Options for Virtual Desktop Technology: A State of the Union

Desktop virtualization technology is evolving, as IT must address a growing number of options, management concerns and the rise in mobile computing. Start with the basics for a successful virtual desktop environment.

BY DAN BRINKMANN
Businesses today still use desktops and laptops in a traditional distributed computing model. But as business owners demand a lower total cost of ownership, better security, greater mobility and a more agile IT infrastructure, this traditional model is showing its age. As a result, IT departments are looking for new strategies and technologies to manage their end-user computing environments.

The term desktop virtualization is associated with a confusing range of options. Terminal Services, Remote Desktop Services, virtual desktop infrastructure, application virtualization and Desktop as a Service are just some of the associated technologies.

The number of desktop virtualization companies, technologies and techniques is increasing, so don’t expect this challenge to get easier any time soon. What they have in common, though, is that they run counter to the traditional imaging and patch strategies that companies have used in the past to deploy and maintain their desktop environments.

The No. 1 reason that desktop virtualization projects fail is because IT professionals often launch these projects without identifying a clear business problem for which the technology is a solution. Fresh off the heels of success with server virtualization, systems administrators may believe that desktop virtualization is the next logical step in the enterprise IT lifecycle.
Some might call virtual desktop infrastructure (VDI) a failure because it hasn’t replaced traditional desktops and laptops in the way that server virtualization replaced physical servers. It’s true that there may never be “The Year of VDI,” but most industry observers acknowledge that desktop virtualization will remain complementary to traditional desktop/laptop delivery and management technologies. Rarely does it make sense for an organization to virtualize 100% of its desktops in the data center. Instead, IT professionals should view desktop virtualization as just part of a larger IT strategy to provide the highest value to the business.

**Desktop Virtualization Use Cases**

Let’s consider some examples of common desktop virtualization use cases.

**Disaster Recovery.** As business continuity and disaster recovery plans develop, companies increasingly rely on desktop virtualization to provide on-demand access at a failover site. Traditionally, businesses interested in disaster recovery would warehouse PC inventory at an alternate facility where users could come and work in the event the primary location was unavailable.

With virtualization, IT can provision thousands of desktops in a virtual environment, quickly providing access to applications in the event that worker access to primary endpoints is not possible.

In addition, virtual desktops and modern remoting protocols enable users to gain access to their desktops and applications remotely. Now that mobile devices provide nearly ubiquitous Internet access, workers expect to be able to connect to corporate systems anywhere, anytime via multiple consumer devices. This use case provides redundancy but raises other concerns.

**Security.** As personal user devices begin to more frequently access corporate networks, IT administrators have raised questions about the security of these devices and how to handle unmanaged endpoints. The increasing mobility of users and their devices makes it harder for IT departments to manage company desktops and laptops. Viruses and spyware have become more complex and difficult to detect.

Both physical and virtual machines still have the same Windows operating sys-
Desktop virtualization can improve the security of data at rest. Company data on laptops or desktops is no longer stored in unsecured environments; it is now stored within the walls of the data center.

Applications can be isolated by using multiple operating system instances or application virtualization isolation technologies. Separate virtual desktop environments can be used to access sensitive data, providing an additional layer of separation and security.

Nonpersistent desktops can revert the desktop operating system and applications back to a known-good state. IT-controlled virtual desktops in the data center can be more reliably updated with antivirus signature files, patches and updates. Data from desktops can be backed up or collected with electronic discovery systems.

**Bring your own device.** Bring your own device (BYOD) is one of today’s technology buzzwords, but whether it will become reality for most corporate IT environments is unknown. What is known is that worker-owned devices are being brought into the enterprise, and some users prefer personal devices over corporate-provided ones.

Desktop virtualization can provide an easy path to accessing applications while relieving IT staffers from having to support the endpoints themselves. Subsidizing partial costs for users who choose to bring their own devices could reduce the capital expense of user laptops and desktops.

**Management.** Reducing the total cost of ownership (TCO) of desktops and laptops is a key objective for IT departments. Traditional desktop and laptop management systems can add significant complexity and increase the cost of supporting users.

Management of desktops and laptops can require numerous applications, including those for application deployment, inventory, OS management and antivirus protection. Supporting an increasingly mobile workforce with greater tech...
savy has made things more difficult for IT. Other concerns include less control for IT, security challenges, network issues and remote access.

**VIRTUAL DESKTOP TECHNOLOGY OPTIONS**

Before looking to the future of desktop virtualization, it is important to first understand the common methods of virtual and remote desktop delivery.

**Server-hosted virtual desktops.** This approach is commonly referred to as VDI. A server-hosted virtual desktop (SHVD) consists of a desktop operating system centrally hosted on a virtual machine in a data center. Each user has his own desktop, so there is a 1:1 mapping of users to operating system instances.

SHVD can be either persistent or nonpersistent. Persistent desktops keep all changes to the OS, app and user profile after logoff. These virtual desktops allow complete personalization by the user, including user-installed applications. Persistent virtual desktops usually lose some of the management benefits of desktop virtualization because they do not automatically revert back to a gold image.

