



**The Official Guide to:**

# **Citrix XenClient 1.0 Service Pack 1**

**Reference Design, Best Practices and Additional Resources**

**Version 1.0**

**Commissioned by Citrix Systems, Inc.**

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Many thanks to the Citrix XenClient team for all their help!

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## Document Revision History

This is the first version “The Official Guide to Citrix XenClient 1.0 Service Pack 1”.

- Please stay tuned to [DABCC.com](http://DABCC.com), [Citrix XenClient Central](#), and the [DABCC: Citrix XenClient Resources page](#) for the latest version of this project.

Please send all suggestions and comments to [dbrown@dabcc.com](mailto:dbrown@dabcc.com).

Date	Version	Updated By	Description of Changes
2/8/2011	1.0	Douglas Brown	First Version

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## Document Overview

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Welcome to version 1.0 of the Official Guide to Citrix XenClient: Reference Design, Best Practices, and Additional Resources Guide.

The first thing you need to understand about this guide and XenClient is they are both 1.0 and Citrix has been very clear in their statements and positing that XenClient 1.0 Service Pack 1 is geared toward test, evaluation, pilots, and proof of concepts. The goal is for you to get familiar with what this technology can do for you and your organization. In keeping with that goal the design, best practices, and additional resources found in this guide are limited to this scope. In the future, this guide will be upgraded as Citrix releases future versions.

My goal for this guide is to provide you with the knowledge required to understand the architectural requirements and configuration best practices to successfully deploy and evaluate the new Citrix XenClient 1.0 Service Pack 1 client virtualization solution. This includes design requirements, best practices, and links to additional resources.

I've also tried to organize this guide keeping as close as possible with the same flow a Citrix XenClient deployment would follow. However, this guide does not include step-by-step instructions, yet. In version 1.0 of this guide, I'm not trying to recreate the wheel by reproducing a lot of content that is easily available in other locations in order to deliver this guide to you quicker. In future releases these sections will be 'built out' to provide more comprehensive instructions and resources.

To me, client-side hypervisors are the future! I'm excited and I hope this guide will help you to get to know what a technology such as XenClient can do for you! This is amazing stuff and brings the power and promise of virtualization to the end-points, something we seem to forget when talking about VDI and other related technologies. This guide is truly a labor of love so expect more and more of it!

If you have any comments, suggestions, and/or would like to contribute to this guide please email me directly at [dbrown@dabcc.com](mailto:dbrown@dabcc.com)

I hope you find this useful!

DB

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*Note: This guide was written on a virtual machine running on Citrix XenClient 1.0 Service Pack 1!*

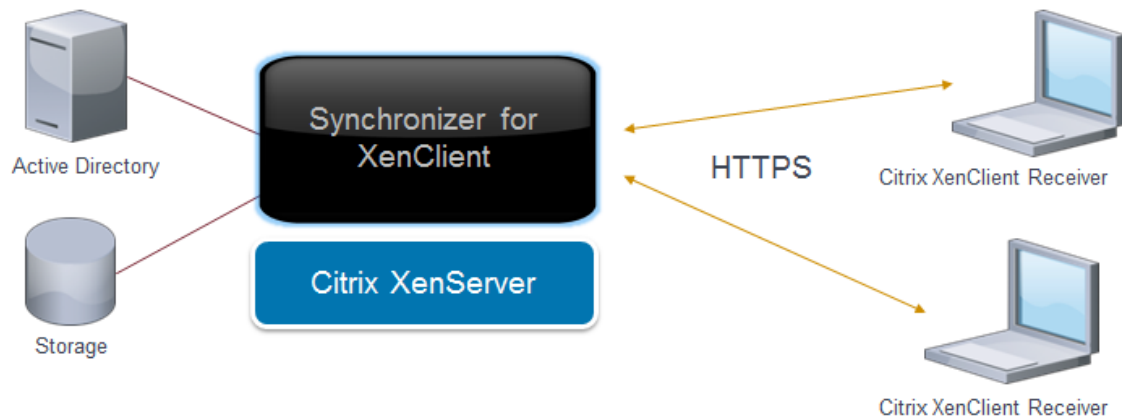
# **XenClient Design Considerations**

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## 1. Citrix XenClient 1.0 Service Pack 1 Overview

Citrix XenClient brings a new paradigm to deployment and management of desktop devices. XenClient leverages the promise of server virtualization, the power of server-based computing, and the usability of traditional computing to ultimately give IT one solution to deploy, manage, and secure virtual desktops without compromising the user's experience.

In the real world of IT users have portable physical machines and many for a very good reason. Those users tend to roam from location to location using various travel methods such as car, train, and/or airplane. Sometimes they are connected via the Internet or on the corporate network, and sometimes they are not. There are many of types of these workers and XenClient is a perfect solution for them!



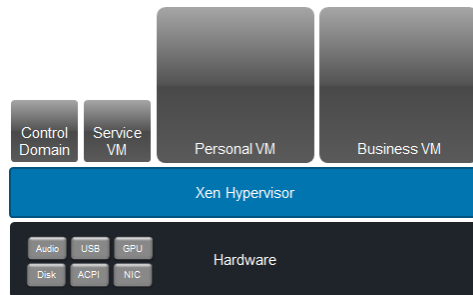
XenClient 1.0 Service Pack 1 consists of two major components:

- XenClient Hypervisor (client)
- Synchronizer for XenClient (server)

In this guide, you will learn about the above two components and their requirements, best practices, recommendations, and where to find additional resources.

## 2. XenClient Client Hypervisor Design

Citrix XenClient is composed of a client and server component. The client component is a type-1 client hypervisor based of the 64-bit Xen 3.4 hypervisor. It has a very simple architecture consisting of the Xen 3.4 hypervisor, a control domain, a service virtual machine, and any user installed and/or corporate delivered virtual machines.



To understand the role of each component, let's walk through the XenClient boot process and detail each as they load.

When a XenClient machine is booting the first thing that happens after POST is the Xen hypervisor is loaded. The hypervisor is the base component whose job it is to manage the machines physical hardware and assign them to "virtual machines" running on top of it. The Xen 3.4 hypervisor is very small and consists of only seventy thousand lines of code. The hypervisor is the bottom layer of the XenClient stack.

XenClient 1.0 Service Pack 1 supports two types of virtualization: paravirtualization and hardware-assisted virtualization. It uses Intel's [VT-d](#) and [VT-x](#) technology to communicate with its virtual machines.

Once the Xen hypervisor is loaded XenClient will load the Control Domain. The Control Domain is a privileged virtual machine tasked with routing all traffic from all virtual machines to the hypervisor. This includes USB, network, disk, and [QEMU](#) traffic.

QEMU is used for PC Emulation. It emulates a PC environment for a virtual machine, if the device is not paravirtualized. XenClient does not use the CPU or Memory emulation features found in QEMU. And once the paravirtualized storage and networking drivers are loaded, XenClient will not use the emulated disk and network components in QEMU either.

The Control Domain (dom0) is also where the 'translation' between guest OS drivers and 'hypervisor aware' drivers occurs. Users and /or their virtual machines have no direct access to the control domain and cannot manipulate it in any way. It is a hidden system VM.

Next boots the Service Virtual Machine. It is a private Linux-based virtual machine that runs the Citrix Receiver user interface. It's responsible for sending virtual machine control communications directly to the control domain (dom0), such as VM start, stop, pause, delete, etc. It also sends virtual configuration update information directly to dom0 securely.

The Citrix Receiver user interface is the piece the user sees. It is actually only a few HTML pages displayed on a [Midori GTK2 web browser](#) running in full screen mode. You can actually "tab" between open windows, which comes in handy from time to time. If at any time the Receiver for XenClient interface experiences issues or freezes you can refresh it using the CTRL-Q shortcut command.

Once the Service VM has loaded and the Citrix Receiver UI is ready users can start to create, download, and/or interact with their virtual machines.

We now have a basic understanding of the XenClient architecture so it's time to dive a bit deeper and discuss the much dreaded hardware compatibility list and supported configurations.

## 2. 1. Hardware & Software Requirements and Recommendations

The first thing you will realize about Citrix XenClient, and any virtualization hypervisor solution, is that there is a hardware compatibility list and it tends to be small. With server-virtualization this is not a problem as the amount of quality server hardware requiring support is rather small and thus a virtualization vendor can ‘bake’ the correct driver support into the control domain. With client virtualization this task becomes much more difficult as the type and amount of devices requiring support becomes unmanageable. This ultimately leaves us with a stringent hardware compatibility list.

**Note:** Although the XenClient HCL is limited, Citrix has added and will be adding support for the machines that are the highest volume mainstream devices on the market today. In other words, Citrix is working on supporting the most popular devices first and then working down through the lesser- used laptop and desktop machines.

The second important item to recognize is that Citrix XenClient is 1.0 technology, and Citrix does not market or sell it as anything more. Citrix’s goal in releasing XenClient 1.0 as a supported free client hypervisor was to “prime the pump” by allowing everyone to learn the benefits and power of client virtualization.

Citrix is committed to XenClient! In the next release, due out in mid-2011, we will see additional hardware support and much more. If your device is not supported today, don’t worry and check back soon!

The Citrix XenClient 1.0 Service Pack 1 client component has the following hardware requirements:

### 2. 1. 1 CPU

Citrix XenClient 1.0 Service Pack 1 communicates with virtual machines using Intel’s VT-d and VT-x technologies. This being said, any potential CPU will require the VT-x and VT-d features enabled and supported in the system BIOS. As of the writing on this guide, the following CPUs are supported:

- Intel Core 2 Duo with vPro support
- Intel Core i5 (The i5-4xx processors are not supported as they do not have support for VT-d )
- Intel Core i7

**Key Required:** Before installing XenClient it is required to enabled Intel VT-x / Intel VT-d and disable the Intel TPM / TXT in the system BIOS. In a future release Citrix will add support for the TXT feature.

### 2. 1. 2 Graphics Processor

Today, only the [Intel Integrated Graphics GMA 4500 and Intel® HD Graphics](#) graphical processing units (GPUs) are supported.

Citrix have confirmed that support for certain NVIDIA graphics adaptors will be added in a future release.

### 2. 1. 3 Memory

Citrix recommends at least 4GB of RAM. The amount of RAM a user will actually need is truly specific to each user, the number of virtual machines they will actually run at the same time, and their workloads.

Although, my personal best practice is to, load your system up with RAM and watch it fly! But, this can be pricey. ;)

### 2. 1. 4 Disk

Citrix recommends at least 160 GBs of disk space but this really all depends upon the number and size of virtual machines you wish to run on XenClient.

