



Microsoft

White Paper

Citrix DaaS with Azure Virtual Desktop

Business value and cost savings analysis
of a modern cloud deployment

Executive Summary

As organizations shifted from traditional PC desktops to virtualized solutions, IT administrators hosted and provided access to applications and desktops from an on-premises data center. This proved to be more efficient than traditional PC environments because IT admins were able to centrally manage desktop and app delivery, however, datacenter costs were still significant. Now, with the increased capabilities of Microsoft Azure, and enhancements to the Azure Virtual Desktop offering, Citrix and Microsoft offer businesses new opportunity and economics to harness the value of cloud services and deliver high-performing cost-effective virtualization.

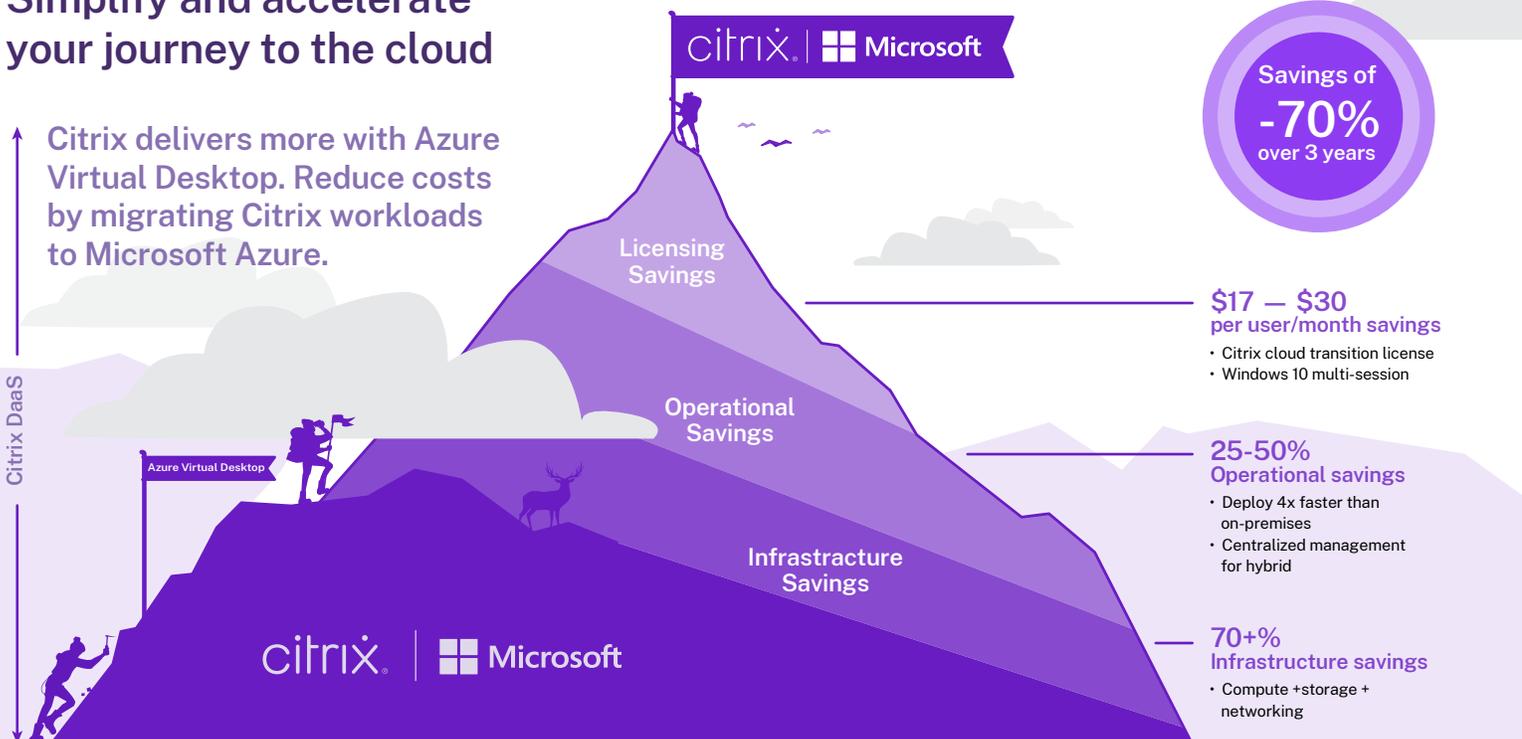
Citrix DaaS services simplify the management of existing deployments through hybrid management of traditional on-prem or cloud environments, enabling new scenarios or workloads to be easily rolled out in Azure without losing existing datacenter investments.

