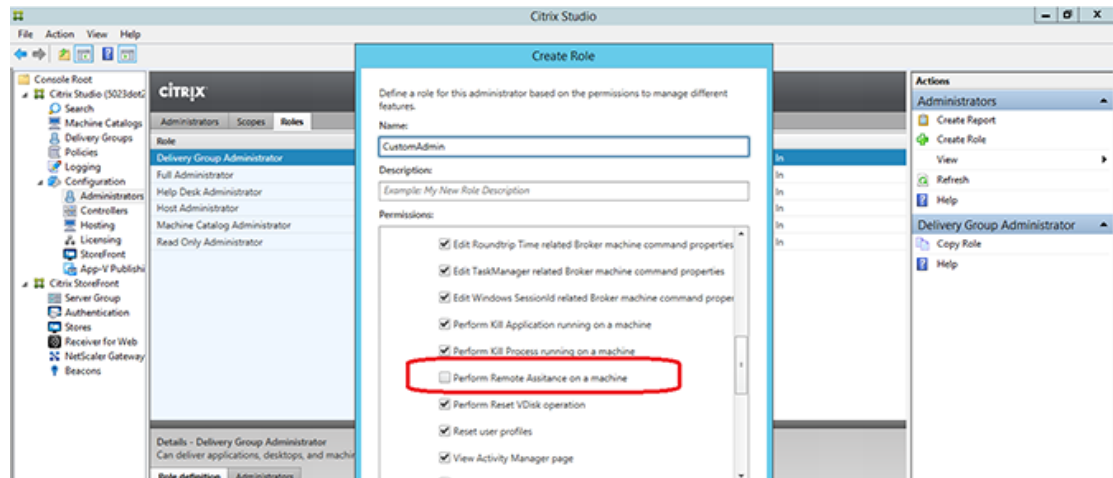
- Delivery Controller permission to log on to Director.
- Permissions to Delivery Groups to view the data related to those Delivery Groups in Director.

Alternatively, you can create a custom role by copying an existing role and include additional permissions for different views. For example, you can copy the Help Desk role and include permissions to view the Dashboard or Filters pages.

Select the Director permissions for the custom role, which include:

- Perform Kill Application running on a machine
- Perform Kill Process running on a machine
- Perform Remote Assistance on a machine
- Perform Reset vDisk operation
- Reset user profiles
- View Client Details page
- View Dashboard page
- View Filters page
- View Machine Details page
- View Trends page
- View User Details page

In this example, Shadowing (Perform Remote Assistance on a machine) is turned off.



In addition, from the list of permissions for other components, consider these permissions:

- From Delivery Groups:
 - Enable/disable maintenance mode of a machine using Delivery Group membership
 - Perform power operations on Windows Desktop machines using Delivery Group membership
 - Perform session management on machines using Delivery Group membership

Configure permissions for VDAs earlier than XenDesktop 7

If users have VDAs earlier than XenDesktop 7 installed on their devices, Director supplements information from the deployment with real-time status and metrics through Windows Remote Management (WinRM).

In addition, use this procedure to configure WinRM for use with Remote PC in XenDesktop 5.6 Feature Pack1.

By default, only local administrators of the desktop machine (typically domain administrators and other privileged users) have the necessary permissions to view the real-time data.

For information about installing and configuring WinRM, see [CTX125243](#).

To enable other users to view the real-time data, you must grant them permissions. For example, suppose there are several Director users (HelpDeskUserA, HelpDeskUserB, and so on) who are members of an Active Directory security group called HelpDeskUsers. The group has been assigned the Help Desk administrator role in Studio, providing them with the required Delivery Controller permissions. However, the group also needs access to the information from the desktop machine.

To provide the necessary access, you can configure the required permissions in one of two ways:

- Grant permissions to the Director users (impersonation model)
- Grant permissions to the Director service (trusted subsystem model)

To grant permissions to the Director users (impersonation model)

By default, Director uses an impersonation model: The WinRM connection to the desktop machine is made using the Director user's identity. It is therefore the user that must have the appropriate permissions on the desktop.

You can configure these permissions in one of two ways (described later in this topic):

1. Add users to the local Administrators group on the desktop machine.
2. Grant users the specific permissions required by Director. This option avoids giving the Director users (for example, the HelpDeskUsers group) full administrative permissions on the machine.

To grant permissions to the Director service (trusted subsystem model)

Instead of providing the Director users with permissions on the desktop machines, you can configure Director to make WinRM connections using a service identity and grant only that service identity the appropriate permissions.

With this model, the users of Director have no permissions to make WinRM calls themselves. They can only access the data using Director.

The Director application pool in IIS is configured to run as the service identity. By default, this is the APPPOOL\Director virtual account. When making remote connections, this account appears as the server's Active Directory computer account; for example, MyDomain\DirectorServer\$. You must configure this account with the appropriate permissions.

If multiple Director websites are deployed, you must place each web server's computer account into an Active Directory security group that is configured with the appropriate permissions.

To set Director to use the service identity for WinRM instead of the user's identity, configure the following setting, as described in [Advanced configuration](#):

Service.Connector.WinRM.Identity = Service

You can configure these permissions in one of two ways:

1. Add the service account to the local Administrators group on the desktop machine.
2. Grant the service account the specific permissions required by Director (described next). This option avoids giving the service account full administrative permissions on the machine .

To assign permissions to a specific user or group

The following permissions are required for Director to access the information it requires from the desktop machine through WinRM:

- Read and execute permissions in the WinRM RootSDDL
- WMI namespace permissions:
 - root/cimv2 – remote access
 - root/citrix – remote access
 - root/RSOP – remote access and execute
- Membership of these local groups:
 - Performance Monitor Users
 - Event Log Readers

The ConfigRemoteMgmt.exe tool, used to automatically grant these permissions, is on the installation media in the x86\Virtual Desktop Agent and x64\Virtual Desktop Agent folders and on the installation media in the tools folder. You must grant permissions to all Director users.

To grant the permissions to an Active Directory security group, user, computer account, or for actions like End Application and End Process, run the tool with administrative privileges from a command prompt using the following arguments:

ConfigRemoteMgmt.exe /configwinrmuser *domain\name*

where *name* is a security group, user, or computer account.

To grant the required permissions to a user security group:

```
ConfigRemoteMgmt.exe /configwinrmuser domain\HelpDeskUsers
```

To grant the permissions to a specific computer account:

```
ConfigRemoteMgmt.exe /configwinrmuser domain\DirectorServer$
```

For End Process, End Application, and Shadow actions:

```
ConfigRemoteMgmt.exe /configwinrmuser domain\name /all
```

To grant the permissions to a user group:

```
ConfigRemoteMgmt.exe /configwinrmuser domain\HelpDeskUsers /all
```

To display help for the tool:

```
ConfigRemoteMgmt.exe
```

Configure HDX Insight

Note: The availability of this feature depends on your organization's license and your administrator permissions.

HDX Insight is the integration of EdgeSight network analysis and EdgeSight performance management with Director:

- EdgeSight network analysis leverages HDX Insight to provide an application and desktop contextual view of the network. With this feature, Director provides advanced analytics of ICA traffic in their deployment.
- EdgeSight performance management provides the historical retention and trend reporting. With historical retention of data versus the real-time assessment, you can create Trend reports, including capacity and health trending.

After you enable this feature in Director, HDX Insight provides Director with additional information:

- The Trends page shows latency and bandwidth effects for applications, desktops, and users across the entire deployment.
- The User Details page shows latency and bandwidth information specific to a particular user session.

Limitations

- ICA session Round Trip Time (RTT) shows data correctly for Receiver for Windows 3.4 or higher and the Receiver for Mac 11.8 or higher. For earlier versions of these Receivers, the data does not display correctly.
- In the Trends view, HDX connection logon data is not collected for VDAs earlier than 7. For earlier VDAs, the chart data is displayed as 0.

To configure the EdgeSight network analysis feature on Director

EdgeSight provides network analysis by leveraging NetScaler HDX Insight to provide the Citrix application and desktop administrators the ability to troubleshoot and correlate issues that can be attributed to poor network performance.

NetScaler Insight Center must be installed and configured in Director to enable EdgeSight network analysis. Insight Center is a virtual machine (appliance) downloaded from Citrix.com. Using EdgeSight network analysis, Director communicates and gathers the information that is related to your deployment. This information is leveraged from HDX Insight, which provides robust analysis of the Citrix ICA protocol between the client and the back-end Citrix infrastructure.

