



The Rising Value— and Falling Cost— of App and Desktop Virtualization

When vendors compete, desktop virtualization customers win. Moore's Law and market forces lead to better solutions at a lower cost.

The rapid increases in computing power described by Moore's Law offer theoretical advantages for IT organizations—but it's market competition that translates those benefits into real value. As vendors battle for market share, costs are falling for every part of the desktop virtualization architecture. Meanwhile, desktop virtualization technology itself is advancing quickly, providing new ways to enable business mobility and enabling the flexibility that people and organizations need to thrive. This trend is a double win for customers—better solutions at a lower cost—and it's making the benefits of a service-based approach to IT available to any organization.

No longer just for early adopters and innovators, desktop virtualization has become a mainstream IT strategy for companies of all sizes. As business mobility and cloud computing transform IT, desktop virtualization enables the transition to IT. Able to meet the needs of users more effectively and securely wherever, however and on whatever device they work from, IT can better support the business while fulfilling its mission of innovation.

The value of desktop virtualization for users, businesses and IT

The business drivers for desktop virtualization span a broad range of priorities and benefits.

Workforce mobility

Enabling people to access their apps, desktops and data from anywhere, desktop virtualization provides a foundation for the business mobility currently transforming the way people and businesses operate. People gain the flexibility to work wherever they can be most productive and effective, and to access a complete mobile workspace on any type of device. For the business, a more mobile workforce can rapidly be deployed across many locations, from partner and customer sites to branch offices and the field, to quickly adapt to changing business requirements.

Telework

By giving people more flexibility to choose the ideal time, place and device for their work, including their own homes, businesses can help them experience work and life in harmony while reducing the cost and time of commuting. Teleworking also provides a highly effective strategy for business continuity, enabling workers to be productive even when a disruption, whether a planned office relocation or a natural disaster or other emergency, prevents them from working in the office.

Consumerization

Consumer technologies such as mobile devices are becoming a fact of life in most organizations. With desktop virtualization, IT can allow people to access the apps, desktops and data they rely on in a mobile workspace

delivered to any device, including PCs, Macs, tablets and smartphones, while maintaining centralized control and minimizing security risks.

New employee onboarding

By delivering apps and desktops on-demand to mobile workspaces anywhere, over any network, IT can provision resources to new users in a matter of minutes. Any available desktop hardware can be used—including aging legacy equipment, low-cost thin clients, PCs, laptops and mobile devices—while ensuring that every worker benefits from a high-definition user experience even for the most demanding corporate applications.

Security and compliance

Because apps, desktops and data remain centralized in the datacenter, IT can more effectively control both information and access. Policy-based access control, activity logging, auditing and reporting aid in the effort to meet strict regulatory compliance standards. Access to IT services can be turned off instantly in the event a device is lost or stolen, or a worker departs the organization, to prevent data breaches.

Business agility and growth

With desktop virtualization, IT can leverage the flexibility of the cloud to scale up and down quickly and easily as needs change. For example, a retailer or manufacturer can provision additional desktops on a temporary basis for seasonal workers, paying on an as-you-go basis as an operating expense rather than incurring new capital expenses. Faster, more agile IT processes also speed time to value for strategic business initiatives such as merger & acquisition activity and branch expansion while expediting the process of bringing new business units online. Centralized management and online support tools eliminate the need for IT personnel to be deployed to new locations, reducing overhead.

As a result, the organization can grow and evolve easily, rapidly and elastically while speeding business impact.

Real estate savings

With mobility and teleworking enabled by desktop virtualization, offices can become smaller and less costly, as many workers shift to alternate locations and space is allocated more efficiently to those who do work onsite on any given day. Large personal work spaces can be eliminated entirely for full-time teleworkers.

IT efficiency

A centralized architecture lets IT support users efficiently across multiple locations by delivering apps and desktops as secure, on-demand services. Operating system migrations—an essential but often arduous process—become quick and painless through single-image management. Small and midsize businesses can achieve a more professional level of IT service through centralized user management while eliminating the headaches that come with managing a distributed, non-standard endpoint environment typical of most small and medium-sized businesses.

