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WHITE PAPER

Virtualization Moves from the Back Office to the Front Office

Sponsored by: Neoware*

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IDC OPINION

PC prices may be on the decline, but the costs associated with managing PCs in medium-sized and large business environments continue to rise as a percentage of a PC's total cost of ownership. In fact, the total cost associated with managing PCs can be $1,000 per PC per year or even higher.

Much of this cost is associated with security concerns: patching the operating system (OS) and applications on each system; updating antivirus, antispyware, antispam, and firewall definitions on each system; backing up the data; and more. The recent release of Microsoft's Windows Vista operating system also highlights the incremental costs of implementing upgrades across organizations. In addition, IT managers share many concerns regarding regulatory compliance, data theft, and loss of devices, particularly notebook PCs. The bottom line: It doesn't appear that the cost of supporting the traditional desktop or laptop PC will decline anytime soon.

As a result of these cost and security issues, an increasing number of companies are considering alternative client devices and new types of infrastructure systems, such as enterprise thin clients and virtualized servers running client sessions with streaming software applications. These new centralized computing architectures may sound confusing initially, but they are actually straightforward implementations of technologies, such as virtual servers and image streaming, that have been available for several years. Best of all, these virtual client solutions provide the simple and easily understandable benefits of cost and security risk reductions from a centralized computing model while maintaining the dynamic, flexible, and compatible nature of individual PCs.

IN THIS WHITE PAPER

IDC discusses new opportunities for reducing client management costs and improving enterprise security while increasing resource utilization through the use of new enterprise architectures enabled by virtual servers, streaming desktop PC images, and enterprise thin clients: a combination that creates virtual clients.

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* Note: Neoware was acquired by Hewlett-Packard in October 2007, after this White Paper was written.

SITUATION OVERVIEW

In medium-sized and large organizations, the most dramatic changes in IT environments over the past several years have happened behind the scenes in back-office datacenters. Most notably, server virtualization, or the concept of taking a single physical computing device and having its capabilities split into what appear to be multiple independent computing devices, is completely reshaping the server market. An increasingly large percentage of server deployments are now using virtualization, and the number and type of servers being used in enterprises are changing dramatically. Essentially, more sophisticated and more powerful servers are being put into service, but in lower numbers.

Over the next few years, however, we believe some of the most dramatic impacts will come in the front office where desktop and notebook PCs reside. Specifically, we expect the concept of client virtualization to play an important role in the reshaping of client platforms and how they interact with today's virtualized server infrastructure.

Server virtualization is a well-known, well-understood trend in today's corporate and institutional datacenters. Virtual servers leverage the available computing and storage resources found in those datacenters. Client virtualization builds on that trend by utilizing some of those capabilities for the creation of virtual machine client workloads. Specifically, with client virtualization, servers running virtualization software, such as VMware's ESX Server, create multiple independent virtual clients, incorporating a client operating system, applications, user identity and personalization information, and data. Each of these virtual client sessions is mapped back to a desktop platform, such as a Neoware thin client, so that all end users feel as if they have their own PC.

For IT managers, this centralization of computing resources is driving renewed interest in centralized computing models. But unlike the days of monolithic mainframes, these new architectures are highly flexible, widely compatible, and easily adaptable to and manageable in today's enterprise. They also offer the side benefit of reductions in power consumption, leading to additional incremental savings. In addition, they are well suited to a variety of new demands, such as organizations with contractors, remote, and/or offshore employees that need to maintain tight control over these devices and the work being created. Better yet, they are enabling a new range of client solutions that maintain the familiarity, flexibility, and power of PCs, as well as the cost savings and security benefits of centralized models.

Operating System Independence = Easy Vista Migration

These new client solutions also offer a level of flexibility that even PCs can't provide — the ability to easily and nearly instantly switch between operating systems. With the recent launch of Windows Vista and the interest that many IT managers have in trying this new OS — this one capability by itself could prove to be enough to encourage IT managers to try these virtual client solutions.

