Microsoft

Virtual Desktop Infrastructure

Windows Server® 2012 R2

Contents

Empower People-Centric IT

The explosion in the use and number of consumer devices and ubiquitous information access are changing the way people perceive their technology. The constant use of IT throughout the day, along with the easy access to information, is blurring traditional boundaries between work and home life.

People expect consistent access to corporate tools and data regardless of the type of device they are using. They also want their corporate-issued technology and resources to look and behave like their personal technology—always on and always available from any device, from virtually anywhere.

This complex set of demands creates challenges for IT pros. For instance, it can be difficult for administrators to maintain data security and compliance. IT must effectively manage the influx of these consumer devices while continuing to deliver on operating efficiency without compromising compliance.

Microsoft® Virtual Desktop Infrastructure (VDI) in the Windows Server® 2012 R2 operating system helps IT to deliver desktops and apps to users on a variety of devices. People can enjoy the full Windows® experience, access corporate data and apps, and be productive from virtually anywhere on whatever device they choose. And although the virtual desktops and apps can be accessed from a variety of devices and locations, the integrity of the data is always maintained, because apps and desktops are centralized in the data center, so the risk of losing data on stolen or lost devices is mitigated.

Centralizing and controlling apps and data enable people to get their work done on the devices they choose while helping IT maintain compliance. In addition, with Microsoft VDI, even organizations that have tight resources now have a solution to embrace the bring-your-own-device (BYOD) trend without compromise. VDI provides:

- **Efficient management**, with the deployment wizard consolidated within Server Manager

- **Rich Windows experience** available on a variety of devices and platforms, Including Windows, Windows RT, Apple iOS, Mac OS X, and Google Android

- **Great value**, with capabilities such as storage tiering and online data deduplication to improve performance, scaling, and solution economics

Microsoft VDI

VDI accelerates and extends desktop and app deployments to any device. It improves remote worker efficiency while helping to keep critical intellectual property secure and simplifying compliance with regulations. With Windows Server 2012 R2 Remote Desktop Services, VDI provides a single infrastructure to enable both virtual and session-based desktops and RemoteApp programs. In fact, all features of Remote Desktop Services are available to both virtual and session-based desktops, which provides a consistent user experience.

New and enhanced features for Remote Desktop Services

The Windows Server 2008 R2 operating system introduced new and enhanced features for Remote Desktop Services and remote access, including Multimedia Redirection, support for multiple monitors, the Windows Aero® Glass desktop, enhanced bitmap codecs, and rich desktop remoting within the corporate network. Windows Server 2008 R2 with Service Pack (SP) 1 introduced Microsoft RemoteFX® technology to further enhance the remote desktop experience.

Windows Server 2012 R2 improves Remote Desktop Services for both administrators and users:

- Remote Desktop Services offers a collection of virtual desktop or virtual session features that are tightly integrated and can be easily configured and managed by using the new centralized and unified management console and wizards.

- All features of Remote Desktop Services are available to both sessions and virtual machines (VMs), providing a consistent user and administrator experience.

- For users, remote desktops behave more like traditional desktops, whether they connect across the LAN or the WAN. Users can even disconnect from their workspace, and then reconnect from another location.

Remote Desktop Services in Windows Server 2012 R2 features that enhance the VDI experience include:

- Simplified deployment and management:

  - **Centralized administration console.** Deploy and manage virtual desktops, sessions, and RemoteApp programs from a unified, central console.

  - **Simplified scenario-based deployments.** Quickly and easily deploy virtual session collections or pooled or personal virtual desktops by using the new scenario-based deployment tools.

  - **Centralized RemoteApp and desktop publishing.** Easily publish and manage resources, such as RemoteApp programs, session-based desktops, and virtual desktops. Use file type association to assign files on the client device to their associated RemoteApp programs.

  - **Intelligent patching.** Automate the process of patching both pooled and personal VMs while minimizing the impact on resource use and bandwidth.

Centralized administration with Server Manager

In Windows Server 2012 R2, the capabilities of Server Manager have expanded considerably to facilitate multiserver tasks such as deployment to both physical and virtual servers, remote role and feature management, and custom server group creation. For Remote Desktop Services, Server Manager gives you the ability to administer groups of servers, configure your RemoteApp programs, manage your virtual desktops, and add servers from one centralized console. Existing consoles, such as RemoteApp Manager and Remote Desktop Session Host (RD Session Host) configuration, have been removed, and their most-used functionalities are now included in Server Manager. Other features can be configured through Windows PowerShell® or Group Policy.

