

**Achieving Business Value through Microsoft VDI Together with Session Virtualization**

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Abstract

This whitepaper discusses the benefits and considerations when planning a Microsoft® Windows Server® Remote Desktop Services solution and the choices associated with a lowest cost deployment for both Session Virtualization and Virtual Desktop Infrastructure (VDI).



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# Executive Summary

Many businesses are considering implementing some form of virtual desktop infrastructure (VDI) solution in order to experience the benefits of deploying and managing their desktop environment centrally in the data center while providing increased flexibility for their users. However VDI is not a single solution for all your desktop computing needs and problems as some VDI vendors might suggest. Confusing the decision are customer questions around successful current usage of session virtualization, previously referred to as Terminal Services, and whether VDI would provide a cheaper and better solution.

What’s important to note is that within the scope of VDI there are two deployment choices that can be made, each with different target use cases. Most scenarios for which the Virtual Desktop Pool (VDP) approach is being considered would be better served at lower cost and with less management overhead by implementing a session virtualization solution using Remote Desktop Services. Furthermore, those businesses that can benefit from implementing VDI are those for whom the Personal Virtual Desktop (PVD) approach can enhance flexibility, security and management while meeting budgetary constraints.

This paper outlines Microsoft's position on how each technology—session virtualization, virtual desktop pools, or personal virtual desktops—can address specific business concerns and needs and provide customers with the best value.

# Business Challenges Driving the Move towards VDI

Many businesses today are under increasing pressure to do more with less. As a result, these businesses are looking closely at implementing across-the-board cost reduction initiatives in all areas, including IT. At the same time, many of these same businesses are in the process of considering desktop migration for their computers to Windows® 7 to provide their users with the flexibility and power they need to work productively. Businesses also want to be able to effectively manage, control and secure their infrastructure as it continues to evolve. Balancing these different needs can be challenging for businesses because of the varying needs of different types of users. Knowledge workers, task workers and mobile users each have their own special desktop computing needs.

For example, knowledge workers such as architects, designers, research analysts and software developers typically work in a designated workspace or office using a desktop computer they can personalize to meet their needs. Sometimes they may need to access their applications and data from computers in other locations as they roam through a building or across a campus. Knowledge workers generally perform complex workflows that require them to simultaneously use multiple programs such as Microsoft® Office applications, visualization and design software, ERP/CRM software, or CAD and other software running on their desktop computer. The programs they use are generally powerful and must not only perform well but also provide them with rich user experiences, which mean their desktop computers must have sufficient CPU, memory, and disk space resources in order to run such programs. The challenges IT faces in meeting the needs of knowledge workers include ensuring rich user experiences even in low-bandwidth locations, maintaining high levels of continuity so that applications and data are always available, and providing the flexibility of being able to roam between desktops.

Task workers on the other hand are employees who have task-specific roles, such as warehouse workers, call center analysts, retail employees and other low-level office workers who perform clerical or data entry work. Task workers tend to perform repetitive tasks using a small set of applications, and they often work in a shared office with other workers having similar roles. Task workers may not even have their own dedicated computers and may find themselves working on different computers each shift they perform. The challenges IT faces in supporting task workers include delivering a low-cost solution that maintains high user productivity, providing users with a consistent and appropriate user experience that aligns to their job, and ensuring maximum flexibility in accessing applications and data from any computer.

It's becoming clearer to many businesses that the traditional approach of deploying desktop computers to all end-users is not always the best solution to meet your business needs. Not only does this traditional approach tend to have high total cost of ownership (TCO) but it also lacks the flexibility to meet the needs of these different types of user scenarios. For example, dedicated desktop computers aren't required by task workers since they usually have no fixed seating arrangements. And providing task workers with the latest computer hardware running the latest desktop operating system is often overkill since these employees typically only need to run a small number of applications for performing tasks like data entry or accessing a customer support database.

These reasons are driving businesses to find new solutions that can help them meet the specific needs of different types of user at the lowest possible cost while empowering IT with the required degree of manageability and control. This is why many businesses are considering VDI as a solution.