1. On the server where Director is installed, locate the DirectorConfig command line tool in C:\inetpub\wwwroot\Director\tools, and run it with parameter /confignetscaler in command line prompt.

2. When prompted, configure the NetScaler Insight Center machine name (FQDN or IP address), username, password, and HTTP or HTTPS connection type.
3. To verify the changes, log off and log back on.

Advanced configuration

Some advanced Director configuration, such as supporting multiple sites or multiple Active Directory forests, is controlled through settings in Internet Information Services (IIS) Manager.

Important: When you change a setting in IIS, the Director service automatically restarts and logs off users.

To configure advanced settings using IIS:

1. Open the Internet Information Services (IIS) Manager console.
2. Go to the Director website under the Default website.
3. Double-click **Application Settings**.
4. Double-click a setting to edit it.

To support users across multiple Active Directory domains and forests

Director uses Active Directory to search for users and to look up additional user and machine information. By default, Director searches the domain or forest in which:

- The administrator's account is a member.
- The Director web server is a member (if different).

Director attempts to perform searches at the forest level using the Active Directory global catalog. If the administrator does not have permissions to search at the forest level, only the domain is searched.

To search or look up data from another Active Directory domain or forest requires that you explicitly set the domains or forests to be searched. Configure the following setting:

`Connector.ActiveDirectory.Domains = (user),(server)`

The value attributes *user* and *server* represent the domains of the Director user (the administrator) and Director server respectively.

To enable searches from an additional domain or forest, add the name of the domain to the list, as shown in this example:

`Connector.ActiveDirectory.Domains =
(user),(server),ENDUSERDOMAIN`

For each domain in the list, Director attempts to perform searches at the forest level. If the administrator does not have permissions to search at the forest level, only the domain is searched.

To add sites to Director

If Director is already installed, configure it to work with multiple sites. To do this, use the IIS Manager Console on each Director server to update the list of server addresses in the application settings.

Add an address of a controller from each site to the following setting:

`Service.AutoDiscoveryAddresses = SiteAController,SiteBController`

where *SiteAController* and *SiteBController* are the addresses of Delivery Controllers from two different sites.

For XenApp 6.5 sites, add an address of a controller from each XenApp farm to the following setting:

`Service.AutoDiscoveryAddressesXA = FarmAController,FarmBController`

where *FarmAController* and *FarmBController* are the addresses of XenApp controllers from two different farms.

For XenApp 6.5 sites, another way to add a controller from a XenApp farm:

`DirectorConfig.exe /xenapp FarmControllerName`

To disable the visibility of running applications in the Activity Manager

By default, the Activity Manager in Director displays a list of all the running applications for the user's session. This information can be viewed by all administrators that have access to the Activity Manager feature in Director. For Delegated Administrator roles, this includes Full administrator, Delivery Group administrator, and Help Desk Administrator.

To protect the privacy of users and the applications they are running, you can disable the Applications tab from listing running applications.

Caution: Editing the registry incorrectly can cause serious problems that may require you to reinstall your operating system. Citrix cannot guarantee that problems resulting from the incorrect use of Registry Editor can be solved. Use Registry Editor at your own risk. Be sure to back up the registry before you edit it.

1. On the VDA, modify the registry key located at `HKLM\Software\Citrix\Director\TaskManagerDataDisplayed`. By default, the key is set to 1. Change the value to 0, which means the information will not be displayed in the Activity Manager.

2. On the server with Director installed, modify the setting that controls the visibility of running applications. By default, the value is true, which allows visibility of running applications in the Applications tab. Change the value to false, which disables visibility. This option affects only the Activity Manager in Director, not the VDA.

Modify the value of the following setting:

`UI.TaskManager.EnableApplications = false`

Important: To disable the view of running applications, Citrix recommends making both changes to ensure the data is not displayed in Activity Manager.

Monitor deployments

With full administrator permissions, when you open Director, the Dashboard provides a centralized location to monitor the health and usage of a site.

If there are currently no failures and no failures have occurred in the past 60 minutes, panels stay collapsed. When there are failures, the specific failure panel automatically appears.

Note: Depending on your organization's license and your Administrator privileges, some options or features might not be available.

Panel	Description
User Connection Failures	Connection failures over the last 60 minutes. Click the categories next to the total number to view metrics for that type of failure. In the adjacent table, that number is broken out by Delivery Groups.
Failed Desktop OS Machines or Failed Server OS Machines	Total failures in the last 60 minutes broken out by Delivery Groups. Failures broken out by types, including failed to start, stuck on boot, and unregistered. For Server OS machines, failures also include machines reaching maximum load.
Licensing Status	<ul style="list-style-type: none">• License Server alerts are sent by the License Server and also display the actions required to resolve the alert.• Delivery Controller alerts display the details of the licensing state as seen by the controller and are sent by the Delivery Controller. <p>You can set the threshold for alerts in Studio.</p> <p>License Server and/or Delivery Controller alerts do not display if your License Server version is earlier than 11.12.1 and/or your Delivery Controller is older than XenApp 7.6 or XenDesktop 7.6.</p>
Sessions Connected	Connected sessions across all Delivery Groups for the last 60 minutes.
Average Logon Duration	<p>Logon data for the last 60 minutes. The large number on the left is the average logon duration across the hour.</p> <p>Logon data for VDAs earlier than XenDesktop 7.0 is not included in this average.</p>

Infrastructure	<p>Health status of your site's hosts, controllers, and infrastructure. View performance alerts.</p> <p>For hosts, the connection status and the health of the CPU, memory, bandwidth (network usage), and storage (disk usage) are monitored using information from XenServer or VMware.</p> <p>For example, you can configure XenCenter to generate performance alerts when CPU, network I/O or disk I/O usage go over a specified threshold on a managed server or virtual machine. By default, the alert repeat interval is 60 minutes, but you can configure this as well. For details, in the XenServer documentation, see Configuring Performance Alerts.</p>
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Note: If no icon appears for a particular metric, this indicates that this metric is not supported by the type of host you are using. For example, no health information is available for System Center Virtual Machine Manager (SCVMM) hosts.

Continue to troubleshoot issues using these options (which are documented below):

- Control user machine power
- Prevent connections to machines

Monitor sessions

If a session becomes disconnected, it is still active and its applications continue to run, but the user device is no longer communicating with the server.

Action	Description
View a user's currently connected machine or session	From the Activity Manager and User Details views, view the user's currently connected machine or session and a list of all machines and sessions to which this user has access. To access this list, click the session switcher icon in the user title bar. See Restore sessions .
View the total number of connected sessions across all Delivery Groups	From the Dashboard, in the Sessions Connected pane, view the total number of connected sessions across all Delivery Groups for the last 60 minutes. Then click the large total number, which opens the Filters view, where you can display graphical session data based on selected Delivery Groups and ranges and usage across Delivery Groups.
View data over a longer period of time	On the Trends view, select the Sessions tab to drill down to more specific usage data for connected and disconnected sessions over a longer period of time (that is, session totals from earlier than the last 60 minutes). To view this information, click View historical trends.

Note: If the user device is running a legacy Virtual Delivery Agents (VDA), such as a VDA earlier than version 7, Director cannot display complete information about the session. Instead, it displays a message that the information is not available in the User Details view and Activity Manager panel.

Filter data to troubleshoot failures

When you click numbers on the Dashboard or select a predefined filter from the Filter menu, the Filter view opens to display the data based on the selected machine or failure type.

Predefined filters cannot be edited, but you can save a predefined filter as a custom filter and then modify it. Additionally, you can create custom filtered views of machines, connections, and sessions across all Delivery Groups.

1. Select a view:
 - **Machines** — Select Desktop OS Machines or Server OS Machines. These views show the number of configured machines. The Server OS Machines tab also includes the load evaluator index, which indicates the distribution of performance counters and tool tips of the session count if you hover over the link.
 - **Sessions** — You can also see the session count from the Machines view.
 - **Connections** — Filter connections by different time periods, including last 60 minutes, last 24 hours, or last 7 days.
2. For Failure by, select the criteria.
3. Use the additional tabs for each view, as needed, to complete the filter.
4. Select additional columns, as needed, to troubleshoot further.
5. Save and name your filter.

To open filter later, from the Filter menu, select the failure type (Machines, Sessions, or Connections), and then select the saved filter.
6. If needed, for Machines or Connections views, use power controls for all the machines you select in the filtered list. For the Sessions view, use the session controls or option to send messages.