During installation, XenClient will erase the entire drive and install with the following disk configuration:

- /config (12MB)
- / (100MB) - root file system
- /boot (12MB) - boot volume, used by grub2
- /storage (remaining space) - location of virtual machine [VHD](#) images and XenClient tools ISO

Citrix XenClient 1.0 Service Pack 1 utilizes ‘[Thin Provisioning](#)’ to serve storage to its virtual machines. (See the Virtual Machine Requirements and Recommendation section below for more information about virtual machine storage requirements and thin provisioning’s role in it.)

The use of Solid State hard drives (SSD) is highly recommended. This guide is being written on a Core Duo with vPro but with an installed SSD. It boots much faster, and the overall user experience is perfect!

The virtual machine VHD files are stored in the */storage/disks* folder, accessible through methods such as:

- **Terminal access** - Press the “ctrl – shift –T” keys within the XenClient Receiver UI to open the XenClient Terminal window. You can also access the XenClient terminal remotely using tools such as [PuTTY](#).
- **Remote file access** – Tools such as [WinSCP](#) allow you to have a Windows access in to the */storage/disks* folder. This is a great way to perform adhoc backups and to copy VMs you previously created to a XenClient machine.

**Note:** With the release of Service Pack 1, Citrix has disabled access for remote SSH connections. It is required to enable it during the XenClient base install under the “Advanced Install” configuration setting. However if you upgraded a XenClient 1.0 device to SP1, SSH will remain open for remote access.

## 2. 1. 5 Wireless LAN

XenClient 1.0 Service Pack 1 supports the following wireless devices:

- Intel WiFi Link 5100
- Intel WiFi Link 5300
- Intel Centrino 6200
- Intel Centrino 6300
- Intel WiMAX/WiFi Link 5150 (WiFi Only)
- Intel Centrino Advanced-N + WiMAX 6250 (WiFi only)
- Broadcom 4322AGN/4312G
- Broadcom 4312G
- Dell Wireless 1397, 1510
- Dell Wireless 1501, 1520

Additional support will be added in future releases on the XenClient hypervisor.

## 2. 1. 6 Recommendations

As you can tell, XenClient has a very limited list of supported hardware. The key points to remember when selecting hardware for XenClient are as follows:

- The CPU and BIOS requires VT-d support. If your CPU is not an i7 then verify it supports VT-d and VT-x. If the CPU is a Core Duo then verify it has vPro technology.
- Verify the machines graphics processing unit (GPU) is the Intel integrated graphics GMA 4500 or Intel HD graphics based system.
- If you will be running multiple VMs then load up on memory. As with any modern day computer, the more memory you have the faster it runs!
- Verify your wireless card is on the supported list.
- Select the fastest disk storage possible. SSDs highly recommended but not required.

For the most up-to-date official list of supported systems please refer to the [Citrix XenClient Hardware Compatibility List](#).

## 2.2. XenClient Installation and Configuration

Once you have decided and settled upon hardware you are ready to install your first Citrix XenClient!

Keeping with the scope of version 1.0 of this guide, we will not get on to the step-by-steps of what it takes to install XenClient as there are many great articles on this subject, such as the following:

- [How to install and configure the Citrix XenClient - Part 1](#)
- [How to Install and Configure the Citrix XenClient- Part 2](#)
- [How to install and Configure the Citrix XenClient - Part 3](#)

We also recommend the following official Citrix support papers and/or blog articles to find additional information related to the install process:

- How to Install XenClient from CD-ROM – Citrix XenClient 1.0 Service Pack 1  
<http://support.citrix.com/article/CTX127696>
- How to Install XenClient via PXE Boot <http://support.citrix.com/article/CTX125485> and Citrix XenClient 1.0 Service Pack 1 User Guide pages 33-42 <http://support.citrix.com/article/CTX127696>
- How to Install XenClient using a USB Flash Drive  
<http://community.citrix.com/display/ocb/2010/11/19/XenClient+-+Create+your+USB+install+stick>
- XenClient 1.0 Proof of Concept Implementation Guide <http://support.citrix.com/article/CTX125351>

## 2.3. Virtual Machine Requirements and Recommendations

Once you've installed the XenClient hypervisor, you are ready to create your first virtual machine. Citrix XenClient is nothing without Virtual Machines (VMs)! VMs are created and/or downloaded and run on the XenClient hypervisor. Before a VM can be downloaded an administrator must first have created it and then uploaded it (as discussed later in this guide).

There are two types of virtual machines; managed and unmanaged.

- **Managed** Virtual Machines are VMs that have been assigned and downloaded from the Synchronizer for XenClient. With managed VMs a user has the ability to backup, restore, and/or author the VM, depending upon the assignment policy.
- **Unmanaged** Virtual Machines are VMs that were created on and/or imported to a XenClient machine but never uploaded to the Synchronizer.

To create a new virtual machine all an administrator needs to do is click “Create VM” > “Install from Disc” and then the “Create from Install Disk” wizard opens. This wizard is pretty simple. It allows the author to assign the OS type, name, description, memory, number of vCPUs, disk size, network type, and whether to start the VM after creation or not.

**Note:** Only a user with Administrator rights on a Synchronizer can upload a new virtual machine. A standard user can modify an existing version and upload the new version if they have been given Author rights in the assignment.

These configurations are very straight forward and most of them depend upon the workload of the VM. However, I will point out some things to be wary of during the wizard.

### 2. 3. 1 Disk Space

As discussed in the “Disk Requirements” section above, XenClient uses Thin Provisioning to allocate physical disk space to virtual machines. This means you have the ability to over-assign disk space when creating the VM.

It is recommended to create large disk partitions, if appropriate. If you think you will utilize the space in the future then you should assign it now and XenClient will allocate it as needed. However, once space is allocated it cannot be returned. For example, if I copy 50GBs of music to my VM and then delete it the 50GBs is just zeroed out and the actual allocated disk space remains the same. This can easily cause problems with running out of physical disk space due to over allocation, even though it is not all being used.

The capability to automatically collapse VHDs while the virtual machine is offline will be added in a future release.

In case a XenClient machines runs out of disk space Citrix has built in a “get out of jail free card” by copying a garbage file, xc-reserved, to the /storage/ folder during install. This file can be safely deleted to free up the needed disk space.

The size of the xc-reserved file depends of the XenClient build as follows:

- 1GB for XenClient 1.0 installs (if you upgrade to SP1 it does not increase the size of the xc-reserved file)
- 4GB for XenClient 1.0 Service Pack 1 fresh installs.

Now that you’ve created your first VM it is time to configure any required advanced settings. In the following section I will detail the key setting to pay attention to at this point of the install process.

### 2. 3. 2 Memory

When creating a new virtual machine you will be prompted to configure the amount of physical memory the VM will be allocated. The default is 1 GB (1024MB).

If not restricted by an assignment policy, a user can change the amount of memory assigned to a VM at any time.

Currently Citrix does not support memory sharing between VMs, referred to as dynamic memory allocation. Citrix has confirmed it is on the roadmap.

Citrix hard allocates memory for XenClient so you don’t have to worry about leaving memory for the virtual machine. If there is not enough memory to start a virtual machine based on that VM’s configuration and the available XenClient memory then the VM fails to start and the user gets an error message noting that the VM does not have enough free memory available.

**Note:** Currently there is a 3GB upper limit for memory assigned to a virtual machine. This is due to issues with interacting with the PCI address space that goes between 3 and 4 GB of memory. This will be addressed in a future release.

### **2. 3. 3 Intel AMT ME Pass-through**

Enabling the Intel Active Management Technology (AMT) Management Engine (ME) Pass-through feature allows one active virtual machine direct access to the Intel AMT management engine. A number of systems management tools like Microsoft SCCM, Altiris, and LanDesk have integrations where a Windows agent will register with the AMT subsystem (a few PCI devices) to read information, store information, and use nifty features like agent heartbeating that AMT supports today.

### **2. 3. 4 Allow OEM Windows Installs**

If you will be installing a version of Windows from OEM install media then you will be required to enable the “Allow OEM Windows Installs” setting in the “Advanced” section of the virtual machine details screen. This setting allows XenClient to expose the host ACPI SLIC table to the VM to allow Windows to verify it is being installed on the correct hardware.

### **2. 3. 5 Expose Physical Hardware Information**

In order to get some OEM software / hardware working you might need to enable the “Expose Physical Hardware Information” Advanced setting. This allows XenClient to share the SMBIOS record types describing host hardware to the guest VM. For example, OEM specific software like HP hotkey software or even OEM versions of CD burning software that need to check if the system is running on the correct hardware require this information.

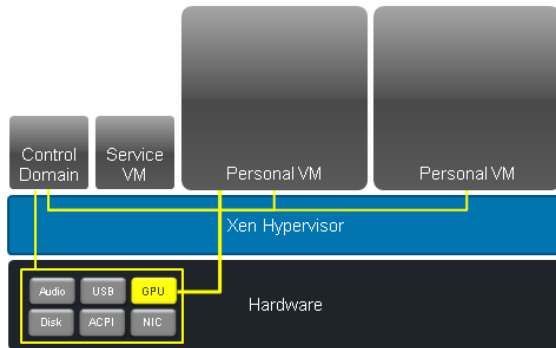
### **2. 3. 6 Display VM in Switcher Bar**

The “Display VM in Switcher Bar” advanced setting configures XenClient to hide the desired virtual machines icon from being displayed on the switch bar. This setting can be very handy when using the secure application sharing feature discussed below. An administrator can pre-configure XenClient machines with VMs designed to publish applications and then hide them from the switcher bar.

This feature however does not hide the virtual machine from being displayed in the list of VMs found on the XenClient Receiver home page.

### 2. 3. 7 3D Graphics Support

Citrix XenClient 1.0 Service Pack 1 ships with an experiential (beta) support for what they call, 3D Graphics. When enabled, XenClient passes graphics calls directory to the physical graphics processing unit (GPU) vs. the control domain > hypervisor > and finally physical hardware. This results in a true native graphics experience within a virtual machine.



Due to the limited amount of video card drivers supported by XenClient 1.0 Service Pack 1 (one) Citrix was able to include the driver within the XenClient Tools install. The first time a virtual machine boots, with the 3D graphics feature enabled, Windows will pop up a message informing the user it has found new hardware (the physical Intel video card vs. the current Citrix XenClient driver) and automatically install the correct Intel integrated graphics GMA 4500 or Intel HD Graphics native driver. Upon reboot a user will experience native graphics experience.