# Examining the Strengths and Challenges of VDI

VDI is a desktop delivery architectural model whereby the user remotely interacts over the network with a client operating system such as Windows 7 running in a server-based virtual machine environment such as Windows Server® 2008 R2 Hyper-V™. In a traditional desktop computing environment, the hardware, operating system and line-of-business applications are tightly bound together on the user's local computer. In a VDI scenario however, the client operating system and applications are stored and executed on a virtualization host located in the data center and accessed remotely from the user's computer.

Microsoft's VDI solution, which can be implemented together with partner technologies from Citrix and Quest Software, provides users with virtual desktops they can access over a well-connected network from a variety of client devices using protocols such as Microsoft's Remote Desktop Protocol (RDP) and Citrix's High Definition User Experience (HDX™). Other software vendors have also developed their own VDI solutions and market these solutions as a way for businesses to reduce the cost of desktop ownership while enabling new kinds of user scenarios.

VDI technology is a business enabler that uses virtualization to support a wide range of business use cases. For example, Microsoft's own implementation of VDI can make use of desktop virtualization capabilities in a layered delivery model:

* Hyper-V and Remote Desktop Services (RDS) are two virtualization technologies found in Windows Server 2008 R2 that can provide users with a virtualized client operating system such as Windows 7. Users are able to interact with their virtual desktop as if it were a local operating system and can access it from any connected client device, in a similar fashion to Terminal Services capabilities.
* Microsoft Application Virtualization (App-V) can be used to separate each user's applications from their OS so they can access their applications anywhere, from any connected client device. App-V is a technology that lets you transform applications into centrally managed virtual services and deliver them to users over the network using RDP.
* User State Virtualization, supported by Roaming User Profiles and Folder Redirection are two well-known Windows technologies that can be used to separate each user's personalized settings and data from their remote sessions in order to enable users to access their files and desktop customizations from any connected client device.

The benefits of virtualizing the operating system, applications and user state include:

* Increased agility through anywhere access for users with connected devices, including support for rich client experiences including thin clients and older computers. Users whose computers are still running legacy operating systems such as Windows XP can leverage the enhanced capabilities of modern operating systems such as Windows 7 running in a virtual environment on servers.
* Business continuity can be enhanced by enabling rapid resolution of desktop failures. Once the old computer or thin client has been replaced with new hardware, the user can log on, access their virtual desktop, and continue to work on the same documents they were working on when the failure occurred with no loss of work.
* Enhanced security and compliance by virtue of the fact that sensitive business data remains in the datacenter instead of being stored locally on end user computers.

Microsoft's VDI solution can also provide users of virtual desktops with the Windows Aero desktop experience, audio and video redirection, and multiple monitor support. In addition to these built-in user experience enhancements found in RDP 7.0, RemoteFX, a new feature being introduced in Service Pack 1 for Windows Server 2008 R2, will enable a rich, local-like, full-fidelity desktop experience for VDI by adding support for any media application, including those using 3D, through the use of advanced codecs and virtualized graphics resources running on virtualization hosts in the data center. Microsoft's VDI solution also provides enhanced stability and robustness because each virtual desktop is fully isolated from other virtual desktops running on the same server running Hyper-V. This isolation allows performance to be better constrained when users are doing work that could impact other users of virtual desktops running on the same host.