Server Manager is essentially the control room for deploying and managing Remote Desktop Services. It interfaces directly with the Remote Desktop Connection Broker (RD Connection Broker), meaning that you can access any part of a remote desktop deployment—the web portal or gateway, virtualization host, or session host—and it can interact with the required license server, as well.

- **Session Shadowing.** Administrators or help desk staff can see or take over a session from the console or from the command line using the Terminal Server client. This functionality back-ports to the Windows 7 with SP1 operating system.

- Enhanced user experience:

  - **Microsoft Remote Desktop app.** Easy access to a variety of devices and platforms, including Windows, Windows RT, iOS, Mac OS X, and Android. The Remote Desktop app delivers rick Windows experience and allows users to be productive on their device. Users can install the app by visiting the app store on their device.

  - **RemoteFX enhancements.** Enjoy the benefits of several user experience enhancements to the Remote Desktop Protocol (RDP), including WAN optimizations, enhanced graphics processing, media streaming, and expanded USB device redirection.

    - **Improved remote app experience.** Remote apps seem more like local apps, including borderless whole-window dragging, actual application thumbnails, transparent windows, and click-to-run remote applications.

    - **Dynamic display changes.** Change the local display resolution by rotating the device, adding a second display, or plugging in a projector.

    - **Quick reconnect.** The app display automatically updates itself immediately without having to reconnect.

  - **User Profile Disk.** Store user personalization and app cache data for pooled VMs and sessions so that data is maintained across user logon sessions.

  - **Fair share.** Dynamic allocation of CPU, network, and disk I/O are balanced, preventing one user from affecting the performance of other users on the same server.

- Lower-cost storage options:

  - **Disk deduplication.** This feature identifies redundant blocks of data and stores only one copy, greatly reducing the storage requirements of VDI for personal or pooled desktops by as much as 80 percent. Disk deduplication also provides performance gains through caching.

  - **Storage tiering.** This feature puts the most frequently accessed material on the fastest disks and helps automate capacity planning by optimizing Read and Write operations.

- **Server virtualization over Server Message Block 2.0 (SMB2).** This feature conveniently stores VM files (including configuration, virtual hard disk [VHD] files, and snapshots) in shared folders that use the SMB2 protocol, thereby reducing costs.

- **Local storage cache.** This feature allows client VM images to be hosted on SMB shares or Cluster Shared Volumes and cached on direct attached storage (DAS), enabling the best performance at lower cost.

Remote Desktop Services architecture overview

Remote Desktop Services allows remote users to gain access to their corporate desktops or applications running either as sessions on an RD Session Host server or VMs on a Remote Desktop Virtualization Host (RD Virtualization Host) server by using a remoting protocol from various end point devices.