Nonpersistent virtual desktops revert back to their gold images after user logoff or on an administrator-controlled schedule. Nonpersistent virtual desktops usually require a personalization system to maintain basic user preferences and data. Application-layering technologies are advancing the use of nonpersistent virtual desktops with the user-installed applications and personalization of persistent virtual desktops.

SHVD is accessed over the LAN or WAN using a remoting protocol such as Remote Desktop Protocol (RDP), High-Definition User Experience (HDX) and PC over Internet Protocol (PCoIP). Poor network connections can greatly reduce performance and degrade the user experience.

Major vendors offering products in this space include Citrix, Dell (via its acquisition of Quest Software), Microsoft and VMware.

**Client-hosted virtual desktops.** Client-hosted virtual desktops (CHVD) involve a Type 1 (bare-metal) or Type 2 (on top of an existing operating system) hypervisor. The hypervisor supports loading a Windows desktop operating system and masks the underlying hardware from the OS instance or instances.

In a CHVD environment, a central image is created and stored in the data cen-
This image can be checked out onto client devices, executed locally and then synced back to the data center to maintain user personalization, data and applications.

This technology is immature and still has significant challenges. Major vendors include Citrix Systems, VMware and, most recently, Microsoft. Microsoft Windows 8 includes a client hypervisor, but Remote Desktop Services doesn’t yet take full advantage of it.

**Server-based computing for app delivery.** This type of server-based computing (SBC) commonly involves Microsoft Terminal Services or Remote Desktop Session Host. Multiple users share a single underlying operating system. Instead of remoting a full desktop to the remote client, only the application is shown. This technology augments an existing desktop environment by seamlessly appearing alongside locally installed applications.

**Desktop as a Service.** Desktop as a Service (DaaS) is a delivery model in which businesses pay for their virtual desktops on a monthly basis from a service provider. The service provider takes the responsibility of deploying and maintaining the customer desktop OS, theoretically reducing the operating expenses (Opex) a business would otherwise spend maintaining it with its own IT department.

This market’s biggest challenges to date have been the Microsoft desktop OS end-user licensing agreement, which limits multi-tenancy, and the lack of service-provider licensing agreements for Windows XP through Windows 8.

This desktop delivery method is often also referred to as a cloud desktop. DaaS today is more of a consumption and payment model than a technology, although this is changing as vendors begin to develop solutions specifically for the service provider market.

SBC for application delivery is also accessed over a LAN or WAN using a remoting protocol such as RDP, HDX or PCoIP. Major vendors include Citrix, Dell and Microsoft.
Server-based computing for desktop delivery. This uses the same technology as SBC for application delivery; but instead of remotely delivering only individual applications, the entire server desktop is delivered. The server desktop is typically skinned to look and feel like a Windows 7 system using the Desktop Experience features built into Windows Server.

SBC for desktop delivery is accessed over the LAN or WAN using a remoting protocol such as RDP, HDX or PCoIP. Citrix, Dell and Microsoft are again the major vendors for SBC for desktops.

Virtual disk streaming. Physical endpoints boot their operating systems over the network from an image stored on a server. Each endpoint uses local resources such as CPU, graphics processing unit (GPU) and memory while the reads and/or writes to the disk drive are redirected to the central image. Since each endpoint uses the local hardware resources, performance is that of the native physical desktop.

Virtual disk streaming is a LAN-only technology and requires significant bandwidth of 100 Mbps to 1 Gbps. It must have low latency to each endpoint to provide access speeds similar to that for local disks. Major vendors offering solutions in this space include Citrix and Dell (via its Wyse Technologies acquisition).

Application virtualization and personalization. Application and personalization technologies don’t provide the operating system layer of desktop virtualization, but rather they can augment a traditional physical endpoint deployment or a virtual desktop delivery model.

Application virtualization. Application virtualization was initially developed to isolate applications from one another to solve incompatibility issues when running applications together. Common examples of this were applications that required different versions of Java on the machine to function correctly. Virtualizing the application in an isolated container allowed each app to see and interact only with its Java-compatible version. In some cases, this isolation can cause problems for apps that need to interoperate because they are isolated from one another by default.

Another benefit of application virtualization is the ability to stream the app to an endpoint on demand as opposed to installing via a setup.exe or .msi package.
Over time, people have deployed Citrix XenApp, Microsoft App-V and VMware ThinApp not for their application-isolation capabilities but instead to provide on-demand deployment of user and department apps.

**Application layering.** Application layering is similar to application virtualization except that it focuses on the on-demand delivery of applications from a single image that the IT department manages.

Typically, applications that are used companywide such as Microsoft Office go into the gold image, a master image for virtual machines. After that, department-installed applications are added, or separate images are built for each department. Application layering allows an organization to use a single gold image and dynamically apply a layer to add department and user apps.

Systems such as VMware Mirage (acquired when VMware bought Wanova) go beyond department- and user-installed programs and can layer operating system, application, user personalization and user data on top of an existing OS.