Falling costs for desktop virtualization

Not long ago, some organizations remained leery of desktop virtualization, concerned about the perceived need to purchase, manage and maintain costly and complex infrastructure—but this view has changed dramatically. Rapidly evolving technologies have made desktop virtualization much more affordable, with savings driven by falling costs for the required infrastructure as well as by increasing competition among vendors. The latest solutions also allow greater flexibility in the ways companies can design and enable their virtualized desktop environment. Meanwhile, the performance of leading solutions has advanced to the point where the user

experience is every bit as good or better than a physical desktop, making desktop virtualization worthy of a direct cost-to-cost comparison—which it wins handily.

Storage

Storage costs have always been the great unknown in conversations about desktop virtualization. Server costs and software licensing fees have been well known, but IT administrators have had to work through confusing shared storage calculators that make it difficult to assess the actual expense involved. As competition has increased, storage vendors have faced pressure to communicate their pricing more clearly. Along with improvements in storage utilization through technologies like thin provisioning (PVS), storage layering (personal vDisk) and flash storage, this has displaced storage from its longtime position as the biggest cost component of desktop virtualization. For example, Citrix Provisioning Services™ uses thin provisioning technology to dramatically reduce the amount of high-performance storage required for desktop virtualization, enabling a single 30 GB desktop image to boot by only allocating 4 – 5 GB of space for significant savings. A new [Citrix® Ready program](#) certifies storage partners for their ability to provision the appropriate amount of storage performance and capacity with a cost-efficient design. Through developments like these, companies can now pay less than \$100 per user for high-performance, redundant shared storage that provides better availability than a physical PC.

Graphics Processing Unit (GPU)

Design and manufacturing organizations that depend on high-end CAD, engineering and other processing-intensive graphical applications can benefit greatly from a new generation of desktop virtualization solutions leveraging the horsepower of GPU computing.

Traditionally, such applications can require a physical workstation with a high-powered GPU for each designer or engineer to support rendering. With a GPU-enabled desktop virtualization solution, IT can share a single GPU among multiple users, driving down per-user costs tremendously. Citrix provides vGPU-sharing technology that allows flexibility for IT to allocate GPU resources according to the requirements of specific use cases; for example, a designer could be provided with a dedicated GPU to design a car, while others on the team would share a single GPU to view the resulting drawings. This balance of high-performance dedicated processing and cost-efficient shared resources helps the organization meet its goals for both cost and productivity.

Servers

The cost of server hardware has been falling faster than we'd expect if only Moore's Law were at play. The rising demand for virtualization of all kinds—server, desktop and application—has created the need for more powerful servers. Vendors have responded by offering more power at the same price point than just a few years ago for not only CPU, but also memory, storage throughput and architecture. At the same time, a growing variety of mature virtualization models give companies more flexibility to support users in the most cost-effective way. Server-hosted desktops are now almost interchangeable with virtual desktop infrastructure (VDI) in terms of cost. While VDI was formerly restricted by RAM, new technologies make it possible to add far more RAM to a single server. Citrix Provisioning Services, with its “RAM Cache with Overflow to Disk” feature, let you use this additional RAM to increase read/write performance significantly, reducing the need for shared storage and the associated cost. This has shifted the focus of performance to CPU—and as more cores are added to CPUs, more and more desktops can be hosted per server, yielding even greater cost efficiencies.

Cloud computing

Competition among cloud vendors has made it increasingly easy and cost-effective for organizations to flex user workloads to the cloud as needed to support growth—whether temporary, seasonal or long-term. Without the need to procure, image and configure on-premise servers to support a larger user base, cloud computing provides instant infrastructure that can be dialed up or down as needed, and paid as an operating expense rather than a capital expense. To enable this strategy, leading desktop virtualization solutions allow IT to manage virtual desktops on premise, in the cloud or both, while allowing simple, transparent access for users regardless of where their desktops are hosted. Citrix takes [an any-cloud approach](#) to desktop virtualization, working with numerous cloud providers to free customers from being locked into a single cloud solution and making it easier to deploy cost-effective desktops on-demand.

