

January 5, 2006

# Desktop Virtualization Is The Future Of The Corporate PC

by David Friedlander and Simon Yates

MARKET OVERVIEW

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Client Choice topic

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## Desktop Virtualization Is The Future Of The Corporate PC

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### EXECUTIVE SUMMARY

Desktop virtualization has existed in some form for more than 15 years, but in the past three years, new models have emerged that will dramatically change desktop computing. Firms have long used server-based computing (SBC) to create virtual instances of desktop applications on a server that multiple remote users can access. Today, emerging products like the Hewlett-Packard and ClearCube blade PCs, Softricity SoftGrid, and VMware Workstation and ACE offer new models for virtualizing the desktop. Desktop virtualization offers significant benefits, including better security, manageability, and access to desktop applications in a distributed world. Virtualization is the most important technology to hit the corporate PC space since the thin client. It will force firms to manage software provisioning to internal and external users and to accept more applications from external sources. However, short-term technology challenges limit the utility of virtualization in the enterprise today.

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### NOTES & RESOURCES

Forrester interviewed vendor and user companies, including: Altiris, Citrix Systems, Hewlett-Packard, Microsoft, Softricity, and VMware.

#### Related Research Documents

- ["The State Of IT Infrastructure Adoption: Business Technographics® North America"](#)  
October 17, 2005, Data Overview
- ["The State Of The Corporate PC And Server 2005"](#)  
October 11, 2005, Market Overview
- ["2005 Corporate PC Market Update"](#)  
June 20, 2005, Trends
- ["Remote Offices: Critical Links In Enterprise Architecture"](#)  
March 24, 2005, Trends

## THE SIREN LURE OF DESKTOP VIRTUALIZATION

Server vendors and customers alike are touting the price/performance benefits of virtualization. According to Forrester's Business Technographics® research, 29% of firms are using server virtualization today — and almost two-thirds of those firms plan to increase their spending on server virtualization in 2006.<sup>1</sup> The early success with server virtualization is leading firms to ask whether virtualization might fit in the desktop space as well. But the goals of server virtualization are very different. On the server side, the goals of virtualization are:

- **Improving server capacity utilization.** As the price of server hardware has fallen, firms have purchased more servers dedicated to specific business applications. Operating system (OS) optimization and application fine-tuning has always made running multiple OSes and applications on a single machine challenging. As a result, organizations have enormous amounts of server hardware capacity that sits idle. For example, capacity utilization generally hovers between 8% and 15% on Windows/Intel servers, and between 25% and 35% on UNIX and Linux servers.
- **Enabling server consolidation.** Poor server utilization is driving organizations to consolidate their server farms. Firms use virtualization technology to collapse multiple, overlapping operating system and application instances running on multiple, distributed servers onto fewer, larger systems.<sup>2</sup> Using new dual and multicore processor systems, administrators can more easily deploy OS instances to specific cores, effectively doubling capacity utilization. With additional virtualization technology, firms can save money on systems management and eliminate the need for costly and time-consuming ports of older applications to new operating platforms.

But on the PC side, the main objectives of virtualization are:

- **Improving client system manageability.** Managing a wide variety of client form factors, multiple generations of operating systems and hundreds of applications is a costly and resource-draining undertaking. Even well-managed PC environments require constant maintenance and support to repair problems and keep systems in compliance with policy. Whether you choose to virtualize individual applications or the whole desktop, virtualization provides centralized manageability that traditional software distribution systems can't match. Virtualization will allow large, globally distributed firms with thousands of PCs to maintain software on desktop systems more cost-effectively by reducing their dependence on specific hardware and OS configurations.
- **Improving security.** Traditional PCs are prone to viruses and worms, need constant security patching, and expose critical data and applications to malicious behavior from internal and external sources. As firms move more users from desktops to laptops, the security risks increase. Users access the Internet through public and unsecured home Wi-Fi networks and thousands of laptops per year are lost or stolen, putting confidential data at risk. Managing access to

sensitive applications and data is easier in a centralized model like server-based computing. Virtualization can offer similar system and information security benefits by segregating applications from data, and making it easier to deprovision access to applications.