But while VDI can provide businesses with tangible benefits, some vendors of VDI solutions have been promising more than they can deliver. Microsoft's position is that while VDI can be a good fit for some use case scenarios, VDI is not a single solution that can solve all your desktop computing problems. Many customers have unrealistic expectations concerning the cost savings they can achieve by implementing an across-the-board VDI desktop delivery solution. It's true that traditional desktop computer refresh cycles can require considerable capital expenditure (CapEx) with some vendors alluding that by implementing VDI you can bypass these costs by extending the life of your legacy computers. But implementing VDI incurs its own high CapEx costs because of the investment businesses must make in significant new infrastructure to deploy their VDI solution. VDI can be complex to implement and often involves purchasing expensive new server hardware together with additional software from one or more vendors. Furthermore, implementing VDI really only delays your organization's computer refresh cycle and doesn't bypass it entirely because eventually a point is reached where it becomes more expensive to maintain your existing computers than to replace them. For while some CapEx can be saved by extending the usable life of legacy computers, this is largely offset by the growing operational expenditure (OpEx) costs of having to continue to maintain legacy hardware and software that are no longer supported under mainstream support agreements with hardware and software vendors. Additionally, given the relative newness of VDI as a solution, financial returns promised by some vendors implementing VDI solutions are still relatively unproven.

Many customers also don't realize that VDI cannot support every type of user scenario typically found in today's enterprises. For example, because VDI requires constant network connectivity with the datacenter in order to deliver virtual desktops to users, VDI is not a workable solution for mobile workers who require offline mobility, or the ability to access their desktops when they are disconnected from the corporate network. The quality of the virtual desktop experience depending upon available bandwidth and network latency, VDI requires a well-connected network for effective implementation. If your organization has small branch offices with slow WAN links or a significant population of mobile workers, you won't be able to save costs by ripping out your entire existing desktop computing infrastructure and replacing it with a single one-size-fits-all VDI solution. The reality is that you will likely end up with two separate end-user computing infrastructures, one for mobile workers and computers at branch offices and the other for users of VDI. Despite what vendors promise about the potential cost savings of implementing VDI, having two separate infrastructures, together with the two separate management platforms needed to manage them, is just as likely to increase your costs instead of lowering them. Microsoft’s standpoint is that VDI should be considered as a business enabler to provide support for different use cases rather than as a TCO reducer.

# Comparing Personal Virtual Desktops vs. Virtual Desktop Pools

When considering implementing a VDI solution for your business it's important to understand the different ways this can be done. For example, Microsoft's VDI solution can be deployed in two different forms: personal virtual desktops (PVD) and virtual desktop pools (VDP). For PVD each user within Active Directory is assigned their own dedicated virtual desktop environment which they can fully customize and exclusively use. This means there is a one-to-one relationship between VDI users and PVDs on servers running Hyper-V.

The benefits of using PVDs are as follows:

* PVDs can be easily managed and maintained with the same tools used to manage physical desktop computers. For example, depending on the size of your organization's infrastructure, you could use either Windows Server Update Services (WSUS) or Microsoft System Center Configuration Manager 2008 R2 for servicing your virtual desktop images.
* Users can have full administrator privileges to their own personal virtual desktops. This provides network administrators with the flexibility of allowing some end users to be "power users" who can install programs they may need to perform their work.

Implementing personal virtual desktops using Windows Server 2008 R2 technologies such as Hyper-V and Remote Desktop Services (RDS) together with the Microsoft System Center family of products and partner technologies from Citrix and Quest enables the PVD model to scale to meet the needs of even the largest enterprises. With RemoteFX, the new feature included with Windows Server 2008 R2 SP1 described in the previous section, Microsoft's PVD solution can now meet the needs of even the most demanding knowledge workers, who need to run multiple, complex programs that provide rich user experiences and make high demands on processor, network and disk storage resources. It is important to remember that while PVD can provide tangible benefits over traditional rich client desktop computers, such benefits come with increased complexity and potentially higher costs.

By contrast, users in the VDP model share a pool of identically configured virtual desktops on servers running Hyper-V in the datacenter. Each of these virtual desktops is basically a copy of a single master desktop image located. Virtual desktops are dynamically assigned from the pool to users when they log on, and because these desktops are identically configured the user will see the same desktop regardless of which virtual desktop in the pool they connect to. Each time a user logs off from the virtual desktop they are using; it can be configured to be reset back to its original state. This means there is a many-to-one relationship between VDI users and the virtual desktops in the pool.

