

VIRTUALIZATION OF THE DESKTOP

Desktop Virtualization - Abstract

Today's computing needs require IT departments to address more PC management challenges than they did just a few years ago. Users increasingly demand access to their applications and data at any location and from any device. The fast growth of computer users who roam from one PC to another has led companies to provide access to the user's desktop from any computer in the workplace, detaching the user from the physical PC. Users are also increasing their use of personal technology at home. This increase leads them to expect similar personal configurations and technological freedoms in the workplace. Additionally, users are now more likely to use their own devices to access corporate applications, such as corporate email, from their personal mobile phones.

Infrastructure virtualization is a powerful trend in the industry today, but the concept of virtualization has been around for many years. Virtualization technology has been pursued by vendors as a framework to divide the resources of a computer into multiple execution environments using a variety of hardware and software abstraction techniques, resulting in the separation of the logical interface from the physical machine. Virtualization originated in the 1960s as a technique to optimize the use of very expensive and relatively scarce computing resources.

Desktop virtualization offers a way to extend the benefits of virtualization - better performance, lower TCO, higher security and greater flexibility - to the full desktop. Each desktop is supported by a physical PC

that creates numerous challenges including data security; update and refresh cycles; power, heat and space consumption; and the management of local packaged applications like productivity suites and browsers, as well as home-grown applications.

Much like server virtualization, virtualization desktops involves separating the physical location of a client device from its logical interface. In practical terms, desktop virtualization allows end users to access all of their data and applications without being tied down to a specific hardware device. It also allows IT departments to reduce management and support costs, along with capital expenses for desktop hardware.

Desktop Virtualization: Introduction

Companies are increasingly turning to virtualization as the answer to these new challenges. Desktop virtualization is the act of separating the different computing layers and storing some or all of them in a data center. Through virtualization, employees can access their applications and data safely over a network and the risk of data loss is minimized. On the IT side, virtualization accelerates deployment of new capabilities without needing to acquire new hardware and configure components. It also reduces application testing requirements and compatibility issues while simplifying disaster recovery and compliance.

Further, over the past few years, businesses have simplified their data center management via server virtualization technologies and achieved enormous cost benefits in the process. Now, new advances in virtualization

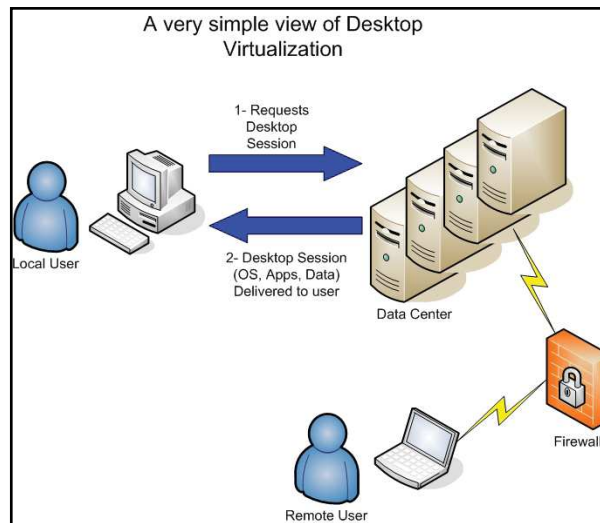
and more availability of broadband access enable companies to do the same with enterprise desktops by providing the tools necessary to rearrange how PC components interact and to choose where those components reside.

Desktop Virtualization

“Desktop virtualization” is a term used for a new approach to the provisioning, delivery, and management of user desktops in the enterprise. The main principle behind this new approach is leveraging existing and well-proven virtualization technologies to virtualize not only servers but also user desktops (the workstations).

Desktop virtualization replaces the traditional workstation/laptop model where users run all their applications and store data on their desktop devices. Instead, the entire desktop experience will be executed in datacenter servers. Although, in theory, the user experience should nearly be the same. Think of the old mainframe days when there was a huge central processing unit and users had thin terminals (monitor, keyboard, and mouse) with almost no processing power. The user’s terminal was just a way to send output to the user and to send input to the processing server.