This OS-switching functionality is a direct result of the flexibility in the virtual architecture. In a real-world example, different desktop images built from different operating systems are stored on a server and can be either automatically loaded from a server or chosen from a start-up list by the end user. These images can be dynamically combined with a user's profiles and preferences to create a dynamic, personal disk image that appears to the user to be booting from a single, local hard drive. For example, there can be a Windows Vista image and a Windows XP image, each of which is stored separately on the virtual machine. End users can switch back and forth between these two environments — while still retaining access to all their critical information — by simply hotkeying. Best of all, these OS and application images can be shared across hundreds or even thousands of users and easily managed and updated by the IT staff. Vista can be hosted on the server side with VMware, Citrix's Presentation Server, and Microsoft's Terminal services, among other options. Microsoft recently acknowledged the importance of this new computing model with a change in its licensing agreements that allows customers to use existing Windows Vista enterprise licenses with this type of virtualized client architecture.

The management of all the client systems that use these images is reduced to simply updating and maintaining the few "master" images that sit at the heart of these virtual client sessions. In this type of architecture, updates, patches, and so forth need to be applied only to these master images. This makes the process of keeping client systems up to date much simpler than having to manually or even automatically update hundreds or thousands of individual disk images. IT staff can focus on keeping these images stable and safe, and all the client systems that use the images are automatically updated as well. The cost (and complexity) reductions from this benefit alone could save organizations thousands of dollars a year, as client support costs represent the largest portion of a client system's total cost of ownership during its typical lifetime.

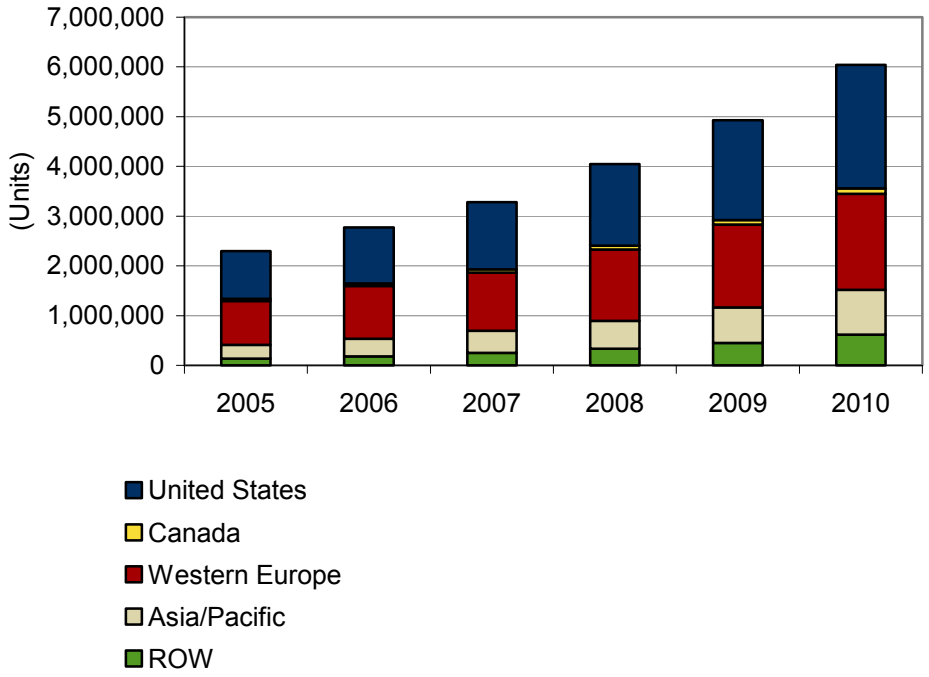
Thin-Client Evolution

To put these changes into context, one needs to understand how thin clients have evolved over the past decade or so. At their introduction, thin clients were unfairly and inaccurately touted as the next big thing ("network computers" as Oracle CEO Larry Ellison infamously dubbed them) and couldn't live up to their overhyped expectations. Even with the introduction of Windows-based terminals, as some of the earliest Windows-compatible solutions were called, these products had a relatively modest impact on the market, typically touted as less than 1% of the worldwide PC market.