The downsides of the virtual desktop pool approach however are numerous:

* Virtual desktop pool solutions are more complex to manage than personal virtual desktop solutions because they necessitate implementing and working with two separate management platforms, one for managing your virtual desktop pool and the other for managing all the other desktop systems in your environment such as users' computers and laptop computers.
* Users in VDP environments are usually not granted administrator privileges because when the user logs off from their virtual desktop, the virtual machine they used must be reset back to its original state so that other users will be able to use the virtual machine. This means users cannot install applications on their virtual desktops or perform other common administrative tasks.
* Because virtual desktop pools are reset back to their original state, any desktop customization by the user is lost. To allow customization VDP can be implemented together with Roaming User Profiles and Folder Redirection so that user customized settings can be saved between sessions and user data can be centralized on network file servers.
* Differencing disks can be used in a VDP environment, but this complicates servicing and adds complexity to managing VDP. VDP implemented this way can be harder to integrate into your existing systems management infrastructure and can require additional partner technology or the creation of your own specialized management tools and scripts for servicing and maintaining master images. This need for running two separate management platforms (one for the VDP environment and another for your desktop and server infrastructure) results in higher CapEx costs, increases the complexity of your infrastructure, and leads to higher OpEx costs due to management overhead. By contrast, PVD can easily integrate into your existing system management infrastructure and incurs less CapEx costs because of this. Because personal virtual desktops can be managed as easily as computers using your existing management tools, the OpEx costs for PVD can be lower too.

Microsoft's VDP solution, which can be implemented on its own in low complexity environments, should be implemented in conjunction with partner technologies such as Citrix® XenDesktop™ at higher complexity scale. The resulting solution can meet the needs of today's task workers who work in flexible environments such as hot-desking scenarios. It is important to keep in mind that VDP can meet the needs of such workers; it typically adds complexity and higher cost.

In addition to supporting knowledge workers and task workers however, most enterprises also need to support mobile workers such as travelling sales professionals, consultants and field engineers. These users typically perform work that requires the use of laptop computers, which are intermittently connected to the corporate network via VPN when they are on the road or when they return to their office. Implementing a VDI solution however requires constant network connectivity and VDI therefore cannot be used to support a mobile user population. So despite the claims of some VDI vendors, the reality is that VDI is simply not a one-size-fits-all solution to all your enterprise needs.

The facts then concerning VDI are these:

* VDI is expensive to deploy although once implemented it may lead to lower OpEx costs if properly managed (though this is not a given).
* Personal VDI can easily be integrated into your existing systems management infrastructure while VDP requires purchasing, deploying and becoming familiar with its own separate management platform.
* Pooled VDI cannot meet all your end user needs since mobile workers will still require laptop computers and these will need to be managed properly within your infrastructure in order to achieve TCO savings.

# Session Virtualization vs. Virtual Desktop Pools

For enterprises such as call centers with a large population of task workers, virtual desktop pools have many attractions. There is an existing time-tested technology you can implement to meet the needs of such users, that is less complex to deploy, easier to manage, and potentially cheaper than VDP. This technology is Remote Desktop Services (RDS), a server role in Windows Server 2008 R2 that provides a set of services that enables users to access desktops and applications running on hosts in the datacenter from both the corporate network and across the Internet. Formerly known as Terminal Services in Windows Server 2008, this server role was renamed and expanded as Remote Desktop Services in Windows Server 2008 R2 to reflect its expanded role of providing both session-based and virtual machine-based desktops and applications that users can access from anywhere using either managed or unmanaged devices. The new Remote Desktop Virtualization Host (RD Virtualization Host) role service is a fundamental component of Microsoft's VDI solution. RD Virtualization Host integrates with the Hyper-V server role to provide virtual machines that can be deployed as either personal virtual desktops or virtual desktop pools which users can then access by using either RemoteApp and Desktop Connection (a new feature of Windows 7 and Windows Server 2008 R2) or RD Web Access (formerly called TS Web Access).