If, upon first booting a virtual machine with 3D Graphics support enabled, your screen goes black just wait for the HD light on your laptop to show no activity and then reboot your XenClient machine. Once back try it again. If it never works disable 3D Graphics and submit a bug report.

The following are three key points to be aware of:

- Citrix XenClient tools are required to be installed in the desired guest virtual machine prior to enabling the 3D Graphics feature.
- Virtual Machines with the 3D Graphics Support feature enabled cannot publish applications to other VMs.
- Only one virtual machine with the 3D Graphics Support feature enabled is allowed to run at any one time.

## 2. 3. 8 Importing Virtual Machines

With the release of Service Pack 1 for XenClient, Citrix enabled the ability to import images created in XenServer or [XenConvert 2.3](#). The process of importing virtual machines has been simplified but does still require a few manual steps, as follows:

1. Create a new Virtual Machine within the Citrix Receiver for XenClient. DO NOT START the virtual machine before saving the VM.
  2. Copy the desired virtual machine VHD file to the /storage/disks/ folder of the XenClient machine.
  3. Locate the newly created virtual machine's corresponding VHD file (created in step 1).
- Browse to the /config/vms/ directory on the XenClient machine to find the virtual machine config files. These files contain the configuration information for each virtual machine. The first thing you will need to do is open one config file at a-time until you find the one dedicated to the newly created VM (step 1).

- To find the name of the virtual machine search for the "name" entry, as shown below:

```
} ,  
  "name": "Windows 7 (xcwin7-1) ",  
  "slot": "1",
```

- Once you find the config file for the virtual machine created in step 1 then you will need to search for the VHD file entry, as shown below.

```
"1": {  
  "path": "\\storage\disks\e61f1346-379a-4806-95b6-  
379a16abb8bb.vhd",  
  "type": "vhd",
```

4. Now that you know the filename of the VHD created in step 1 you will be required to browse to the /storage/disks/ folder and rename it. For example, e61f1346-379a-4806-95b6-379a16abb8bb.vhd.old.
5. Find the VHD uploaded in step 2 and rename it to the name of the VHD file specified in the config file. For example, e61f1346-379a-4806-95b6-379a16abb8bb.vhd. Start the VM and away you go!

**Recommended:** Although importing virtual machines from other sources is a supported feature Citrix recommended you strive to start with a clean image created in a XenClient environment. This will help with reducing unwanted files, drivers, and other misc. components not required when running on the Xen hypervisor. It is just always wise to create clean environments but NOT required.

### **2. 3. 9 Recommendations**

The key points to remember when creating virtual machines are as follows:

- Create large virtual disk drives and allow XenClient to utilize Thin Provisioning to serve disk space as needed.
- In case a XenClient machines runs out of disk space Citrix has built in a “get out of jail free card” by copying a garbage file, xc-reserved, to the /storage/ folder during install. This file can be safely deleted to free up the needed disk space.
- If you will be installing a version of Windows from OEM install media then you will be required to enable the “Allow OEM Windows Installs” setting
- Install XenClient tools before other software
- Start with clean virtual machines created on a XenClient machine.
- Use the “Display VM in Switcher Bar” advanced setting to hide the view of virtual machines only used to publish applications.

## 2. 4. Peripheral Sharing Requirements and Recommendations

Once you have a virtual machine running you might find the need to plug in a USB stick or burn a CD. In this case, you will need to understand a bit about XenClient peripheral sharing.

Citrix XenClient 1.0 SP1 offers sharing of the following four types of devices (peripherals).

- USB Sharing
- Optical Drive Sharing
- Hard Disk Sharing
- Network Sharing

### 2. 4. 1 USB Sharing

If there is one constant, it is that users use USB devices, iPhones, printers, external hard drive, thumb drives, and about 500,000 more types. If a user will be using multiple virtual machines then they will run into USB sharing issues.

Citrix XenClient categorizes USB sharing in two categories; Human Interface Device (HID) and non-HID USB devices. ;)

A “Human Interface Device (HID)” device (mouse and/or keyboard) is very easy to setup, just plug it in. XenClient does the rest. The device is available no matter which virtual machine a user is using. It just works.

A Non-HID device is a bit more complicated. For example, if a user will try to write to external devices (disk drive, optical drive) at the same time across two or more virtual machines then potential contention or much worse could arise. Knowing this, XenClient assigns the USB to the virtual machine it was plugged-in to for exclusive access.

The only exception to this behavior is when a device is plugged in to the XenClient machine while the user is running within the Citrix Receiver for XenClient screen. In this case, the USB device will be assigned to the control domain and the user will be required to manually assign the device to the desired virtual machine within the USB setting found in the VM’s full detail – USB tab.

It is also important to understand that a USB device is not always a device that is plugged in to a USB port on the XenClient machine. Many systems have a number of built in devices, such as fingerprint readers, 3G modems, Bluetooth modules that you are required to manually assign to a virtual machine.

The following are a few items to understand about XenClient USB sharing:

- A Non-HID USB device can be assigned to any virtual machine through the Citrix Receiver for XenClient
- A user can create a persistent rule “always assign” so that for built-in devices or when you plug in a device it will always go to a specific VM.
- When using a non-HID USB device with a Secure Application Sharing application, the device must be assigned to the virtual machine the application is running from.
- Citrix recommends taking care when unplugging a USB device (physically or by assigning it to a new virtual machine) as improper ejection could lead to potential data loss.

- It is not recommended to update the firmware of any device connected via XenClient. It is possible they update could fail leaving the device unusable.

**Note:** Administrators have the ability to turn off user access to USB devices when assigning virtual machines. This only applies to virtual machines managed by the Synchronizer

## 2. 4. 2 Optical Media Sharing

XenClient has the ability to share optical media (CDs, DVDs) between virtual machine. This allows every virtual machine read access to the optical drive at the same time, without requiring to manual configuration. It just works. However, there are the following limitations.

- It is not possible to write on one virtual machine while reading from another.
- When multiple virtual machines access the same media simultaneously the user will experience reduced read performance.

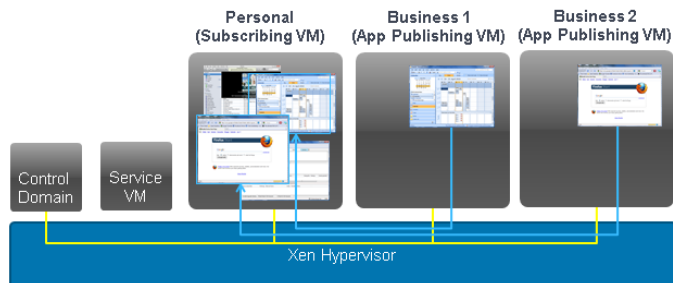
## 2. 4. 3 Hard Drive Sharing

Citrix XenClient uses thin-provisioning to allocate storage for virtual machines. As discussed in the “Disk Space” section above, this allows users to over provision virtual machine disk space as it is only created when used.

## 2. 5. Secure Application Sharing Requirements and Recommendations

Applications are to Virtual Machines like Virtual Machines are to XenClient! Without any of them there is not much to do. ;) Within a XenClient virtual machine a user has full access to do anything the current IT policies allow. XenClient does not apply any policies and/or restrictions within a virtual machine.

It does however provide an experimental feature that allows a user to seamlessly view applications executing on another virtual machine. The goal would be to allow a user to have a primary VM to call their own while allowing IT to share business applications securely and seamlessly to the primary VM. Think of it as a Citrix “published” application, in many ways it is. Citrix calls this feature “Secure Application Sharing”.



Secure Application Sharing works by sending the keystrokes, mouse movements, and display from the host virtual machine (known as the Publishing VM) to the user’s desktop (known as the Subscribing VM). To accomplish this Citrix actually use their ICA protocol to send the display graphics to the subscribing VM. The physical keystrokes and mouse movements are trapped by the Xen hypervisor and sent directly to the publishing VM. The Subscribing VM is then seeing the display, the keystroke and mouse movements over ICA.

Installing Secure Application Sharing is very straight forward. First, the XenClient tools are required to be installed and then all you need to do is install the Secure Application Publishing tool's Publishing role on the publishing VM and the Secure Application Publishing tool's Subscriber role on the Subscriber VM. Then from the Citrix Receiver for XenClient under the virtual machine experimental setting you are required to enable the "Subscribe to Applications" setting.

Once the Secure Application Sharing tools are installed on the Publishing VM they will start to "spider" through the list of applications that are installed and listed in the VM's Program's list and then "publishes" those applications to subscribers.

Once configured, users can 'subscribe' to applications via Citrix Dazzle and have shortcuts added to their desktop and/or Programs list. Dazzle is installed on a Subscriber VM during install of the subscriber tools.

The following are a few best practices and issues to be aware of when using Secure Application Publishing:

- Citrix recommends not setting the Windows task bar to auto-hide in an Application Subscribing VM, as the task bar may not appear as expected when a Secure Application Sharing session is active.
- A virtual machine with 3D Graphics enabled cannot act as an Application Publishing VM.
- A virtual machine cannot act as an Application Publishing VM and a Subscribing VM at the same time.
- It is not supported to install the Subscribing VM and Publishing VM services on the same virtual machine with the same hostname.
- Any changes made to data with published applications are reflected in the VM on which it is actually running.
- Ensure that you have installed all available Windows updates before installing Secure Application Sharing tools.
- Citrix Dazzle is installed as part of the Secure Application Sharing feature, but is not exclusive to XenClient. Dazzle is a self-service application store which allows users to pick and choose the application they will have access to. Once selected the application shortcuts are placed on the desktop and/or in the Windows Start menu Profile list. This can be configured for both applications delivered from Application Publishing VMs or XenApp / XenDesktop servers.
- An administrator can also configure Application Publishing VMs to publish applications delivered to them via Citrix XenApp. Users are then able to use Citrix Dazzle to subscribe to the XenApp delivered applications in the same fashion as local Application Publishing VM shared applications.

For more information about Secure Application publishing and the steps required to install and configure please refer to pages 24-25 of the [Citrix XenClient 1.0 Service Pack 1 Users Guide](#).