Continue to troubleshoot issues using these options (which are documented below):

- Control user machine power
- Prevent connections to machines

Monitor historical trends across a site

The Trends view accesses historical trend information for sessions, connection failures, machine failures, logon performance, and load evaluation for each site. To locate this information, click from the Dashboard or Filters view, click Trends.

To change the default scope of each graph, apply a different filter to the data.

Action	Description
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Export graph data	Select the tab containing the data to export. Click Export and select the file format: .PDF or .CSV.
View trends for sessions	From the Sessions tab, select the Delivery Group and time period to view more detailed information about the concurrent session count.
View trends for connection failures	From the Connection Failures tab, select the machine type, failure type, Delivery Group, and time period to view a graph containing more detailed information about the user connection failures across your site.
View trends for machine failures	From the Desktop OS Machine Failures tab or Server OS Machines tab, select the failure type, Delivery Group, and time period to view a graph containing more detailed information about the machine failures across your site.
View trends for logon performance	<p>From the Logon Performance tab, select the Delivery Group and time period to view a graph containing more detailed information about the duration of user logon times across your site and whether the number of logons affects the performance. This view also shows the average duration of the logon phases, such as brokering duration, VM start time, and so on.</p> <p>This data is specifically for user logons and does not include users trying to reconnect from disconnected sessions.</p>
View trends for load evaluation	From the Load Evaluator Index tab, view a graph containing more detailed information about the load that is distributed among Server OS machines. The filter options for this graph include the Delivery Group or Server OS machine in a Delivery Group, Server OS machine (available only if Server OS machine in a Delivery Group was selected), and range.
View hosted applications usage	<p>The availability of this feature depends on your organization's license.</p> <p>From the Hosted Applications Usage tab, select the Delivery Group and time period to view a graph displaying peak concurrent usage and a table displaying application based usage. From the Application Based Usage table, you can choose a specific application to see details and a list of users who are using, or have used, the application.</p>
View network analysis data using HDX Insight	<p>The availability of this feature depends on your organization's license and your administrator permissions.</p> <p>From the Network tab, monitor your network analysis, which provides a user, application, and desktop contextual view of the network. With this feature, Director provides advanced analytics of ICA traffic in your deployment.</p>

The flag icons on the graph indicate significant events or actions for that specific time range. Hover the mouse over the flag and click to list events or actions.

Note: HDX connection logon data is not collected for VDAs earlier than 7. For earlier VDAs, the chart data is displayed as 0.

Continue to troubleshoot issues using these options (which are documented below):

- Control user machine power
- Prevent connections to machines

Monitor hotfixes

To view the hotfixes installed on a specific machine VDA (physical or VM), choose the Machine Details view.

Control user machine power states

To control the state of the machines that you select in Director, use the Power Control options. These options are available for Desktop OS machines, but might not be available for Server OS machines.

Note: This functionality is not available for physical machines or machines using Remote PC Access.

Command	Function
Restart	Performs an orderly (soft) shutdown of the VM. and all running processes are halted individually before restarting the VM. For example, select machines that appear in Director as "failed to start," and use this command to restart them.
Force Restart	Restarts the VM without first performing any shut-down procedure. This command works in the same way as unplugging a physical server and then plugging it back in and turning it back on.
Shut Down	Performs an orderly (soft) shutdown of the VM; all running processes are halted individually.
Force Shutdown	Shuts down the VM without first performing any shut-down procedure. This command works in the same way as unplugging a physical server. It may not always shut down all running processes, and you risk losing data if you shut down a VM in this way.
Suspend	Suspends a running VM in its current state and stores that state in a file on the default storage repository. This option allows you to shut down the VM's host server and later, after rebooting it, resume the VM, returning it to its original running state.
Resume	Resumes a suspended VM and restores its original running state.
Start	Starts a VM when it is off (also called a cold start).

If power control actions fail, hover the mouse over the alert, and a pop-up message appears with details about the failure.

Prevent connections to machines

Use maintenance mode to prevent new connections temporarily while the appropriate administrator performs maintenance tasks on the image.

When you enable maintenance mode on machines, no new connections are allowed until you disable it. If users are currently logged on, maintenance mode takes effect as soon as all users are logged off. For users who do not log off, send a message informing them that machines will be shut down at a certain time, and use the power controls to force the machines to shut down.

1. Select the machine, such as from the User Details view, or a group of machines in the Filters view.
2. Select *Maintenance Mode*, and turn on the option.

If a user tries to connect to an assigned desktop while it is in maintenance mode, a message appears indicating that the desktop is currently unavailable. No new connections can be made until you disable maintenance mode.

Troubleshoot user issues

Use the Director's Activity Manager to view information about the user:

- Check for details about the user's logon, connection, and applications.
- Shadow the user's machine.
- Troubleshoot the issue with the recommended actions in the following table, and, if needed, escalate the issue to the appropriate administrator.

Troubleshooting tips

User's issue	See these suggestions:
Logon takes a long time or fails intermittently or repeatedly	Diagnose user logon issues
Application is slow or won't respond	Resolve application failures
Connection failed	Restore desktop connections
Session is slow or not responding	Restore sessions
Video is slow or poor quality	Run HDX channel system reports

Note: To make sure that the machine is not in maintenance mode, from the User Details view, review the Machine Details panel.

Search tips

When you type the user's name in a Search field, Director searches for users in Active Directory for users across all sites configured to support Director.

When you type a multiuser machine name in a Search field, Director displays the Machine Details for the specified machine.

When you type an endpoint name in a Search field, Director uses the unauthenticated (anonymous) and authenticated sessions that are connected to a specific endpoint, which enables troubleshooting unauthenticated sessions. Ensure that endpoint names are unique to enable troubleshooting of unauthenticated sessions.

The search results also include users who are not currently using or assigned to a machine.

- Searches are not case-sensitive.
- Partial entries produce a list of possible matches.
- After you type a few letters of a two-part name (username, family name and first name, or display name), separated by a space, the results include matches for both strings. For example, if you type jo rob, the results might include strings such as "John Robertson" or Robert, Jones.

To return to the landing page, click the Director logo.

Upload troubleshooting information to Citrix Technical Support

Run Citrix Scout from a single Delivery Controller or VDA to capture key data points and Citrix Diagnosis Facility (CDF) traces to troubleshoot selected computers. After capturing this information, Scout securely uploads the data points to Citrix Technical Support. The Tools As a Service (TaaS) platform uses this information to reduce the time to resolve customer-reported issues.

Scout is installed with XenApp or XenDesktop components. Scout appears in the Windows Start Menu or Windows 8 or 8.1 Start Screen when you install or upgrade to XenDesktop 7.1, XenDesktop 7.5, or XenApp 7.5.

To start Scout, from the Start Menu or Start Screen, select Citrix > Citrix Scout.

For information on using and configuring Scout, and for frequently asked questions, see <http://support.citrix.com/article/CTX130147>.

The following video summarizes how to use Scout.

None

Shadow users

From Director, use the *shadow user* feature to view and work directly on a user's virtual machine or session. The user must be connected to the machine that you want to shadow. Verify this by checking the machine name listed in the user title bar.

1. In the User Details view, select the user session.
2. Activate shadowing for the selected user session:
 - For machine monitoring, in the Activity Manager view, click Shadow.
 - For session monitoring, in the User Details view, locate the Session Details panel and click Shadow.
3. After the connection initializes, a dialog box prompts you to open or save the `.msrcincident` file.
4. Open the incident file with the Remote Assistance Viewer, if not already selected by default. A confirmation prompt appears on the user device.
5. Instruct the user to click Yes to start the machine or session sharing.

For additional control, ask the user to share keyboard and mouse control.

Streamline Microsoft Internet Explorer browsers for shadowing

Configure your Microsoft Internet Explorer browser to automatically open the downloaded Microsoft Remote Assistance (.msra) file with the Remote Assistance client.

To do this, you must enable the Automatic prompting for file downloads setting in the Group Policy editor:

Computer Configuration > Administrative Templates > Windows Components > Internet Explorer > Internet Control Panel > Security Page > Internet Zone > Automatic prompting for file downloads.

By default, this option is enabled for sites in the Local intranet zone. If the Director site is not in the Local intranet zone, consider manually adding the site to this zone.

Send messages to users

From Director, send a message to a user who is connected to one or more machines. For example, use this feature to send immediate notices about administrative actions such as impending desktop maintenance, machine log-offs and restarts, and profile resets.

