

Benefits of the Virtual Desktop on Enterprise Networks

A white paper by
Wyse Technology Inc.

WYSE
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Abstract

The personal computer revolution is far from over, but enterprises are rightfully questioning the high maintenance costs, endless replacement cycles, security vulnerabilities and high energy costs that plague the standard networked PC. A breakthrough in thin computing now promises to reduce the challenges associated with distributed networked PC deployments while providing end users improved access to all of their business applications.

Called Virtual Desktop Infrastructure, or VDI, this solution combines all of the performance, reliability, and TCO benefits of the latest thin client workstations from Wyse Technology, with powerful virtualization software from VMware running on centralized servers. The VDI alternative to PCs is explored in depth in this white paper.

Information technology and business managers will learn how Virtual Desktop Infrastructure can be used to:

- Increase security;
- Improve the user experience;
- Deploy full PC desktops on centralized servers;
- Reduce PC maintenance costs; and
- Set up workgroups and entire departments in minutes

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DESKTOP COMPUTING TODAY

Personal computers have so revolutionized the enterprise that it would be difficult to envision life without them. However the productivity that many organizations enjoy from running their applications on traditional PCs comes at a considerable cost. Many of these costs have been well documented over the years, but additional hidden costs are more recently coming to light. Expensive hardware replacement cycles are nothing new, for example, nor is the need in many organizations for a dedicated help desk and IT staff to setup, manage, maintain and upgrade user equipment. Tougher to quantify issues that must now be addressed include security and compliance issues around unprotected desktop and laptop machines and privacy issues around sensitive client information that's stored locally. Data loss costs U.S. businesses more than \$18 billion a year, according to a Pepperdine University study. That 2003 study is the most recent estimate available, but author David Smith, an associate economics professor at the university says the number is probably much higher today. The time and money it takes to acquire, configure and deploy standard PCs is also gaining consideration in today's more nimble and competitive global markets. Furthermore, as energy costs skyrocket, the energy inefficiencies of standard PCs and desktop computers are under close scrutiny.

The Thin Computing Alternative. With as much as 80 percent of IT's budget typically allocated to maintenance, it's no surprise that alternative approaches to standard PCs have arisen. Thin computing fits into this camp. While still providing access to desktop applications and data that people need to do their jobs, thin computing centralizes all of the data and software in powerful servers at one or more strategically selected locations. This enables standard PCs to be replaced by less expensive, more reliable and more secure thin clients. With no local operating system or applications to install and patch, maintenance and support costs go down while end users enjoy the same desktop experience as with PCs. Equally important, thin clients are much easier to deploy.

The traditional approach to thin computing can be described as "shared services." It works by centralizing processing on servers running multiuser systems software like Citrix XenApp, Microsoft Terminal Services, or Sun Secure Global Desktop. These solutions deliver popular applications such as Microsoft Office, SAP, and Oracle to the desktop. With shared services, applications run simultaneously on the server which pushes the user interface updates in real-time to individual users seated at thin client workstations.

A more recent thin computing approach, called "streaming," delivers the entire operating environment—both operating system and applications included—to the desktop device over a network. With streaming technology, the operating system and applications are delivered bit-by-bit to a highly secure, "stateless" desktop, where they run locally on each user's CPU. The software is delivered incrementally and on demand, giving each

user only what they need at any one time. Wyse WSM, a powerful thin-computing software solution, delivers operating system and applications on demand to zero client computing devices. Able to deliver full, rich operating systems like Windows XP Professional, it delivers the power and flexibility of a PC to the user while giving IT the manageability they want from a thin-computing infrastructure. With the flexibility to deploy applications independent of the operating system, Wyse WSM allows customers to standardize operating system images across their organization and deliver applications based on user roles and responsibilities. Administrators can also easily provision new applications or updates to existing applications without having to modify the operating system image.

Because applications execute locally as they do in the current PC model, streaming solutions work best with newer thin workstations equipped with faster processors and RAM such as the powerful **Wyse V Class family of Thin Clients**. These systems are compatible with a wide range of enterprise applications. In addition, they can offer performance comparable to a desktop PC, even for multimedia applications such as Windows Media Player or QuickTime.

