



Client Virtualization

Next-generation technologies enable IT to increase productivity, reduce complexity, cut costs and improve management of devices. It's time to take a serious look.

Table of Contents

- 1 Executive Summary
- 2 What Is Client Virtualization?
- 2 Why Client Virtualization?
- 3 Presentation Virtualization
- 4 Application Virtualization
- 5 Desktop Virtualization
- 6 Where Is the ROI?
- 6 Understanding the Risks
- 7 Managing the User Experience
- 7 Getting Started
- 8 CDW: Your Client Virtualization Partner

Executive Summary

For organizations with hundreds to thousands of endpoints, managing their devices can be an enormous challenge. Employees are more mobile than ever, working from home and on the road, and easy access to the Internet means that most organizations now operate on 24x7 schedules, 365 days a year. The challenges and costs of supporting hundreds or thousands of users utilizing all kinds of devices is something IT has been trying to get under control for quite a while.

Client virtualization brings a wide array of products and solutions that offer the promise of finally enabling IT to gain more control over their client infrastructure while at the same time still offering a rich, rewarding experience to users throughout the organization.

With client virtualization, IT has the opportunity to reduce total costs, improve security, and enhance compliance and business continuity, thereby beginning to put in place an infrastructure that will be practical, efficient, flexible and scalable for years to come.

What Is Client Virtualization?

At its most basic level, client virtualization technologies enable IT to deploy both applications and desktops in a more efficient and secure manner to almost any endpoint over any network. Because client virtualization comes in a variety of flavors, the technology can sometimes be overwhelming, depending upon which vendor is promoting which flavor. To keep the concepts simple, what follows are descriptions of three prominent ways in which client virtualization is deployed, in order of maturity and including listings of key vendors. Each of these approaches will be discussed in greater detail in the body of this article.

- **Presentation Virtualization.** With presentation virtualization, applications are stored in the data center and end users access them through a web portal from which the applications and the data are “presented” to them from a Windows Server session. Leading vendors include Citrix and Microsoft.

- **Application Virtualization.** With application virtualization, applications are virtualized into an executable file that is run from the client device. The virtual application is then isolated from the operating system, ensuring compatibility no matter which version is being used. Leading vendors include Microsoft, Citrix and VMware.

- **Desktop Virtualization.** With desktop virtualization, the operating system and applications are stored within the data center and are presented/streamed to the end user via any client access device. Leading vendors include VMware, Citrix and Microsoft.

Why Client Virtualization?

So why should you consider client virtualization, and why now?

For IT professionals, endpoint management is becoming more and more challenging. Workers are more mobile, organizations more global and devices become both commonplace and more diverse. Yet, in the face of these mounting challenges, many IT departments are also facing declining budgets and growing pressure by corporate management to “move at the speed of business.”

Client virtualization, in any of the available flavors, offers IT the opportunity to gain more control over their endpoint devices, which means they can dramatically reduce the costs of supporting these devices and users, while at the same time improve security, compliance and disaster readiness throughout the organization. What’s more, client virtualization offers a highly scalable solution that reduces IT overhead and simplifies IT management, enabling the organization to be more flexible when rolling out new applications and services as needs change.

How can client virtualization simplify management, improve security, reduce costs and make IT more responsive to the organization’s needs? Here are some of the benefits that an

organization would expect to see after implementing client virtualization technologies.

Patch Management: Think about the tasks involved in patch management. You have to update the firmware and software drivers frequently; you have to update the operating system; you have to update the utilities and plug-ins — for instance, Internet Explorer, Antivirus Client agents, Instant Messaging Client, WebEx client, Flash Plug-in, etc. That does not include the applications, which are also getting updates frequently. As each of these patches becomes available, you have to test application compatibility to ensure that all related applications will still work together. As an example, a CRM application may not work with Office 2010 and, at the same time, may only work with a particular version of the Flash player in Internet Explorer 7. And you have to run through this regression testing for hundreds of different applications.

With client virtualization — and, in particular, desktop virtualization — a centralized image is used, which makes patching desktops much easier and more predictable, enabling patch management to be rolled out to all end users in a matter of minutes.

Security: Endpoint security has become a nightmare, both figuratively and literally, for many IT professionals. The threats to security are becoming more complicated. Users can save mission-critical data on unsecured flash drives. They can burn that information to a DVD or upload it to a dropbox, Apple iDisk, Windows Live SkyDrive or other locations where data can easily be compromised. Users can also save documents on their notebooks or their broadband modem’s flash drive. Without encryption, any of this data could easily be extracted from any of these devices, even by a novice PC user.