In reality, however, enterprise thin clients — which are defined as networked computing systems without local storage that use centralized servers as their processing and data engines — continuously grew from modest beginnings and have now reached critical mass. IDC research showed worldwide thin-client shipments of over 2.7 million units in 2006, a 19.3% improvement versus 2005. Looking forward, IDC believes worldwide thin-client shipments will continue to grow at this rapid pace, reaching over 6 million units in 2010, for a 22% CAGR. In addition, in developed markets such as the United States and Western Europe, thin clients are expected to represent over 10% of all enterprise desktop shipments in 2010. Figure 1 shows the thin-client forecast graphically.

FIGURE 1

Worldwide Enterprise Thin-Client Shipments by Region, 2005–2010



Source: IDC, 2007

Thin clients are now recognized as a very viable client option in many types of industries and are proving particularly popular in financial and healthcare environments, where security and privacy issues are paramount, due in large part to regulatory compliance issues that govern the security of data. Still, as popular as thin clients have become, a few mitigating factors have slowed their adoption. First, application compatibility, particularly for custom-built in-house programs, can be a problem in certain situations. Both Citrix's Presentation Server and Microsoft's Terminal Server — the two main server-based application-sharing environments that sit at the heart of most thin-client deployments — have made great strides in application compatibility over the past few years, but exceptions remain. As a result, some organizations have been unable or unwilling to deploy thin clients, despite their interest in them. Second, performance issues on the client can arise in some environments because of the manner in which the application-sharing environments operate. Finally, for some users, running a thin client is seen as a technological step down from a real PC — the technical equivalent of being moved out of an office and into a cubicle.

With virtual client architectures, however, all three of these issues can be addressed. First, with a virtual client, each user has a version of Windows customized to his or her needs, but centrally managed, which eliminates any compatibility problems and helps with the "perception" issue of running a less full-featured solution. In addition, depending on how the virtualized session software is configured, the front-of-screen performance on client platforms can be greatly improved. In some situations, such as

with Neoware Image Manager, the entire OS image is provided to the clients and all operations are executed locally — as if it were a standalone PC. In others, each client can be allocated a dedicated amount of CPU capability from the server, which can improve performance even when using the ICA or RDP screen update protocols typically used in traditional thin-client environments. In fact, in some situations, multiple CPUs can be allocated to a single virtual machine, providing the possibility of even faster performance on a thin client than on a dedicated PC.

One of the critical factors enabling this evolution of thin clients is streaming software solutions, such as Neoware Image Manager. Running as a server-side application, Neoware Image Manager allows the creation, management, and streaming of single-user OS images to any PC, thin client, or virtual machine. At start-up, the clients are directed to look to the server during boot-up and, from that point forward, use the server as a "virtual" hard drive, but function as if it were a local drive. The OS loads into memory on the client or virtual machine and operates as if it were a standalone PC. In a virtual client architecture, it's possible to have the OS and applications load onto and operate on the server in a protected, virtualized partition that, to the end user, appears to be a standalone PC. The benefits of using this image-based approach are many. Specifically, IT managers can consolidate, centralize, and secure their corporate images, which makes them easier to manage and reduces disk space. In addition, using centralized images makes it easier to deploy applications, all of which eases IT management and, therefore, reduces costs.

The New IT Architecture

In all cases, these new architectures and new client solutions are leveraging the incredible increase in processing power and storage space in corporate datacenters over the past few years. In 2006 alone, the typical corporate datacenter saw a huge improvement in pure CPU horsepower and storage as a result of growth in multi-CPU/multi-core servers, rack-mountable servers, storage area network (SAN) capacity, and other high-level trends that are bringing more processing power and more storage capacity into smaller spaces at lower prices. Plus, these trends show no signs of letting up anytime soon, ensuring that tremendous capabilities are within reach of IT managers who choose to utilize a portion of those resources for client solutions. Traditional client/server architectures may use only 10–20% of the total CPU available in servers. Virtualization architectures can leverage over 90% of the CPU's capabilities.

In fact, this buildup of computing resources in the datacenter is helping drive a shift from client/server architectures to what could be called a virtualized desktop. In this virtualized desktop model, all PCs can be consolidated at the datacenters, providing the enhanced power savings and resource utilization. Server-based computing models evolve in this scenario such that even the client processing occurs on servers.