1. In the Activity Manager view, select the user and click Details.
2. In the User Details view, locate the Session Details panel and click Send Message.
3. Type your message information in the Subject and Message fields, and click Send.

If the message is sent successfully, a confirmation message appears in Director. If the user's machine is connected, the message appears there.

If the message is not sent successfully, an error message appears in Director. Troubleshoot the problem according to the error message. When you have finished, type the subject and message text again and click Try again.

Diagnose user logon issues

Use these general steps:

1. From the User Details view, troubleshoot the logon state using the Logon Duration panel.
 - If the user is logging on, the view reflects the process of logging on.
 - If the user is currently logged on, the Logon Duration panel displays the time it took for the user to log on to the current session.
2. Ask the user to log off and then log on again so that you can observe the Logon Duration data. The panel typically updates after about 3 minutes, but it could take longer depending on the time taken for the logon to complete.
3. Examine the phases of the logon process:
 - **Brokering** – Time taken to decide which desktop to assign to the user.
 - **VM start** – Time taken to boot the desktop.
 - **HDX connection** – Time taken for HDX connection establishment, dependent on the network.
 - **GPOs** – Time taken to apply group policy objects.
 - **Login scripts** – Time taken for scripts.
 - **Profile load** – Time taken to load the user profile.
 - **Interactive session** – Time taken to establish an interactive user session.

The total logon time is not an exact sum of these phases. For example, some phases occur in parallel, and in some phases, additional processing occurs that might result in a longer logon duration than the sum.

Tip: To identify unusual or unexpected values in the graph, compare the amount of time taken in each phase of the current session with the average duration for this user for the last seven days, and the average duration for all users in this Delivery Group for the last seven days.

Escalate as needed. For example, if the VM startup is slow, the issue could be in the hypervisor, so you can escalate it to the hypervisor administrator. Or, if the brokering time is slow, you can escalate the issue to the Site administrator to check the load balancing on the Delivery Controller.

Troubleshooting tips: Examine unusual differences, including:

- Missing (current) logon bars
- Major discrepancy between the current duration and this user's average duration. Causes could including:

- A new application was installed.
- An operating system update occurred.
- Configuration changes were made.
- Major discrepancy between the user's logon numbers (current and average duration) and the Delivery Group average duration.

If needed, click Restart to observe the user's logon process to troubleshoot issues, such as VM Start or Brokering.

Resolve application failures

In the Activity Manager view, click the Applications tab. You can view all the applications on all machines to which this user has access, including local and hosted applications for the currently connected machine, and the current status of each.

Note: If the Applications tab is greyed out, contact an administrator with the permission to enable the tab.

The list includes only those applications that were launched within the session.

For Server OS machines and Desktop OS machines, applications are listed for each disconnected session. If the user is not connected, no applications are displayed.

Action	Description
End the application that is not responding.	Choose the application that is not responding and click End Application. Once the application is terminated, ask the user to launch it again.
End processes that are not responding.	<p>If you have the required permission, click the Processes tab. Select a process that is related to the application or using a high amount of CPU resources or memory, and click End Process.</p> <p>However, if you do not have the required permission to terminate the process, attempting to end a process will fail.</p>
Restart the user's machine.	<p>For Desktop OS machines only, for the selected session, click Restart,</p> <p>Alternatively, from the Machine Details view, use the power controls to restart or shut down the machine. Instruct the user to log on again so that you can recheck the application.</p> <p>For Server OS machines, the restart option is not available. Instead, log off the user and let the user log on again.</p>
Put the machine into maintenance mode.	If the machine's image needs maintenance, such as a patch or other updates, put the machine into maintenance mode and escalate the issue to the appropriate administrator. Click , and from the Machine Details view, click Details and turn on the maintenance mode option. Escalate to the appropriate administrator.

Restore desktop connections

From Director, check the user's connection status for the current machine in the user title bar.

If the desktop connection failed, the error that caused failure is displayed and can help you decide how to troubleshoot.

Action	Description
Ensure that the machine is not in maintenance mode.	On the User Details page, make sure maintenance mode is turned off.
Restart the user's machine.	Select the machine and click Restart. Use this option if the user's machine is unresponsive or unable to connect, such as when the machine is using an unusually high amount of CPU resources, which can make the CPU unusable.

Restore sessions

If a session becomes disconnected, it is still active and its applications continue to run, but the user device is no longer communicating with the server.

In the User Details view, troubleshoot session failures in the Session Details panel. You can view the details of the current session, indicated by the session ID.

Action	Description
End applications or processes that are not responding.	<p>Click the Applications tab. Select any application that is not responding and click End Application. Similarly, select any corresponding process that is not responding and click End Process.</p> <p>Also, end processes that are consuming an unusually high amount of memory or CPU resources, which can make the CPU unusable.</p>
Disconnect the Windows session.	Click Session Control and then select Disconnect. This option is available only for brokered Server OS machines. For non-brokered sessions, the option is disabled.
Log off the user from the session.	Click Session Control and then select Log Off.

To test the session, the user can attempt to log back onto it. You can also shadow the user to more closely monitor this session.

Note: If user devices are running Virtual Delivery Agents (VDAs) earlier than XenDesktop 7, Director cannot display complete information about the session; instead, it displays a message that the information is not available. These messages might appear in the User Details page and Activity Manager.

Run HDX channel system reports

In the User Details view, check the status of the HDX channels on the user's machine in the HDX panel. This panel is available only if the user machine is connected using HDX.

If a message appears indicating that the information is not currently available, wait for one minute for the page to refresh, or select the Refresh button. HDX data takes a little longer to update than other data.

Click an error or warning icon for more information.

Tip: You can view information about other channels in the same dialog box by clicking the left and right arrows in the left corner of the title bar.

HDX channel system reports are used mainly by Citrix Support to troubleshoot further.

1. In the HDX panel, click Download System Report.
2. You can view or save the .xml report file.
 - To view the .xml file, click Open. The .xml file appears in the same window as the Director application.
 - To save the .xml file, click Save. The Save As window appears, prompting you for a location on the Director machine to download the file to.

Reset a Personal vDisk

Caution: When you reset the disk, the settings revert back to their factory default values and all data on it is deleted, including applications. The profile data is retained unless you modified the Personal vDisk default (of redirecting profiles from the C: drive), or you are not using a third-party profile solution.

To reset, the machine with the Personal vDisk must be running; however, the user does not have to be logged on to it.

This option is available only for Desktop OS machines; it is disabled for Server OS machines.

1. From the Help Desk view, choose the targeted Desktop OS machine.
2. From this view or in the Personalization panel of the User Details view, click Reset Personal vDisk.
3. Click Reset. A message appears warning that the user will be logged off. After the user is logged off (if the user was logged on), the machine restarts.

If the reset is successful, the Personal vDisk status field value in the Personalization panel of the User Details view is Running. If the reset is unsuccessful, a red X to the right of the Running value appears. When you point to this X, information about the failure appears.

Reset a user profile

Caution: When a profile is reset, although the user's folders and files are saved and copied to the new profile, most user profile data are deleted (for example, the registry is reset and application settings might be deleted).

1. Instruct the user to log off from all sessions.
2. From Director, in the user title bar of the Help Desk view, choose the machine where the profile is located.
3. Click Reset Profile and then Reset.
4. Instruct the user to log on again. The folders and files that were saved from the user's profile are copied to the new profile.

Important: If the user has profiles on multiple platforms (such as Windows 8 and Windows 7), instruct the user to log back on *first* to the same desktop or app that the user reported as a problem. This ensures that the correct profile is reset.

If the profile is a Citrix user profile, the profile is already reset by the time the user's desktop appears. If the profile is a Microsoft roaming profile, the folder restoration might still be in progress for a brief time. The user must stay logged on until the restoration is complete.

If the profile is not successfully reset (for example, the user cannot successfully log back on to the machine or some of the files are missing), you must manually restore the original profile.