Today more end users are bringing in their own endpoints and adding them to the corporate network, which then becomes an instant security risk. Devices such as the iPad are quickly penetrating the market and growing in popularity. Some companies are now looking at implementing network access control (NAC) to allow only certain devices on their network and prevent unauthorized ones. This is one way of addressing the problem, but client virtualization offers other ways without necessarily placing limits on end-user devices.

Viruses can destroy the data on PCs, and virus attacks continue to increase, which makes outbreak management more difficult, even with a well-planned antivirus deployment. Anti-malware software must be continually updated to prevent keyloggers from stealing password information and critical data and moving it offsite. Desktops can be “cleaned” when a user logs off, wiping away any data, downloaded files or possible viruses.

With client virtualization, desktops and applications can be centralized in the data center, thereby offering more granular controls over what end users have access to.

Software Distribution Management: Software goes through major revisions every one or two years. For example, the progression from Office 2007 to Office 2010 took two years. Rolling out an application such as Office requires a great deal of testing and migration assistance. Many new versions of software not only conflict with certain operating system versions, they also conflict with application versions. For example, when Office 2007 came out, it was more than six months before it was supported to work with Adobe Acrobat. In addition, some versions of software require a new version of another software to enable it to work properly. Again, for Office 2007 to work with Adobe Acrobat, customers had to buy upgrades to Adobe Acrobat V8. Further complicating matters in managing and upgrading software, each operating system and application platform may have a completely different update method — for example, updating applications on Windows is completely different from updating applications on the Mac platform.

With client virtualization, software distribution becomes simple because applications can be accessed from within the data center. This allows IT departments to take advantage of the increased speed of the network core and of going to a centralized location. Also, many application compatibility issues are alleviated — in particular with application virtualization — because the applications can be isolated from the operating system.

IT Help Desk/Desktop Staff: Physically sending staff to every office to repair or update devices is time-consuming, cumbersome and not very cost effective. If you have remote offices without local IT support, users may experience significant downtime before a technician can fix a problem. Also, it is inefficient and expensive to have more than a few people manning a help desk to typically solve the same problem for each user. For example: What happens when everyone gets the same virus or everyone has a problem with one application at the same time? There is typically no “rollback” mechanism, which can make troubleshooting very frustrating for the IT department.

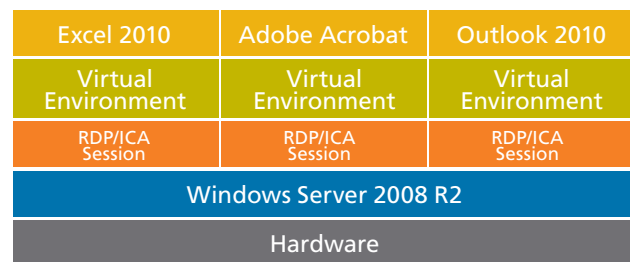
With client virtualization technology — applications are delivered to and from a common image — rollback can occur across the entire organization instantly. In many cases it will not require any travel to a remote office to fix desktops or notebooks.

Presentation Virtualization

Probably the most mature of all client virtualization technologies, presentation virtualization allows multiple users to run applications from a set of Windows servers, thereby remotely delivering applications to almost any device.

Diagram 1 explains what this technology looks like from an architecture perspective. Presentation virtualization, when productized, is known as Windows Remote Desktop Services (formerly Terminal Services), which runs on top of Windows Server 2008 and essentially allows users to access independent sessions that contain the applications installed on the server’s operating system. Although the use of application virtualization technology is recommended (as shown in the diagram), most deployments still use the traditional model of installing applications directly on the server. Reasons for doing so include cost and the maturity of application virtualization, but as of September 2009, Microsoft has included the use of its App-V product as a benefit of the Windows 2008 RDS CAL, which means that every RDS Server has access to application virtualization.

Diagram 1 — Presentation Virtualization Architecture



Endpoints connect to a web portal called the RD Gateway, which acts as a broker and sends requests to application sessions called RemoteApp on RDS servers using the Microsoft RDP (Remote Desktop Protocol) client, which is built into Windows 7 and available for almost every platform today. The client uses the remoting protocol RDP to transfer the application session from the RDS Server to the client.

Another technology layered on top of RDS is Citrix XenApp (Hosted Apps). XenApp has been around since the late 1990s and is the latest version of what was formerly WinFrame, MetaFrame, Presentation Server, and XenApp. Citrix works closely with the Windows Server team and continually adds a large number of enhancements to the base RDS technology, including the ICA protocol, HDX, load balancing, provisioning, user monitoring, etc.