Connections to the remote desktops or remote apps (RemoteApp) on these servers can be stored in an RDP file or displayed by using the publishing features of Remote Desktop Web Access (RD Web Access). As shown in Figure 1, the RD Connection Broker routes incoming connections to the appropriate session or VM, depending on the contents of the RDP file and its load balancing. The Remote Desktop Gateway (RD Gateway) provides more secure WAN access directly or through RD Web Access, and the Remote Desktop Licensing (RD Licensing) server handles licensing for Remote Desktop Services.
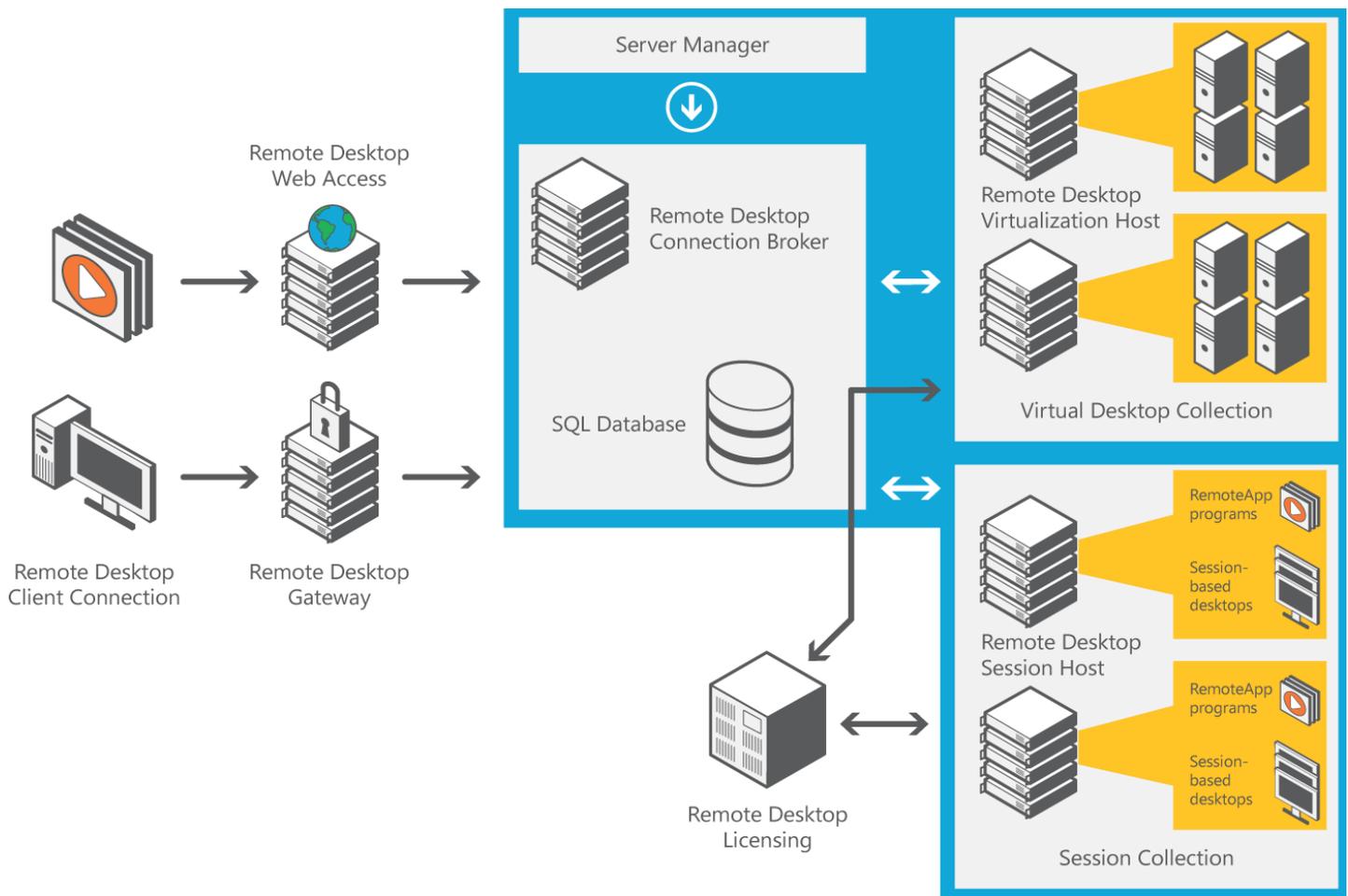

Figure 1. High-level architecture of Remote Desktop Services

The following sections provide a feature-by-feature review of how this Remote Desktop Services architecture enables simplified deployment and management, enhanced user experiences, and reduced infrastructure costs for VDI environments.