The folders (and their files) from the user's profile are saved and copied to the new profile. They are copied in the listed order:

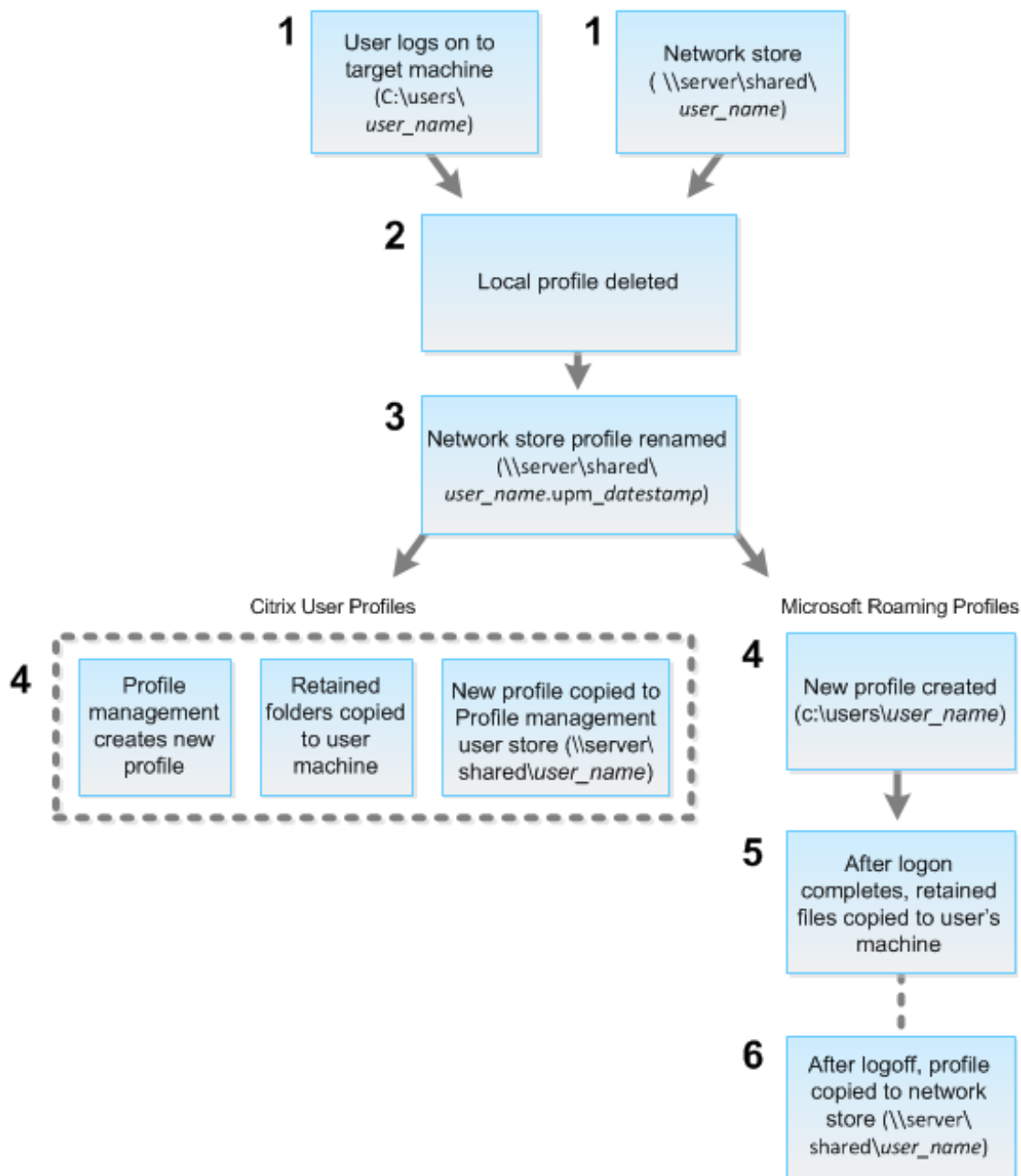
- Desktop
- Cookies
- Favorites
- Documents
- Pictures
- Music
- Videos

Note: In Windows 8 and later, cookies are not copied when profiles are reset.

How reset profiles are processed

Any Citrix user profile or Microsoft roaming profile can be reset. After the user logs off and you select the reset command (either in Director or using the PowerShell SDK), Director first identifies the user profile in use and issues an appropriate reset command. Director receives the information through Profile management, including information about the profile size, type, and logon timings.

The next time the user logs on, this diagram illustrates the processing that occurs.



1. The reset command issued by Director specifies the profile type. The Profile management service then attempts to reset a profile of that type and looks for the appropriate network share (user store). If the user is processed by Profile management,

but receives a roaming profile command, it is rejected (or vice versa).

2. If a local profile is present, it is deleted.
3. The network profile is renamed.
4. The next action depends on whether the profile being reset is a Citrix user profile or a Microsoft roaming profile.
 - For Citrix user profiles, the new profile is created using the Profile management import rules, and the folders are copied back to the network profile, and the user can log on proceeds as normal. If a roaming profile is used for the reset, any registry settings in the roaming profile are preserved in the reset profile.

Note: You can configure Profile management so that a template profile overrides the roaming profile, if required.

- For Microsoft roaming profiles, a new profile is created by Windows, and when the user logs on, the folders are copied back to the user device. When the user logs off again, the new profile is copied to the network store.

To manually restore a profile after a failed reset

1. Instruct the user to log off from all sessions.
2. Delete the local profile if one exists.
3. Locate the archived folder on the network share that contains the date and time appended to the folder name, the folder with a *.upm_datestamp* extension.
4. Delete the current profile name; that is, the one without the *upm_datestamp* extension.
5. Rename the archived folder using the original profile name; that is, remove the date and time extension. You have returned the profile to its original, pre-reset state.

Monitor Personal vDisks

You can use a diagnostic tool to monitor the changes made by users to both parts of their Personal vDisks (the user data and the application parts). These changes include applications that users have installed and files they have modified. The changes are stored in a set of reports.

1. On the machine that you want to monitor, run C:\Program Files\Citrix\personal vDisk\bin\CtxPvdDiag.exe.
2. Browse to a location where you want to store the reports and logs, select which reports to generate, and click OK. The following reports are available:

Report or Log	Generated Files	Changes Monitored
Software hive report	Software.Dat.Report.txt, Software.Dat.delta.txt	Software.Dat.Report.txt records the changes made to the HKEY_LOCAL_MACHINE\Software hive sections: <ul style="list-style-type: none">• List of Applications installed on the machine – that were installed in Layer 0.• List of user installed software – installed by the user on the application.• List of software uninstalled by the user – by the user that were originally installed. See Hive delta report for information on the delta report.
System hive report	SYSTEM.CurrentControlSet.DAT.Report.txt	This file records the changes made to the HKEY_LOCAL_MACHINE\System hive sections: <ul style="list-style-type: none">• List of user installed services – installed by the user.• Startup of following services – which services and drivers whose start type was modified.
Security hive report	SECURITY.DAT.Report.txt	This file monitors all changes that the user makes to the HKEY_LOCAL_MACHINE\Security hive.
Security Account Manager(SAM) hive report	SAM.DAT.Report.txt	This file monitors all changes that the user makes to the HKEY_LOCAL_MACHINE\SAM hive.
Hive delta report	Software.Dat.delta.txt	This file records all registry keys and values modified, by the user in the HKEY_LOCAL_MACHINE\Software hive.

Personal vDisk logs	Pud-lvmSupervisor.log, PvDActivation.log, PvDSvc.log, PvDWMI.log, SysVol-lvmSupervisor.log, vDeskService- <code><#></code> .log	These files are generated by default for the user account>\AppData\Local\Temp\PVDL\ selected location.
Windows operating system (OS) log	EvtLog_App.xml, EvtLog_System.xml, setupapi.app.log, setuperr.log, setupapi.dev.log, msinfo.txt	<p>EvtLog_App.xml and EvtLog_System.xml are system event logs in XML format from the Windows operating system.</p> <p>Setupapi.app.log and setuperr.log contain logs of the setupapi.exe process when msixexec.exe was run during Personal vDisk installation.</p> <p>Setupapi.dev.log contains device installation logs.</p> <p>Msinfo.txt contains the output of the Windows System Information tool. For more information about this output, see your Microsoft documentation.</p>
File system report	FileSystemReport.txt	<p>This file records changes made by the user to the vDisk. The report consists of the following sections:</p> <ul style="list-style-type: none"> • Files Relocated – the files in the user's local drive were moved to the vDisk. Layer 0 files are the master image by the machine when the vDisk was attached. • Files Removed – the files in the user's local drive were removed (for example, removing a file). • Files Added (MOF, INF, SYS) – the files in the user's local drive have extensions that the user added to the vDisk. For example, they installed an application such as a .mof file for autorecord. • Files Added Other – Other files added to the vDisk (for example, when they installed a file). • Base Files Modified But Not Relocated – the user modified but that the Personal vDisk did not capture in the vDisk.