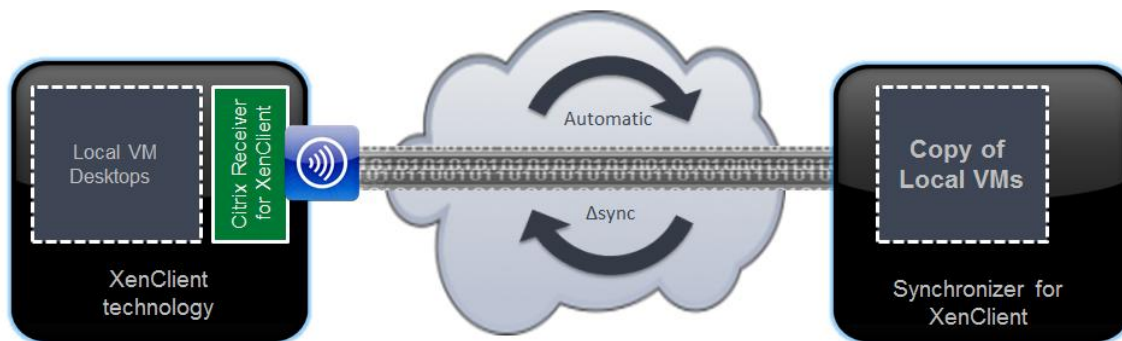
## 2. 6. XenClient Endpoint Summary Recommendations

The key points to remember when planning for, deploying, and maintaining the Citrix XenClient clients are as follows:

- The CPU and BIOS requires VT-d and VT-x support. If your CPU is not an i7 then verify it supports VT-d and VT-x. If the CPU is a Core Duo then verify it has vPro technology.
- Verify the machines graphics processing unit (GPU) is the Intel integrated graphics GMA 4500 or Intel HD graphics.
- If you will be running multiple VMs then load up on memory. As with any modern day computer, the more memory you have the faster it runs!
- Verify your wireless card is on the supported list.
- Select the fastest disk storage possible. SSDs highly recommended but not required.
- Create large virtual disk drives and allow XenClient to utilize Thin Provisioning to serve disk space as needed.
- In case a XenClient machines runs out of disk space Citrix has built in a “get out of jail free card” by copying a garbage file, xc-reserved, to the /storage/ folder during install. This file can be safely deleted to free up the need disk space.
- If you will be installing a version of Windows from OEM install media then you will be required to enable the “Allow OEM Windows Installs” setting
- Start with a clean virtual machines created on a XenClient machine.
- Install XenClient tools before other software
- Use the “Display VM in Switcher Bar” advanced setting to hide the view of virtual machines used to publish applications only.
- Use the Secure Application Publishing feature to run secure business application and/or application requiring a specific OS type / configuration.

### 3. Synchronizer for XenClient Design

The Synchronizer for XenClient 1.0 Service Pack 1 is the brains behind the XenClient solution, tasked with managing virtual machines, assigning users and groups, backup and recovery, and the management of any assigned policies.



The Citrix XenClient server component, known as the Synchronizer for XenClient, is a XenServer virtual appliance delivered in the Xen Virtual Appliance (XVA) format. Under the hood the Synchronizer is a Debian Linux distribution, the Synchronizer core application and services, and a database that maintains the relationships between virtual machine images, devices, users, and groups.

The Synchronizer for XenClient is managed through a simple web-based tool .

#### 3. 1. Hardware & Software Requirements and Recommendations

In the following section we will discuss the Citrix Synchronizer for XenClient’s hardware and software requirements along with best practices and recommendations, and the key components required to successfully implement a Citrix XenClient solution.

The Citrix Synchronizer for XenClient is delivered as a XenServer virtual appliance. If you don’t already have a XenServer environment in place don’t worry, you can download a 100% free version here: <http://www.citrix.com/xenserver/tryit>

##### 3. 1. 1 CPU

By default the Synchronizer for XenClient virtual appliance is configured to use one Virtual CPU. This default setting works fine for smaller environments of less than 50 endpoints and when using the mixed transfer (HTTP/HTTPS) mode, as discussed below.

As the number of XenClient endpoint devices grows it is recommended to increase the Virtual CPU as follows:

- **2 vCPUs** – This setting is recommended for environments experiencing moderate load and up to 100 simultaneous transfers. It will decrease HTTPS transfer times by up to 50%.
- **4 vCPUs** – This setting is recommended for environments under heavy load and up to 150 simultaneous transfers. It will decrease HTTPS transfer times by up to 70%.

**Note:** These numbers assume you ramp your deployment in a reasonable way and then only 5% of the systems would reload images in any given week once you get everyone deployed.

### 3. 1. 2 Memory

By default the Synchronizer for XenClient virtual appliance is configured to use 1 GB of memory. This default setting works fine for environments serving up to 50 simultaneous connections. This translates to supporting up to 1000 XenClient static image mode virtual machines with no backups and up to 50 new system transfers per day.

As the number of XenClient endpoint devices and virtual machines grows it is recommended to increase the system memory configured as follows:

- **2GB RAM** – It is recommended to increase the size of memory allocated to the Synchronizer for XenClient to 2GB to allow up to 100 simultaneous connections. This translates to supporting up to 2000 XenClient static image mode virtual machines with no backups and up to 100 new system transfers per day.
- **4GB RAM** - It is recommended to increase the size of memory allocated to the Synchronizer for XenClient to 4GB to allow up to 150 simultaneous connections. This translates to supporting up to 3000 XenClient static image mode virtual machines with no backups and up to 150 new system transfers per day.

**Note:** These numbers assume you ramp your deployment in a reasonable way and then only 5% of the systems would reload images in any given week once you get everyone deployed.

### 3. 1. 3 Storage

By default, after importing the Synchronizer for XenClient virtual appliance you will find the following four virtual disks:

- XDVMS Root Disk – 4GB
- XDVMS Swap – 512 MB
- xt-config-vol – 1GB
- xt-data-vol – 18GB by default

The first three virtual disks are system related and non-configurable. The xt-data-vol virtual disk is the default location for virtual machine images, known as the ‘image repository’.

The Synchronizer for XenClient uses block level differencing with compression for managed virtual machines.

Currently the Synchronizer for XenClient offers two types of image repositories, local storage (via the xt-data-vol virtual disk) and/or a NFS image repository (configured using the Synchronizer UI)

#### Local Storage

The xt-data-vol virtual disk is the default location for storing XenClient images (VHDs). This means the virtual machine VHD files will be part of the Synchronizer for XenClient virtual appliance image.

The xt-data-vol virtual disk is ideal for smaller numbers of virtual machines and proofs of concept. If you will be storing the virtual machines on the xt-data-vol virtual disk it is highly recommended to increase the size of the xt-data-vol virtual disk in the virtual appliance properties prior to starting the VM for the first time.

However, you can, at any point, increase the size of the xt-data-vol virtual disk by shutting down the Synchronizer for XenClient virtual appliance and increasing the disk space size in XenCenter. It will automatically find the newly added space once the Synchronizer is restarted.

### **NFS Image Repository**

Within the Synchronizer for XenClient UI an administrator has the ability to create an image repository located on a NFS share. Using NFS storage has a lot of benefits such as the potential for higher availability, storage size, and many more.

Once a NFS image repository is added any new virtual machine VHD files will be stored on the NFS share. The Synchronizer will not move any existing virtual machine VHD files from local storage to NFS storage. If you will be using a NFS Image Repository it is recommended to create it before uploading the first virtual machine so all VHD files will be located on the same piece of storage.

It is also recommended to use an enterprise NFS storage solution to verify the best performance and fault tolerance capabilities.

To access the virtual machine VHD files it is as simple as browsing to the desired share from your workstation. This can come in very handy when creating your backup and recovery plan as it is as easy as backing up the desired NFS shares.

**Important!** The image repository is extremely important as it houses all your desktops. It is extremely important to make sure you have a ‘working’ backup in case of emergency. Please refer to the “Synchronizer Backup & Restore Requirements” section for more information.

### **3. 1. 4 Recommendations**

When planning to deploy the Synchronizer for XenClient virtual appliance it is important to remember the following:

- Due to the fact that the Synchronizer for XenClient is a standalone entity that does not communicate with any other Synchronizers it makes planning for scale pretty simple. It comes down to how many users, images and simultaneous transfers occur. If you plan to service more than 3000 of any then you will need to deploy another standalone Synchronizer.
- Pay attention to the amount of users and simultaneous transfers you estimate and adjust the Synchronizer for XenClient virtual appliance appropriately. If you have the resources it can't hurt bumping up the memory usage to 4GB.
- Be aware of your storage requirements - make sure you either expand the xt-data-vol virtual disk or create the desired NFS shares.
- If you will be using a NFS Image Repository it is recommended to create it before uploading the first virtual machine so all VHD files will be located on the same piece of storage.

It's that simple, truly it is...

## 3. 2. Infrastructure Requirements and Recommendations

In the following section we will discuss the infrastructure preparation and configurations, required to successfully plan for and deploy the Citrix Synchronizer for XenClient.

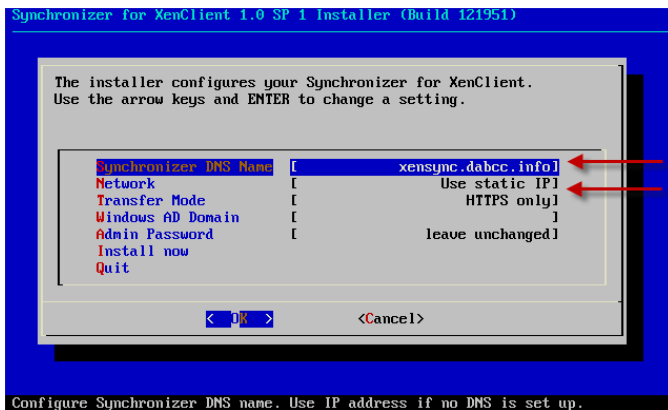
### 3. 2. 1 DNS & Network Settings

The Synchronizer for XenClient requires a working DNS system to communicate with the XenClient Receiver. During the installation of the Synchronizer for XenClient you will be required to enter a valid fully qualified domain name.

**This is very important!** If DNS is not properly working then the XenClient endpoints will be unable to check-in, update, upload, backup, and/or use any functionality relating to the Synchronizer.

It is required to define and create a CNAME or A-record for the desired host name prior to starting the Synchronizer for XenClient for the first time. You will need to create this DNS entry in both public and private DNS, if internet access is required.

This will also be the FQDN used to create any desired SSL certificates.



It is also so extremely important to configure the Synchronizer to use an IP address that DOES NOT CHANGE. It is recommended to configure for use with a Static IP address or you can create a DHCP reservation based on the Synchronizer's MAC address.

### 3. 2. 2 Image Repository

As discussed in the Storage section above, if you will be utilizing a NFS Image Repository, you will be required to plan for and create the desired shares prior to uploading your first virtual machine.