Enter Virtualization. Another recent approach detailed further in this white paper is desktop virtualization. In this case, a thin layer of software such as VMware's Server Virtualization technology is inserted between the server hardware and the operating system. This virtualization layer supports the management of multiple virtual machines on the server, each of which can be thought of as a tightly-isolated environment with its own OS and applications.

Virtualization software on the server opens many doors. IT managers, for example, can use it to run Windows, Linux, Novell Network and Solaris operating systems on the same server at the same time. However, one of the most useful applications of the technology is to enable enterprise desktops running on multiple, sever-based virtual machines. When VMware's Server Virtualization software (Virtual Infrastructure) and VMware's Connection Brokering Software (Virtual Desktop Manager) is coupled with inexpensive, thin clients like the Wyse V10L, a powerful new form of thin computing arises. This solution, called Virtual Desktop Infrastructure (VDI) and available from Wyse Technology, works by assigning each thin client to its own virtual machine on the server.

Like shared services, the VDI user experience is fairly similar to a standard PC. However, one key benefit that VDI delivers is that Windows XP Professional executes independently for each workstation in its own dedicated virtual machine. In this way, no two users' applications can conflict with one another. This also offers better application compatibility as end user applications are written to work best on a desktop operating system like Windows XP Professional. What's more, with desktop environments consolidated within the data center, organizations can deliver secure, isolated desktops that can be dynamically powered on or off. And each thin client is centrally managed and accessible from

anywhere on the network.

INSIDE THE VDI INFRASTRUCTURE

To better understand how VDI can help companies deliver end-user desktops without the limits of physical PCs, it helps to review a basic network installation in the data center. Playing a key role is the server where the desktop virtual machines are hosted on any x86-based hardware running VMware Virtual Infrastructure software. Packaged together, the server hardware and software is called the VMware ESX server. In general, sizing up the size and speed of this server is a function of the number of attached clients, anticipated network traffic and related end user application load factors. For example, a midrange server with 4 dual core processors and 32GB of RAM would be well-suited for an enterprise with up to 65 thin client workstations attached. Adding an inexpensive iSCSI or NFS shared storage system for advanced features like vMotion and Dynamic Resource Scheduling would round out the configuration.

The Proper Protocol. Establishing the server's connection with the thin clients is the job of a remote desktop protocol such as Microsoft's Remote Desktop Protocol, or RDP. While other protocols are and will be offered, RDP is a popular choice for VDI as it is bundled free inside Windows XP Pro and Windows Vista. RDP also supports many different network topologies and LAN protocols. Other remote desktop protocols in use include ICA, the sophisticated Independent Computing Architecture from Citrix, and VNC, an acronym for Virtual Network Computing. Either ICA or VNC makes it possible to interact with a properly configured computer or virtual machine from any device on the network. Knowledge workers frequently need access to multimedia applications, such as computer-based training, video conferencing, intelligent hypermedia systems, groupware support, and informal media spaces that enable geographically dispersed groups to collaborate effectively. Increasingly, they'll also be turning to multimedia applications that help them to deal with large amounts of interrelated information through visualization, and to manipulate and access information quickly and easily across organizational boundaries. While Terminal Services and Citrix XenApp are great for task workers, VDI has the power and application compatibility profile to meet the needs of knowledge workers. In the case of knowledge workers, the user experience needs to be exceptional, not only with respect to the range of applications available, but also to the sophistication of those applications. Wyse has met the needs of the sophisticated knowledge worker via the Wyse TCX product suite. The Wyse TCX product Suite is comprised of Wyse TCX Multimedia, Wyse TCX Multi-display and Wyse TCX USB Virtualizer products. In a VDI-based deployment, Wyse TCX Multimedia software can provide rich multimedia playback capabilities, Wyse TCX Multi-display streamlines the user experience of an

end-user while working across multiple screens, and, Wyse TCX USB Virtualizer enables the sharing and discovery of local USB devices plugged into Wyse thin clients as if they were connected directly to the virtual desktop.