Configuration Logging

Configuration Logging captures Site configuration changes and administrative activities to the Database. You can use the logged content to:

- Diagnose and troubleshoot problems after configuration changes are made; the log provides a breadcrumb trail
- Assist change management and track configurations
- Report administration activity

You set Configuration Logging preferences, display configuration logs, and generate HTML and CSV reports from Citrix Studio. You can filter configuration log displays by date ranges and by full text search results. Mandatory logging, when enabled, prevents configuration changes from being made unless they can be logged. With appropriate permission, you can delete entries from the configuration log. You cannot use the Configuration Logging feature to edit log content.

Configuration Logging uses a PowerShell 2.0 SDK and the Configuration Logging Service. The Configuration Logging Service runs on every Controller in the Site; if one Controller fails, the service on another Controller automatically handles logging requests.

By default, the Configuration Logging feature is enabled, and uses the Database that is created when you create the Site (the Site Configuration Database). Citrix strongly recommends that you change the location of the database used for Configuration Logging as soon as possible after creating a Site. The Configuration Logging Database supports the same high availability features as the Site Configuration Database.

Access to Configuration Logging is controlled through Delegated Administration, with the Edit Logging Preferences and View Configuration Logs permissions.

Configuration logs are localized when they are created. For example, a log created in English will be read in English, regardless of the locale of the reader.

What is logged

Configuration changes and administrative activities initiated from Studio, Director, and PowerShell scripts are logged. Examples of logged configuration changes include working with (creating, editing, deleting assigning):

- Machine Catalogs
- Delivery Groups (including changing power management settings)
- Administrator roles and scopes
- Host resources and connections
- Citrix policies through Studio

Examples of logged administrative changes include:

- Power management of a virtual machine or a user desktop
- Studio or Director sending a message to a user

The following operations are not logged:

- Autonomic operations such as pool management power-on of virtual machines.
- Policy actions implemented through the Group Policy Management Console (GPMC); use Microsoft tools to view logs of those actions.
- Changes made through the registry, direct access of the Database, or from sources other than Studio, Director, or PowerShell.
- When the deployment is initialized, Configuration Logging becomes available when the first Configuration Logging Service instance registers with the Configuration Service. Therefore, the very early stages of configuration are not logged (for example, when the Database schema is obtained and applied, when a hypervisor is initialized).

Manage Configuration Logging

By default, Configuration Logging uses the database that is created when you create a Site (also known as the Site Configuration Database). Citrix recommends that you change the location of the database used for Configuration Logging (and the database used for the Monitoring Service, which also uses the Site Configuration Database by default) after creating a Site, for the following reasons:

- The backup strategy for the Configuration Logging Database is likely to differ from the backup strategy for the Site Configuration Database.
- The volume of data collected for Configuration Logging (and the Monitoring Service) could adversely affect the space available to the Site Configuration database.
- It splits the single point of failure for the three databases.

Note: Product editions that do not support Configuration Logging do not have a Logging node in Studio.

Enable and disable Configuration Logging and mandatory logging

By default, Configuration Logging is enabled, and mandatory logging is disabled.

1. Select Logging in the Studio navigation pane.
2. Select Preferences in the Actions pane. The Configuration Logging dialog box contains database information and indicates whether Configuration Logging and mandatory logging are enabled or disabled.
 - To enable Configuration Logging, select the Enable logging radio button. This is the default setting. If the database cannot be written to, the logging information is discarded, but the operation continues.
 - To disable Configuration Logging, select the Disable logging radio button. If logging was previously enabled, existing logs remain readable with the PowerShell SDK.
 - To enable mandatory logging, clear the Allow changes when the database is disconnected checkbox. No configuration change or administrative activity that would normally be logged will be allowed unless it can be written in the database used for Configuration Logging.

You can enable mandatory logging only when Configuration Logging is enabled, that is, when the Enable Configuration Logging radio button is selected. If the Configuration Logging Service fails, and high availability is not in use, mandatory logging is assumed. In such cases, operations that would normally be logged are not performed.

- To disable mandatory logging, select the Allow changes when the database is disconnected check box. Configuration changes and administrative activities are allowed, even if the database used for Configuration Logging cannot be accessed. This is the default setting.

Change the Configuration Logging database location

Note: You cannot change the database location when mandatory logging is enabled, because the location change includes a brief disconnect interval that cannot be logged.

1. Create a database server, using a supported SQL Server version.
2. Select Logging in the Studio navigation pane.
3. Select Preferences in the Actions pane.
4. In the Logging Preferences dialog box, select Change logging database.
5. In the Change Logging Database dialog box, specify the location of the server containing the new database server (using one of the forms in the following table) and the database name.

Database type	What to enter	With this database configuration
Standalone or mirror	<i>servername</i>	The default instance is used and SQL Server uses the default port.
	<i>servername\INSTANCENAME</i>	A named instance is used and SQL Server uses the default port.
	<i>servername,port-number</i>	The default instance is used and SQL Server uses a custom port. (The comma is required.)
Other	<i>cluster-name</i>	A clustered database.
	<i>availability-group-listener</i>	An Always-On database.

- To allow Studio to create the database, click OK. When prompted, click OK, and the database will be created automatically. Studio attempts to access the database using the current Studio user's credentials; if that fails, you are prompted for the database user's credentials. Studio then uploads the database schema to the database. (The credentials are retained only during database creation.)
- To create the database manually, click Generate database script. The generated script includes instructions for manually creating the database. Ensure that the database is empty and that at least one user has permission to access and change the database before uploading the schema.

The Configuration Logging data in the previous database is not imported to the new database. Logs cannot be aggregated from both databases when retrieving logs. The first log entry in the new Configuration Logging database will indicate that a database change occurred, but it does not identify the previous database.

Display configuration log content

When initiating configuration changes and administrative activities, the *high level operations* created by Studio and Director are displayed in the upper middle pane in Studio. A high level operation results in one or more service and SDK calls, which are *low level operations*. When you select a high level operation in the upper middle pane, the lower middle pane displays the low level operations.

If an operation fails before completion, the log operation might not be completed in the Database; for example, a start record will have no corresponding stop record. In such cases, the log indicates that there is missing information. When you display logs based on time ranges, incomplete logs are shown if the data in the logs matches the criteria. For example, if all logs for the last five days are requested and a log exists with a start time in the last five days but has no end time, it is included.

When using a script that calls PowerShell cmdlets, if you create a low level operation without specifying a parent high level operation, Configuration Logging will create a surrogate high level operation.

To display configuration log content, select Logging in the Studio navigation pane. By default, the display in the center pane lists the log content chronologically (newest entries first), separated by date.

To filter the display by	Complete this action
Search results	Enter text in the Search box at the top of the middle pane. The filtered display includes the number of search results. To return to the standard logging display, clear the text in the Search box.
Column heading	Click a column heading to sort the display by that field.
A date range	Select an interval from the drop down list box next to the Search box at the top of the middle pane.

Generate reports

You can generate CSV and HTML reports containing configuration log data.

- The CSV report contains all the logging data from a specified time interval. The hierarchical data in the database is flattened into a single CSV table. No aspect of the data has precedence in the file. No formatting is used and no human readability is assumed. The file (named MyReport) simply contains the data in a universally consumable format. CSV files are often used for archiving data or as a data source for a reporting or data manipulation tool such as Microsoft Excel.
- The HTML report provides a human-readable form of the logging data for a specified time interval. It provides a structured, navigable view for reviewing changes. An HTML report comprises two files, named Summary and Details. Summary lists high level operations: when each operation occurred, by whom, and the outcome. Clicking a Details link next to each operation takes you to the low level operations in the Details file, which provides additional information.

To generate a configuration log report, select Logging in the Studio navigation pane, and then select Create custom report in the Actions pane.

- Select the date range for the report.
- Select the report format: CSV, HTML, or both.
- Browse to the location where the report should be saved.

Delete configuration log content

To delete the configuration log, you must have certain Delegated Administration and SQL Server database permissions.

- **Delegated Administration** — You must have a Delegated Administration role that allows the deployment configuration to be read. The built-in Full administrator role has this permission. A custom role must have Read Only or Manage selected in the Other permissions category.

To create a backup of the configuration logging data before deleting it, the custom role must also have Read Only or Manage selected in the Logging Permissions category.