### 3. 2. 3 Client Access Scenarios

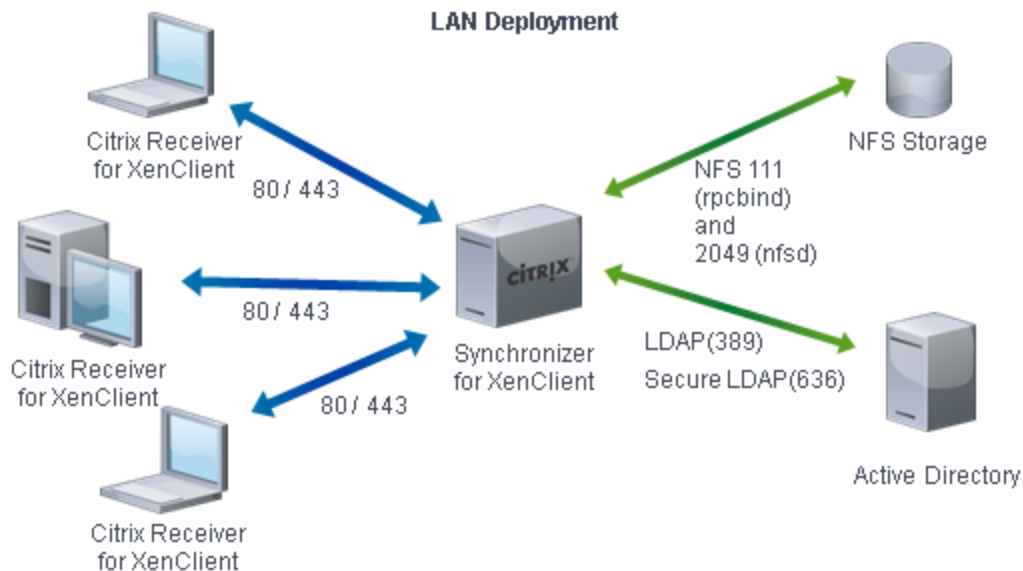
Citrix XenClient is a perfect solution for on-the-go users and thus you will need to plan for and make any desired infrastructure changes to allow XenClient endpoints access to the Synchronizer for XenClient, both for local and remote connections.

The IT policies for allowing users to communicate with the XenClient infrastructure remotely and the user's locations will dictate which deployment architecture you will require.

This guide details the following three access deployment scenarios:

#### Internal Deployment Architecture

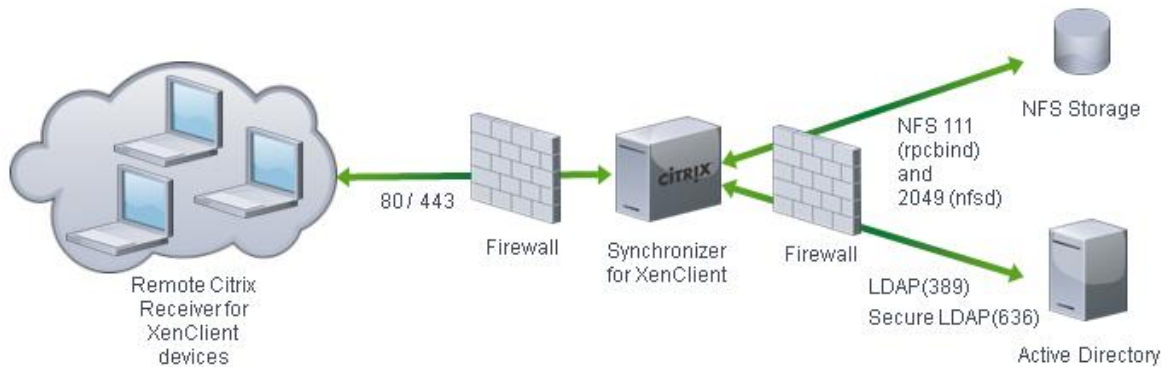
If the XenClient machines are only deployed on a LAN and/or IT has decided a XenClient machine will have no WAN / Internet access to the Synchronizer for XenClient then the “Internal Deployment Architecture” will work just perfect.



An internal deployment is a flat network and hence it is very simple and easy to deploy. In order for the Receiver for XenClient to communicate with the Synchronizer all that is required is to verify the FQDN of the Synchronizer is accessible from the Receiver for XenClient over port 443 (and optionally 80 if the Synchronizer is configured for mixed-mode).

## External Deployment Architecture

If the XenClient machines will require WAN / Internet access to the Synchronizer for XenClient then the “External Deployment Architecture will be used.

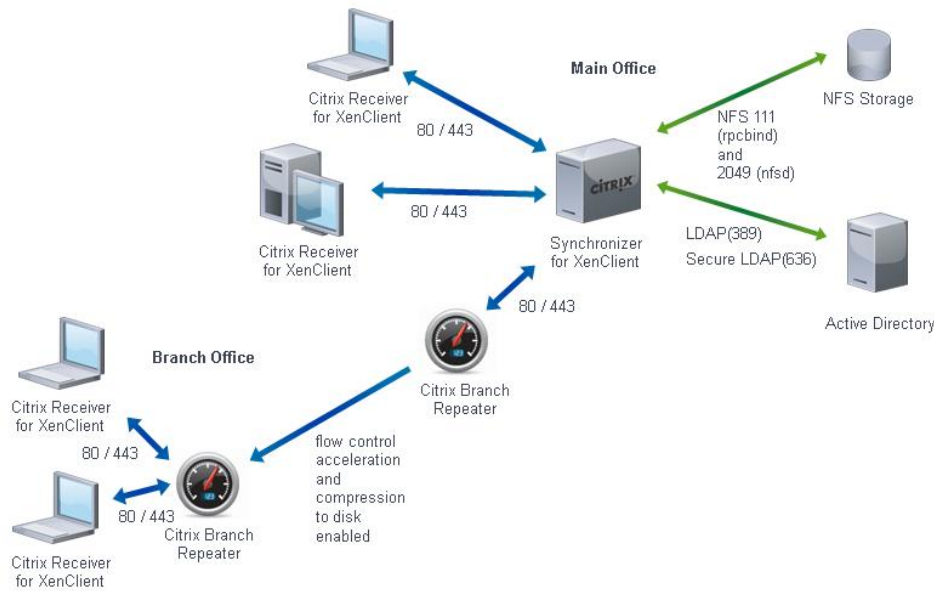


An external deployment requires the following:

- Make the appropriate firewall rules to open port 443 (and optionally 80 if the Synchronizer is configured for mixed-mode) of the Synchronizer for XenClient virtual appliance.
- The Synchronizer is installed in the DMZ.
- If a NFS Image repository will be used then it is required to open port 111 and 2049 on the firewall between the DMZ and the NFS share.
- If Active Directory integration is enabled then the Synchronizer for XenClient will require [Active Directory access through the firewall](#) over LDAP (port 389) or Secure LDAP (port 636) to an Active Directory Domain Controller.
- Verify the FQDN of the Synchronizer is accessible both internally and external

## Remote Office Architecture

If XenClient machines will be primarily located in remote offices, then the Remote Office architecture will be used.



In most cases when you think of transferring large files (10, 20, 30GB images) across a WAN link you cringe but due to the fact XenClient is a virtualization solution that converts the machine physical disks to simple VHD files you are fully free to take advantage of [WAN Optimization](#) solutions, such as Citrix's [Branch Repeater](#) product.

When a Citrix Branch Repeater is added you can expect to see speed and performance improvements as high as [97%](#).

A remote office deployment requires the following:

- A XenClient machine located in a remote office is required access to the Synchronizer over port 443 (and optionally 80 if the Synchronizer is configured for mixed-mode).
- Verify the FQDN of the Synchronizer is accessible both from the LAN and remote office.
- When using the Remote Deployment Architecture the Synchronizer can be located on the LAN.
- A Citrix Branch Repeater is installed on both ends of the connection (one on LAN and one in the remote office).
- The Citrix Branch Repeater is available both as physical hardware and a virtual appliance. It is recommended to use the Branch Repeater virtual appliance for branch office.
- Enable both Branch Repeaters for flow control acceleration and compression to disk.

### 3. 2. 4 Recommendations

The key points to remember when planning and configuring the required infrastructure changes to successfully deploy XenClient are as follows:

- If DNS is not properly working then the XenClient endpoints will be unable to check-in, update, upload, backup, and/or use any functionality relating to the Synchronizer.
- Configure the Synchronizer to use an IP address that DOES NOT CHANGE. It is recommended to configure for use with a Static IP address.
- If you will be utilizing a NFS Image Repository then it is recommended to install it prior to uploading your first virtual machine.
- Select the appropriate client access architecture per your user access requirements.
- Port 443 (and optionally 80 if the Synchronizer is configured for mixed-mode) must be routed to the Synchronizer for remote access.

### 3. 3. Synchronizer for XenClient Configuration

Once you have imported the Synchronizer for XenClient you will be required to run through a quick installer program to configure settings such as the Synchronizer's DNS name, IP address, transfer mode, active directory integration, and the appliance's root password.

#### 3. 3. 1 Transfer Mode

The Synchronizer for XenClient 1.0 Service Pack 1 communicates with the Citrix Receiver for XenClient through one of the following two modes:

##### **HTTPS (TCP 443) only**

By default, the Synchronizer for XenClient uses the HTTPS transfer mode. The following are a few key points to understand:

- Uses HTTPS (port 443) for communicating with the Receiver for XenClient.
- Uses HTTPS (port 443) for downloading virtual machine's VHD files from the Synchronizer.

### HTTPS/HTTP (TCP 443/80) Mixed Mode

The Synchronizer for XenClient offers an alternative transfer mode that includes the HTTP protocol, called HTTPS/HTTP Mixed Mode. The following are a few key points to understand:

- Uses HTTPS (port 443) for communicating with the Receiver for XenClient.
- Uses HTTP (port 80) for downloading virtual machine's VHD files from the Synchronizer.
- When using the mixed transfer mode, due to the fact the Synchronizer will not be required encrypt / decrypt the virtual machine traffic the decreased Synchronizer's CPU load results in more users on the Synchronizer.
- Allows non-SSL WAN acceleration products to cache VHD chunks.
- VHD files are visible but fully encrypted

The following are a few things to understand about both transfer modes:

- When uploading virtual machines the VHD files are encrypted and left encrypted on the Synchronizer. Then when the data is sent to the client the VHD files are left encrypted. This provides another layer of protection and also means that you can safely send VHD data publically over an HTTP link without exposing any data.
- You can use the Citrix Branch Repeater with both modes. If you will be utilizing 3rd party WAN acceleration products other than a Citrix Branch Repeater you will likely need to use mixed mode so that your WAN acceleration solution can cache the data chunks. All data chunks will be encrypted.
- An administrator can configure the transfer mode at any time through the Synchronizer for XenClient 1.0 Installer program. To launch the installer program an administrator must login to the Synchronizer's terminal and then type: `./installer.sh`.

