Abstract

Desktop virtualization presents an unparalleled opportunity for improving both end user productivity and IT operations. Activities such as operating system migrations or the deployment of new business-critical applications can be delivered faster and more easily using desktop virtualization than is possible using legacy desktop management systems. Desktop virtualization also offers new opportunities to improve IT service to business by enabling increased workforce mobility, improving data security, creating remote working opportunities, and offering employees increased choice of computing device.

However, most approaches to desktop virtualization require major infrastructure investments, cause challenges with mobility and end-user performance, and create a host of additional change management issues. Many companies that would like to reap the benefits of desktop virtualization have held off from these initiatives because of these significant challenges.

This paper illustrates an approach to desktop virtualization called Intelligent Desktop Virtualization (IDV), which makes it possible to reap the advantages of desktop virtualization without extensive capital outlay, without wholesale reworking of existing desktop management practices, and without compromising user experience. With IDV, organizations can get going with desktop virtualization quickly and easily without the infrastructure investment.
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I. Introduction

Conventional desktop management solutions have long focused on the challenges of operating system patch management and application deployment. Until recently these solutions have offered an acceptable if somewhat cumbersome way of managing PCs. However, as businesses demand greater agility from their IT organizations and business processes place increasing emphasis on employee mobility, IT departments are seeking solutions that can fundamentally transform their desktop management processes and slash operations costs.

At the same time, IT organizations are faced with the challenge of migrating existing desktops from Microsoft Windows XP to Windows 7. Resolving the conflicts between the business need for an agile desktop infrastructure capable of swiftly responding to change and IT’s need to protect and maintain existing services while migrating to a new desktop operating system is a major challenge. Many IT organizations are looking to desktop virtualization technologies as the preferred means of addressing these challenges.

Desktop virtualization presents an unparalleled opportunity for accelerating desktop change. Major change activities such as the migration from Windows XP to Windows 7 or the deployment of new business-critical applications can be delivered faster and with less disruption using desktop virtualization than is possible using legacy desktop management systems. Desktop virtualization also offers new opportunities to improve IT service to business by enabling increased workforce mobility, improving data security, creating remote working opportunities, and offering employees increased choice of computing device.

Although the cost of buying, configuring and installing a typical enterprise desktop PC is about $1,200, the annual total cost of ownership (TCO) using traditional desktop management can be three to five times higher. Desktop virtualization can significantly reduce the configuration and installation cost as well as the desktop TCO through reduced administration costs, fewer help desk calls, and fast resolution in the event of system failure.

II. Server-Hosted VDI

Because server virtualization has been so successful, many companies are looking to extend this model to the end user computing environment by hosting virtualized desktops in the data center — a computing model commonly referred to as server-hosted VDI (Virtual Desktop Infrastructure). Some even have the expectation that it will be possible to achieve the same savings on the desktop as have been delivered in the data center.

Not as Easy as It Sounds
As attractive as server-hosted VDI may appear, it can be difficult and expensive to deploy. Server-hosted VDI is a significant departure from both server virtualization and distributed desktop environments. Enterprise class environments are complex to design, build, and maintain, and require close cooperation between desktop, server, storage, and networking teams to ensure its success. Server-hosted VDI can be costly to implement — an independently published benchmark shows that the capital cost can be as much as $2,600 per desktop before taking into account the costs of application integration. Large enterprises may have a core set of 100 to 200 applications, with as many as 1,000 to 2,000 applications over all. Server-hosted VDI solutions require all applications to be taken into consideration for a rollout to be successful. In many cases, experience gained in supporting conventional Windows desktop environments does not translate well to server-hosted VDI, and new, proprietary application packaging and deployment tools are frequently required. Many of these tools are relatively immature and there can be challenges getting all of the applications to work with them.

**Storage & Memory Challenges**

As projects move beyond pilot stage into production rollout an increasing number of obstacles to adoption present themselves. Chief among these is the challenge of scaling out storage infrastructure to support server-hosted VDI environments. Microsoft Windows was designed to run on a dedicated PC with its processor, memory, and its own local high-performance, low-latency hard drive. In a server-hosted VDI environment, data storage is relocated to centralized storage (SAN), which can quickly become a bottleneck for performance. Consumption of server memory can also present a major challenge, particularly when users open up many applications at the same time. This problem is compounded by the fact that storage and memory are much more expensive in servers than they are in PCs.