- **SQL Server database** — You must have a SQL server login with permission to delete records from the database. There are two ways to do this:
 - Use a SQL Server database login with a sysadmin server role, which allows you to perform any activity on the database server. Alternatively, the serveradmin or setupadmin server roles allow you to perform deletion operations.
 - If your deployment requires additional security, use a non-sysadmin database login mapped to a database user who has permission to delete records from the database.
 1. In SQL Server Management Studio, create a SQL Server login with a server role other than 'sysadmin.'
 2. Map the login to a user in the database; SQL Server automatically creates a user in the database with the same name as the login.
 3. In Database role membership, specify at least one of the role members for the database user: ConfigurationLoggingSchema_ROLE or dbowner.
- For more information, see the SQL Server Management Studio documentation.

To delete the configuration logs:

1. Select Logging in the Studio navigation pane.
2. Select Delete logs in the Actions pane.
3. You are asked if you want to create a backup of the logs before they are deleted. If you choose to create a backup, browse to the location where the backup archive should be saved. The backup is created as a CSV file.

After the configuration logs are cleared, the log deletion is the first activity posted to the empty log. That entry provides details about who deleted the logs, and when.

Monitor Service OData API

In addition to using the Citrix Director console to display historical data, you can query data using the Monitor Service's API. You can use the API to:

- Analyze historical trends for future planning
- Perform detailed troubleshooting of connection and machine failures
- Extract information for feeding into other tools and processes; for example, using Microsoft Excel's PowerPivot tables to display the data in different ways
- Build a custom user interface on top of the data that the API provides

The Monitor Service API uses the Open Data (OData) protocol, which is a Web protocol for querying and updating data, built upon Web technologies such as HTTP. For more information about the OData protocol, see: <http://www.odata.org>.

The Monitor Service API is built on top of SQL Server databases using Windows Communication Foundation (WCF) Data Services that are populated during processing and consolidation. Two endpoints are exposed using WCF with wsHttpBinding. The base address is: `http://{dc-host}/Citrix/Monitor/OData/v2`. You can also use SSL to secure endpoints; see [Securing endpoints using SSL](#) for more information.

1. The Data endpoint exposes read-only access directly to the database entities and can be accessed using the OData query language. This endpoint allows highly flexible access in terms of filtering and column selection. The Data API URI is: `http://{dc-host}/Citrix/Monitor/OData/v2/Data`. For more information about accessing the Monitor Service data, see [Accessing data using the API](#).
2. The Methods endpoint exposes service operations that are used by Citrix Director to retrieve data that requires complex grouping and high performance standards, such as queries on the Dashboard and Trends pages. The Methods API URI is: `http://{dc-host}/Citrix/Monitor/OData/v2/Methods`. Methods are used only in Director itself so are not used by the majority of Citrix customers. They are therefore not documented here.

What's new in this release?

The version of the API included with XenApp and XenDesktop 7.6 provides the following new features:

- **Hotfix inventory.** Using the User Details view or Machine view in Director, you can see a list of all the Citrix hotfixes that have been installed on a machine. You can use the API to extract this data and create custom reports (for example, the state of installed hotfixes over an entire site) or pull it into an analytics engine. New classes have been introduced and the Machine class has been extended to support tracking Citrix hotfixes installed on the controller and VDAs.

- **Anonymous session troubleshooting.** Sessions can be run as a set of pooled local user accounts. The API has a new `IsAnonymous` property for the `Session` class (default value `FALSE`).
- **Hosted application usage reporting.** Director provides new capacity reports that show the usage of hosted applications over time. The API allows you to report on the details of each application instance running in a user session.

All the updates to data are fully documented in the API Reference at <http://support.citrix.com/help/monitorserviceapi/7.6/>.

The `GetSessionSummary` method has been deprecated at this release.

Accessing data using the API

The following types of data are available through the Monitor Service API:

- Data relating to connection failures
- Machines in a failure state
- Session usage
- Logon duration
- Load balancing data
- Hotfixes applied to a machine
- Hosted application usage

For a full description of the data objects, see

<http://blogs.citrix.com/2013/08/27/xendesktop-7-monitor-service-what-data-is-available/>.

To use the Monitor Service OData API, you must be a XenApp or XenDesktop administrator. To call the API, you require read-only privileges; however, the data returned is determined by XenApp or XenDesktop administrator roles and permissions. For example, Delivery Group Administrators can call the Monitor Service API but the data they can obtain is controlled by Delivery Group access set up using Citrix Studio. For more information about XenApp or XenDesktop administrator roles and permissions, see Delegated Administration.

Querying the data

The Monitor Service API is a REST-based API that can be accessed using an OData consumer. OData consumers are applications that consume data exposed using the OData protocol. OData consumers vary in sophistication from simple web browsers to custom applications that can take advantage of all the features of the OData Protocol. For more information about OData consumers, see: <http://www.odata.org/ecosystem#consumers>.

Every part of the Monitor Service data model is accessible and can be filtered on the URL. OData provides a query language in the URL format you can use to retrieve entries from a service. For more information, see:

<http://msdn.microsoft.com/en-us/library/ff478141.aspx>

The query is processed on the server side and can be filtered further using the OData protocol on the client side.

The data modeled falls into three categories: aggregate data (the summary tables), current state of objects (machines, sessions, etc), and log data, which is really historical events (connections, for example).

Note: Enums are not supported in the OData protocol; integers are used in their place. To determine the values returned by the Monitor Service OData API, see <http://support.citrix.com/help/monitorserviceapi/7.6/>.

Aggregation of data values

The Monitor Service collects a variety of data, including user session usage, user logon performance details, session load balancing details, and connection and machine failure information. Data is aggregated differently depending on its category. Understanding the aggregation of data values presented using the OData Method APIs is critical to interpreting the data. For example:

- Connected Sessions and Machine Failures occur over a period of time, therefore they are exposed as maximums over a time period.
- LogOn Duration is a measure of length of time, therefore is exposed as an average over a time period.
- LogOn Count and Connection Failures are counts of occurrences over a period of time, therefore are exposed as sums over a time period.

Concurrent data evaluation

Sessions must be overlapping to be considered concurrent. However, when the time interval is 1 minute, all sessions in that minute (whether or not they overlap) are considered concurrent: the size of the interval is so small that the performance overhead involved in calculating the precision is not worth the value added. If the sessions occur in the same hour, but not in the same minute, they are not considered to overlap.

Correlation of summary tables with raw data

The data model represents metrics in two different ways.:

- The summary tables represent aggregate views of the metrics in per minute, hour, and day time granularities.
- The raw data represents individual events or current state tracked in the session, connection, application and other objects.

When attempting to correlate data across API calls or within the data model itself, it is important to understand the following concepts and limitations:

- **No summary data for partial intervals.** Metrics summaries are designed to meet the needs of historical trends over long periods of time. These metrics are aggregated into the summary table for complete intervals. There will be no summary data for a partial interval at the beginning (oldest available data) of the data collection nor at the end. When viewing aggregations of a day (Interval=1440), this means that the first and most recent incomplete days will have no data. Although raw data may exist for those partial intervals, it will never be summarized. You can determine the earliest and latest aggregate interval for a particular data granularity by pulling the min and max SummaryDate from a particular summary table. The SummaryDate column represents the start of the interval. The Granularity column represents the length of the interval for the aggregate data.
- **Correlating by time.** Metrics are aggregated into the summary table for complete intervals as described above. They can be used for historical trends, but raw events may be more current in the state than what has been summarized for trend analysis. Any time-based comparison of summary to raw data needs to take into account that there will be no summary data for partial intervals that may occur or for the beginning and ending of the time period.

- **Missed and latent events.** Metrics that are aggregated into the summary table may be slightly inaccurate if events are missed or latent to the aggregation period. Although the Monitor Service attempts to maintain an accurate current state, it does not go back in time to recompute aggregation in the summary tables for missed or latent events.
- **Connection High Availability.** During connection HA there will be gaps in the summary data counts of current connections, but the session instances will still be running in the raw data.
- **Data retention periods.** Data in the summary tables is retained on a different grooming schedule from the schedule for raw event data. Data may be missing because it has been groomed away from summary or raw tables. Retention periods may also differ for different granularities of summary data. Lower granularity data (minutes) is groomed more quickly than higher granularity data (days). If data is missing from one granularity due to grooming, it may be found in a higher granularity. Since the API calls only return the specific granularity requested, receiving no data for one granularity does not mean the data doesn't exist for a higher granularity for the same time period.
- **Time zones.** Metrics are stored with UTC time stamps. Summary tables are aggregated on hourly time zone boundaries. For time zones that don't fall on hourly boundaries, there may be some discrepancy as to where data is aggregated.