Endpoints

As computing devices become ever more powerful—from laptops, PCs and tablets to the smartphones in our pockets—desktop virtualization no longer needs to rely solely on the datacenter for processing. Several desktop virtualization architectures are designed to leverage the local processing power of the endpoint for many compute- and graphics-intensive tasks, greatly increasing efficiency while enabling a high-performance experience for users. Meanwhile, advancing consumer technology has increased the number of low-cost endpoint options available to IT and users. Google Chromebooks reflect the radical shift in thinking about endpoints; at a price point under \$200, the devices can be considered somewhat disposable. At the same time, mobile devices such as tablets can be viewed as some of the

most powerful thin clients to hit the market, offering a high-performance experience at a low cost in a versatile form factor that lets people get more done, in more ways, wherever their work takes them. The [Citrix HDX™ Ready System-on-a-Chip \(SoC\)](#) initiative enables chip manufacturers to deliver a full computing system on a chip, dramatically reducing the cost of high-definition zero clients. Device upgrades can be delivered as software, eliminating the need for IT to go through a major hardware upgrade to benefit from the latest innovations.

Networks

Users now access corporate resources in more places than ever, often over public networks. This is changing the way IT thinks about networking: why invest heavily in distributed private network infrastructure when you can leverage a public Internet service in tandem with a secure connection? Technologies for WAN optimization can ensure good user experiences even on mobile devices over 3G and 4G. With Citrix XenDesktop® Platinum, customers can use the virtual WAN accelerator technology in CloudBridge™ to deliver high-performance virtual desktops over any network. For customers using another vendor's WAN acceleration technology, network-based Quality of Service (QoS) is enabled through XenDesktop Multi-Stream ICA, which uses multiple TCP connections to carry ICA traffic between the client and the server. New enterprise mobility management (EMM) solutions focus on allowing remote users to access apps, desktops and data over secure network connections rather than joining their devices to the network, greatly simplifying network security for IT. Within the infrastructure, the virtualization of network appliances and the rise of software-defined networking (SDN) are reducing costs while increasing flexibility.

Simpler, more efficient virtualization architectures

Many of the same factors driving down the cost of desktop virtualization are also increasing its simplicity. In the past, companies had to painstakingly optimize their server and storage architectures and choose endpoint devices carefully to ensure an acceptable user experience for virtual desktops. Today, nearly any device and infrastructure can deliver a good user experience, allowing more straightforward, cost-efficient architectures. Single-image management becomes easier to implement, and companies can quickly realize the operational benefits they've expected from desktop virtualization.

At the same time, IT can now choose among a wide range of mature desktop virtualization architectures to design the ideal implementation for the organization and its users. Models such as hosted shared desktops, hosted VDI desktops, and client-side virtualization offer the flexibility to meet the diverse needs of groups throughout the business in terms of flexibility, application access, personalization, mobility, performance and work locations.

Conclusion

Desktop virtualization has never offered such compelling value for customers. Facing intense competition, vendors in every part of the architecture—from desktop virtualization software, to back-end hardware, to endpoints—are leveraging Moore's Law to make better products available at a lower cost. This transformed marketplace makes it possible for organizations of all kinds, including small businesses, enterprises and everyone in between, to embrace desktop virtualization as an affordable way to enable the mobility and agility they need, while maintaining control and security. As IT strategy and the solution landscape converge, the barriers to business mobility have never been lower.

For more information about Citrix desktop virtualization solutions, please visit www.citrix.com/solutions/desktop-virtualization.

Additional resources

[Citrix XenDesktop](#)

[Citrix XenApp®](#)

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About Citrix

Citrix (NASDAQ:CTXS) is a leader in mobile workspaces, providing virtualization, mobility management, networking and cloud services to enable new ways to work better. Citrix solutions power business mobility through secure, personal workspaces that provide people with instant access to apps, desktops, data and communications on any device, over any network and cloud. This year Citrix is celebrating 25 years of innovation, making IT simpler and people more productive. With annual revenue in 2013 of \$2.9 billion, Citrix solutions are in use at more than 330,000 organizations and by over 100 million users globally. Learn more at www.citrix.com.

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