Scenario-based deployments

Server Manager provides access to new deployment wizards that make it easier to deploy almost everything you need based on your desired scenario. You can choose either a session virtualization or VDI deployment, and the scenario-based installation (shown in Figure 2) installs the required role services to support it.
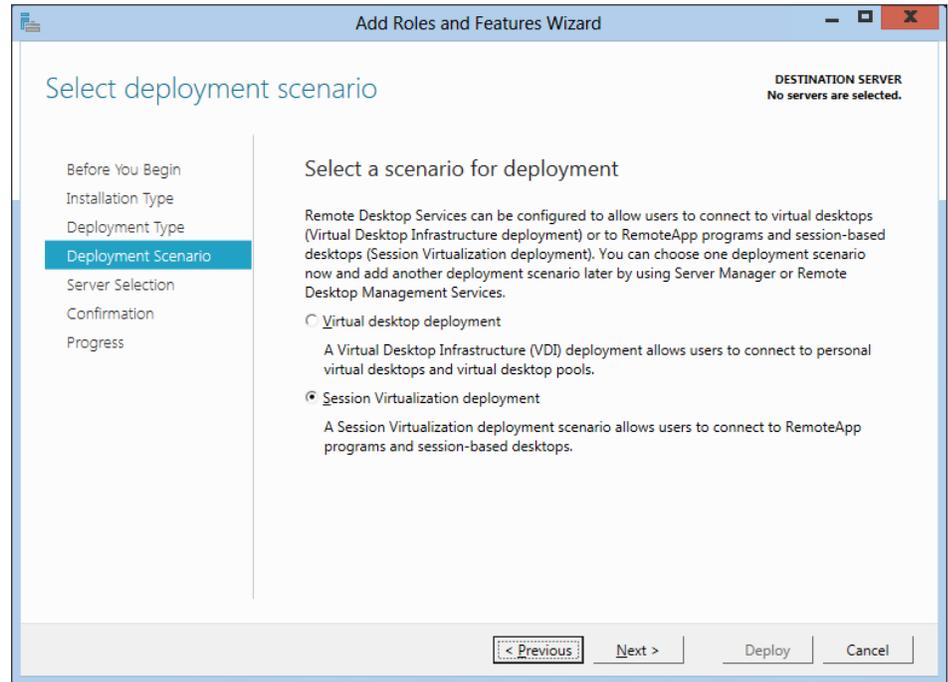

Figure 2. Selecting a scenario-based deployment from the Add Roles and Features Wizard

Technical description

Windows Server 2012 R2 makes it easier to deploy virtual desktops and sessions by providing a unified console that walks you through a role-based or scenario-based installation. All features of Remote Desktop Services are available to both sessions and VMs, which provides a consistent user experience.

VDI deployments

Windows Server 2012 R2 introduces the concept of *collections*. A virtual desktop collection consists of one or more virtual desktops used in a VDI deployment scenario. You can choose to deploy pooled or personal collections: The method you select depends on your environment and preferences, as summarized in Table 1.

Pooled collection	Personal collection
Single, shared master VM	Separate VM instance for each user
Operating system–level changes (user changes persist on the user VHD)	Changes retained after logoff

Pooled collection	Personal collection
One image to manage	Coordinated with Windows Server Update Services (WSUS) and Microsoft System Center Configuration Manager to avoid patch storms
Reduced storage requirements	Users can install apps and be an administrator on their own VM
Lower deployment cost	–
Supports User Profile Disk	–

Table 1. Pooled versus personal collections

Pooled VM collections. You can choose to deploy VDI through VM pools. In this model, all users in the VM pool share a single master image. The changes that each user makes during a session are stored on a transient VHD that's discarded when the user logs off (although user profile changes are persisted). The main advantage of this model is having a single image to manage, which reduces storage requirements and simplifies management, thereby reducing deployment costs. In Windows Server 2012 R2, the entire model of deploying pooled VM collection is transparent to the administrator. Single-image management and administration are natively supported, and the entire process is simplified for ease of deployment.

Personal VM collections. Personal VMs are based on a master VM. Windows Server 2012 R2 automates the rollout process by copying the master image for each instance of the personal VM. When the initial rollout is complete, you can maintain VMs as if they were physical machines and manage them by using WSUS and System Center Configuration Manager.

Session virtualization deployments. Remote Desktop Services session virtualization, formerly known as *Terminal Services,* is a proven and mature centralized desktop infrastructure that many organizations deploy instead of VDI to increase user density on the host and therefore reduce costs. Windows Server 2012 R2 makes it easier to deploy this architecture by offering a session virtualization deployment scenario.

A session virtualization deployment consists of RD Session Host servers and infrastructure servers, such as RD Licensing, RD Connection Broker, RD Gateway, and RD Web Access, which, as mentioned above, are consistent across both VM and session deployments.

You can deploy session-based desktops or RemoteApp programs. For detailed information on publishing and managing RemoteApp programs, session-based desktops, and virtual desktops from a unified console, see "Centralized publishing of RemoteApp and desktops" later in this paper.