Once the Synchronizer for XenClient is imported and configured you are ready to login, create accounts, upload virtual machines, and assign them to the new users / groups.

### 3. 3. 2 Users and Groups

The Synchronizer for XenClient assigns virtual machines to users / groups.

The Synchronizer for XenClient has the ability to be configured to utilize a corporation's existing Windows Active Directory (AD) environment. This allows an administrator to use the current users / groups when assigning virtual machines and end-user will not be required to use and manage another user account and password.

An administrator can configure two user roles: admin and standard user.

- **Admin role** – A user must have Admin rights to be able to upload virtual machines.
- **User role** – The “user” role is to be assigned to anyone “using” XenClient, no matter their position in an organization.

Note: Both the Admin and User role allows the ability to make changes to existing assigned virtual machine image if they are allowed Authorship in the Assignment.

It is a best practice to limit the number of accounts that are assigned the “admin” role to only those who will be authoring virtual machines and they should only be used to upload and author VMs. Just because a user is an active directory administrator and/or the person responsible for the XenClient environment does not mean they need the admin role assigned to their primary user account. This could potentially cause problems.

For example, in my environment I have created one admin within the Synchronizer web tool that I only use to create and manage virtual machines with. This account is a non-active directory account. I also have configured my active directory account (dbrown) with the typical user role and this is the account I use to login to the Synchronizer from my XenClient laptop and the account the virtual machine I have access to is assigned to.

**Note:** An administrator can configure the Synchronizer for XenClient to utilize Active Directory accounts through Synchronizer Installer program. To launch the installer program, an administrator must login to the Synchronizer’s terminal and then type: `./installer.sh`.

### 3.4. Managed Virtual Machine Image Requirements and Recommendations

In the following section we will discuss the Citrix Synchronizer for XenClient’s managed virtual machine image requirements along with best practices and recommendations.

Managed Virtual Machines are VMs that have been assigned and downloaded from the Synchronizer for XenClient. With managed VMs a user has the ability to backup, restore, and/or author the VM, depending upon the assignment policy.

The Synchronizer for XenClient uses VHD chaining to allow for one large parent file and a set of copy-on-write (CoW) children. This also allows for an efficient method to store subsequent versions of VM image files and backups of user data.

When uploading a new virtual machine the author must decide upon two image modes, static and the experimental dynamic mode.

#### 3.4.1 Static Virtual Machines

A Static virtual machine is just that, a static VM. Once assigned to a user the user can install software, patches, configure folders, and personalize their VM. They can do anything allowed to them. It is their “PC”. Any changes to a static virtual machine are made within the user’s image only.

If an administrator would want to update a static virtual machine image they will be required to download the image, make changes to it, and then upload it again. This results in a new “version” of the VM. This new version can then be assigned to users and/or groups, but it does not affect any currently downloaded VMs.

Since the same copy of Windows will be run by multiple users it is required to use a tool such as [sysprep](#) to change the machine’s name and SID before using it.

**Note:** Citrix recommends static mode for any production virtual machines.

### 3. 4. 2 Dynamic Virtual Machines

Citrix XenClient 1.0 SP1 offers an experimental “Dynamic” Virtual Machine Image mode. With Dynamic VMs administrators have the ability to create and manage a single VM image which can be shared by multiple users.

When a non-administrator uses a dynamic VM any system and/or application changes made are deleted upon logoff and the machine is brought back to default configuration next time the user logs in. Only changes made to your user folders will remain.

An administrator can update the base image at any time by simply configuring the XenClient Receiver for authorship, making the change, and then uploading the VM back to the Synchronizer. At this point, the administrator is required to re-deploy the updated virtual machine to the desired users.

**Note:** For the complete steps required please refer to page 25 of the Citrix Synchronizer for XenClient 1.0 Service Pack 1 Administrator Guide)

The following are a few things to understand about Dynamic VM images:

- Each Dynamic VM consists of three images (VHDs), one for the base image, one for application streaming, and one for documents and settings. The application streaming and deployment disk is persisted across reboots, but not backed up. Document and settings is persisted across reboots and backed up. Neither apply for base OS VHD.
- If a Dynamic VM image will be executed on different hardware types it is recommended to download the VM on each hardware type in order for the OS to install the required drives in the base image.
- When a Dynamic VM is downloaded and turned on the first time the operating system will find new hardware and install it.
- If the virtual machine is to be a member of a domain you will need to re-join Windows to the domain. This requires administrator privileges.
- Due to the above prerequisites it might be a best practice for an administrator to download and configure any dynamic virtual machines for end-users that are less than savvy prior to delivering the XenClient machine. However, this is not required.

**Note:** For information on Dynamic VMs working with XenApp streamed application please refer to the following Citrix article:

<http://community.citrix.com/display/ocb/2011/01/21/The+concept+of+XenClient+Dynamic+VMs+and+XenApp+Streamed+Apps+working+together;jsessionid=0EA3D7D8DCD961674763A8AC1BA23354>

### 3. 4. 3 Recommendations

The key points to remember when planning and creating managed virtual machines are as follows:

- Citrix recommends static mode for any production virtual machine.
- For static virtual machine, since the same copy of Windows will be run by multiple users it is required to use a tool such as sysprep to change the machine’s name and SID before using it.
- For dynamic virtual machines, if the virtual machine is to be a member of a domain, you will need to re-join Windows to the domain. This requires administrator privileges.

### 3. 5. Assigning Virtual Machines Requirements and Recommendations

Once you have installed the Citrix Synchronizer for XenClient and uploaded your first virtual machine, you are free to assign the virtual machine to users / groups.

An assignment creates a relationship between a virtual machine and a user or group. When assigning a virtual machine image to a user an administrator will be prompted to configure a series of policies.

Virtual Machine assignments can be configured to be available for only a desired time period. This allows administrators to assign VMs to contract workers or business partner and have it expire at the end of the contract and/or project.

Once a virtual machine has been assigned to a user/group it will appear in the list of available virtual machines in the Citrix Receiver for XenClient.

XenClient assignment policies are broken down in to the following seven sections:

#### 3. 5. 1 Settings

The following XenClient virtual machine policies are found in the Settings section:

##### Lease Time

The lease time policy defines the number of days the assigned virtual machine will be active without “checking” in with the Synchronizer for XenClient.

If the user does not authenticate with the Synchronizer before the lease time expires, the leased VM shuts down and the message “Locked” is displayed in the XenClient Receiver list of VMs.

Once a user successfully authenticates with the Synchronizer the lease time will be renewed. Currently there is no way around this limit. The virtual machines will remain locked until the user re-authenticates with the Synchronizer.

You need to be aware of a couple potential issues:

- A remote worker can find themselves locked out of their working environment if there are unable to authenticate to the Synchronizer. It is highly recommended to provide “remote” access to the Synchronizer to prevent this problem. Please refer to the “Client Access Scenarios” section for more information on remote Synchronizer access.
- To permanently prevent users from accessing all managed virtual machines running on the XenClient machine the administrator must mark the device a lost/stolen.
- Revoking a user’s access to a particular virtual machine prevents the user from downloading new copies of the VM. If the virtual machine has already been downloaded then revoking a virtual machine makes turns it in to an unmanaged virtual machine.
- If the Synchronizer for XenClient becomes unavailable for whatever reason, such as downtime or corruption, then virtual machines will be unable to check in and thus will become locked once their lease time expires. Again, there is no way around this so make sure you have a good backup of your Synchronizer and a plan to restore in case of catastrophe.

The default setting is 14 days.

## **Auto Backup**

The “Auto Backup” policy allows the Synchronizer for XenClient to automatically backup the virtual machine every x minutes. This feature does not prevent an end-user from triggering a manual backup from the Citrix Receiver for XenClient.

The default setting is disabled.

## **Frequency**

If the “Auto Backup” setting is enabled then “Frequency” policy is utilized. The Frequency setting defines the number of hours between automatic virtual machine backups.

The default setting is 48 hours.

## **Phone Home Frequency**

The “Phone Home Frequency” setting defines the number of minutes the XenClient Receiver waits between checking the Synchronizer to for policy changes.

The default setting is 60 minutes.

## **Allow Manual Backups**

One of the powerful features of client virtualization is the ability to backup your virtual machines. If configured, the Synchronizer for XenClient will backup VMs on predetermined intervals, as detailed above. An administrator can also enable the “Allow Manual Backups” setting to allow users to trigger manual backups through the Citrix Receiver for XenClient.

The default setting is disabled.

## **Allow Authorship**

The “Allow Authorship” setting allows administrators to define if the user will have the ability to upload the virtual machine to the Synchronizer. The ability to upload allows the user to create new versions of the virtual machine image by making changes to the image before uploading them to the Synchronizer.

In most cases, this setting is best left disabled for users and enabled for admins.

The default setting is disabled for users and enabled for admins.

## **Allow Changing VM Properties**

The “Allow Changing VM Properties” policy allows users to manually change the assigned virtual machine’s properties, such as name, description, disk size, number of vCPUs, memory, etc.

The default setting is enabled.

### 3. 5. 2 System Settings

The following XenClient virtual machine policies are found in the System Setting section:

#### Memory

The “Memory” setting allows administrators to centrally control the amount of memory to be assigned to the virtual machine. If used in conjunction with the “Allow Changing VM Properties” policy administrators have the ability to ‘lock’ the assigned virtual machine to the desired memory size.

The default setting is the amount of memory the virtual machine was uploaded with.

#### Number of Virtual CPUs

The “Number of Virtual CPUs” setting allows administrators to centrally control the number of virtual CPUs to be assigned to the virtual machine. If used in conjunction with the “Allow Changing VM Properties” policy administrators have the ability to ‘lock’ the assigned virtual machine to the desired number of vCPUs.

The default setting defaults to the number of VCPUs the virtual machine was uploaded with.

### 3. 5. 3 Disk Encryption

The “Disk Encryption” setting determines whether the virtual machine images (VHD) files will be stored encrypted on the client or not.