Part of what enables these hosted desktop models is a new class of software referred to as connection brokers. In a virtual client model, multiple independent instantiations of a single-user OS are initiated on a server running virtualization software such as VMware. The connection broker serves as the means by which these sessions are initiated or ended and determines, for example, which thin-client system is associated with which server and which virtual session. Connection brokers provide these capabilities dynamically, which means the compute resources available can be easily assigned and

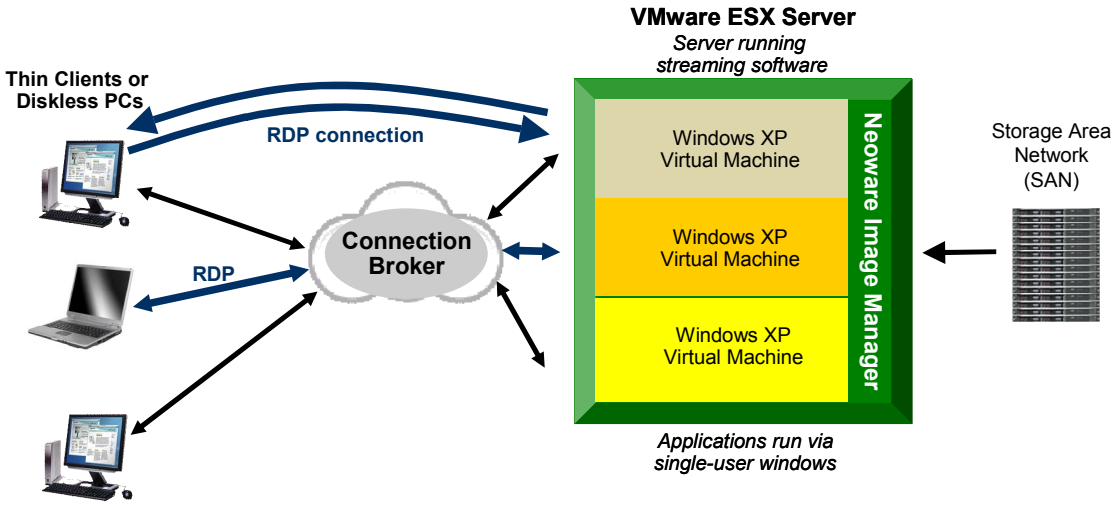
reassigned as different users log in to or log out of the system. Even better, properly configured systems can deliver additional capabilities on demand. So, for example, if a single user temporarily needs additional CPU horsepower to run a sophisticated database query or a spreadsheet recalculation, a connection broker can automatically assign additional CPU capabilities to that request and then reallocate them to other users when the job is finished. This sort of dynamic computing model goes beyond the flexibility of individual desktop or notebook PCs and shows some of the inherent benefits of a centralized computing architecture.

In many ways, these new architectures represent a return to the centralized mainframe computing models of yore. However, unlike those proprietary, limited architectures, the new model of centralization allows complete compatibility with existing Windows (or Linux)-based environments, the flexibility to easily add whatever software or hardware solutions are required for a given business, and more efficient resource utilization, particularly in terms of processing power. Plus, the client experience is a friendly, graphical UI with which users are completely comfortable and thus requires no additional training.

Figure 2 shows a diagram of a typical network architecture utilizing virtual clients and streaming software. Note that the heart of each virtual machine can be a single shared, standardized, and easily managed disk image when using image streaming software such as Neoware Image Manager.

FIGURE 2

Network Architecture with Virtual Clients and Image Streaming Software



Source: IDC, 2007

Also unlike the older centralized models, clients remain diverse in these new environments. Because of the proliferation and stability of wireless networks, most notably, mobile thin clients are now a very real and practical possibility. Thin clients are reliant on a stable, reasonably fast network connection, but those demands can be easily met with 802.11-based WiFi networks and even some of the 2.5G and 3G wireless

broadband networks enabled by cellular service providers. As a result, several thin-client vendors, including Neoware, have introduced notebook-format thin clients, which provide users with the flexibility they've grown accustomed to with mobile form factors yet retain the security and manageability benefits of centralized computing models.