Administrators can also unlock additional benefits, ease administrative burdens, and enhance end-user experience- all with a more agile and secure IT environment. In this paper, we will assess the financial benefits of transitioning to Citrix DaaS and Azure Virtual Desktop from a traditional on-premises deployment. We will also examine how this transition can fit within an organization’s overall corporate strategy, help prepare for today’s business demands, and those in the future.

In general, organizations who solely rely on a traditional on-premises application virtualization environment, can achieve a savings of up to 70% when adopting cloud-based services. These savings comprise of significantly reduced spending on IT infrastructure, simpler and more efficient management, and new and more cost-effective license programs

Simplify and accelerate your journey to the cloud

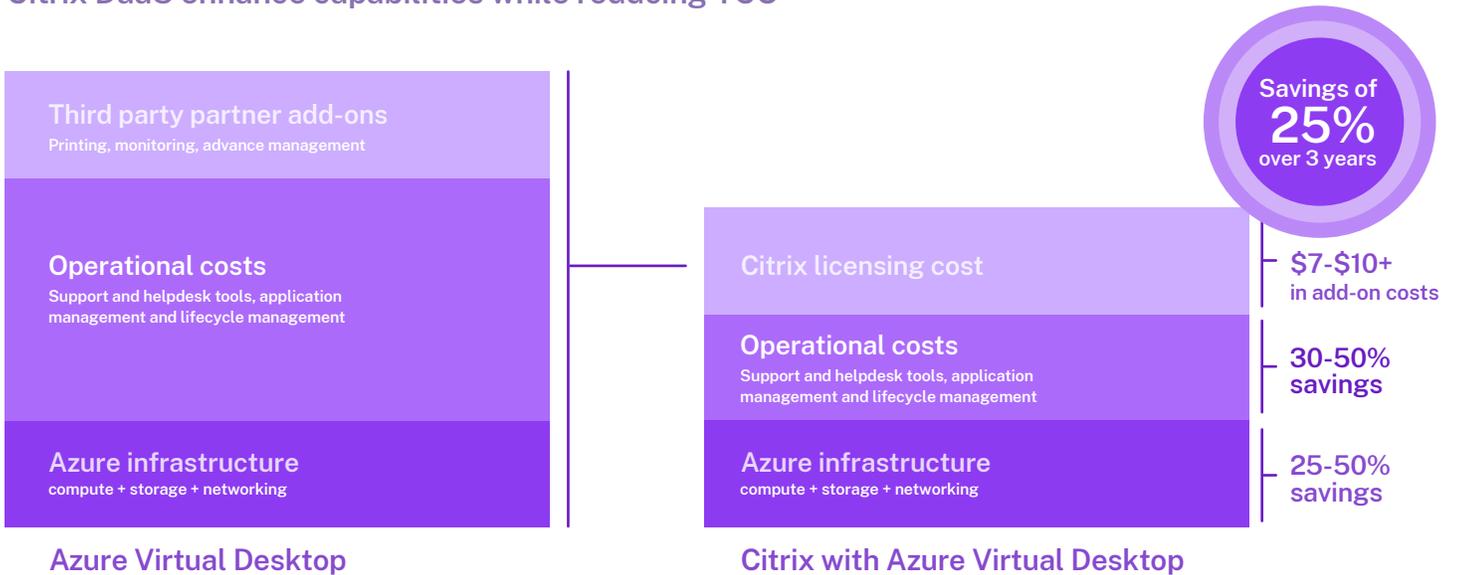
Citrix delivers more with Azure Virtual Desktop. Reduce costs by migrating Citrix workloads to Microsoft Azure.



While some of these savings can be achieved with native Azure Virtual Desktop alone, customers use Citrix DaaS with AVD realize the full savings potential of migrating to the cloud. A joint solution typically reduces the total cost of ownership by 25 percent.