A few things to understand about virtual machine disk encryption:

- When a user uploads a virtual machine image (VHD) file the Synchronizer encrypts it with a per-VHD transfer key.
- All VHD files stored on the Synchronizer are encrypted at all times.
- The contents of the VHD files used by the VM will be encrypted using the AES XTS (256bit) cypher.
- When a user downloads a virtual machine the VHD image files remain encrypted with the transfer key.
- During the ‘installation’ step in the download process the VHD files are decrypted.
- Once the virtual machine is downloaded the disk encryption policy is checked:
  - If the encryption policy is enabled the virtual machine’s VHD files are encrypted with a device image key (separate from the transfer key).
  - If the encryption policy is disabled the virtual machine’s VHD files are left unencrypted on the local machine.
- Disk encryption is only applied when a VM is first deployed to a device. Editing an assignment at a later point will not cause the disk to be encrypted.
- On Intel Core i5 and Core i7 CPU based machines XenClient will offload the encryption and decryption to the CPU by using the new Intel AES-NI instructions.

The default setting is disabled.

### 3. 5. 4 USB Permissions

The following XenClient virtual machine policies are found in the USB Permissions section.

**Important!** Some USB devices could be negatively affected by policies not intended for the desired class of USB device. For example, some USB modems initially present themselves as mass storage devices to allow the user to install drivers contained on the mass storage embedded in the device. Due to the USB modem initially identifying itself as a mass storage device, if the mass storage device policy is disabled then the virtual machine will not have access to this modem.

#### Audio

The “Audio” setting allows administrators to enable or disable virtual machine access to devices that interface external audio devices, such as microphones, audio line level signals, etc.

The default setting is enabled.

#### Still Imaging

The “Still Imaging” setting allows administrators to enable or disable virtual machine access to devices for capturing still images, such as camera, scanners.

The default setting is enabled.

#### Printers

The “Printers” setting allows administrators to enable or disable virtual machine access to USB printers.

The default setting is enabled.

#### Mass Storage

The “Mass Storage” setting allows administrators to enable or disable virtual machine access to mass storage devices, such as external hard drives, DVD burners, USB sticks, etc.

The default setting is enabled.

#### Video

The “Video” setting allows administrators to enable or disable virtual machine access to devices for capturing video content, such as web cams, digital video cameras.

The default setting is enabled.

### **Unclassified USB Devices**

The “Unclassified USB Devices” setting allows administrators to enable or disable virtual machine access to all USB devices which do not have a standard USB class ID.

The default setting is enabled.

### **3. 5. 5 Network Permissions**

The following XenClient virtual machine policies are found in the Network Permissions section:

#### **Wired**

The “Wired” setting allows administrators to enable or disable access to wired networks.

The default setting is enabled.

#### **Wireless**

The “Wireless” setting allows administrators to enable or disable access to wireless networks.

The default setting is enabled

### **3. 5. 6 Other Hardware Permissions**

The following XenClient virtual machine policies are found in the Other Hardware Permissions section:

#### **Audio**

The “Audio” setting allows administrators to enable or disable access to the virtual machine’s audio device.

An administrator can select from one of the following settings:

- Disable – All audio is disabled on the virtual machine.
- Enabled, no Recording – Audio is enabled but without the ability record (input) audio.
- Enabled, with Recording – Audio is enabled with the ability to record (input) audio.

The default setting is Enabled, with Recording.

## Optical Drive

The “Optical Drive” setting allows administrators to enable or disable access to the virtual machine’s optical drive.

An administrator can select from one of the following settings:

- Disabled – The optical drive is disabled and not seen by the virtual machine’s OS.
- Read-Only - A user will have read-only access to the optical drive.
- Read-Write – A user will have read-write access to the optical drive.

The default setting is Read-Write

## 3. 5. 7 Recommendations

The key points to remember when planning and creating managed virtual machines are as follows:

- A remote worker can find themselves locked out of their working environment if their XenClient machine is unable to authenticate with the Synchronizer. It is highly recommended to provide “remote” access to the Synchronizer to prevent this problem, if desired.
- Limit the number of administrators. It is a best practice to limit the XenClient admin role for an account that will be used to upload and manage images only.
- Use assignment policies to restrict and secure delivered virtual machines to only the features defined as ‘required’ for the particular workload / user.

## 3. 6. Backup & Recovery Requirements & Recommendations

Citrix XenClient is a desktop virtualization (client virtualization) solution coupled with a backend Synchronizer for hosting, managing, and deploying virtual machines. Because an entire PC is turned in to a single file (VHD) XenClient for unmanaged virtual machines, this allows for a more streamlined and potentially easier backup and recovery.

Although, if a virtual machine is downloaded from the Synchronizer and is either a dynamic images and/or contains backups then it is required to use the Synchronizer for backup and recovery. This also means if the Synchronizer is lost or corrupted then the entire environment of virtual machines becomes unavailable. That being said, it is extremely important to design and implement a proper backup and recovery solution.

A proper XenClient backup solution includes considerations for the following four scenarios:

### 3. 6. 1 Unmanaged Virtual Machine Backup & Recovery Requirements

An ‘unmanaged’ virtual machine is one that resides on a XenClient machine’s local disk and is not managed by a Synchronizer. Due to the fact unmanaged virtual machines are not linked to a Synchronizer there is no built in backup and recovery mechanism, thus you will be required to create your own.

As mentioned, virtual machine images are stored in the /storage/disks folder of the local disk. You can use a tool such as [WinSCP](#) to upload and download files from a XenClient device to a remote computer. This can

be used to copy (download) virtual machines to a remote location in case of disaster and then restore (upload) them back to a new XenClient machine.

Currently there is no way to back up XenClient metadata (the list of virtual machines) so you will be required to restore virtual machines from a remote location. To do this you will need to complete the following steps:

1. Using the XenClient UI create a new blank virtual machine keeping with to same configuration as the VM you will be restoring. **DO NOT START IT!**
2. Map the new virtual machine to its corresponding VHD file located in the /storage/disks folder. As documented in step 3 of the “Importing Virtual Machines” section above.
3. Once you know the name of the correct VHD file you will want to make note of it and then rename the VHD file to something like, filename.vhd.old.
4. Use WinSCP (or any desired solution) to copy the backed up virtual machine to the XenClient machine’s /storage/disks folder and rename it to the name of the file you discovered in step 2.
5. Start the virtual machine!! You are done!

**Note:** DO NOT make copies of the config files found in the /config/vms folder to the /config/vms folder. During system startup XenClient will load every file in the /config/vms/ directory. If a file is stored there with a different extension XenClient will append the “.db” extension to the file and try to load it. XenClient will hang on loading the Citrix Receiver if files found in the /config/vms folder are found to be invalid. This applies to folders too.

### 3. 6. 2 Managed Virtual Machine Backup and Recovery Requirements

A ‘managed’ virtual machine is one that resides in and is managed by a Synchronizer for XenClient. Managed VMs have the ability to be backed up automatically and manually.

The Synchronizer ‘managed’ virtual machines backups currently work as follows:

- Backs up all changes on the client
- Back up includes page file and deleted blocks
- When a virtual machines image or backup is uploaded to Synchronizer, the data is encrypted using AES CBC 128bit encryption. A new key is created each time an upload is initialized. The keys are stored in a secure user key store, protected by the device key and the user passphrase.

Currently, due to the above, Citrix is not recommending using backups outside of test environments. Citrix has also confirmed a future version will include significant enhancements including:

- Removal of deleted data blocks
- Removal of page file
- New Hybrid image mode
  - Only backup user profile data

The above data is the real reason behind why Citrix does not recommend using the backup features of the Synchronizer for XenClient for mass consumption yet. There is just too much data consumed. This will be addressed!

### 3. 6. 3 Synchronizer Backup & Recovery Requirements

The Synchronizer for XenClient is a Citrix XenServer virtual appliance and hence you will be able to utilize the Citrix XenServer recommendations and best practices for its backup and recovery.

One of the easiest ways to backup the Synchronizer is to take periodic snapshots of the Synchronizer virtual machine. However, this is no substitution for a proper backup and recovery plan.

To learn more please refer to the ‘Backup and Recovery’ section (pages 84-98) of the ‘Citrix XenServer 5.6 Feature Pack 1 Administrators Guide’ here: <http://support.citrix.com/article/CTX127321>

It is also recommended to research and utilize 3rd party solutions such as:

- PHD Virtual – <http://www.phdvirtual.com>
- R1Soft - <http://www.r1soft.com/product-overview/virtualization-backup-software/>

**Note:** If you will be using the local xt-data-vol folder for storing your managed virtual machines then they will be backed up when you backup the Synchronizer virtual appliance.

### 3. 6. 4 NFS Image Repository Backup & Recovery Requirements

If you will be utilizing a NFS Image Repository it is very important to have a working backup. If you lose or corrupt the image repository without a backup then you will lose access to all the virtual machines.

It is highly recommended to backup the NFS Image Repository data at the same time you backup the Synchronizer virtual machine. It is also highly recommended to shut down the Synchronizer virtual machine prior to taking the backup in order to close any open files, but not required.

For XenClient 1.0 SP1, Citrix is recommending that the NFS Image Repository be hosted in an enterprise class storage solution complete with backup and recovery features.

### 3. 6. 5 Recommendations

The key points to remember when creating a backup plan for the Synchronizer for XenClient are as follows:

- Unmanaged virtual machines are just that, unmanaged, and thus you will be required to manually back up their corresponding VHD files.
- Managed virtual machines can be backed up via the Synchronizer for XenClient. For the current version of the Synchronizer, Citrix does not recommend using this outside of test environments as it is potentially unstable and the Synchronizer is backing up too much information. This will be addressed in the next release of XenClient.
- The Synchronizer for XenClient must be backed up too. An administrator can utilize virtual machine ‘snapshots’ and full backups via 3<sup>rd</sup> party solutions to backup the Synchronizer for XenClient virtual appliance.

- If an NFS Image Repository will be used then it is recommended you use an enterprise ready NFS storage solution that has a built in and/or preexisting backup and recovery solution. It is very important to backup these virtual machines and if you lose them all managed users will lose their work.
- It is highly recommended to backup the NFS Image Repository data at the same time you backup the Synchronizer virtual machine.
- It is highly recommended to shut down the Synchronizer virtual machine prior to taking the backup in order to close any open files, but not required.