FUTURE OUTLOOK

The opportunity for virtualized clients is strong. The critical issues of security, manageability, and high PC support costs continue to plague medium-sized and large enterprises, and these concerns are only increasing. Unfortunately, we believe the types of network break-ins, security scares, and privacy concerns that have appeared in the headlines of both IT publications and the general press over the past few years will continue. IDC believes that these types of incidents, in particular, will continue to force IT professionals out of their current comfort zone of managed (or partially managed) PCs in traditional client/server architectures and into new server/client alternatives. As a result, the interest in and the desire for creating centralized, server-based computing architectures will continue to grow. In fact, we are seeing CIOs and other IT professionals reconsidering their previous skepticism on the value and benefits of moving to thin clients, which, in turn, is creating a great deal of interest in the category.

Virtual clients, which have the potential to take the thin-client concept to a new level, offer yet another way to reduce the security and manageability risks/costs associated with traditional "fat" PC clients. By offering the complete compatibility and flexibility of a true, individual PC running a full Windows operating system (including Windows Vista), virtual clients can overcome some of the more common concerns associated with thin clients yet maintain the benefits of a centralized computing model, including simplified management and tighter control.

CHALLENGES/OPPORTUNITIES

Although the concept of virtual clients may be appealing, the technology is not without certain challenges. First, while the compatibility and performance of virtual clients running in their own partition on a virtualized server are undeniable, there is a lower client-to-server ratio when running virtual clients than when running traditional application-sharing environments such as Citrix's Presentation Server or Microsoft's Terminal Server. For example, whereas a single quad-core server may support 75–80 Citrix ICA or Terminal Server RDP sessions with thin clients, that same server may support only 12 simultaneous virtual client sessions. Given the higher densities and lower costs of 4-, 8-, and even 32-way servers, this may not be a huge problem (and given application compatibility issues that may not be solved any other way, it may be the only alternative), but it is a cost issue that needs to be considered.

In addition, there are an increasing number of related but different solutions to the problem of reducing client management costs and increasing security. It's easy to become confused about the differences between "regular" thin-client implementations, blade PCs, application streaming, OS streaming, and image streaming, all with or without client virtualization and connection brokers. Each solution offers a slightly different set of benefits, and it's not always clear which is best for a given situation or environment. The good news is they all represent very viable alternative client options that are gaining increasing favor with IT professionals around the world. In the case of

virtual clients, the benefit is leveraging the infrastructure that most medium-sized and large businesses have already or are in the process of putting together in their datacenters. Raw CPU processing power and storage capacities are growing at phenomenal rates, and virtual client opportunities represent an exciting new way to leverage the ongoing trend toward server virtualization.

CONCLUSION

The combination of desktop image streaming solutions, such as Neoware Image Manager, and thin-client devices in conjunction with server virtualization software and connection brokers is opening up the possibility of creating an entirely new category of connected computing devices: virtual clients. By leveraging the trends in the datacenter along with the growing interest in centralizing client activities, for both security and manageability benefits, virtual clients offer an intriguing new opportunity for medium-sized and large businesses. They feature the flexibility and compatibility of individual PCs but retain the centralized control of server-based solutions — in essence giving IT managers the best of both worlds. Though the name "virtual" may imply that something doesn't really exist, all signs point to virtual clients as a very real force to be reckoned with in the years to come.

DEFINITIONS

Connection broker: A piece of server software that enables the creation and management of independent user session partitions on a virtualized server

Image: A shortened version of disk image that refers to a computer file structure that has the complete set of files stored on another device, such as a hard drive (Typically, a disk image for a PC includes an operating system, drivers, applications, and in some cases, user data files. Image streaming refers to the transferring of the contents of this image file over a network connection to a connected client device.)

Thin client: Networked computing devices without local storage that use centralized servers as their processing and data engines

Virtual client: A collection of devices and software that enable the simulation of a traditional PC experience through the use of a centralized computing architecture

Virtual server: A single physical server partitioned into several independently functioning machines that can be running separate operating systems and performing completely separate tasks (This is accomplished through the use of a hypervisor, a layer of software that sits below an operating system and communicates directly with a server's hardware.)