Requirements

Scenario-based deployment has the following requirements:

- Windows Server 2012 R2

- Remote Desktop Services role services

- VMs running Windows 7 with SP1 or later (Windows 8 VMs are required for a good remoting experience)

- For client computers, a desktop operating system with the RDP 8 client installed

Summary

In Windows Server 2012 R2, administrators have an easier and more cost-effective way to quickly deploy and manage virtual desktop, session-based, or RemoteApp collections from one management console. Remote users benefit from a local-like, personalized experience and network and processor optimizations. (User benefits are described in more detail in "RemoteFX enhancements" later in this paper.)

Centralized publishing of RemoteApp and desktops

Centralized resource publishing presents a centralized desktop or app to users, providing a user experience that is similar to locally installed apps. By using the new publishing features in Server Manager, you can view a history of the resources assigned to users, change the published resources for any given collection, and edit the properties of published resources.

In addition to Server Manager, you can now configure a RemoteApp and desktop connection URL by using Group Policy, which allows users to subscribe to a desktop or application feed. This means that by simply entering their email address, users can automatically gain access to their remote resources.

Technical description

You can use Server Manager to publish RemoteApp programs to either a session collection or virtual desktop collection, as shown in Figure 3. You can also search for applications that do not appear in the Start menu.
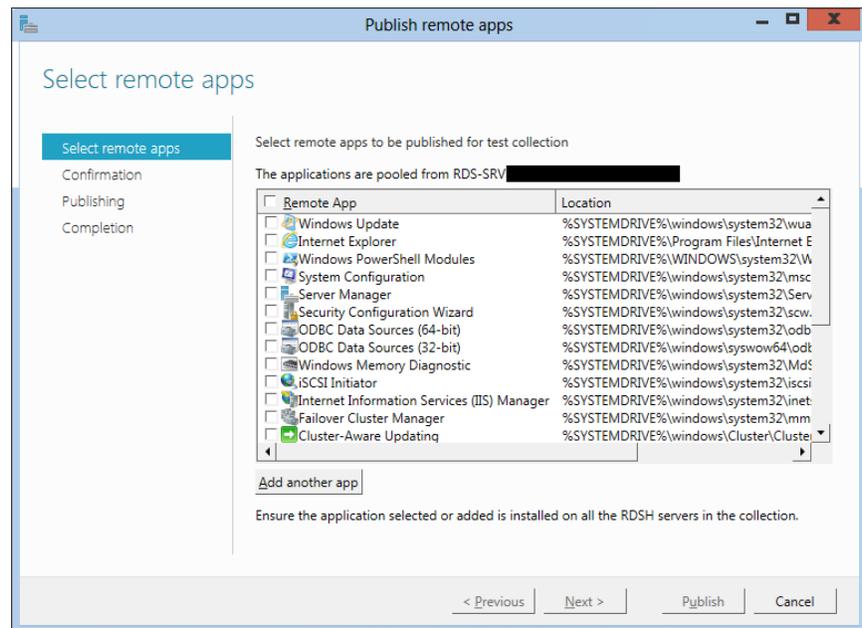

Figure 3. File type association for a RemoteApp program

The file type association is used to assign the file association on the client device to the associated RemoteApp program. To configure the file type association for a published RemoteApp program, you must first ensure that the default connection URL is configured in the appropriate Group Policy setting. After the default connection URL is configured, you can change the file type associations of a published RemoteApp program by using Server Manager, as shown in Figure 4.
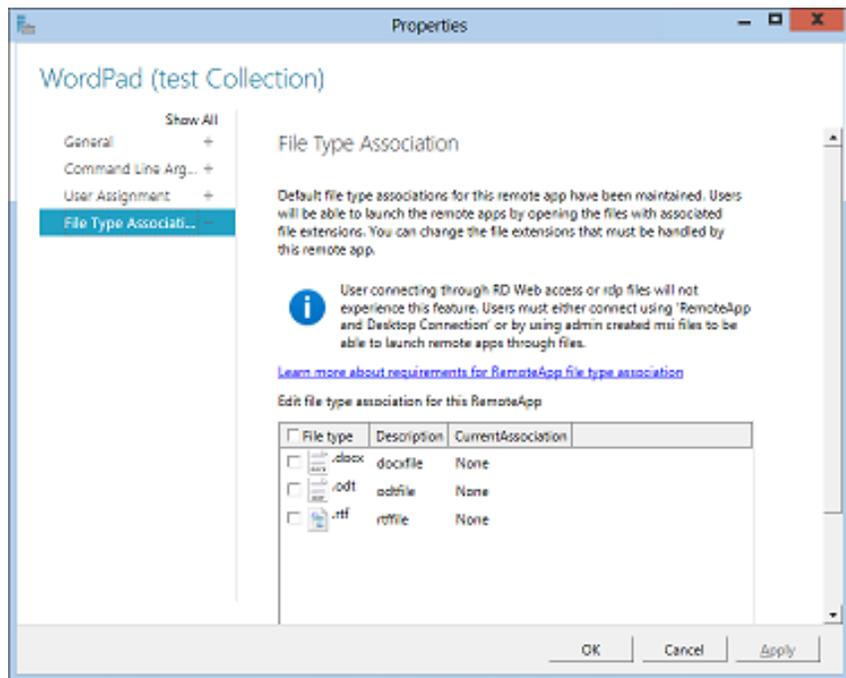
Figure 4. Email-based discovery for RemoteApp and desktop connections