The diagram on the right illustrates this principle in a simplified view:



Desktop virtualization is the concept of separating a personal computer desktop environment from the physical machine through a client-server computing model. The resulting "virtualized" desktop is stored on a remote central server, instead of on

the local storage of remote client; thus, when users work from their remote desktop client, all of the programs, applications, processes, and data used are kept and run centrally, allowing users to access their desktops on any capable device, such as a traditional personal computer, notebook computer, smart phone, or thin client.

The desktop virtualization model allows the use of virtual machines to let multiple network subscribers maintain individualized desktops on a single, centrally located computer or server. The central machine may be at a residence, business, or data center. Users may be geographically scattered, but all may be connected to the central machine by a local area network, wide area network, or via the public Internet.

Desktop virtualization offers advantages over the traditional model, in which every computer operates as a completely self-contained unit with its own operating system, peripherals and application programs. Overall expenses are reduced because resources can

be shared and allocated to users on an as-needed basis. The integrity of user information is improved because all data is maintained and backed up in the data center. Conflicts in software are minimized by reducing the total number of programs stored on any given machine.

Despite the sharing of resources, all users can customize and modify their desktops to meet their specific needs. In this way, desktop virtualization offers improved flexibility compared with the simpler client/server paradigm.

Limitations of desktop virtualization include potential security risks if the network is not properly managed, some loss of user autonomy and privacy, challenges in setting up and maintaining drivers for printers and other peripherals, difficulty in running certain complex applications such as multimedia and problems keeping IP addresses on users' virtual machines matched with those at the datacenter.

Types of Desktop Virtualization

There are two main variants of desktop virtualization:

Hosted desktop virtualization: This is when a server located in a data center hosts virtual machines. Users connect to the server via connection brokers and receive their user interface via standard protocols, such as Remote Desktop Protocol. VMware Inc. is among the leaders in this market. Other vendors include Citrix Systems Inc., Virtual Iron Software Inc., and Qumranet Inc.

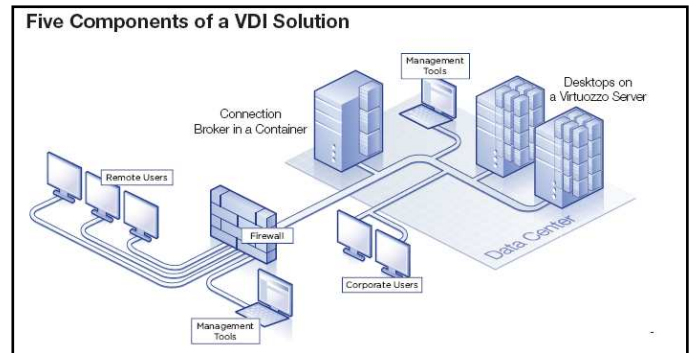
Client virtualization: In this model, “hypervisor” software installed on the client device allows one desktop to run multiple operating systems. Top vendors in this market include VMware Inc., Microsoft Corp., Sentillion Inc., and Parallels Inc.

How to achieve Desktop Virtualization?

Virtual Desktop Infrastructure [VDI]

VDI is an integrated solution of hardware, software and management tools to provide a replacement for standard desktop deployments. In the simplest terms, VDI places user desktops on a centralized server. There are five components that comprise the VDI solution. In order of user to centralized server these are: the end user access, a connection broker that manages end user to server connections, a virtualized

desktop instance, and a virtualization engine to create the desktops and finally, the



management tools to manage the virtualization.

VDI Components

End User Access

VDI changes the way the user accesses his or her desktop. Most users are not as technical as the typical administrator, so it is important to make the transition straightforward. Ideally using the VDI technology must be as easy as or easier than it was to use a dedicated workstation or laptop. It is possible to use Terminal Services or other remote access protocols on a regular PC, but many organizations decide to deploy thin client solutions to make things simple for its end users. There are several choices for thin clients, Wyse, Neoware and Computer Labs are some examples of thin client offerings. The thin client works with a hardware monitor. It is a very thin OS that boots and manages interaction with one of many remote connectivity technologies. Some thin clients come pre-packaged with a connection broker.

Connection Broker

The simple purpose of the connection broker is to manage the end user connections with the virtualized desktops. In smaller installations, a connection broker isn't absolutely necessary; however in installations in excess of 100 users, it is essential. Some examples of connection brokers are Provision

Networks Remote Desktop Broker and Leo-stream Virtual Desktop Connection Broker.

