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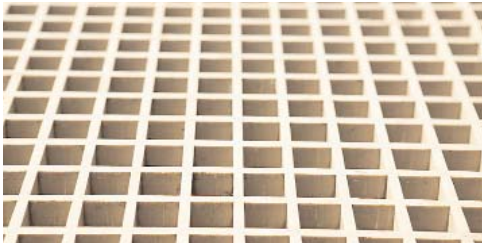
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## **Benefits of the Virtual Desktop on Enterprise Networks**

Introducing Enterprise Desktop Virtualization

A white paper by  
Wyse Technology Inc.

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**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 and security vulnerabilities that plague the standard networked PC. A breakthrough in thin computing now promises to end the PC monopoly on the desktop while giving users improved access to their favorite productivity applications.

Called Enterprise Desktop Virtualization, or EDV, this solution combines all of the performance, reliability of support benefits of the latest thin client workstations from Wyse Technology, the leading provider of thin computing systems, with powerful virtualization software from VMware running on centralized servers. The EDV alternative to PCs and conventional PC networks is explored in depth in this white paper.

Information technology and business managers will learn how Enterprise Desktop Virtualization can be used to:

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

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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 have been well documented over the years while more 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 manage and maintain 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. 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.

**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 computing networks are much easier to deploy and manage.

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 Presentation Server, 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 screens in real-time to individual users seated at thin client workstations. In general, shared services work well for about 80 percent of a company's applications.

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.

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. But in return, these systems are compatible with a wide range of enterprise applications. In addition, they can demand less network bandwidth and to users offer performance comparable to a desktop PC, even for multimedia applications like 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 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 container with its own operating system 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 Virtualization software is coupled with inexpensive, thin clients like the Wyse S10, a powerful new form of thin computing arises. This solution, called Enterprise Desktop Virtualization (EDV) and available from Wyse Technology, works by assigning each thin client to its own virtual machine on the server.

Like shared services, the EDV user experience is essentially the same as a standard PC. However, one key benefit that EDV 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. What's more, with desktop environments consolidated within the data center, organizations can deliver secure, isolated desktops that are always on. And each thin client is centrally managed and accessible from anywhere on the network.

## **INSIDE THE EDV INFRASTRUCTURE**

To better understand how EDV 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 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

network attached storage system (NAS) for applications and files 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 EDV as it is bundled inside Windows XP Pro and 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.

**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, the connection broker provides the seamless power-on connection and reconnection experience for users as they interact with various virtual machines on the server. Not all thin client workstations work equally well with this technology. For best results, use a desktop device that is specifically aware of these connection brokers.

**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 S10 Thin Client, which combines excellent performance, low power consumption and standard PC connections like USB ports in one compact container.



**The Thin Computing Advantage**

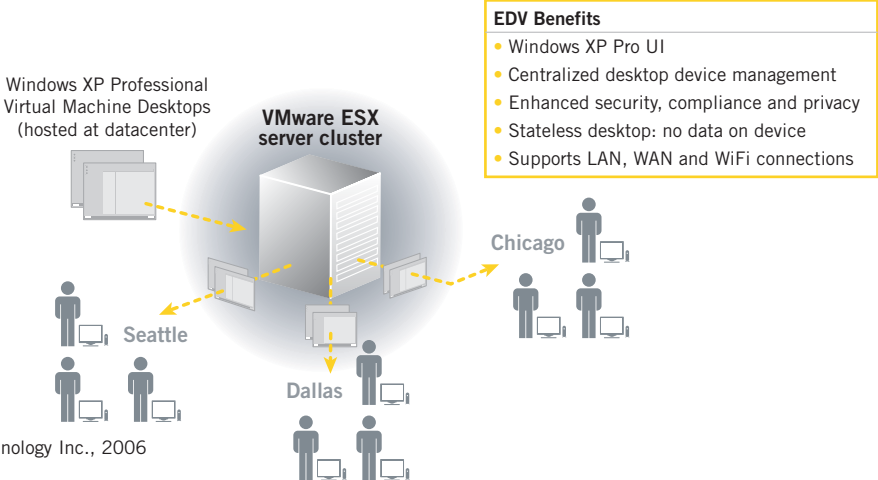
	<b>Thin Client</b>	<b>PC</b>
Usability	<ul style="list-style-type: none"> <li>• Runs standard business applications</li> </ul>	<ul style="list-style-type: none"> <li>• Runs standard business applications</li> </ul>
Security	<ul style="list-style-type: none"> <li>• Secured at server</li> </ul>	<ul style="list-style-type: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