Users can type their email address, and the Remote Desktop Services Domain Name System (DNS) feed lookup automatically discovers the RemoteApp and desktop connection URL. You do this by creating a DNS TXT record for the email address domain containing the RemoteApp and desktop connection URL.

Requirements
Centralized resource publishing requires the following configurations and permissions:

- An installed and configured session virtualization or VDI deployment

- A configured session collection or virtual desktop collection

- If publishing RemoteApp programs from a virtual desktop collection, access to the Windows Management Instrumentation and file and printer sharing programs in Windows Firewall on each virtual desktop in the virtual desktop collection

Summary
With centralized resource publishing, you can publish RemoteApp programs and complete desktops, whether they are session based or VM based, from a single console with minimal need to run additional scripts, tools, or administrative applications. Users can more easily access relevant applications through the DNS feed lookup and automatic web page creation tools that are part of Windows Server 2012 R2.

Intelligent patching

Intelligent patching simplifies the process of updating both pooled and personal virtual desktops with little impact on resource use or bandwidth.

Patching virtual desktops in a large deployment
Administrators must address several obstacles when patching multiple VMs in a pooled or personal VM deployment:

- You have no control over when the user logs off, and then logs on again to begin using the patched operating system.

- You may have to enforce downtime for users while you are performing patch operations.

- Patching large numbers of VMs at the same time can significantly affect productivity.

- You may be unable to patch sleeping VMs or those in a saved state.

With intelligent patching in Windows Server 2012 R2, you can patch virtual desktop images in large deployments more easily and efficiently in an orchestrated way to reduce downtime and maintain high levels of productivity.

Technical description
Intelligent patching in Windows Server 2012 R2 solves numerous issues for both pooled and personal virtual desktop collections.

Pooled virtual desktop collections

In Windows Server 2012 R2, you can use built-in tools to manage application installations and security updates for virtual desktops in a pooled virtual desktop collection. You merely apply app installation and security updates to the master VM image, and then all virtual desktops in the pooled collection are switched with the master image.

You can then select one of the following modes for patching the virtual desktops that fits the needs of your organization:

- Wait for the user to log off, and then switch to the patched virtual desktop.

- Notify the user with a deadline, force the user to log off at that time, and then switch to the patched virtual desktop.

- Immediately force the user to log off, and then switch to the patched virtual desktop.

You can reduce disruption to productivity by allowing active users to remain logged on and new users to connect while free virtual desktops in the pool are being patched. Doing so reduces the required downtime for patching and gives you the flexibility to choose how you want to roll out the patch, depending on the severity of the issue being patched.

Personal virtual desktop collections

For personal virtual desktops, you can apply application installations and security updates by using WSUS or another software update mechanism. This approach is similar to the update process on a traditional desktop.

For personal virtual desktops, intelligent patching resolves several issues:

- Simultaneous patching of virtual desktops causes a sudden increase in the load on the server. In Windows Server 2012 R2, the RD Connection Broker works with a management system, such as System Center Configuration Manager, to patch the personal virtual desktops in a way that balances the load on the host to prevent disruptions to users.

- By default, Server Virtualization disables waking up virtual desktops from sleep, but in Windows Server 2012 R2, the RD Connection Broker has been modified to use the virtual desktop BIOS to wake up the virtual desktop to allow patching. The wake-up function also uses intelligent patching to reduce the load on the server that's running the virtual desktops.