Virtualized Desktop and Virtualization Engine

The last important component of the VDI solution is the management toolset used to deploy the virtual desktops. It's critical to have a good management toolset to accompany the deployment. Software and OS patches must be simple and controllable, while desktops need to be simple to create and modeled to provide a consistent desktop to users.

VDI is a new technology that gives IT departments some choice and control over how to manage their exploding desktop infrastructure. With a set of components, deploying a VDI solution can be an effective way to centrally manage and control desktop instances and delivery.

Why Consider a VDI Deployment?

VDI is moving the computing from the end-user to a centralized location. This is a dramatic change in any organization.

The main benefits of VDI include:

- Centralized software management is much simpler and more cost effective for the IT organization.
- OS and application patches can be done quickly, reliably and managed centrally.
- Increased resource efficiencies- centralizing the processing onto a server ensure that resources are used fully and efficiently. Some desktops may only use a small percentage of processing capability, while others constantly exceed processing capabilities.
- Data security- Data backups can be completed easily and quickly without user interruption. Typically laptop or workstation backups would be done while the end-user was using the system, slowing processing and detracting from the end-user productivity. As a result,

many laptops and workstations are only backed up piecemeal, and instigated by the end-user, if at all. The server could also be a highly reliable and redundant configuration with high RAID and SAN configurations to ensure availability and data access.

- Data is secure and is only accessed by the end-user. For example, there have been instances of laptops with highly secure customer or government data that has been lost by employees.
- Creating a desktop for a new user can be done with only a couple of clicks and in less than two minutes.
- Freeing IT staff from many of the mundane and time consuming tasks of managing and maintaining the desktop computing infrastructure.

The Benefits of Desktop Virtualization

Unlike server virtualization, which got its foothold in many organizations as a way to consolidate servers, desktop virtualization doesn't aim to reduce the number of PCs. By separating physical machines from their logical interfaces, desktop virtualization aims to reduce the headaches and complexity associated with deploying and maintaining client devices, which ultimately helps IT departments reduce desktop management costs.

Hosted Desktop Benefits

In the hosted desktop virtualization model, data and applications run on servers in the data center and are essentially streamed to clients. That leads to greater security, because data and applications reside on physically secure servers rather than on more easily compromised client devices. Also, transferring much of the desktop processing workload from client devices to the data center enables IT departments to reduce wear

and tear on client hardware and thereby extend its life span.

In addition, hosted desktops enable IT departments to improve support. With traditional desktop computing, the IT department must dispatch a technician every time a client device won't start properly. With virtual hosted desktops, however, a technician can rebuild the entire operating system without ever setting foot outside the data center, and have the end user up and running in minutes. That means increased productivity for IT employees and end users alike.

Moreover, unlike "dumb" terminals that deliver the same plain vanilla computing experience to everyone, virtual hosted desktops support customization. Just like a regular PC, virtual machines reflect users' personal operating system and application settings. They can also store personalized screen savers and digital music collections.

Client Virtualization Benefits

The client virtualization model of desktop virtualization delivers equally compelling benefits. For instance, IT departments can use client virtualization to isolate confidential data and applications within discrete virtual machines. That helps protect the data from hackers if they compromise a client device's operating system. Similarly, IT administrators can assign different security restrictions to virtual machines based on the sensitivity of the data they contain. For example, they can configure some virtual machines to bar users from copying data onto thumb drives and other portable storage devices, while configuring other virtual machines more permissively.

For end users, client virtualization means greater flexibility, since they can run multiple operating systems and thereby accommodate both legacy applications and

newer systems. A company that uses a homegrown application incompatible with Windows Vista, for example, no longer has to rewrite the software before upgrading to Microsoft's latest operating system. Using client virtualization, the company can simply run the application on its Windows Vista PCs inside a Windows XP-based virtual machine. Client virtualization is also an ideal model for organizations that allow employees to use their laptops for both work and personal use. IT departments can create different corporate and personal images on separate virtual machines, and impose stringent security controls only on the corporate image. That enables companies to remain in compliance with government data privacy regulations while still giving employees the freedom to use their computers for personal tasks as they wish.