While virtual machine-based desktop and application virtualization using RD Virtualization Host is an entirely new feature of RDS in Windows Server 2008 R2, traditional session-based virtualization is still present in RDS with the Terminal Server role service now being called Remote Desktop Session Host (RD Session Host) to clarify its role of delivering session-based desktops and applications (RemoteApp programs). RD Session Host has also been enhanced in Windows Server 2008 R2 with simplified configuration of client desktop experience, per-user RemoteApp filtering, Fair Share CPU Scheduling, Windows Installer RDS compatibility, Roaming User Profile cache management and Remote Desktop IP Virtualization. Together with the client experience enhancements to RDP 7.0 described earlier in this paper, RD Session Host now has greater scalability, improved performance, higher isolation and a richer end-user experience than could be achieved with previous versions of Terminal Services.

Session virtualization is a mature technology that has been a part of Windows since Windows NT 4.0. In the past, the traditional use cases for session virtualization were task workers and supporting other workers who required remote access. As the needs of businesses have evolved, the role of RDS has evolved to the point where it can provide up to 80% of the capabilities required by both task workers and high-end knowledge workers. While yesterday's task workers may have been able to perform their jobs using simple text-based programs, today's workers often need access to rich applications such as Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) software, Microsoft Office applications, and Web browsers.

With all its new features and enhancements, session virtualization using RD Session Host can meet the needs of today's use cases as well as or even better than a VDP solution for several reasons:

* Session virtualization requires less hardware to implement than VDP and therefore has lower CapEx costs.
* Sessions are "cheaper" than virtual desktop pool in terms of the server resources needed such as memory, processing power and disk storage.
* Session hosts can be managed using tools that are already familiar to many administrators, and session hosts are simpler to manage than a VDP infrastructure.
* Session virtualization and Microsoft VDI solutions both use the same remoting protocol (RDP or HDX) and therefore support the same level of user experience features on the client.

Session virtualization is also a reliable, mature technology that has proven its value and stood the test of time. In fact, the concept of centralizing desktop delivery from the datacenter isn't new as Microsoft and Citrix have been doing this for over a decade. VDI by comparison is a relatively new technology whose benefits are less well proven and involves implementing RDS role services including:

* RD Virtualization Host: Integrates with the Hyper-V™ role to provide virtual machines that can be used as personal virtual desktops or virtual desktop pools.
* RD Sessions Host running in redirection mode: Requests the RD Connection Broker to initiate the virtual desktop for the client.
* RD Connection Broker: Providing users with a single, personalized way of accessing their RemoteApp programs, session-based desktops and virtual desktops.
* RD Gateway: Provides secure remote access to RDS hosts/infrastructure from outside the corporate network over the Internet.

Microsoft's basic VDI solution implements thee RD Connection Broker role service included in RDS; for a more scalable solution, you'll need to use a third-party connection broker from a Microsoft partner such as Citrix or Quest Software.

## Scalability of Session Virtualization Compared to Virtual Desktop Pools

Session virtualization also scales to more users per server than a comparable VDP infrastructure. For example, benchmark tests[[1]](#footnote-1) performed by Microsoft using reference hardware in a lab environment with automation tools for simulating user activity suggest that RD Session Host can have a scaling advantage of up to 2:1 or higher over a VDP solution implemented using similar high-end server hardware with CPUs supporting Second Level Address Translation (SLAT), Fiber Channel SAN for disk de-duplication, Gigabit Ethernet networking and as much physical RAM as you can afford.

The actual server used for performing these tests was a single SLAT-capable un-clustered[[2]](#footnote-2) 4-socket AMD Opteron 8378 2.4 GHz (Quad core) server having 128 GB DDR2 RAM. For the VDI scenario the virtual machines were stored on an EMC CX3-20 SAN with a 15 x 146 GB 15K RPM Fibre Channel drives with SAN connectivity being provided by a 4 Gbps EMC LP 1150 Host Bus Adapter.