Summary

With Windows Server 2012 R2, you can easily patch virtual desktop images by using a centralized management console or the RD Connection Broker alongside your existing management system, such as System Center Configuration Manager.

For pooled collections, you can patch the master image, which then becomes the new master image for the collection. When users log off, and then log on again, their desktops are automatically replaced with the patched version. For personal collections, you can configure the Configuration Manager site server and deploy the Configuration Manager patching agent in each virtual desktop. System Center Configuration Manager can wake up virtual desktops during off-business hours, patch the images, and then return each virtual desktop to a saved state.

RemoteFX enhancements

In Windows Server 2008 R2 with SP1 and Windows 7 with SP1, Microsoft introduced RemoteFX, which enables the delivery of a full-fidelity Windows user experience to a range of remote client devices, including rich clients, thin clients, and ultrathin clients. RemoteFX delivers a rich user experience for VDI by providing a 3D virtual adapter, intelligent codecs, and the ability to redirect USB devices in VMs. RemoteFX was integrated with RDP, which enabled shared encryption, authentication, management, and device support. RemoteFX also delivers a rich user experience for session-based desktops and RemoteApp programs to a broad range of client devices.

Windows Server 2012 R2 builds on this platform to enable a far richer and easier experience on all types of networks and all types of devices. Specifically, RDP in Windows Server 2012 R2 enables a more consistent user experience when connecting to centralized desktops, even on networks in which bandwidth is limited and end-to-end latency is high.

Technical description

The enhanced user experience in Windows Server 2012 R2 and Windows 8 RemoteFX includes the following new or enhanced features:

- **RemoteFX for WAN** helps maintain a consistent user experience over highly variable WANs.

- **RemoteFX Adaptive Graphics** provide a full Windows Aero and 3D user experience over WANs.

- **RemoteFX USB redirection** supports the RD Session Host role service and allows all standard USB devices to appear only within each user's individual remote session.

- **RemoteFX Media Streaming** provides a smooth multimedia experience over variable or unreliable networks.

- **RemoteFX Multitouch** allows users to use touch-enabled and gesture-enabled apps in remote desktop environments.

- **RemoteFX virtualized GPU (vGPU)** enables VMs to use a GPU in the host server to deliver a more robust experience and enable use of 3D or video-intensive applications in a remote session.

RemoteFX for WAN

With today's modern workforce, clients frequently need to connect from branch offices, homes, or hotels over low-bandwidth or high-latency connections. To support remote desktops and applications over WANs, Remote Desktop Services must be able to quickly adapt to different network conditions.

In Windows Server 2012 R2, RemoteFX for WAN responds to this challenge by including optimizations for low-bandwidth, high-latency connections over RDP. To help achieve this, RDP adds the following improvements:

- **Dynamic transport detection.** RDP in Windows Server 2012 R2 intelligently chooses between TCP and User Datagram Protocol (UDP) transports to achieve the optimum user experience, depending on the content type and the connection quality. When Remote Desktop is enabled on a computer, UDP for port 3389 is automatically enabled in Windows Firewall. For enhanced performance, administrators should verify that this port is enabled on the network.

- **Compensation for network packet loss.** RDP uses several techniques for networks with packet loss, including Forward Error Correction (FEC), to recover quickly from packet loss without requiring retransmission.

- **Network auto-detect.** RDP in Windows Server 2012 R2 detects end-to-end network speed by measuring latency and available bandwidth, and then adjusts the type of connection and the data transfer based on the available bandwidth and latency.

RemoteFX Adaptive Graphics

RemoteFX Adaptive Graphics provides graphics processing that enables higher-fidelity delivery of virtual desktop and RemoteApp programs, including video, text, Aero Glass, and 3D experience across various networks (such as those where bandwidth is limited and latency is high).