Challenges of Desktop Virtualization

As with any technology, desktop virtualization doesn't come without trade-offs. For organizations considering hosted desktops, client virtualization, or a combination of the two, it's necessary to first understand desktop virtualization's limitations.

Hosted Desktop Virtualization Challenges

- Most networks aren't powerful enough to deliver rich graphics, such as those offered by the aero interface in Windows Vista, to a virtual hosted desktop.
- Virtual hosted desktops are server-based and delivered to end users over the network. If the network goes down, therefore, users will be unable to access their desktops.
- Virtual hosted desktops require significant bandwidth, and the ratio of users to servers is not as high as in other client computing models. As a result, some

organizations may need to make costly upgrades to their servers, storage, and network infrastructure before rolling out desktop virtualization.

- End users may experience latency when operating their virtual desktops. Remote workers in particular may experience poor performance if their virtual hosted desktops are delivered across a wide area network.

The best way to address these challenges is to deploy hosted desktops only to appropriate users. Traditional target users for virtual hosted desktops are workers who use their computers for very specific tasks that are not knowledge-intensive, such as employees in call centers and administrative workers. Remote and mobile workers can be good fits for hosted desktop virtualization too, provided they have access to high-speed network connections.

Client Virtualization Challenges

Client virtualization has its challenges as well. For one, running multiple virtual machines simultaneously requires more powerful client hardware, particularly in terms of processing and memory. As a result, organizations must often make up-front investments to get their desktops “virtual machine ready.” Additionally, end users sometimes experience degraded performance when running applications not native to their client device’s base operating system. For example, some Apple Mac-based systems may not operate as speedily on a Microsoft Windows-based PC, even when they’re run in a Mac-based virtual machine.

To overcome these challenges, organizations should carefully assess where implementing client virtualization makes sense. Traditional use cases for this model include technical end users, such as software testers. Client virtualization enables them to have

multiple virtual test machines with multiple different operating systems running on one physical desktop. Employees who need to work with applications on incompatible platforms can also benefit from client virtualization, as can contract workers who need to access a customer’s network through their own PCs. IT departments can simply create virtual desktops for them with all the applications and data they require. Accessing that hosted desktop through a virtual machine allows contractors to keep the customer’s applications and data separate from their own.

Benefits of virtual desktop computing

- **Maintain the Windows desktops and builds from one central location**
 - No need to visit physical machines to install or update software or change configuration.
- **Support is improved by shadowing sessions and watching the user’s steps**
 - Use RDP tools or the VMware server console to follow what the user is doing when giving support remotely, or take control of the machine.
- **Easy recovery, replacement of machines.**
 - Blue screen, dead OS, no problem! Simply delete the virtual machine and replace it in minutes rather than hours. No need to physically collect a machine.
- **Centralized control, shutdown or restart machines remotely**
 - If a user changes department, simply change the connection profile for that user, allowing them to access the appropriate department build Shutdown or restart a client machine remotely
- **Manage your pool of machines**
 - Add or remove virtual desktops as needed in a few minutes. No need to wait for hardware to arrive, when staff changes occur.
- **Lower costs**
 - Old PCs and low cost thin clients can be used, as the processing is done by the server not the client

- No difficult Terminal Server management, 3rd party utilities needed
- No Terminal Server CAL costs
- Reduced support and time administering physical desktops.

- Difficulty in running certain complex applications such as multimedia
- Increased downtime in the event of network failures
- Complexity and high costs of VDI deployment and management

Limitations of Desktop Virtualization include:

- Potential security risks if the network is not properly managed
- Some loss of user autonomy and privacy
- Challenges in setting up and maintaining drivers for printers and other peripherals

Notable providers:

- VMware View
- Citrix XEN Desktop
- Wyse
- Microsoft Remote Desktop Services and/or Terminal Services

CONCLUSION

Augmenting traditional PCs with a powerful and cost-effective thin computing alternative makes good business sense for many organizations. Particularly when budgets are tight, IT resources are scarce, and security is a concern, consolidating desktop environments in the data center is a solution well worth considering.

Using virtualization technology in the server room and clients on the desktop, companies reduce maintenance and support costs while users continue to enjoy the same desktop experience as with PCs. With this approach, organizations can deliver secure, isolated desktops that are always on, accessible from anywhere and easy to set up and maintain.

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