One of the most challenging problems to overcome in supporting server-hosted virtual desktops occurs during system startup, typically at the start of the working day. When large numbers of desktops are started or log in around the same time, the storage loading (measured in IOPS) will dramatically spike, which can render storage and desktops unresponsive. IOPS can be increased by deploying solid-state hard drives or high-performance flash memory caching controllers, or by increasing the number of disk spindles so that read/write activities can be processed in parallel. However, at best, these approaches are only partial solutions to the problem, and can increase the cost of storage to $1,000 or more per desktop.

What is often overlooked is that any centralized desktop virtualization solution must have a business continuity service, further increasing the overall cost. The high cost of storage and need for business continuity services highlight the primary area of concern for any enterprise class VDI deployment. While it is relatively simple to identify capital cost outlay, it is harder to predict what operational savings might be made or how long it might take to see a positive return on investment (ROI). In a worst-case scenario, there may be no positive return on investment within the expected operational life of the system.

**End User Concerns**

While there are numerous challenges in achieving any net cost savings with server-hosted VDI, there are also reservations over the user experience that some VDI solutions deliver. Even the most forgiving remote display protocol cannot fully mask the impact of low bandwidth, high latency network connections. Failure to ensure
that network performance meets requirements at all times will result in an unacceptable user experience. User mobility can also present challenges. VDI requires network connectivity back to the hosting data center at all times, which can be difficult in locations that have limited mobile communications services.

III. Intelligent Desktop Virtualization

Desktop virtualization does not have to be like this. It is possible to reap the advantages of desktop virtualization without extensive capital outlay, without wholesale reworking of existing desktop management practices, and without a compromising user experience. Intel has defined a concept called Intelligent Desktop Virtualization (IDV) that depicts a state of computing and desktop management where both IT and end users win. IDV solutions will provide IT the ability to control and secure desktop images and devices while ensuring users enjoy high-performance, mobility, and flexibility.

IDV delivers on this promise by stipulating three tenets that must be in place:

1) Manage centrally and execute locally to minimize data center build-out and use the processing power of an intelligent client to optimize the user experience. Even for server-hosted VDI, local execution through multimedia redirection provides a better user experience a boost in VM density on the server. Greater levels of local execution deliver better performance and reduce costs.

2) Deliver layered images intelligently to enhance updating and patching, streamline storage, and avoid image drift. When IT separates the desktop image into its logical layers, it can manage each layer separately and minimize the number of images. Intelligent delivery requires that the local image running on the PC be synchronized with the central image. This ensures that both end user and IT are working with a golden image at all times. The synchronization and storage of these images should be enhanced with de-duplication technology to minimize storage and network bandwidth requirements.

3) Use device-native management to provide out-of-band (OOB) access to the device to provide enhanced manageability independent of the OS and hardened security capabilities.

By adhering to these three principles IT will be able to update and patch a single central image and deliver it to the user’s device where it best can be executed. Local execution also allows offline usage, enabling greater mobility. If a user wants to access her work environment from a tablet instead of a PC, the bidirectional synchronization assures the central image is up to date. If the user’s in-band network stack is compromised for any reason, an OOB management channel such as that provided by Intel® vPro™ technology or a client hypervisor can be used to get the user up and running quickly without a desk-side visit by a technician.

Instead of hosting virtual desktops on a high-performance virtual infrastructure in the data center, it is possible to use the same virtualization techniques employed in server-hosted VDI but run the desktop locally on a client hypervisor loaded on a conventional desktop or laptop computer. This Intelligent Desktop Virtualization approach offers considerable benefits over a server-hosted VDI environment.
Best Experience and Best Value

Running applications locally on the desktop provides the best possible user experience without changing the way employees work, and without the need to modify applications in any way. Client-hosted desktop virtualization also provides a ready means of supporting user installed applications without compromising central management services. Centralized management coupled with local execution provides the best user experience. This is especially valuable for a mobile workforce without a permanent connection to a central data center. This ability to run without ties to a central data center infrastructure offers high reliability and eliminates any need for a large-scale business continuity environment to provide desktop services in the event of a data center outage.