## WHAT IS DESKTOP VIRTUALIZATION?

Forrester defines desktop virtualization as (see Figure 1):

*A PC environment where some or all components of the system including operating systems and applications execute in a protected environment, isolated from the underlying hardware and software platform. The virtualization layer controls interactions between the virtual environment and the rest of the system.*

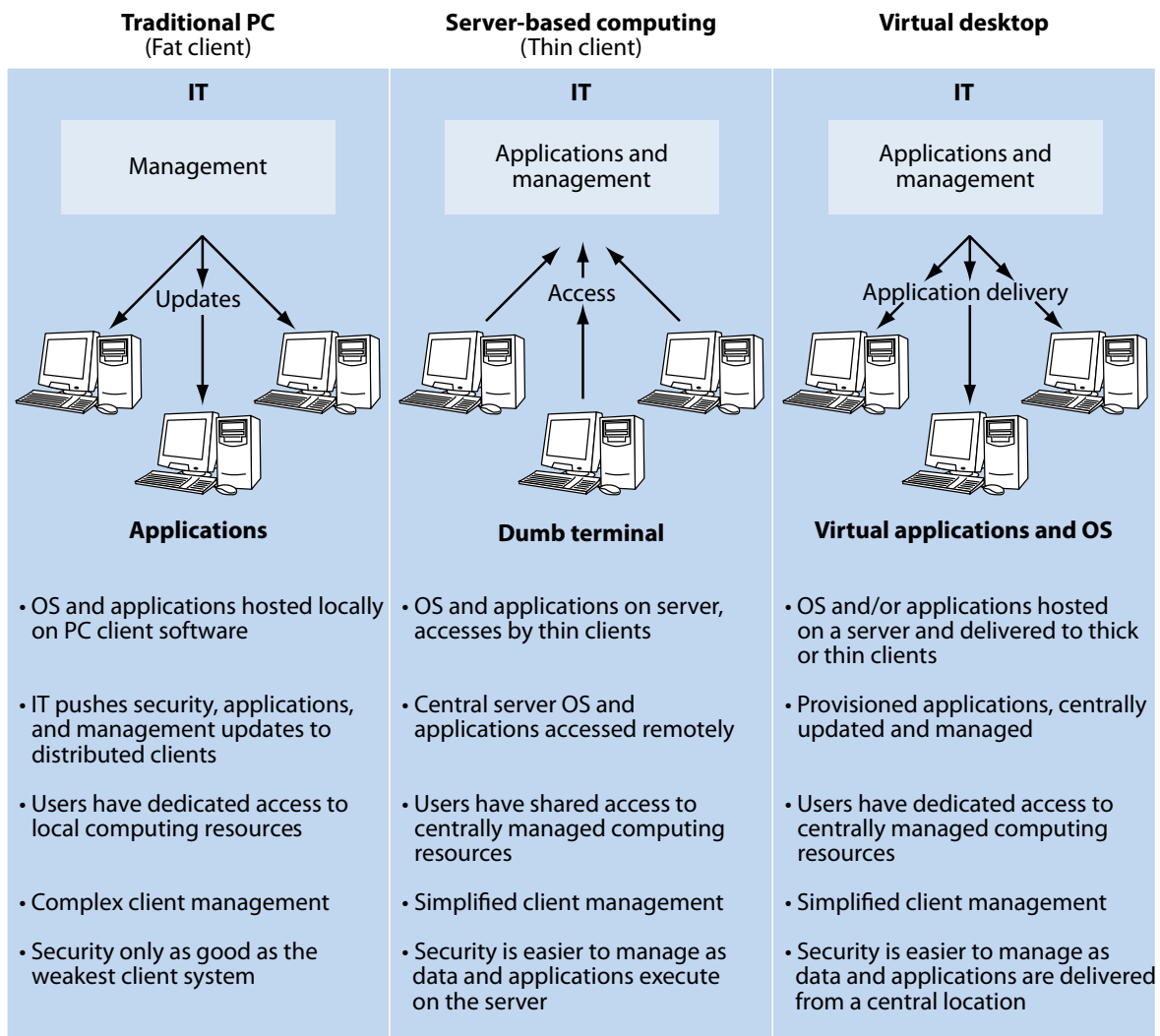
For client systems, virtualization can be:

- **Hardware-led.** Hardware virtualization pools core elements of hardware like CPU power, memory, I/O, and storage in a data center and provides access to applications that leverage those resources remotely on an as-needed basis. The goal of hardware-led virtualization is to supply computing power to the end user as a utility.
- **Software-centric.** Virtualized software decouples some or all aspects of the PC user operating environment — potentially including the operating system, applications, and data — from the underlying installed OS to create an isolated and more secure virtual environment.