Benchmark results were obtained for two different types of knowledge worker scenarios:

* **Average knowledge worker.** This scenario consists of a series of interactions with Microsoft Office 2007 applications (Word, Excel, Outlook, and PowerPoint) and Internet Explorer. These tasks include creating and saving Word documents, printing spreadsheets using Excel, sending and receiving e-mail using Outlook, adding slides to PowerPoint presentations and running slide shows, and browsing Web pages using Windows Internet Explorer. Statistics collected from the Software Quality Management data submitted by real-world Office users indicates that these benchmark actions should represent a good approximation of the average Office user.
Note that while PowerPoint tasks occur during only approximately 10% of the work cycle for this scenario, PowerPoint uses more than half of the CPU resources when it is running. The result is that CPU usage for this scenario has large variations between when PowerPoint is running and not running.
* **Light knowledge worker.** This scenario is similar to the average knowledge worker scenario in most ways. The significant difference in this case is that the light knowledge worker scenario does not use PowerPoint, while tasks performed with other Office applications and Internet Explorer are proportionally performed more often. The result is that CPU usage for this scenario is significantly lighter but much more uniform than for the previous scenario.

Table 1 shows our results for the maximum number of users (or equivalently the maximum number of VMs) that can be supported in the VDI scenario when each virtual machine was assigned either 1024 or 512 MB of RAM respectively depending on whether they were running Windows 7 or Windows XP as their guest operating system.
Note that the number of VDI users supported in the VDI scenario is either the maximum number the system could support without significant degradation in user experience or was determined as the point at which no more virtual machines could be started on the host due to lack of memory[[3]](#footnote-3).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Knowledge Worker Scenario | Guest OS / Memory | RDSH Users  | VDI Users (VMs) | RDSH/VDI Ratio  |
| Average worker | Windows 7 with 1024 MB RAM | 310  | 120 | 2.6  |
| Windows XP with 512 MB RAM | 310 | 170 | 1.8 |
| Light worker | Windows 7 with 1024 MB RAM | 310 | 120 | 2.6 |
| Windows XP with 512 MB RAM | 310 | 220 | 1.4 |

*Table 1: Test results for number of users supported by RD Session Host vs. VDP for different knowledge worker scenarios and using different guest operating systems.*
Table 2 shows our results for the maximum number of users that can be supported in the VDI scenario when each virtual machine is assigned only 512 MB RAM and is running either Windows 7 or Windows XP. The number of VDI users that can be supported is shown both for SLAT enabled and disabled while RDSH testing was performed only with SLAT enabled.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Knowledge Worker Scenario | Guest OS | SLAT | RDSH Users | VDI Users (VMs) | RDSH/VDI Ratio |
| Average worker | Windows 7 | Enabled | 310 | 190 | 1.6 |
| Disabled | N/A | 160 | N/A |
| Windows XP | Enabled | 310 | 170 | 1.8 |
| Disabled | N/A | 140 | N/A |
| Light worker | Windows 7 | Enabled | 310 | 220 | 1.4 |
| Disabled | N/A | 190 | N/A |
| Windows XP | Enabled | 310 | 220 | 1.4 |

*Table 2: Test results for the number of users supported by RD Session Host vs. VDP when all virtual machines are assigned 512 MB RAM with SLAT enabled or disabled on the server.*
In contrast to these benchmark tests with show a scaling ratio of 2:1, real-world experiences of customers with production VDI deployments suggest that the scaling advantage of RD Session Host over VDP can actually often be as high as 5:1. This is because customers often support up to 25 users (sessions) per core in RD Session Host environments compared with 4 to 6 virtual machines per core for VDP deployments (depending on use cases and the virtualization platform being used). This scaling advantage of RD Session Host over VDP, which can range from 2:1 up to 5:1, demonstrates that lower TCO that can be achieved by implementing a Windows Server 2008 R2 session host solution instead of a VDP solution.