Simplify and accelerate your journey to the cloud

Citrix DaaS enhance capabilities while reducing TCO



Assumptions:
1,000 knowledge workers with medium workloads using Windows 10 multi-session VMs.

* Numbers based on internal Citrix testing.

In addition to reducing costs, adopting a hybrid-cloud strategy and deploying workloads with Citrix on top Azure Virtual Desktop also provides numerous organizational benefits:

- Deployment flexibility:**
Take advantage of new cloud scale while maximizing your existing datacenter investment. IT can transition on-premises deployments to hybrid/cloud resource locations in a time frame that aligns with business needs.
- Optimized operations:**
Unify and simplify the management of on-premises and cloud-hosted resources to improve IT efficiency and streamline business continuity and disaster recovery planning. Enjoy increased scalability and optimized performance while reducing deployment costs and monthly spending.
- Secure experiences:**
Provide an optimized user experience across any device thanks to industry-leading support for SSO, 3D graphics intensive workloads, interactive communications tools, and more. Reduce your security risk and protect intellectual property with comprehensive tools like session recording, session watermarking, and user behavior analytics.
- Faster time to value:**
Deploy Azure workloads in just five clicks with Citrix Desktops-as-a-Service (DaaS). Manage your environment across multiple clouds and datacenters with ease. Simplify new employee and contractor on-boarding for mergers and acquisitions as well as a multitude of business-critical use cases.

After reading this paper, you will have a better understanding of how to assess the economic and net-new benefits of investing in Citrix DaaS and transitioning your virtualization deployment to the cloud.

Detailed Analysis of Economic Benefits

As organizations redefine their business practices to embrace flexible working, the need for IT agility has come to the forefront of corporate strategy. Modernizing IT practices by adopting service-based offerings and shifting infrastructure from traditional datacenters into hybrid-cloud models improves scale and agility while reducing spending and increasing IT efficiency.

The combination of Azure Virtual Desktop and Citrix DaaS service provides an easy path to modernize your environment and substantially reduce data center spending. This section examines potential financial benefits from leveraging proprietary Citrix technology in combination with Azure Virtual Desktop in detail.

The following quantified benefits are based on Citrix and Microsoft research along with customer telemetry. For illustrative purposes, each of these benefits have been applied to a sample app and desktop virtualization customer with 1,000 users, migrating from a traditional on-prem VDI to an Azure-hosted Citrix and Microsoft solution. Based on this customer scenario, **up to \$1M in savings can be realized along with a top line growth of \$2.3M**. Citrix uses these same cost reduction and growth frameworks in real-world customer engagements.

This is the financial impact of deploying Citrix technology in combination with Azure Virtual Desktop:

- **Infrastructure savings:** Up to \$310,420
- **Licensing savings:** Up to \$452,500
- **Cloud savings:** Up to \$83,800
- **Operational savings:** Up to \$183,200
- **Revenue growth:** \$2.3M from increased employee productivity
- Citrix sales and value engineering teams have leveraged the cost reduction and business growth framework, outlined in this paper, as part of a broad variety of customer engagements.

Sample Customer Cases

These customer examples were captured during real-world conversations.

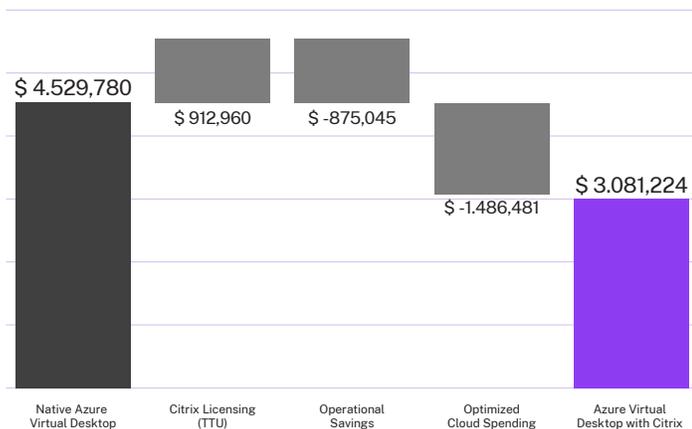
UK-based insurance firm

With more than 100 years in the insurance industry, this well-established firm set out to improve its IT agility and efficiency. The key drivers for this project were to improve its adaptability and responsiveness to changing market conditions, as well as realize cost savings. The firm also wanted to centralize and expand its work-from-home capabilities.