These endpoints connect to a web portal called Citrix Web Interface, which acts as a broker and sends requests to application sessions called Hosted Apps on XenApp Servers using the Citrix Receiver (ICA/HDX). Citrix Receiver is a free down-

load on Citrix's website and has the broadest endpoint and OS support. The client uses a remoting protocol called ICA (Independent Computing Architecture), which is what transfers the application session from the XenApp Server to the client. In addition to the Citrix Web Interface, a newer store-like client called Citrix Dazzle allows users to select the apps they want and add them to their checkout basket, which then adds only those apps to their system. Citrix Dazzle mimics the Apple App Store functionality and has been favorably received by Citrix customers worldwide.

The Benefits of Presentation Virtualization

Presentation virtualization is a mature technology that has been around for more than 20 years, so customers have the benefit of working with a proven technology that has gone through several iterations based on a vast array of user experiences. The other benefits of presentation virtualization include:

- High density — up to 200 application sessions per server
- Endpoint types — almost any device, any operating system (when using Citrix)
- Bandwidth requirements — 50ms latency for Citrix HDX, 150ms latency for RDP, 300ms latency for Citrix ICA (non-HDX features)
- Easier provisioning — sessions deployed to end users on demand
- Increased security secure applications and data delivered centrally

Typical Requirements

Typical applications for presentation virtualization can include productivity, utilities and engineering. The components required to use this technology are straightforward and can be broken down as follows:

- Hardware (quantity varies by number of users and applications)
 - Server hardware (racks or blades, x64 processors)
 - Endpoint hardware with RDP or ICA/HDX Client (optional)
 - Citrix Access Gateway (optional)
 - Citrix Branch Repeater (optional)
- Software (quantity varies by number of users and applications)
 - Windows Server 2008 R2
 - Windows Server 2008 R2 CAL
 - Windows Server 2008 TS or 2008 R2 RDS CAL (includes App-V entitlement)
 - Citrix XenApp 6 (optional)
 - Citrix Data Store requirements: SQL Server 2005, 2008 or Oracle 11g R2 database server (optional)

Application Virtualization

Application virtualization is an umbrella term that describes software technologies that improve portability, manageability and compatibility of applications by encapsulating them from the underlying operating system on which they are executed. A fully virtualized application is not installed in the traditional sense, although it is still executed as if it were. The application is fooled at runtime into believing that it is directly interfacing with the original operating system and all the resources managed by it, when in reality it is not.

The Benefits of Application Virtualization

For users, application virtualization offers the opportunity to be flexible in the types of devices they use to access their work. They can use a thin client or a rich client and partition off their personal files and applications separately. They can access their applications from mobile phones as well. Applications can run completely isolated from one another and from the operating systems, leading to conflict-free execution on endpoint devices. For IT, this can eliminate the need for recoding and additional investment in server hardware. Application virtualization can also enable IT to deliver flexible application access to all user profiles on a wide variety of devices and platforms.

By streaming applications as well as operating systems, application virtualization has the ability to support mobile users on almost any device as long as they have access to an Internet connection. By offering users the opportunity to have a richer client, IT can support a robust user experience while isolating users' work activities from their personal activities, thereby protecting the corporate network from security threats. Workers will be more mobile, productive and happier if they can choose any device they want, whether that is a rich PC, a thin client, a notebook, a Mac or an iPad. These types of employees will typically include knowledge workers such as sales personnel, marketers, professionals and management. Application virtualization is also an effective tool for power users or technical users, such as software testers, as it allows them to have multiple virtual machines running many operating systems on one desktop, enhancing productivity and reducing costs significantly.

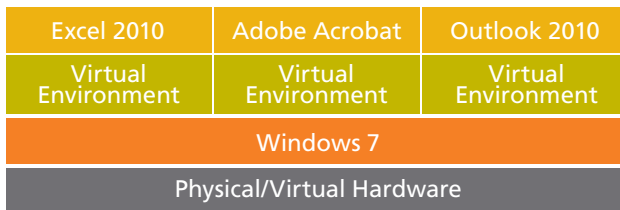
Typical Requirements

The components required to use application virtualization are straightforward and can be broken down as follows, as shown in Diagram 2:

- Hardware (quantity varies by number of users and applications)
 - Server hardware (racks or blades, x64 processors)
 - Endpoint hardware (Windows 7 OS only, including virtual desktops)