Source: Wyse Technology Inc., 2006

What makes the Wyse S10 a great match for EDV 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 S10 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.

At less than 7 inches tall and 1.38 inches wide, the Wyse S10’s small footprint is an important feature where space is at a premium. The S10 includes a small stand for placement next to a monitor as well as a monorail system for mounting the device behind a flat screen or onto a wall, desk, cash register or any other surface where space is tight.

**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 like 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.** 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, assuming external Internet access is allowed.

**How IT Benefits.** Though users may hardly notice a difference, an IT administrator has a lot to gain from the technical merits of EDV 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 under-utilized 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 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 Enterprise Desktop Virtualization.

**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, EDV 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.

**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 EDV 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 totally transparent to users.

#### Overview of the Virtual Desktop

Manageability	Accessibility	Responsiveness
<ul style="list-style-type: none"> <li>– Standardized desktops on common virtual machine images</li> <li>– Virtual machines are always connected and powered on, enabling easy software updates</li> <li>– Complete hardware independence</li> <li>– Improved resource management</li> </ul>	<ul style="list-style-type: none"> <li>– Remote access to complete desktop environment from inexpensive thin workstations</li> <li>– Instantly access virtual desktops at anytime since they are always on and available</li> <li>– Safe and secure access for each user to their favorite programs</li> </ul>	<ul style="list-style-type: none"> <li>– Easily provision entire desktops by simply creating or copying files</li> <li>– Quickly recover desktops from crashes or disasters by deploying a new virtual desktop to a user</li> <li>– Troubleshoot desktops through virtual machine snapshots and quickly resolve or reprovision new desktops</li> </ul>

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 hours.

**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.

## **EDV AT WORK IN THE REAL WORLD**

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

**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 EDV 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 an EDV solution to host the desktops on an ESX server infrastructure in the U.K. Optimized to save electrical 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 EDV is a solution well worth considering.

Using VMware's virtualization technology in the server room and Wyse thin clients on the desktop, EDV 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 the Authors**

Formerly managing editor of Datamation magazine, Paul Pinella writes frequently about information technology and the Internet. He may be reached at [info@bigskypr.com](mailto:info@bigskypr.com).

Ashwin Kulkarni and Jason McGeogh, both of Wyse Technology Inc., also contributed to this white paper.

## **Appendix B – About Wyse Technology Inc.**

Wyse provides the hardware, software and services that shift computing complexity to the network, liberating IT departments from unnecessary support and maintenance functions, empowering users to be more productive in their jobs, and protecting and improving access to critical information and business applications. Headquartered in San Jose, Calif. with offices worldwide, Wyse has been #1 in thin-client market share for the last 7 years the industry has been tracked. A pioneer in thin client computing, Wyse offers a family of thin client workstations designed to match a wide variety of client needs. This includes workstations optimized for use in networks based on shared services, software streaming and desktop virtualization.

## **Appendix C – About VMware**

Headquartered in Palo Alto, Calif., VMware was founded in 1998 to bring virtual machine technology to industry-standard computers. VMware delivered its first product, VMware Workstation, in 1999 and entered the server market in 2001 with VMware GSX Server and VMware ESX Server. With the launch of VMware Server in early 2006, VMware introduced the first free commercially available virtualization products for users new to virtualization. More than 4 million users and 20,000 corporate customers of all types and sizes use VMware software, including 99 of the Fortune 100 companies.



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