Desktop virtualization comes in four forms today:

- **Server-based computing (SBC).** SBC environments like Citrix Access Presentation Server and Microsoft Terminal Server virtualize multiple application instances on a single server OS and allow users to access those applications remotely.<sup>3</sup>
- **Application sandboxing.** In a sandbox environment, one or more applications run in an isolated environment on the PC and communicate through the virtualization layer with the host OS.
- **Virtual systems.** In this scenario, a desktop virtual machine creates a virtual instance of an entire OS on a host system so that no software executes on local hardware.
- **Blade PCs.** A blade PC runs the entire desktop instance — both hardware and software — on a blade in a data center and provides users with remote access to the desktop environment over the network.

**Figure 1** How Virtualized Systems Differ From Traditional PCs And SBC Environments



Source: Forrester Research, Inc.

### SBC Virtualizes Applications On The Server For Remote Access

Citrix was the pioneer of desktop virtualization. The 1989 incarnation of Citrix’s Presentation Server product allowed IT to run Windows desktop applications in a shared server environment. The Citrix product runs as an add-on to Microsoft Windows Server 2003, which provides the core multi-user functionality through the Terminal Services component. Users can access the same applications concurrently on a server from any PC or thin client. In effect, the applications are virtualized on the server and accessed remotely. However, because the technology depends on a network connection

and firms must tweak their apps to run in a shared server environment, application compatibility remains a problem. Citrix has moved further into the virtualization world through its GoToMyPC product, which allows users to run virtual instances of their desktops over the Internet by remote control.

### Application Sandboxes Isolate Applications From The Rest Of The System

In a sandboxed virtual environment, one or more applications run in an isolated environment on the PC and communicate only through the virtualization layer to connect with other applications and access the host OS and local resources like memory, disk, and networking. There are two approaches to application sandboxing:

- **Application streaming.** Softricity — a pioneer in the application streaming market with its SoftGrid product— repackages applications and breaks them down in to “streamable” components that can be cached in a sandbox — a protected area on the desktop.<sup>4</sup> Because the applications are never installed on the host OS, the virtualization prevents application conflicts and allows multiple versions of the same app to run at once on a single desktop. Additionally, because the product only sends changes to the desktop and does not need to be tested for each desktop configuration, updates are much easier to deploy. Applications can also be configured to expire at a specific time or based on other criteria, providing greater control over application access and making it easier recover licenses. However, these tools often require complex repackaging of applications to prepare them for deployment in the virtual environment. Although initial deployment will require a significant time commitment, applications only need to be packaged and tested once since the virtual sandbox is identical across all systems.
- **File system virtualization.** Vendors like Altiris and Citrix are now entering the application sandboxing market. Both have introduced similar technology for isolating applications, preventing application conflicts and simplifying deployment on servers. While these products are technologically simpler than application streaming, they virtualize only the file system rather than the whole application. As a result, they can use existing application install files, but do not offer the same level of control over application provisioning and deprovisioning as SoftGrid. Citrix’s product is only available today for its server product, but it should be available in 2006 for desktop deployments.

### Virtual Systems Provide Virtualized Operating Systems And Applications

A desktop virtual machine creates a virtual instance of an entire OS on a host system. A virtual desktop OS can be completely isolated from the host system, allowing IT to provide secure applications in either the host or virtual environment. Users can be prevented from transferring information between the environments, and the two environments can use completely separate network connections. Three vendors are pushing into this market.