- Software (quantity varies by number of users and applications)
 - Windows Server 2008 R2
 - Windows Server 2008 R2 CAL
 - Microsoft App-V, VMware ThinApp, Citrix XenApp (streamed apps)
 - Database requirements: SQL Server (not required for ThinApp)

Diagram 2



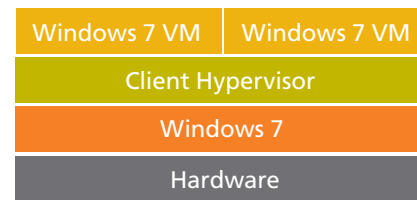
Desktop Virtualization

Desktop virtualization is a computing architecture that involves running client operating systems, such as Windows 7, as virtual machines. These virtual machines are most often stored and run in a centralized data center, though vendors such as VMware and Citrix have new technologies that permit the end user's notebook or desktop to run the virtual machine as well. Unlike presentation virtualization, desktop virtualization is not a shared execution environment; in other words, only one person will use a virtual machine at any time. This one-to-one mapping from user to virtual machine inherently increases the level of security in a desktop virtualization computing model.

Three subtechnologies fit under the umbrella of desktop virtualization, as follows, listed according to maturity:

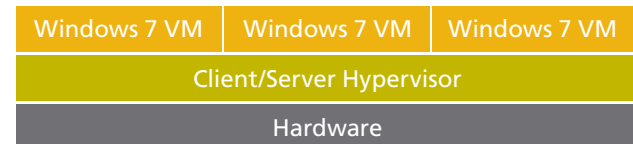
1. Type 2 Client Hypervisor (Diagram 3). This virtualization technology runs like an application on top of a general-purpose operating system, such as Windows 7 or Mac OS X.
2. Type 1 Server Hypervisor (Diagram 4). This technology is on every customer's radar today. It involves running a virtual desktop directly on a server hypervisor (hence Type 1), allowing the end user to connect via a remoting protocol to that virtual desktop.
3. Type 1 Client Hypervisor (Diagram 4). This is an emerging technology that offers the promise of delivering virtualization technology locally while providing the best user experience as well as secure access to applications. Unlike the Type 1 Server Hypervisor model, rather than running the virtual desktop on a server hypervisor, it is run directly on top of a client hypervisor on a desktop or notebook.

Diagram 3



Type 2

Diagram 4



Type 1

Because most desktop virtualization deployments use a cluster of servers and storage to run virtual machines, end users need only to be able to connect into their data center in order to access their virtual desktop. Users may have thin clients, desktops, notebooks or even smartphones as endpoints. Regardless of the endpoint used, as long as it is supported by the virtual desktop vendor, the user's desktop will look and feel the same, which makes the overall user experience seamless as users roam easily from device to device. A common-use case with virtual desktops would be an employee who works with a thin client at his or her desk in the office and then can also work from home using an employee-owned personal computer.

The Benefits of Desktop Virtualization

For users, one of the big benefits of desktop virtualization is the freedom to plug into the network at any time from any location from virtually any device as long as they can get a connection. For IT, desktop virtualization means even greater control of the IT environment, enhancing security and compliance while making processes much more consistent and streamlined to conduct training, roll out new applications and patches, and fix and maintain hardware. IT also has an opportunity to reduce its total cost of ownership by purchasing less expensive thin clients and extending their lifecycle beyond what would be typical for a notebook or rich client. Maintenance costs will go down, and training costs can be streamlined as well with either desktop or application virtualization. Major players in desktop virtualization are VMware with VMware View and Citrix with XenDesktop.

For workers who are fixed in one place, desktop virtualization can provide significant benefits in improving productivity and reducing costs. These workers can be equipped with thin clients, saving the organization money on hardware costs and extending the lifecycle of desktop clients. For workers in areas such as call centers and customer-support facilities, devices

can be easily shared among different shifts, enabling 24x7 productivity from a single device. As new workers come onboard, they don't have to be provisioned and can just begin working on any device. As changes are made through upgrades or patches or new software, everyone in the organization can be on the same page, literally and figuratively.