To achieve these goals, the firm undertook a thorough assessment of its technological capabilities and the costs of an IT upgrade. After analysis, the firm concluded that application virtualization was the best solution to meet the requirements of its 4,800 users.

The IT team deployed Citrix DaaS combined with Azure Virtual Desktop to achieve the best cost-to-functionality ratio. This solution enabled the firm to realize a savings of approximately \$8 per user per month or about 32 percent of the overall solution compared to a native Azure Virtual Desktop environment.

Figure 1: ~32 percent savings realized using Citrix DaaS and Desktop service + Azure Virtual Desktop



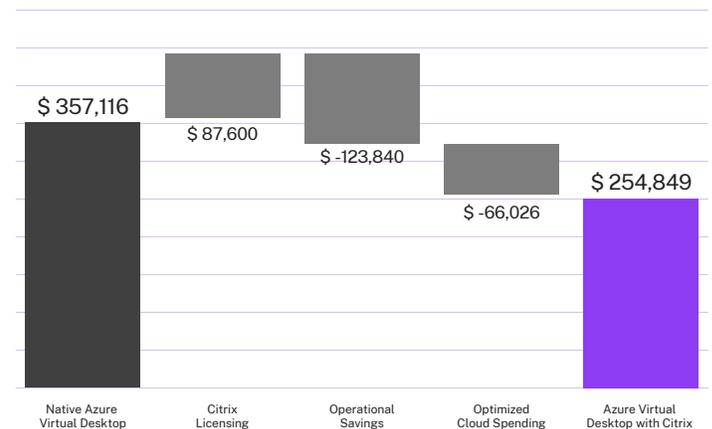
Global leader in real estate

This EMEA-based real estate consultancy has more than 120 years of experience. The goals of this project were to reduce IT costs and improve agility by standardizing the firm’s IT environment, replacing unsupported components, centralizing IT management, and reducing ongoing maintenance.

The firm undertook an in-depth assessment of several solutions to replace its on-premises application virtualization infrastructure, which provided approximately 300 users with access to line-of-business applications. It also evaluated a number of third-party technologies for management and monitoring.

In the end, the clear winner was dedicated management using Citrix DaaS and Azure Virtual Desktop. Citrix was able to provide enhanced functionality for administrators and end-users while delivering a savings of approximately \$9 per user per month or 29 percent of the overall solution cost.

Figure 2: ~29 percent savings realized using Citrix DaaS + Azure Virtual Desktop



Infrastructure Cost Optimization

Running app and desktop virtualization workloads on public clouds significantly reduces infrastructure-related costs. Savings not only apply to physical datacenter line items, like utility bills for cooling and power, they also extend to consumption-based spending, like just-in-time provisioning of VMs and load optimizations for cloud platforms.

Cost Effective Compute and Storage

When deploying on-premises app and desktop virtualization, organizations must build datacenters that can accommodate peak demand, short-term capacity increases, and projected future growth. As a result, upfront Capex costs are high. With cloud, organizations can pay on a monthly basis for actual capacity consumed, which reduces hardware overprovisioning and related excess spending. With a cloud-based infrastructure, organizations can:

- Avoid large upfront financial commitments and lengthy deployment schedules
- Match paid-for capacity to operational needs
- Align IT hardware, software, and services with changing business requirements
- Provide accurate departmental chargeback or spending data

To prevent large capacity swings, public cloud vendors also offer discounts for “reserved instance” virtual machines. These VMs are convenient for meeting the capacity requirements of highly utilized, always-on systems. Opting for these pay-as-you-go VMs to cover peak or temporary loads further optimizes IT costs by reducing compute and storage fees.

Based on research from Microsoft, **savings of approximately 30%** can be achieved. For a customer scenario with a highly volatile workload of 1,000 users, this translates into savings of ~\$8,520¹ annually

Flexible Network Provisioning

In a consumption-based model, cloud services for app and desktop virtualization also deliver better value for networking.