- **VMware ACE.** The VMware ACE product provides a fully managed virtual PC that can be deployed easily to a large number of users. It is very useful for firms that want to provision contractors, consultants, or partners with a complete secure corporate desktop without investing in additional hardware. However, it can also be cumbersome to deploy and update for remote users. Thus, vendors like AppStream are partnering with VMware to help provision virtual desktop images more efficiently. The VMware Workstation product provides more robust capability for testing or engineering environments, but it isn't suitable for mass deployment.
- **Ardence.** Ardence has also launched a virtualization product that provisions an entire desktop OS to a PC in "streamable" components, much like Softricity. Ardence — unlike Softricity and VMware — does not require a host OS already installed and packages and provisions a complete OS image to desktop hardware with no OS installed. The advantage of this approach is that IT can easily remove and reprovision a complete Windows or Linux environment with a clean install.
- **Microsoft Virtual PC.** Microsoft also clearly sees a role for virtualization throughout its technology portfolio, but must protect its overwhelming share and control of the desktop OS while staking a claim in the desktop virtualization market. Today, Microsoft positions Virtual PC as a software virtualization solution that allows users to run multiple PC-based operating systems simultaneously on one machine or, with Virtual PC for Mac, as a way to run Windows applications on a non-Windows machine. Microsoft's long-term client virtualization strategy isn't clear yet, but the recently announced licensing strategy for Virtual Server offers some clues about the company's direction. For Virtual Server, Microsoft announced that any server could run four virtual instances of the OS as part of the Windows Server license and that users could buy additional virtual licenses as well. Today, to run Virtual PC on a Windows machine, users still need a full Windows license for the host OS and a separate license for each virtual instance of the OS.

### Blade PCs Virtualize PC Hardware In The Data Center

A blade PC runs the entire desktop instance on a blade in a data center and provides users with remote access to the desktop environment. Blade PCs allow for dynamic provisioning, so that the system can reprovision a blade instantly when a user logs off. The user logs onto a dedicated blade in the data center, which then retrieves the user's stored data and settings and provisions applications. When the user logs off, the system backs data and settings up on network-attached storage (NAS) and removes the newly provisioned applications to be ready for the next user. If the blade fails, failover software provisions a new blade and asks the user to log in again, then reprovisions the applications.

Blade PCs are the most similar to today's PCs. The hardware is based on industry-standard Intel and AMD processors, chipsets, and graphics cards and uses a standard operating system without any

specific modifications for virtualization. As a result, porting apps to a blade PC is painless. However, the hardware itself can cost upwards of \$1,500 for a blade/client combination, and buyers must also expect increased upfront management and provisioning software costs.

HP relaunched its Consolidated Client Infrastructure (CCI) blade solution in late 2005 when the company switched from Transmeta efficeon processors to AMD Athlon64. HP put CCI deployments on hold while its engineers re-architected its solution around Athlon after Transmeta pulled out of the chip fabrication business in early 2005 to focus on licensing. In the meantime, the other major blade PC manufacturer, ClearCube, expanded its relationship with IBM Global Services and signed a deal with Lenovo to sell ClearCube PC blades to US customers.

### DESKTOP VIRTUALIZATION PROMISES SECURITY AND RELIABILITY BENEFITS

Desktop virtualization promises a number of benefits, including:

- **Reduced desktop support costs.** Provisioning PCs is much simpler in a virtualized environment. In traditional desktop environments, administrators must test applications against multiple desktop configurations. With virtualization, IT can test applications against only one environment prior to deployment and still eliminate most follow-up support issues.
- **Improved application and data security.** Because virtualized environments give IT greater control over system and application provisioning and access, it is easier to secure access rights, and in many cases, data. For example, SBC allows firms to centralize sensitive data more easily on networked storage and prevent it from leaking on to vulnerable remote systems.
- **Better software license management.** If firms deploy all corporate applications through a virtualized environment, it is easier to track software usage and licenses. Virtualization products often include some functionality for tracking software and managing licenses.
- **System stability and reliability.** Virtual environments can help prevent application conflicts and are easier to repair when there are problems. Application sandboxing prevents conflicts, and a virtual machine can more easily be restored to a working state than a PC.

### Virtualization Introduces Complexity And Compatibility Issues

But virtualization has its limitations. None of the existing technologies can completely replace the existing thick client PC. Common drawbacks of PC virtualization include:

- **Technical complexity.** These virtualization products often use workarounds to hook into the host OS to provide a seamless user experience. However, this creates a more complex environment that may cause applications or systems to crash or experience other hard-to-diagnose problems.