## Challenges with Using Session Virtualization

While session virtualization clearly has many advantages over VDP for supporting the task worker environment, there are a few areas where VDI may have the advantage, especially when considering the implementation method for session virtualization in earlier versions of the Windows Server operating system. For example, in a VDI infrastructure the virtual desktops are completely isolated from one another, so two users accessing different virtual desktops are actually running different operating system instances and accessing different instances of applications. With session virtualization however, the operating system and applications on the session host are shared by all users who have sessions running on the host. In previous versions of Terminal Services, this means that a few users could place a significant load on a particular host, slowing things down for the host's other users. With the new Fair Share CPU Scheduling feature of RDS in Windows Server 2008 R2, this concern is now lessened. This is because Fair Share CPU Scheduling is able to use the kernel-level scheduling mechanism in Windows Server 2008 R2 to dynamically distribute processor time across sessions based on the number of active sessions and the load of those sessions. The result is that one user accessing his session running on an RD Session Host server will not affect the performance of another user's session even when that RD Session Host server is under heavy load.

Another traditional issue with session hosts concerns application compatibility because some applications were written specifically for Windows client operating systems and don't install or run properly on the Windows server operating system of a session host, which can be a problem. With VDI this is not a problem because users are provided with a virtual desktop environment running a client version of Windows. If that's the only reason why your organization is leaning towards implementing a VDP solution instead of the cheaper and easier to manage RD Session Host approach, you should take another look at App-V for RDS, a technology described earlier in this paper that lets you transform applications into centrally managed virtual services and deliver them to users over the network using RDP. App-V for RDS, which is included as part of the RDS Client Access License (CAL), can help reduce the cost of application deployment, eliminate application conflicts and reboots, simplify your base image footprint, expedite application provisioning and increase end user productivity.

By deploying App-V for RDS together with RD Session Host you can mitigate many common compatibility issues that result from installing and running certain applications on session hosts, especially if you add Roaming User Profiles and Folder Redirection to the mix to centralize user data and settings in the datacenter. In fact, implementing RD Session Host together with App-V for RDS, and Roaming User Profiles (RUP) and Folder Redirection (FR) provides most of the benefits of VDP but with considerably lower CapEx costs. If your organization has any of the System Center family of products deployed, you can leverage their capabilities to streamline the management of your session virtualization infrastructure to reduce TCO. This is because System Center can integrate tightly with your RDS environment providing a single point of administration for configuring and managing your client systems, applications and RD Session Host servers. System Center's advanced monitoring and data protection capabilities also help you ensure your task workers and other session host users have access to the applications and data they need to do their job without interruptions or delays.

## Session Virtualization: Best Solution for Task Workers

If your business is looking for an enterprise-ready solution that meets the needs of today's task workers, you need to take your time and look beyond expensive and complex VDI solutions such as VMware View and instead consider implementing RD Session Host together with App-V for RDS and RUP/FR, especially if you are already using System Center for managing your existing desktop computing infrastructure. The combination of session virtualization using RD Session Host, application virtualization using App-V for RDS, and user state virtualization using RUP/FR can meet the needs of almost any task worker environment with lower costs and simpler ongoing management than any VDP solution.

For the few scenarios where VDP might be a better approach than session virtualization, for example students in a lab who need a pristine desktop environment every time they log on to a shared computer, Microsoft recommends implementing a VDP solution using a partner technology like Citrix. XenDesktop with Citrix Provisioning Services, offers next-generation, user-centric desktop virtualization that runs on Hyper-V provides a complete system for desktop delivery.  XenDesktop includes single image provisioning and management and storage optimization technologies that can dynamically assemble virtual desktops on-demand and provide users with a pristine desktop each time they log on. XenDesktop supports Windows 7 as the VDI desktop and can deliver a high-definition HDX user experience across multiple device types and network configurations. XenDesktop integrates well with Windows Server technologies and System Center, and it supports running Windows 7 as the VDI desktop. XenDesktop’s high-speed delivery protocol also provides unparalleled responsiveness over any network which helps in desktop optimization and ensures that performance never degrades. XenDesktop supports the VDP deployment better than other competitive solutions in the marketplace because its provisioning engine can compose a master image dynamically along with any new updates and then stream that image into virtual desktop, which can help avoid some of the pool management overhead involved in maintaining your master images in a VDP environment.