Typically physical on-premises networks are provisioned for peak bidirectional traffic. In contrast, cloud-hosted workloads only bill for actual outbound traffic. Customers can further optimize their networking costs by opting for fixed fees (using an ExpressRoute data plan) to cover base usage and then using variable outbound traffic for additional bandwidth.

Based on Microsoft research, **savings of approximately 20 percent** can be achieved compared to traditional datacenter networking. For a customer scenario with 1,000 users, this translates into savings of ~\$6,100 annually.

Windows 11 Multi-Session

Available only on Azure Virtual Desktop, Windows 11 Multi-Session offers new flexibility for customers who need a true Windows 11 environment for application compatibility or enhanced user experience. Previously, Windows 11 VDI deployments were designed with a small virtual machine dedicated to each active user. Due to the required hardware, software, and IT maintenance, this setup incurred a high cost per user.

Now with cloud-based app and desktop virtualization running on Azure Virtual Desktop, customers can leverage Windows 11 Multi-Session, which enables the use of larger, shared virtual machines. Sharing compute and storage costs dramatically reduces the cost per user.

Based on research from Microsoft, savings of up to 85 percent can be achieved versus legacy VDI. For a customer scenario with 1,000 Windows 11 users, this can translate into cost savings of approximately \$282,300 per year.²

Citrix Infrastructure Simplification

Citrix Cloud is an always-on SaaS-style service maintained by Citrix, which includes Citrix DaaS and the Citrix Cloud control plane. Citrix Cloud dramatically reduces the infrastructure components required to support traditional on-premises Citrix DaaS deployments and eliminates the need for OS licenses, hypervisor licenses, hardware maintenance, and similar line items.

To conceptualize how much Citrix Cloud reduces infrastructure, assume a typical 1,000-user Citrix Virtual Apps and Desktops on-prem environment. Depending on performance and redundancy requirements, per Citrix best practices customers will need between six and 10 servers to support brokers, databases, gateways, etc.

Based on Citrix research, this hardware cost is completely avoided because all services are provided via the Citrix Cloud control plane. This translates into **\$8,100 - \$13,500⁹ savings annually**.

Licensing Cost Savings

Running app and desktop virtualization workloads on Azure Virtual Desktop also reduces licensing fees. These savings include:

Savings on RDS Client Access Licenses (RDS CALs)

After transitioning from on-premises Windows Server based app and desktop virtualization to Windows 11 Multi-Session on Azure Virtual Desktop, customers no longer need RDS CALs.

Based on Microsoft list pricing, this translates into savings of **~\$17 per user, per month or ~\$204,000 per year** for a 1,000 user environment.

Windows 7 Extended Security Updates

Some customers require Windows 7 for application compatibility purposes. When adopting Microsoft Azure-based app and desktop virtualization, customers receive three years of Extended Security Updates (ESU) free of charge. Depending on the calendar year and Windows 7 license tier, extended updates can translate into savings of \$25 - \$200 per device per year.

For an organization that requires Windows 7 Enterprise for 1,000 users until 2022, this translates into **~\$150,000 savings**.

Savings on common add-ons for Azure Virtual Desktop

Many organizations customize their virtualized environments to meet specific internal needs or regulatory requirements. As a result, IT often deploys multiple third-party tools to streamline management and boost platform capabilities. These tools include advanced security controls like conditional access restrictions, data loss prevention, and enhanced management capabilities (monitoring, application management, printing).

Citrix DaaS includes robust security, app and OS lifecycle, and UX enhancements that match and exceed the capabilities of many add-on solutions. These enhancements enable customers to leverage a single management interface for end-to-end control, which reduces the environment's complexity, support burden, and overall cost.

Based on Citrix internal research, replacing third-party add-ons for Azure Virtual Desktop **generates savings of ~\$98,500 per year**, when considering licensing costs and the reduction in management and training efforts.

Optimizing Cloud Spending

Several features of Citrix DaaS ensure cloud resources can be used more efficiently. These features enable customers to increase the user density per virtual machine or decrease overall Azure resources consumption, reducing the cost per user.