- **Application and OS compatibility.** Application sandboxing and SBC require applications to be packaged or configured specifically for the virtual environment. Certain types of applications will not work in virtualized environments. Additionally, virtualization technology often supports a limited number of operating systems — thus, firms with older platforms may not be able to take full advantage of virtualization.
- **Software licensing issues.** Virtualization of the client does raise issues with software licensing. Whereas vendors often license server software based on the processor count, they license desktop software on a per-user basis. Therefore, running multiple instances of an OS or application on a single machine or accessing applications through a centrally managed solution like Citrix or Softricity usually doesn't cause problems. However, if IT wants to deploy complete desktop images dynamically using products like blade PCs, VMware ACE, or Ardenne, desktop software vendors may not be able to track software installations accurately for licensing purposes.

## RECOMMENDATIONS

### START EVALUATING DESKTOP VIRTUALIZATION TODAY

While desktop virtualization is still in its infancy, it will ultimately provide a happy medium between traditional fat client PCs and thin clients by creating a more secure computing environment that also leverages local hardware resources and functions in offline mode. To prepare, firms must:

- **Continue to standardize and consolidate.** Standardization — and by extension, reduced complexity — of the client environment remains a primary goal for IT managers responsible for the client environment. Standardizing hardware, OS, and application refresh cycles lowers migration and support costs and brings greater predictability and stability to the desktop. Before firms can successfully introduce virtualization, they must standardize the client environment.
- **Clearly define virtualization goals in a five-year time frame.** Virtualized desktops are not ready to serve as complete replacements for standard desktops, but application sandboxing, SBC and similar technologies can help improve security and manageability in the near term. Firms should include virtual desktops in their three- to five-year technology plans and start delivering specific applications through sandboxing technology as the first step. For your pilots, choose applications that have stringent security requirements, such as CRM systems that contain private data about customers.
- **Target specific user groups for early deployment.** Call centers, trading floors, and other standardized, mission-critical environments make good test beds for virtualization, because they're often highly standardized already and the users have common application requirements.

## WHAT IT MEANS

## VIRTUALIZATION: THE CORPORATE PC ARCHITECTURE OF THE FUTURE

In the next five years, PC architecture will change dramatically as virtualization shifts from the periphery to the center stage and will replace the standard OS and application installs. This means:

- **Companies will need to provision software on demand internally and externally.** IT departments will no longer install applications. Instead, users will access most software on-demand, either from a local cache on the system or from a remote server. Virtualization will make it easier for IT to serve up applications to external users, including partners and customers, without compromising manageability or security.
- **IT won't control every application on the user's PC.** Some software will be fully provisioned and managed from outside the organization. IT will need to put processes in place to review virtualized applications for deployment from external sources.
- **Software vendors will need to adapt their applications to a virtualized world.** ISVs will need to begin certifying their applications in virtual desktop environments — just as they do for virtualized server environments today.

## ENDNOTES

- <sup>1</sup> Forrester's Business Technographics® July 2005 North American And European Enterprise Infrastructure And Data Center Survey found that of the 603 enterprises surveyed, 29% were already using server virtualization and that another 29% were considering using the technology. See the October 17, 2005, Data Overview "[The State Of IT Infrastructure Adoption: Business Technographics® North America.](#)"
- <sup>2</sup> The primary reasons for using virtualization technology — often referred to as system partitioning — as a core underpinning in server consolidation projects are based on three drivers: 1) greater flexibility in use of systems architecture resources; 2) improved application isolation and availability; and 3) the ability to meet the changing requirements for systems resources and capacities. See the July 19, 2005, Best Practices "[Using Virtualization For Server Consolidation.](#)"
- <sup>3</sup> More than 90% of Fortune 1,000 firms have deployed at least some applications on Citrix Systems MetaFrame XP Presentation Server and/or Microsoft Terminal Server. As the market continues to evolve over the next two to three years, it will increasingly overlap with both the remote-access and electronic software distribution segments. See the March 16, 2004, Market Overview "[Server-Based Computing.](#)"
- <sup>4</sup> The stability and scalability of application streaming solutions has improved to the point where they are suitable for widespread enterprise deployments, with referenced customer sites with multi-thousand installed users across LAN and WAN environments. See the March 24, 2005, Trends "[Remote Offices: Critical Links In Enterprise Architecture.](#)"

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