Typical Requirements

The components required to use desktop virtualization can vary, depending upon which type of hypervisor is used:

- **Type 2 Client Hypervisor**
 - Hardware (quantity varies by number of users and desktops)
 - Server hardware (racks or blades, x64 processors)
 - Endpoint hardware (netbook, notebook, desktop)
 - Software (quantity varies by number of users and applications)
 - Windows Server 2008 R2
 - Windows Server 2008 R2 CAL
 - Microsoft Virtual PC, MED-V, VMware Workstation, ACE, Fusion, View Client Local Mode, Parallels, etc.
- **Type 1 Server Hypervisor**
 - Hardware (quantity varies by number of users and desktops)
 - Server hardware (racks or blades, x64 processors)
 - Endpoint hardware (netbook, notebook, desktop, thin client, mobile device)
 - Software (quantity varies by number of users and applications)
 - Windows Server 2008 R2
 - Windows Server 2008 R2 CAL
 - Windows Client with Software Assurance or Virtual Desktop Access (VDA) subscription (required to access Windows 7 in a VM)
 - Microsoft Hyper-V, System Center, Citrix XenDesktop, VMware View, etc.
- **Type 1 Client Hypervisor**
 - Hardware (quantity varies by number of users and desktops)
 - Server hardware (racks or blades, x64 processors)
 - Endpoint hardware (notebook, desktop with specific virtualization technology)
 - Software (quantity varies by number of users and applications)
 - Windows Server 2008 R2
 - Windows Server 2008 R2 CAL
 - Citrix XenClient, Virtual Computer, Neocleus, etc.
 - Windows 7 licensing for this model is to be determined

Where Is the ROI?

Calculating the ROI of a client virtualization solution is rather simple if you truly understand your current TCO. However, if you don't have a good handle on this today, calculating ROI becomes an almost impossible task.

Assuming your organization clearly understands the TCO of desktop/application management today, the cost savings from deploying a client virtualization solution will differ between tangible and intangible savings, and will also differ if you deploy just one technology, all technologies or a mix of client virtualization technologies.

Tangible Savings

- Power savings from using thin clients instead of desktops
- Shorter time to resolution for help desk calls can mean reduced help desk headcount
- Fewer office visits to fix PCs means reduced desktop technician headcount
- Fewer shipments of PCs back to the office for repair means savings in shipping costs

Intangible Savings

- Better management and rollback with only a single image to manage
- More time for patch testing and release management
- Easier and faster deployment of new applications and upgrades
- More control over desktop and application security

Understanding the Risks

While client virtualization can deliver tremendous benefits to the organization through lower costs, simplified management and improved security, it is also important to understand that deploying a client virtualization solution can be complex and challenging. Many organizations with successful server virtualization projects think they can do the same thing with client virtualization, but there are actually very few similarities.

One of the important distinctions to understand right from the start is that because deploying client virtualization directly impacts the end user, managing user expectations is critical. In most organizations, users are accustomed to a rich desktop experience and don't want to lose any of the benefits of what they have, including, for example, rich graphics or the ability to stream video. Managing users and negotiating the corporate culture is equally as critical to a successful deployment. If some users learn that their desktop and all of their data are in the data center, they may become very concerned with this change and may not be supportive. Also, if the

desktop or application performs poorly, users will start experiencing poor performance. This can put a strain on the help desk and employees if the tools they need to do their jobs successfully aren't working.

Another area to consider in deploying a client virtualization solution is making sure your overall IT infrastructure is up to the task, specifically in networking and storage. Many organizations don't understand the bandwidth requirements needed to successfully deploy a client virtualization solution and, in particular, how latency can impact a remote session. The most common place where this fails is when IT "assumes" that everyone has a high-speed connection at home but doesn't actually test the throughput and latency. Not all end users will be able to initially connect without incident. Sometimes, because the corporate core and access switches aren't maintained properly, even LAN access can become an issue, especially in networks with unmanaged switches.

The bottom line: You must clearly understand how your network functions — it's unrealistic to just plug in a client virtualization solution and expect it to work immediately.

Another risk for IT to manage: When everything is centralized, what happens when the entire system fails? For example, in a desktop virtualization environment, the broker, the database or the entire storage array can fail. Some organizations believe that since they are just running desktops, they can run a storage system with little redundancy, which is less than adequate. Depending upon your user requirements, you will likely need a storage system with many spindles, a lot of I/O throughput, and full backup and redundancy.

Delivering graphics to the desktop can also be a challenge with a desktop virtualization solution. Video is becoming more critical to organizations for a variety of applications such as training videos, collaboration and video messages from corporate management. If the desktop performance isn't delivered properly — with no latency — users will be upset and unproductive. In the same vein, many organizations are utilizing unified communications solutions that involve audio, video and a wireless headset. This requires full resources at the endpoint. Plan on having a clear, concise plan in place when deploying unified communications solutions and client virtualization solutions because today you may not be able to do both at the same time.