Data granularity and retention

The granularity of aggregated data retrieved by Director is a function of the time (T) span requested. The rules are as follows:

- $0 < T \leq 1$ hour uses per-minute granularity
- $0 < T \leq 30$ days uses per-hour granularity
- $T > 31$ days uses per-day granularity

Requested data that does not come from aggregated data comes from the raw Session and Connection information. This data tends to grow fast, and therefore has its own grooming setting. Grooming ensures that only relevant data is kept long term. This ensures better performance while maintaining the granularity required for reporting. For customers who are not licensed to use the Platinum edition, grooming begins at day 8 regardless of the default grooming retention. Platinum customers can change the grooming retention to their desired number of retention days, otherwise the default is used.

The following settings are used to control grooming:

Setting name	Affected grooming	Default value (days)	Accessed using
GroomSessionsRetentionDays	Session and SessionDetail records	7 for non-Platinum users, 90 for Platinum	Cmdlet (set/get-monitorconfiguration)
GroomSummariesRetentionDays	DesktopGroupSummary, FailureLogSummary and LoadIndexSummary records. Aggregated data - daily granularity.	7 for non-Platinum users, 90 for Platinum	Cmdlet (set/get-monitorconfiguration)

GroomHourlyRetentionDays	Aggregated data - hourly granularity	32 days	Monitor.Configuration Database Table. See note below.
GroomMinuteRetentionDays	Aggregated data - minute granularity	3 days	Monitor.Configuration Database Table. See note below.
GroomFailuresRetentionDays	MachineFailureLog and ConnectionFailureLog records	7 for non-Platinum users, 90 for Platinum	Cmdlet (set/get-monitorconfiguration)
GroomLoadIndexesRetentionDays	LoadIndex records	7 for non-Platinum users, 90 for Platinum	Cmdlet (set/get-monitorconfiguration)
GroomDeletedRetentionDays	Machine, Catalog, DesktopGroup and Hypervisor entities that have a LifecycleState of 'Deleted'. This will also delete any related Session, SessionDetail, Summary, Failure or LoadIndex records.	7 for non-Platinum users, 90 for Platinum	Cmdlet (set/get-monitorconfiguration)
GroomMachineHotfixHistoryRetentionDays	Hotfixes applied to the VDA and Controller machines	90 for both non-Platinum and Platinum users	Cmdlet (set/get-monitorconfiguration)

Caution: Modifying values on the Monitor Service database requires restarting the service for the new values to take effect. You are advised to make changes to the Monitor Service database only under the direction of Citrix Support.

Retaining data for long periods will have the following implications on table sizes:

- **Hourly data.** If hourly data is allowed to stay in the database for up to two years, a site of 1000 delivery groups could cause the database to grow as follows:

1000 delivery groups x 24 hours/day x 365 days/year x 2 years = 17,520,000 rows of data. The performance impact of such a large amount of data in the aggregation tables is significant. Given that the dashboard data is drawn from this table, the requirements on the database server may be large. Excessively large amounts of data may have a dramatic impact on performance.

- **Session and event data.** This is the data that is collected every time a session is started and a connection/reconnection is made. For a large site (100K users), this data will grow very fast. For example, two years worth of these tables would gather more than a TB of data, requiring a high-end enterprise-level database.

Securing endpoints using SSL

This topic explains how to use SSL to secure the Monitor Service OData API endpoints. If you choose to use SSL, you must configure SSL on all Delivery Controllers in the site; you cannot use a mixture of SSL and non-SSL.

To secure Monitor Service endpoints using SSL, you must perform the following configuration. Some steps need to be done only once per site, others must be run from every machine hosting the Monitor Service in the site. The steps are described below.

Part 1: Certificate registration with the system

1. Create a certificate using a trusted certificate manager. The certificate must be associated with the port on the machine that you wish to use for OData SSL.
2. Configure the Monitor Service to use this port for SSL communication. The steps depend on your environment and how this works with certificates. The following example shows how to configure port 449:
 - Associate the certificate with a port:

```
netsh http add sslcert ipport=0.0.0.0:449 certhash=97bb629e50d556c80528f4991721ad4f28fb74e9  
appid='{00000000-0000-0000-0000-000000000000}'
```

Tip: In a PowerShell command window, ensure you put single quotes around the GUID in the appId, as shown above, or the command will not work. Note that a line break has been added to this example for readability only.

Part 2: Modify the Monitor Service configuration settings

1. From any Delivery Controller in the site, run the following PowerShell commands once. This removes the Monitor Service registration with the Configuration Service.

```
asnp citrix.*
```

```
$serviceGroup = get-configregisteredinstance -servicetype Monitor | Select -First 1 ServiceGroupU  
remove-configserviceGroup -ServiceGroupUid $serviceGroup.ServiceGroupUid
```

2. Do the following on all Controllers in the site:

- Using a cmd prompt, locate the installed Citrix Monitor directory (typically in C:\Program Files\Citrix\Monitor\Service). Within that directory run:

```
Citrix.Monitor.Exe -CONFIGUREFIREWALL -ODataPort 449 -RequireODataSsl
```

- Run the following PowerShell commands:

```
asnp citrix.* (if not already run within this window)
```

```
get-MonitorServiceInstance | register-ConfigServiceInstance
```

Get-ConfigRegisteredServiceInstance -ServiceType Config | Reset-MonitorServiceGroupMembership

Examples

The following examples show how to export Monitor Service data using the OData API.

Example 1 - Raw XML

1. Place the URL for each data set into a web browser that is running with the appropriate administrative permissions for the XenApp or XenDesktop Site. Citrix recommends using the Chrome browser with the Advanced Rest Client add-in.
2. View the source.

Example 2 - PowerPivot with Excel

These instructions assume that you have already installed Microsoft Excel and PowerPivot.

Open Excel (running with the appropriate administrative permissions for the XenApp or XenDesktop Site).

If you are using Excel 2010:

1. Click the PowerPivot tab.
2. Click PowerPivot Window.
3. Click **From Data Feeds** in the ribbon.
4. Choose a Friendly Connection Name (for example: XenDesktop Monitoring Data) and enter the data feed url: `http://{dc-host}/Citrix/Monitor/OData/v2/Data` (or `https:` if you are using SSL).
5. Click **Next**.
6. Select the tables you want to import into Excel and click **Finish**. The data is retrieved.
7. You can now use PowerPivot to view and analyze the data with PivotTables and PivotCharts. For more information, see the Learning Center:
<http://www.microsoft.com/en-us/bi/LearningCenter.aspx>

If you are using Excel 2013:

1. Click the Data tab.
2. Choose From Other Sources > From OData Data Feed
3. Enter the data feed url: `http://{dc-host}/Citrix/Monitor/OData/v1/Data` (or `https:` if you are using SSL) and click **Next**.
4. Select the tables you want to import into Excel and click **Next**.
5. Accept name defaults or customize names and click **Finish**.

6. Choose **Connection Only** or **Pivot Report**. The data is retrieved.
7. You can now use PowerPivot to view and analyze the data with PivotTables and PivotCharts. For more information, see the Learning Center:
<http://www.microsoft.com/en-us/bi/LearningCenter.aspx>

Example 3 - LINQPad

These instructions assume that you have already installed LINQPad.

1. Run LinqPad with the appropriate administrative permissions for the XenApp or XenDesktop Site.

Tip: the easiest way is to download, install and run on the Delivery Controller.
2. Click the Add connection link.
3. Choose WCF Data Services 5.1 (OData 3) and click **Next**.
4. Enter the data feed URL: `http://{dc-host}/Citrix/Monitor/OData/v2/Data` (or `https:` if you are using SSL). If necessary, enter the username and password to access the Delivery Controller. Click **OK**.
5. You can now run LINQ queries against the data feed and export the data as needed. For example, right-click Catalogs and choose **Catalogs.Take(100)**. This returns the first 100 Catalogs in the database. Choose **Export>Export to Excel with formatting**.

For further worked examples of how to use the API with LINQPad, see <http://blogs.citrix.com/2014/01/14/creating-director-custom-reports-for-monitoring-xendesktop/>.