# Personal Desktop Pools and RD Session Host: Better Together

Finally, while the traditional desktop computer can clearly meet the needs of today's knowledge workers, personal virtual desktops can too. Personal virtual desktops can meet the needs of today's knowledge workers just as well as traditional desktop computers by using RDS, Hyper-V and System Center Virtual Machine Manager (VMM), together with partner technologies like Citrix XenDesktop and Quest vWorkspace. Key to enabling this are the RDP 7.0 enhancements found in Windows Server 2008 R2 together with additional capabilities like RemoteFX introduced in Service Pack 1 for Windows Server 2008 R2. These advanced technologies ensure that the user experience of a knowledge worker accessing personal virtual desktops over a well-connected LAN is similar to that of a knowledge worker using a traditional desktop computer. You can use the System Center family of products to manage and maintain your personal virtual desktops as easily as your desktop computers.

Microsoft is invested in desktop virtualization, including VDI, and is fully committed to supporting our VDI solutions. Microsoft’s strategy is to provide the best value and technology for customers, and therefore the technologies we recommend depend upon the specific needs each individual customer has, and in particular for what that customer's users need. The bottom line is that it's all about the user. We believe that session virtualization using RD Session Host, App-V for RDS and RUP/FR provides the best business value for task workers through to lower end knowledge workers, with the exception of a few specific scenarios where the VDP approach might be more appropriate. We also believe that the PVD approach solves broader challenges than VDP and can provide significant benefits for higher end knowledge workers, though we recommend that customers considering implementing VDI perform a detailed cost/benefit analysis before moving to this solution. Our own recommendation is that enterprises who need to support a variety of user segments including task workers and knowledge workers and who desire optimum flexibility and manageability at a reasonable cost should consider implementing a reference architecture that is based on the VDI Premium Suite licensing SKU, incorporating partner technologies, and uses session virtualization for supporting task workers while provisioning personal virtual desktops to knowledge workers.

# Find Out More

Learn more about Microsoft's VDI solutions and licensing options at <http://www.microsoft.com/vdi>.

Find out what's new in Windows Server 2008 R2 Remote Desktop Services at <http://www.microsoft.com/rds>

Learn how to implement PVD in a test environment using the Step By Step guides found at <http://go.microsoft.com/fwlink/?LinkId=154801> and <http://go.microsoft.com/fwlink/?LinkId=147909>.

Learn how to implement VDP in a test environment using the Step By Step guides found at <http://go.microsoft.com/fwlink/?LinkId=154802> and <http://go.microsoft.com/fwlink/?LinkId=147906>.

Find out more about RemoteFX at <http://www.microsoft.com/windowsserver2008/en/us/rds-remotefx.aspx>

Learn how to plan, deliver, operate, and manage the right desktop technologies for end users across your organization by downloading the Windows Optimized Desktop Toolkit 2010 from <http://go.microsoft.com/fwlink/?LinkId=163304>.

Learn more about App-V for RDS and other benefits of the Microsoft Desktop Optimization Pack from <http://www.microsoft.com/windows/enterprise/products/mdop/default.aspx>.

Find out more about the capabilities and benefits of the Microsoft System Center family of products at <http://www.microsoft.com/systemcenter>.

1. Benchmark testing in a lab environment does not represent “real world” analysis. Microsoft bears no responsibility for any actions you may take based on the benchmark data included in this paper and recommends you perform your own benchmark testing and analysis as you approach the pilot phase of your VDI deployment. [↑](#footnote-ref-1)
2. Clustered Hyper-V supports up to 1,000 VMs per cluster with no more than 384 running VMs per node, no more than 4 virtual processors per VM and no more than 8 virtual processors per logical processor. [↑](#footnote-ref-2)
3. Dynamic Memory, a feature of Hyper-V introduced in Service Pack 1 for Windows Server 2008 R2 and which can increase the number of virtual machines that can run on a host, was not used when performing these tests. [↑](#footnote-ref-3)