CPU & Memory Optimization

Citrix DaaS features innovative CPU and memory optimization technology that continuously analyzes, optimizes, and re-prioritizes application resource consumption. This technology improves user density by approximately 28 percent⁴, based on Citrix-internal testing and customer telemetry. More users per server instance means lower cloud compute costs and a lower cost per user.

For a customer scenario with 1,000 users, Citrix CPU and memory optimization technology can typically realize **savings of ~\$20,600 per year** for a medium workload.

Bandwidth Optimization

Citrix optimizes and extends the value of Azure Virtual Desktop with Citrix HDX user experience technology and ICA protocol for communication with end user devices. HDX features a variety of unique compression and offloading algorithms that leverage client-side resources to improve the user experience, while simultaneously reducing network resource consumption. Based on Citrix internal testing and customer telemetry, Citrix HDX can reduce the network traffic generated by every user by approximately 40 percent.

For a customer scenario with 1,000 users, the reduction in egress data traffic (from the virtual desktop to the end user) can generate **savings of up to ~\$21,100**.

Storage Optimization

Citrix DaaS adds an innovative storage optimization technology — MCS I/O optimization — to Azure Virtual Desktop. This sophisticated caching solution is designed to offload random write operations to high-speed RAM.

Redirecting I/O to cache reduces the number of writes to disk and improves session responsiveness. By writing larger, sequential blocks of data, MCS provides better disk utilization and application responsiveness, allowing organizations to utilize standard disks instead of high-performance disks and thereby reduce costs.

For a customer scenario with 1,000 users, the MCS I/O optimization technology can typically realize **savings of ~\$14,600 per year for a medium workload**.

Citrix Autoscale

Citrix DaaS provides a built-in and easy to use automated autoscaling functionality which ensures virtual desktops only consume Azure resources when users need them. Outside of working hours, all unnecessary systems are automatically powered down.

Based on Citrix internal research, the autoscaling functionality can generate annual **savings of ~\$6,000** for a 1,000 user environment⁵.

Load Balancing

Citrix DaaS enhances Azure Virtual Desktop with advanced user session load balancing. This feature factors in real-time resource consumption, number of users, and other metrics to ensure a better, more even distribution of user sessions. In addition, it reduces the idle margin on Azure Virtual Desktop instances, which increases user density without impacting user experience.

Based on Citrix internal research, advanced user session load balancing can generate **savings of ~\$11,500 per year** in a 1,000 user environment.

Monitoring

Every desktop virtualization environment requires detailed monitoring capabilities to ensure high quality performance. Monitoring also enables admins to proactively identify areas or components that require attention. While Azure Virtual Desktop includes basic monitoring and management capabilities, there is an additional cost for customers. Compare that to Citrix DaaS, which adds a range of sophisticated proactive service management and monitoring capabilities without any additional cost at runtime.

For a customer scenario with 1,000 users, the built-in monitoring capabilities of Citrix DaaS can generate **savings of ~\$10,000 per year**.

Operational Cost Savings

Citrix DaaS includes built-in management functionalities that extend the value of Azure Virtual Desktop. These purpose-built tools reduce the environment's operational cost by increasing helpdesk staff efficiency during deployment and maintenance tasks, like image and app lifecycle management, and troubleshooting.

Just as organizations experience considerable IT benefits by moving to SaaS cloud-based applications, switching to a DaaS service-based cloud management plane brings similar benefits:

Faster, Proactive Troubleshooting

To maintain high levels of end user satisfaction and productivity, first-and second-level support engineers must be empowered to solve most incidents at the first user contact. For these tasks, Citrix DaaS includes Citrix Director (with HDX Insight).

Citrix Director is a purpose-built support dashboard that provides engineers with simple controls to interact with a user's session to solve common problems, like hung processes, or pinpoint areas that need further investigation. It also provides a comprehensive view of infrastructure health, end-to-end user session performance, network metrics, historical trends, and more — functionality that usually requires a multitude of tools.

Citrix Director is a one-stop-shop for speeding up end user support, admin efficiency, user productivity, and time-to-resolution.

Based on Citrix internal research, Citrix Director can save as much as 660 hours per year for common troubleshooting scenarios. For a customer environment with 1,000 users each filing eight incidents per year, the increased admin effectiveness can generate **savings of ~\$52,800 over one year**.