The Connection Broker. Another key software technology, called a connection broker, simplifies the IT and user experience by acting as a traffic cop between the physical user devices and the virtual desktops residing on the server. Available from several vendors including VMware, the connection broker provides the seamless power-on connection and reconnection experience for users as they interact with various virtual machines on the server.

Thin Client Hardware. Completing the connection to the server's virtual machines is a desktop workstation. While a standard PC may be used for this purpose, most companies that embrace thin computing do so as an alternative to PCs (see sidebar, "The Thin Computing Advantage"). They know that adding even one PC to a thin computing network introduces unnecessary expense and risk. A better choice is a cost-effective workstation such as the Wyse V10L Thin Client, which combines excellent performance, low power consumption and standard PC connections like USB ports in one compact container.



Wyse V10L Thin Client

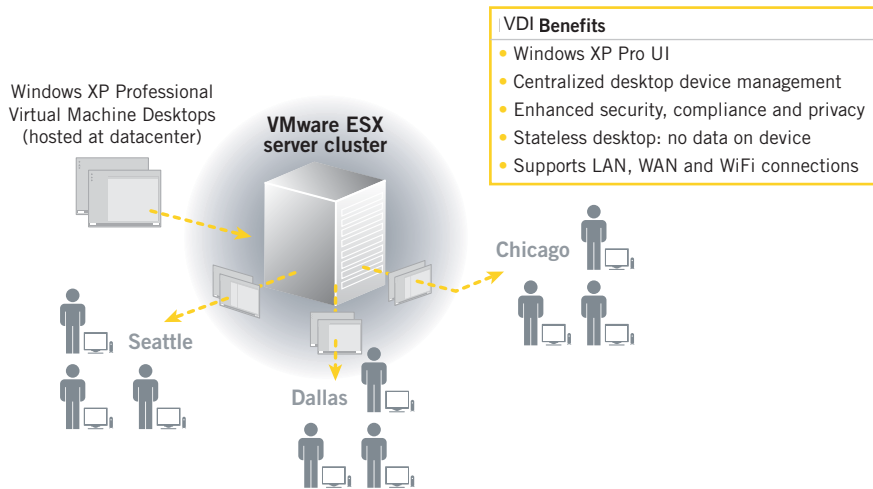
The Thin Computing Advantage

	Thin Client	PC
Usability	<ul style="list-style-type: none">• Runs standard business applications	<ul style="list-style-type: none">• Runs standard business applications
Security	<ul style="list-style-type: none">• Secured at server	<ul style="list-style-type: none">• Secured at desktop
Manageability	<ul style="list-style-type: none">• Easy to use and support	<ul style="list-style-type: none">• Easy to use
Availability	<ul style="list-style-type: none">• Always on	<ul style="list-style-type: none">• Only when at desktop
Reliability	<ul style="list-style-type: none">• 180K – 300K hours MTBF	<ul style="list-style-type: none">• 20-30K hours MTBF
TCO	<ul style="list-style-type: none">• Pay for use, low cost to IT and the business	<ul style="list-style-type: none">• Pay for convenience, high cost to IT

Source: Wyse Technology Inc., 2006

What makes the Wyse V10L a great match for VDI is the built-in, optimized Wyse Thin OS software. It delivers RDP session performance several times faster than other embedded operating systems requiring more powerful and expensive hardware. And because the Wyse V10L workstations are stateless—meaning no data is stored locally on them—and the Wyse Thin OS software does not have a publicly exposed API that can be exploited by hackers, this solution offers greater security and protection from viruses. The Wyse Thin OS software also provides built-in support for the Wyse TCX product suite, enabling the best-in-class end user experience in a VDI deployment.

Virtual Desktop Environment



Source: Wyse Technology Inc., 2006

BENEFITS OF A VIRTUAL DESKTOP STRATEGY

Most organizations considering a thin computing solution have already made significant investments in legacy hardware and software such as PCs, servers and networking gear. While much of this equipment can be leveraged for thin computing, some additional hardware and software may be necessary to reap the full benefits of the thin computing approach. Fortunately, the business and operational benefits are often considerable for end users and IT administrators alike.