Running a virtual desktop locally results in lower capital cost of implementing desktop virtualization, and at the same time avoids much of the implementation risk. Eliminating the infrastructure also results in significantly lower operating costs, including administration, power, and cooling costs. As all processes remain within the existing desktop support team, existing desktop support processes can remain unchanged. New tools may be required, but new ways of thinking are not, vastly simplifying implementation.

Some Intelligent Desktop Virtualization solutions also enable strong tech support at a lower cost through the ability for IT administrators to remotely access a PC and assist an end user without making a desk-side visit. When this is implemented at the client hypervisor level, IT professionals can assist the end user with any PC issue, ranging from help configuring Outlook to a Windows blue screen, because even if Windows fails, the hypervisor will still be running, enabling rapid recovery and enhanced productivity.

Secure by Design

The choice to adopt client-hosted desktop virtualization achieves security objectives through data encryption, virtual desktop isolation, time-based lockout, and remote kill capabilities. Using a type-1 hypervisor on the end-point provides additional security by eliminating an operating system that could be compromised. Some client-hosted desktop virtualization solutions also offer options for centrally storing the data on a SAN, while still executing locally on a desktop PC.

IV. Conclusion

As organizations begin to look more closely at desktop virtualization the benefits of this distributed architecture are becoming increasingly clear. A survey performed by Entelechy Associates indicates that the attributes that most influence desktop virtualization technology were those where a distributed solution offered significant advantages over server-hosted VDI.

The chart on the following page illustrates those findings with the percentages representing the proportion of respondents indicating each attribute to be a critical factor for them.
While server hosted VDI has a role to play in contributing to the widespread adoption of desktop virtualization, in many cases desktop virtualization can be implemented more readily and at lower cost using Intelligent Desktop Virtualization.

V. The Virtualization Practice

The Virtualization Practice provides analysis, commentary, and resources on current Virtualization and Cloud Computing news, events, and community. We break Virtualization into Topics, and feature a world class expert in that topic as the analyst for the topic. Topic Analysts are responsible for writing original, objective, analytical posts in their area of expertise, for writing and maintaining a white paper on their market and the vendors that serve that market, and for assisting sponsoring vendors with marketing activities.

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Simon is an independent industry analyst covering desktop virtualization and application delivery technologies with a sideline in data center power management. He is a former Gartner Analyst and focuses his writing on desktop virtualization. He is also an experienced solutions architect with unmatched insight into the challenges of designing large (200,000 seat plus) high availability presentation and desktop virtualization systems.
VI. Intel

Intel is the leader in microprocessor innovation. By introducing Intel® Virtualization Technology (Intel® VT) to the market, Intel enabled virtualized machines to run at near-native performance levels. Intel continues to innovate with technologies such as 2nd Generation Intel® Core™ processors that combine CPUs and graphics processing. Intel® Core™ vPro™ processors offer greater levels of manageability and security at the hardware level.

*Learn more about Intel® Core™ vPro™ at [www.intel.com/technology/vpro](http://www.intel.com/technology/vpro).*

VII. Virtual Computer

Virtual Computer is a market leader in Intelligent Desktop Virtualization, combining client-hosted VDI with centralized management. The company’s flagship product, Virtual Computer NxTop®, makes managing thousands of desktops and laptops as easy as managing one, while offering new levels of flexibility and productivity to end-users. NxTop delivers ultra-fast native PC performance, complete mobility, and better manageability than server-hosted VDI for a fraction of the cost.

*Get a free download of NxTop at [www.virtualcomputer.com](http://www.virtualcomputer.com).*

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1 Gartner Says Effective Management Can Cut Total Cost of Ownership for Desktop PCs by 42%; IDC Understanding the Business Value of Centralized Virtual desktops

2 Server Hosted Virtualization Desktop CapEx Cost Model - HP VirtualSystem for VMware View July 2011