### 3.7. Synchronizer for XenClient Summary Recommendations

The key points to remember when planning for, deploying, and maintaining the Citrix Synchronizer for XenClient virtual appliance are as follows:

- Due to the fact that the Synchronizer for XenClient is a standalone entity that does not communicate with any other Synchronizers it makes planning for scale pretty simple. It comes down to how many users, images and simultaneous transfers occur. If you plan to service more than 3000 of any then you will need to deploy another standalone Synchronizer.
- Pay attention to the amount of users and simultaneous transfers you estimate and adjust the Synchronizer for XenClient virtual appliance appropriately. If you have the resources it can't hurt bumping up to 2 vCPUs.
- Be aware of your storage requirements - make sure you either expand the xt-data-vol virtual disk or create the desired NFS shares.
- If you will be using a NFS Image Repository it is recommended to create it before uploading the first virtual machine so all VHD files will be located on the same piece of storage.
- Use mixed mode for deployments when possible. When using the mixed transfer mode the Synchronizer will not be required to encrypt / decrypt the virtual machine hard disk traffic resulting in decreased CPU load on the Synchronizer and thus you will be able to support more users per Synchronizer.
- If DNS is not properly working then the XenClient endpoints will be unable to check-in, update, upload, backup, and/or any functionality relating to the Synchronizer.
- Configure the Synchronizer to use an IP address that DOES NOT CHANGE. It is recommended to configure for use with a Static IP address.
- Port 443 (and optionally 80 if the Synchronizer is configured for mixed-mode) must be routed to the Synchronizer for XenClient for remote access.
- It is a best practice to limit the amount of accounts that are assigned the "admin" role to only those who will be authoring virtual machines and they should only be used to upload and author VMs. Just because a user is an active directory administrator and/or the person responsible for the XenClient environment does not mean they need the admin role assigned to their primary user account. This could potentially cause problems.
- Citrix recommends static mode for any production virtual machine.
- A remote worker can find themselves locked out of their working environment if their XenClient machine is unable to authenticate with the Synchronizer. It is highly recommended to provide "remote" access to the Synchronizer to prevent to problem, if desired.
- Limit the amount of administrators. It is a best practice to limit the XenClient admin role for an account that will be used to upload and management images only.
- Use assignment policies to restrict and secure delivered virtual machines to only the features defined "required" for the particular workload / user.
- Unmanaged virtual machines are just that, unmanaged, and thus you will be required to manually back up their corresponding VHD files.

- Managed virtual machines can be backed up via the Synchronizer for XenClient. For the current version of the Synchronizer, Citrix does not recommend using this outside of test environments as it is potentially unstable and the Synchronizer is backing up too much information. This will be addressed in the next release of XenClient.
- The Synchronizer for XenClient must be backed up too. An administrator can utilize virtual machine 'snapshots' and full backups via 3rd party solutions to backup the Synchronizer for XenClient virtual appliance.
- If an NFS Image Repository will be used then it is recommended you use an enterprise ready NFS storage solution that has a built in and/or preexisting backup and recovery solution. It is very important to backup these virtual machines and if you lose them all managed users will lose their work.
- It is highly recommended to backup the NFS Image Repository data at the same time you backup the Synchronizer virtual machine.
- It is highly recommended to shut down the Synchronizer virtual machine prior to taking the backup in order to close any open files, but not required.

## **Project Installation Steps**

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## 1. Installation Checklist (Draft)

The following is a draft checklist of the steps required to successfully install and deploy Citrix XenClient 1.0 Service Pack 1.

**Note:** this list is a work in progress and may not include everything needed in your environment. It may also include steps you do not require implemented. Please use this as a baseline only and create your own installation checklist. If you have comments and/or would like to contribute to this list please email [dbrown@dabcc.com](mailto:dbrown@dabcc.com).

1. Prepare the Networking Environment
  - a. Configure DNS
  - b. Open TCP port(s) 443 (optionally 80 if the Synchronizer is configured for mixed-mode) and link to the Synchronizer for XenClient
  - c. Create Any Desired Active Directory Citrix XenClient Specific User(s) / Group(s)
2. Install XenClient
  - a. Install XenClient 1.0 Service Pack 1
  - b. Configure XenClient System Settings
  - c. Configure XenClient Networking
  - d. Configure Power Settings
  - e. Configure Input Settings
  - f. Configure Login Settings
3. Install First Virtual Machine on XenClient
  - a. Enable VM installation for OEM installation media, if required.
  - b. Install Windows
  - c. Install XenClient Tools
  - d. Patch Windows
  - e. Install any base OS applications
  - f. Configure any required peripherals with XenClient and the appropriate VM
4. Install Secure Application Sharing, if required.
  - a. Install Application Publishing tools on Application Publishing VM
  - b. Install Application Subscribing tools on Application Subscribing VM
  - c. Configure any white or black listed applications
5. Install & Configure Synchronizer for Citrix XenClient
  - a. Install Citrix XenServer
  - b. Install Synchronizer for Citrix XenClient Server
  - c. Update the Synchronizer for XenClient's XenTools
  - d. Create NFS Image Repository, if required
  - e. Configure the Synchronizer's image transfer mode
  - f. Enable Active Directory support, if required
  - g. Create XenClient admins
  - h. Create users & groups
  - i. Configure Backup for the Install Synchronizer for Citrix XenClient Virtual Appliance
  - j. Configure Backup for any remote Image Repository(s)
  - k. Register XenClient with Synchronizer for Citrix XenClient Server
  - l. Upload first VM (Dynamic or Static)
  - m. Create VM assignments and configure policies
6. Login to a different XenClient machine than the one used to create the uploaded machine as a normal user and download the desired assigned virtual machine(s). You are done!

## **Additional Resources**

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## 1. Additional Resources

In this section you will find links to additional XenClient 1.0 Service Pack 1 related information.

### 1.1. Official Citrix XenClient White Papers and Admin Guides

The following is a list of official Citrix XenClient white papers, user, and administrator guides.

- Citrix XenClient Central  
<http://community.citrix.com/citrixready/xenclient>
- Citrix XenClient Forums  
<http://forums.citrix.com/category.jspa?categoryID=219>
- Citrix XenClient 1.0 Service Pack 1 Release Notes  
<http://support.citrix.com/article/CTX127695>
- Citrix XenClient 1.0 Service Pack 1 User Guide  
<http://support.citrix.com/article/CTX127696>
- Citrix Synchronizer 1.0 Service Pack 1 Administrator Guide  
<http://support.citrix.com/article/CTX127693>
- Citrix Synchronizer 1.0 Service Pack 1 Release Notes  
<http://support.citrix.com/article/CTX127695>
- XenClient 1.0 Proof of Concept Implementation Guide  
<http://support.citrix.com/article/CTX125351>
- Citrix XenServer Deployment Articles & Multimedia  
<https://community.citrix.com/kits/#/kit/3125008>

### 1.2. Official Citrix XenClient Support Articles

The following is a list of official Citrix XenClient knowledgebase and community blog articles.

- Official Hardware Compatibility List  
<http://www.citrix.com/English/ps2/products/subfeature.asp?contentID=2300408>
- XenClient - Disk Management - VHD files and chains  
<http://community.citrix.com/display/ocb/2011/01/17/XenClient+-+Disk+Management+-+VHD+files+and+chains>
- The concept of XenClient Dynamic VMs and XenApp Streamed Apps working together  
<http://community.citrix.com/display/ocb/2011/01/21/The+concept+of+XenClient+Dynamic+VMs+and+XenApp+Streamed+Apps+working+together;jsessionid=0EA3D7D8DCD961674763A8AC1BA23354>
- XenClient's Autoboot Feature Explained  
<http://community.citrix.com/display/ocb/2011/02/02/XenClient%27s+Autoboot+Feature+Explained>

- How to Change Local Time zone Settings on XenClient  
<http://support.citrix.com/article/CTX125258>
- How to Configure SSH on XenClient Synchronizer  
<http://support.citrix.com/article/CTX125168>
- How to Change the Border Color and Width of Securely Shared Applications  
<http://support.citrix.com/article/CTX126578>
- XenClient - Why Synchronizer for XenClient is a must have  
<http://community.citrix.com/display/ocb/2010/11/24/XenClient+-+Why+Synchronizer+for+XenClient+is+a+must+have>
- Pimp my XenClient  
<http://community.citrix.com/display/ocb/2010/10/15/Pimp+my+XenClient>
- How to Install XenClient via PXE Boot  
<http://support.citrix.com/article/CTX125485>
- How to Install XenClient via USB Flash Drive  
<http://community.citrix.com/display/ocb/2010/11/19/XenClient+-+Create+your+USB+install+stick>
- How to P2V Your Existing Workstation  
<http://community.citrix.com/display/ocb/2010/11/18/XenClient+-+How+to+P2V+your+existing+OS>  
and  
<http://forums.citrix.com/thread.jspa?threadID=275334&tstart=0>
- How to Update the Synchronizer virtual appliance's XenTools  
<http://forums.citrix.com/thread.jspa?threadID=274872&tstart=0>
- How to Generate a XenClient Status Report  
<http://support.citrix.com/article/CTX126555>

### 1.3. Official Citrix XenClient Videos

The following is a list of official Citrix XenClient how to and overview videos:

- XenClient - Introduction to XenClient  
<http://www.citrix.com/tv/#videos/2046>
- XenClient - Download and install  
<http://www.citrix.com/tv/#videos/2017>
- XenClient - Configuring XenClient and Virtual Machine  
<http://www.citrix.com/tv/#videos/2044>
- XenClient - Using Multiple Local Virtual Machines  
<http://www.citrix.com/tv/#videos/2045>
- Official Citrix XenClient HDX Performance Video  
<http://www.youtube.com/watch?v=xrwbVpfYesY>

## 1. 4. 3rd Party Citrix XenClient Resources

The following is a list of 3rd party Citrix XenClient related articles, white papers, and miscellaneous resources:

- DABCC - Citrix XenClient Resources  
<http://www.dabcc.com/channel.aspx?id=284>
- Converting VMDK to VHD for use with XenClient  
<http://jariangibson.com/2010/12/20/converting-vmk-to-vhd-for-use-with-xenclient/> (not need when using XenClient SP1 but still a great article to understand)
- XenClient is a Heavy Metal Hit  
<http://virtualizationreview.com/blogs/the-boards-facts/2010/05/xenclient-heavy-metal-synergy.aspx>
- Using XenClient to Update Provisioning Services vDisk Images  
<http://jariangibson.com/2010/12/21/using-xenclient-to-update-provisioning-services-vdisk-images/>
- How to install and configure the Citrix XenClient - Part 1  
<http://www.dabcc.com/article.aspx?id=15547>
- How to Install and Configure the Citrix XenClient- Part 2  
<http://www.dabcc.com/article.aspx?id=15669>
- How to install and Configure the Citrix XenClient - Part 3  
<http://www.dabcc.com/article.aspx?id=15769>

If you feel I'm missing a key additional resource please email me at [dbrown@dabcc.com](mailto:dbrown@dabcc.com) and I will make sure I add it to the next release of this document.