Finally, it is important to understand the specific licensing requirements around the virtualization platform, operating system and applications. If you are not in compliance, you can be heavily fined. Always clearly understand the licensing requirements in any particular client virtualization environment, and confirm whether or not the IT department handles software licensing.

Managing the User Experience

In most cases, when you roll out a client virtualization plan, the end user's experience will change. How much it changes will depend on the technology you deploy. In any case, it is important to set the right expectations and manage the user experience so that in the end the users are happy with the change and not resistant to it.

You should plan a strategy for a rollout as you would for a normal Tier 1 migration. Have IT and help desk personnel trained and ready to answer questions. Also plan for messaging directly to end users. Position the transition as an upgrade with benefits for everyone. Avoid focusing on the technical benefits, such as the idea that everything will be centralized. End users tend to be concerned that they are being watched so be prepared to allay any fears of that nature. Another successful tactic, especially if you deploy thin clients as part of the client virtualization strategy, is to pair the thin client with dual monitors or a single big widescreen monitor.

Plan to do a proof of concept to validate that it works, and do a pilot and roll out the deployment in stages. It does not make sense to come in on a Monday and turn everyone over to the new system at the same time. It is also essential to find a champion to support your effort in each organization unit. Having a couple of pilots going on with all types of users involved will help in garnering the support of users throughout the organization. It will also help IT to gauge the performance impact on the servers and storage in the data center and to monitor how users are being affected by their new desktop solutions. If you're doing a test and a series of pilots, make it widespread — test from desktops, notebooks, iPads, iPhones, home PCs and any other endpoint device that might be supported by the deployment.

Getting Started

Figuring out which approach or approaches to take for your organization is a complicated process involving many variables. First, it's important to understand why you're even looking at client virtualization solutions — and it can't be because the pundits say you should or your vendor is pushing it. What are the challenges facing your organization and in what ways can client virtualization address them? Which users are you supporting; what are their tasks; what are their technology profiles — are they stationary, mobile, local, global? Do they have constant network access or is it periodic? What types of devices are they using for access? Also, what types of other devices and functions do they require — printers, monitors, scanners, flash keys, others?

As with any major technology initiative, it helps to have an experienced partner who is not tied in to one specific technology solution. The other advantage to having a partner

is that you will be able to deploy the technology methodically and strategically, knowing that you don't have to roll it out all at once and you can use different approaches for different parts of the business, again depending upon the needs of the business and the profiles of the workers.

A successful rollout strategy will typically involve the following steps:

1. **Assess:** Understand the user requirements.
2. **Plan:** Define the architecture.
3. **Design:** Develop detailed design and operational plans.
4. **Proof of concept:** Conduct a proof of concept analysis.
5. **Pilot:** Migrate users in multiple target pilot groups.
6. **Implement:** Roll out to target users.
7. **Monitor and manage:** Watch closely and manage the lifecycle of the solution.

Another important consideration is to review your licensing agreements. Centralizing operating systems and applications could impact your usage statistics, which might mean a reduction in the number of licenses in some areas or increases in other areas. Working with an experienced partner can help you manage through that potentially complicated process.

CDW: Your Client Virtualization Partner

CDW helps organizations reduce the cost and complexity of their computing infrastructure, freeing up financial resources for more strategic initiatives. One of the ways in which CDW accomplishes this is by constantly leveraging virtualization and optimization technology and techniques. CDW's approach includes:

- An initial discovery session to understand your goals, requirements and budget
- An assessment review of your existing environment and definition of project requirements
- Detailed vendor evaluations, recommendations, future environment design and proof of concept
- Procurement, configuration and deployment of the final solution

CDW IT: Delivering applications virtually gives us the agility we need to respond dynamically, which ultimately improves our customer satisfaction.

CDW IT maintains 5,000+ desktops and notebooks for its workforce. Because CDW understood then the challenges of endpoint management, they deployed Citrix XenApp in 1999 to deliver all their applications virtually. In 2009, as CDW opened a new office in Arizona, CDW IT was able to bring 200 coworkers online immediately, since all users were essentially using XenApp for all applications. CDW IT is now scaling out this application delivery methodology and is expected to have 2,500 users using XenApp by the end of 2010.

"The benefits of this are staggering for CDW: New applications, updates and patches can be rolled out to the entire workforce at the click of a button while maintaining security and application delivery to almost every device and operating system. This helps our agility and response to the business with precision and speed."

— Mike Pflieger, Sr. Director, IT Operations