Windows and Application Lifecycle Management

Citrix DaaS includes Citrix App Layering. This unique image management technology enables admins to maintain a single golden copy of the virtual desktop, including the operating system, platform components, and individual applications. When a change is made, only a single copy of the affected part is modified instead of multiple instances across each golden image. By limiting modifications to well-defined sections of a virtual desktop, Citrix App Layering simplifies ongoing maintenance and troubleshooting, and reduces rollback time.

Based on Citrix internal research, Citrix can reduce the time spent on Windows and application lifecycle management by 670 hours per year, which translates into **\$26,800 savings** annually. These savings are based on a customer environment with 1,000 users and two planned changes per month.

Unified Hybrid Cloud and Workload Management

Citrix DaaS unifies management for traditional on-premises app and desktop virtualization workloads, Desktop as a Service (DaaS) workloads, Microsoft Azure, and other physical and hyper-converged platforms.

Without the Citrix Cloud management plane, organizations would need at least two app and desktop virtualization solutions. Management duplication increases complexity and adds to the total cost of ownership.

Based on Citrix internal research, unified management can translate into **~\$79,600 annual savings⁶** for a customer environment with 1,000 users and a hybrid environment with two sites.

Reduced Infrastructure Management

Citrix DaaS speeds up the provisioning of apps and desktops because most services are activated rather than installed and configured. As many functions are cloud-only, they do not require any additional provisioning.

Using Citrix DaaS in conjunction with a public or private cloud for networking, compute, and storage also streamlines IT management by offloading responsibility for infrastructure security, performance, and resources availability to third-party providers, like Microsoft Azure.

Reduced Environment Management

The Citrix Cloud operations team seamlessly deploys and manages upgrades to the Citrix Cloud management plane and individual services. As a result, customers always have access to the latest Citrix technology while avoiding the operational overhead associated with manual upgrades.

Traditional Citrix deployments often require months of extensive testing and production cycles when new versions are available. With a service-based deployment model, this process is practically eliminated.

The Citrix Cloud team also provides many common environment management support services, eliminating many IT tasks, such as security patching, version updates, and environment monitoring. This significantly reduces the number of personnel required for in-house environment support.

Statistically, software maintenance and support are some of the largest long-term costs. Citrix Cloud significantly reduces installation, training, maintenance, upgrades, and troubleshooting costs.

For a customer environment with 1,000 users, environment management support can translate into **~\$24,000⁷ savings annually**.

Employee Productivity

Digital workspaces increase security, streamline flexible working, and improve employee productivity. Citrix DaaS encompasses a family of innovative technology products that have a long history of delivering higher performance, empowering users to work more efficiently.

Faster User Logons

Technologies built into Citrix DaaS — such as Session Pre-Launch and Session Lingering — speed up user logons to virtualized applications. The average launch time of environments running Session Pre-Launch and Lingering is two seconds. Environments without these technologies have an average session launch time of 60 seconds.

Even without Session Pre-Launch and Lingering, customers can leverage Citrix Workspace Environment Management (WEM), which reduces the average session launch time to approximately 15 seconds.

Assuming that Citrix technologies reduce end user logon time by an average of 30 seconds, a customer with 1,000 users can gain more than 2,100 hours of extra working time annually. Based on the hourly productivity figures from the U.S. Bureau of Labor Statistics outlined earlier and assuming one percent of the extra time is used for productive work, these time savings can **generate additional annual revenue of \$1.2 million.**

Improved End User Experience

Citrix DaaS includes technologies that positively impact user experience, session/application performance, and application responsiveness. As a result, users spend less time waiting for applications to load or respond. When users connect using a long-distance network connection, better performance is especially noticeable. Because every customer environment is unique, it is technically very challenging to determine what effects these individual improvements have on productivity. It is assumed that all functions improve the time employees can spend on productive activities by one percent collectively. (This is a very conservative estimate.)

American workers produced an average of \$57.54 worth of goods and services per labor hour, according to a 2010 report by the U.S. Bureau of Labor Statistics (BLS). In this case, a one percent increase would translate into an **additional \$1.15 output per labor hour.** For an organization with 1,000 active Citrix users, the overall output would increase by approximately \$1.1 million per year.