How End Users Benefit. How End Users Benefit. By deploying virtual desktops, the user is provided with a working environment no different than what they already use on a PC. Because each virtual machine is self contained, users logging into Windows XP are presented with their familiar Windows applications and customized desktop environment like wallpaper and color schemes. But because their desktop session is now centralized, they gain the added capability of being able to access their desktop from anywhere and at any time—including from another network connection at work or to catch up on work from home.

How IT Benefits. How IT Benefits. Though users may hardly notice a difference, an IT administrator has much to gain from the technical merits of VDI and, by extension, so does the overall business. Among the most important technical traits of virtualization are the following, each of which brings a number of business benefits explored in greater detail below.

1. Partitioning—The ability to divide up a server's resources so that multiple virtual machines can run simultaneously and independently on a single physical server is

referred to as partitioning. This allows organizations to consolidate underutilized servers and reduce the number of desktop PCs that need to be supported;

2. Encapsulation—Everything about a virtual machine, including the operating system and applications, is stored in files. So making, copying and moving virtual machines on the server is as simple and dynamic as copying and moving files and directories;
3. User Isolation—Because virtual machines run independently of one another, crashes or viruses affecting one virtual machine don't affect other virtual machines running on the same server; and
4. Hardware Independence—The VMware virtualization layer abstracts the hardware from the OS and applications. As a result, virtual machines don't care what the actual hardware is, freeing IT to choose what servers and vendors to use in the data center.

Here are a few of the operational and business benefits that data center administrators can expect by implementing VDI.

Data Center Consolidation. Studies consistently show it is more cost effective to manage fewer servers running at higher capacity than larger numbers of servers that are under-performing. Thanks to partitioning, VDI helps IT managers to consolidate multiple servers and to better utilize those that are already deployed. By consolidating full desktop environments on servers, organizations are better positioned to quickly add new users or to recreate an entire workgroup or department in the event of a disaster. In the event of mergers and acquisitions, organizations can quickly bring new employees up to speed without any legacy full desktop hardware provisioning downtime.

Easy Software Maintenance. One of the biggest drains on maintenance budgets is the frequent need to patch the operating system and applications on PCs in multiple locations. In a thin computing VDI environment, this task becomes much easier as multiple files can be quickly updated on the server. Patching and migrating a standard virtual machine image with common virtual hardware is fast, efficient and completely transparent to users.

Wyse WSM can also be used in conjunction with VDI to deliver software on demand to virtual machines or virtual machine images thus leading to further standardization of patch management tasks.

Overview of the Virtual Desktop

Manageability	Accessibility	Responsiveness
<ul style="list-style-type: none"> – Standardized desktops on common virtual machine images – Virtual machines are always connected and powered on, enabling easy software updates – Complete hardware independence – Improved resource management 	<ul style="list-style-type: none"> – Remote access to complete desktop environment from inexpensive thin workstations – Instantly access virtual desktops at anytime since they are always on and available – Safe and secure access for each user to their favorite programs maintaining user preferences 	<ul style="list-style-type: none"> – Easily provision entire desktops by simply creating or copying files – Quickly recover desktops from crashes or disasters by deploying a new virtual desktop to a user – Troubleshoot desktops through virtual machine snapshots and quickly resolve or reprovision new desktops without the need to send help desk personnel to physical user location

Source: Wyse Technology Inc., VMware, 2006

Scalable and Portable. While software developers find partitioning useful for building and testing systems under multiple environments, an even bigger benefit for many organizations is that each virtual desktop session is independent of the physical hardware and is therefore easy to move and scale. With encapsulation, each virtual machine is stored in a small set of files that are independent of the physical hardware. Because everything is stored in one place—including the hardware setup, BIOS configuration, memory state, disk state and CPU—administrators can copy, save and move virtual machines wherever and whenever needed by simply manipulating a few files. As a result, an entire workgroup can be set up and configured in a matter of minutes.