**Personalization.** Personalization solutions capture profile data in a Windows operating system to make it portable so that it can be applied to other Windows operating systems on demand. Personalization is extremely important in a non-persistent desktop environment because it makes your desktop feel like your desktop.

This technology is also sometimes used outside of a virtual desktop environment to reduce the amount of time it takes to replace an end-user’s PC for hardware or software maintenance. Vendors in this space include AppSense, Citrix, Dell, Liquidware Labs, Microsoft, RES Software and VMware.

**CHALLENGES OF DESKTOP VIRTUALIZATION**

Desktop virtualization can be difficult to implement and does not always save money. In addition, the user experience is not easy for IT shops to predict and measure.

**Complexity.** Desktop virtualization has increased the complexity of delivering Windows desktops and applications. The fairly simple methods in place today for image-based OS deployment, patching and personalization using Windows local...
profiles are well known and have been fairly static.

Moving to a nonpersistent delivery model to reduce TCO increases virtual desktop complexity. In order for desktop virtualization to perform as intended, many technology layers have to work in harmony.

The use of application virtualization in an effort to simplify application delivery can create its own problems, ranging from slow performance and app crashes to communication problems between virtualized and nonvirtualized applications.

Lack of user personalization of virtual desktops can result in users refusing to switch to nonpersistent desktops because they don’t work in the same way their physical desktops have worked. Additional products to properly capture personalization data can increase the complexity and cost of desktop virtualization.

For example, desktop virtualization can involve the following technology stack: storage, compute, hypervisor, virtual desktop operating system, virtual desktop applications, virtual desktop personalization, broker, remoting protocol, endpoint operating system, peripherals, endpoint applications, endpoint user personalization. All of these elements should work together smoothly, and different IT teams may be responsible for each of these layers, further increasing complexity.

**Cost.** Most desktop virtualization setups today move compute resources from the endpoint to the data center. Companies are trading the relatively low cost of a PC for a high-powered server that is stored in a power- and temperature-controlled data center.

In most deployments, enterprises are still using shared storage, and this component alone is reportedly priced, on average, at about 40% of the cost of a desktop virtualization system. Most companies now expect that capital expense costs for desktop virtualization will probably be the same as for a traditional PC deployment.

Vendors have made many promises about the Opex savings of desktop virtualization. These savings are also usually based on a nonpersistent desktop delivery model, the most difficult desktop delivery model to achieve. Replacing lower-
salary desktop technicians with tenured and highly skilled desktop virtualization administrators can erase some Opex savings.

User experience. Moving the desktop or applications from the endpoint and into the data center can undermine the user experience. Poor LAN or WAN conditions can harm the experience of remoting desktops and applications. Applications that used to run entirely local using dedicated resources can be less responsive in some cases when centralized in the data center. Applications that require offline access can complicate the design of a virtual desktop infrastructure.

THE FUTURE OF DESKTOP VIRTUALIZATION

Looking ahead at the future of desktop virtualization, the increasing use of NAND memory for storage not only reduces the cost of deploying SHVD, but also increases the rate of success that customers have. The amount of IOPS that even small amounts of NAND can handle reduces the likelihood that an undersized disk infrastructure will cause performance problems. As this technology becomes less expensive to deploy, the performance and overall cost of desktop virtualization should improve.

Virtualized GPU. In the next few years, enterprises will likely use physical GPUs installed into VDI hosts to provide virtual GPUs (vGPUs) to the virtual desktops running on them. VGPU technology has the potential to deliver near-native user experiences with video while offloading more of the workload to the endpoint, further increasing scalability.

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VGPUs would allow a virtual machine to use physical GPU resources in the same way a physical desktop would. Video rendering and encoding could be done in hardware versus in CPU, as it is today.

In addition, vGPUs could use transcoding video coder/decoders to the H.264 standard to allow for potential offload to the client as well as more efficient use of the bandwidth by transcoding down to reduce bit rates.
Change in the user workspace. Desktop virtualization offerings are evolving to include native application delivery, mobile application management, mobile device management, externally hosted applications in Software as a Service (SaaS) and “follow-me data.” Follow-me data allows users to sync their files across different platforms and devices to provide ubiquitous access to their user data. This is commonly referred to as a “Dropbox-style” solution.

As vendors add these complimentary technologies to virtual desktop products, the workspace is shifting from the Windows desktop to a vendor-provided workspace that aggregates these solutions into a single portal.

With multiple devices and an increasing number of non-Windows devices in consumer hands, the market is shifting to support heterogeneous endpoints. IT should prepare for a future in which workers gain access to internal and external applications and data, regardless of device, using brokered authentication.

Layering and personalization evolve. IT can use desktop virtualization to rapidly provision department- and user-installed applications. Personalization can provide user settings, preferences and so on across platforms, and it can be applied to any device on demand. These layers of technology can reduce the complexity and cost of using nonpersistent Windows systems.

A combination of these developing desktop virtualization technologies will allow the user experience to approach that of a native local experience or even exceed it. The more seamless the delivery of desktops, apps and data is, the more likely it is that users will accept virtualization and that IT will be successful in managing it.

THE FUTURE OF DESKTOP VIRTUALIZATION
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