Additional Benefits

Citrix DaaS also provides many benefits and features not included in our financial analysis:

Reduced Risk of Outages and Faster Recovery

Citrix proactively detects issues, reduces the risk of service outages, and decreases the time of recovery from outages for Azure Virtual Desktop customers. These benefits are enabled through built-in functionality, like session probing, multi-site load balancing, and fast rollback of application and configuration changes.

Reduced Risk of Security Breaches

Citrix DaaS includes several technologies that reduce the risk of security breaches for Azure Virtual Desktop customers, including App Protection, session watermarking, session-aware policy control, and session recording.

Citrix Analytics for Security

Citrix Analytics continuously assesses the behavior of Citrix DaaS users and Citrix Workspace users — a function that is supported by machine learning, which uses predictive approaches to identifying malicious user behavior.

It also aggregates and correlates data across networks, virtualized applications, desktops, and content collaboration tools.

As a result, Citrix Analytics is able to proactively protect sensitive corporate information, address user security threats, and generate a range of valuable insights.

Remote PC Access

Citrix DaaS features Remote PC Access, which enables organizations to allow employees to access corporate PCs and laptops outside the office. To ensure this process is secure and seamless, the Citrix platform assigns physical machines to users when they login locally. Once users gain access to office PCs, they can access any application, data or resource required to do their jobs while enjoying the full power of Citrix HDX user experience technologies.

Remote PC Access uses the same components as Citrix DaaS. As a result, the process of deploying and configuring Remote PC Access is similar to deploying Citrix DaaS for the delivery of virtual resources. This uniformity ensures a consistent and unified administrative experience, which reduces management complexity and cost.

To learn more about Citrix DaaS, please visit www.citrix.com

APPENDIX A: Cost savings calculations

- 1 Comparison of 1,000 CCU working on 48 VMs (D4 v4) with a three-year reserved instance option (proxy for on-prem cost) versus 800 CCU working 180 hours on 38 VMs (D4 v4) with a pay-as-you-go option, and 200 CCU working on 10 VMs with a three-year reserved instance option.
- 2 Comparison of 1,000 CCU working on single user Windows 11 VMs (D2s v3) with three-year reserved instance option (proxy for on-prem cost) versus 1,000 CCU working on Windows 11 multi-session VMs (D8 v3) with three-year reserved instance option.
- 3 Cost for on-prem systems varies widely depending on specifics of the customer implementation. Therefore, Azure compute cost is used as a proxy for average on-prem management cost.
- 4 Internal testing based on LogoiVSI determined a scalability increase of between 20.8 percent and 43 percent.
- 5 Employee working hours are assumed to be weekdays between 8am – 6pm. During night and on weekends, only 15 percent of all systems are powered up to host unexpected user sessions.
- 6 Hybrid management cost varies widely depending on features and functions as well as integration options of the solutions. Azure Virtual Desktop management capabilities and the cost resulting from that is used as the proxy for an average on-prem management cost.
- 7 A typical 1,000 user environment with on-prem AVD requires approximately 10 infrastructure systems. It is assumed that each system requires five hours of maintenance. On a \$40 per hour basis this equates to savings of \$24,000 annually. Cost for on-prem systems varies widely depending on specifics of the customer implementation. Therefore, this calculation is used as a proxy for average on-premises management cost.

APPENDIX B: References

[IDC Solution Brief: Assessing the Business Value of VDI in the Public Cloud](#) (Please speak to your sales rep or Citrix Partner to get access to this brief.)

[Citrix Cloud Services Total Economics Benefits Assessment Guide](#)

Workspace services

[Preparing for the Workspace of the Future](#)
[Cloud Workspace Services: Adoption Made Simple](#)
[Simplify your cloud strategy by taming cloud sprawl](#)
[Full list of Citrix Virtual Apps and Desktops service](#)

Stages of Software Deployment

[Citrix AutoScale](#)
[Citrix Trust Center](#)

Less infrastructure — better disaster recovery

[Microsoft Azure TCO calculator](#)

Business continuity

[Citrix Cloud Business Continuity Advantage](#)
[Citrix DaaS reference architecture and deployment methods](#)



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