Secure. With virtual machines isolated from one another, a crash or failure in one virtual machine will not affect the other virtual machines on the same server. Viruses and worms that somehow infect one partition are isolated to just that virtual machine. It's the same as if each virtual machine were running on a separate physical box. This enables IT administrators to use resource controls such as VMware's Virtual Center software tool to provide performance isolation. Operators can specify minimum and maximum resource usage for each virtual desktop session to ensure that one virtual machine

cannot starve other virtual machines on the same server by taking over all resources. In short, an error on one VDI desktop will not affect any other desktop.

Vendor Independent. Because virtual machines run on top of the virtualization layer, they "see" only the virtual hardware presented by the virtualization layer. This virtual hardware is the same regardless of what the physical server is. As a result, a virtual machine can run on any x86 server without modification, breaking the ties between the OS, hardware and applications that have limited IT's options in the past. Furthermore, any migration to new or different server platforms does not change the user experience.

VDI AT WORK IN THE REAL WORLD

VDI is a relatively new form of thin computing but large enterprises are already using it productively. The following user case stories demonstrate how the technology is being used today in two real business scenarios.

Software Developer Desktops. Software Developer Desktops. Many companies today outsource some or all of their software development to control costs. To enable all developers to work efficiently as a team in a distributed shop of local or offshore developers, companies are often forced to create a duplicate infrastructure for each group of programmers. Doubling up on the number of PCs and software to support this is not uncommon.

With VDI solutions, organizations can now provide all developers access to multiple environments running on one set of centralized servers. A large U.S.-based health insurer is a case in point. Faced with a business mandate to outsource IT activities but to keep all data resident in the U.S. for compliance reasons, management needed a cost-effective way to enable off-shore programming. With a VMware ESX server already installed, the company elected to set up a pool of virtual machines which it now uses for all development and testing purposes. Besides saving money and equipment with VDI, the company also credits the technology as an easy way to support legacy operating systems.

Call Center Outsourcing. Call center services are also frequently outsourced to lower cost global providers. The cost of labor is typically low overseas, but the up-front expenditures to build a support infrastructure can be high. In addition, managers are often challenged to ensure security in a complex environment. Such was the case with a large insurance company in the U.K. which due to growth needed to expand its service center in India and reduce costs. An additional challenge facing the company was to find a hosting solution that would be faster than running the applications over a WAN, where performance was deemed unacceptable. Ultimately the insurer chose a VDI solution to host the desktops on an ESX server infrastructure in the U.K. Optimized to save electri-

cal power and space, the solution was rolled out to a new call center in India with 850 users. Call center operators in India now enjoy PC performance comparable to their colleagues in Europe, paving the way for both groups to work more productively and maximize resource sharing.

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 through VDI is a solution well worth considering.

Using VMware's virtualization technology in the server room and Wyse thin clients on the desktop, VDI can help 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.

Appendix A – About Wyse Technology Inc.

Wyse Technology is the global leader in thin computing. Wyse and its partners deliver the hardware, infrastructure software, and services that comprise thin computing, allowing people to access the information they need using the applications they want, with better security, manageability, and at a much lower total cost of ownership than a PC. Thin computing allows CIOs and senior IT professionals to reduce costs, manage risk, and deliver access to information. Wyse partners closely with industry leaders Microsoft, Citrix, VMware, and others to achieve this objective. Wyse is headquartered in San Jose, California, with offices worldwide.

For more information, visit the Wyse Web site at <http://www.wyse.com> or call 1-800-GET-WYSE

Appendix B – About VMware

VMware (NYSE: VMW) is the global leader in virtualization solutions from the desktop to the datacenter. Customers of all sizes rely on VMware to reduce capital and operating expenses, ensure business continuity, strengthen security and go green. With 2007 revenues of \$1.3 billion, more than 120,000 customers and nearly 18,000 partners, VMware is one of the fastest growing public software companies. VMware is headquartered in Palo Alto, California, and on the web at www.vmware.com.



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