The following are some of the key components that enable RemoteFX Adaptive Graphics:

- RemoteFX graphics processing pipeline and codecs

- RemoteFX Progressive Rendering

- Aero and 3D experience that uses the Microsoft basic display adapter

By default, the RemoteFX graphics processing pipeline adaptively determines the optimal RDP experience level based on available bandwidth and server resources. You can change the RDP experience level by using the **Set RDP** experience setting in the Remote Session Environment Group Policy, as shown in Figure 5.
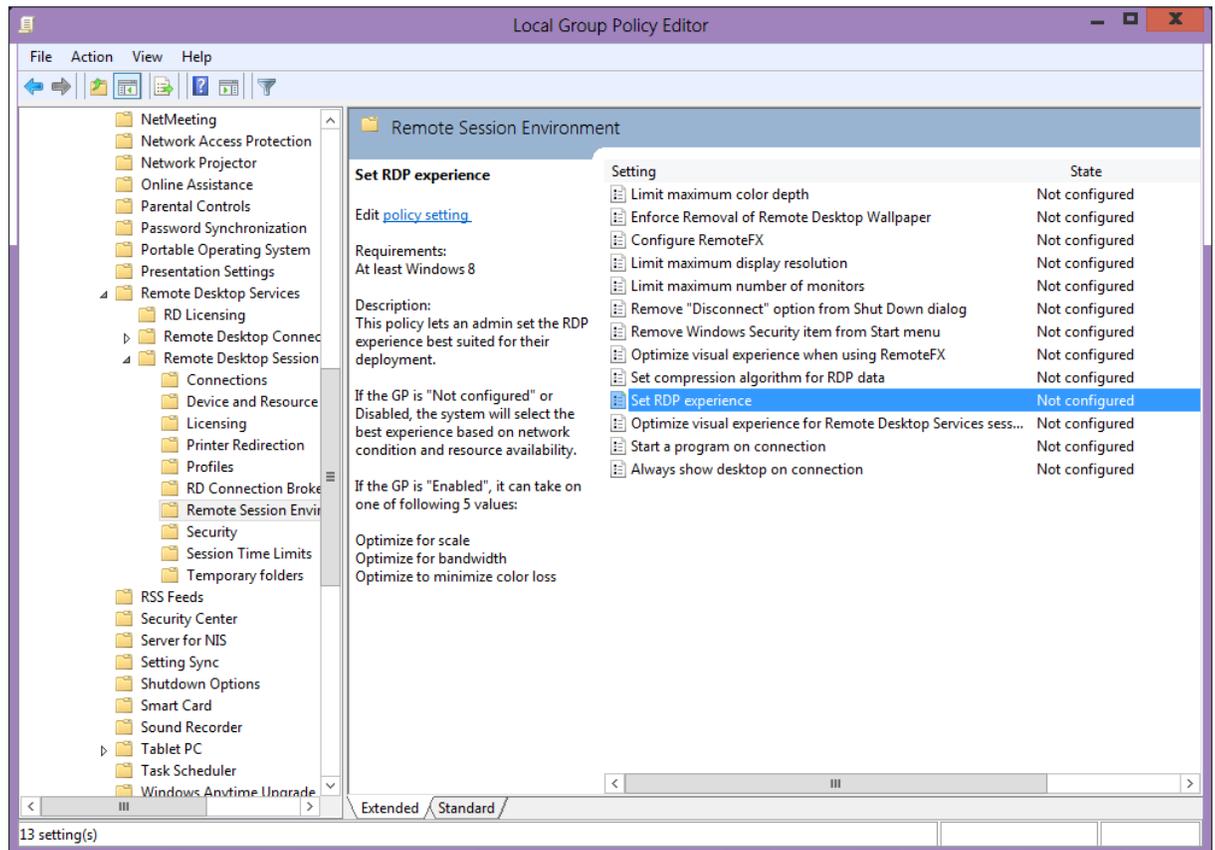
Figure 5. Using the Set RDP experience

If this Group Policy setting is disabled or not configured, the graphics pipeline dynamically adjusts the configuration to give the user the best experience, but if the deployment is targeted toward supporting the maximum number of sessions, this Group Policy setting can be enabled and set to **Optimize for Scale**. In this case, bandwidth use could be high for some scenarios. However, if the deployment environment is such that users are on a bandwidth-limited link, you can set the **Optimize for bandwidth** option. Note that in this case, CPU use may be high.

Figure 6 demonstrates how RemoteFX Adaptive Graphics dynamically adapts to changing network conditions and optimizes encoding to the content.

Figure 6. RemoteFX Adaptive Graphics selectively identifying and downloading content

With progressive rendering, text remains clear while images are progressively refined, as shown in Figure 7.
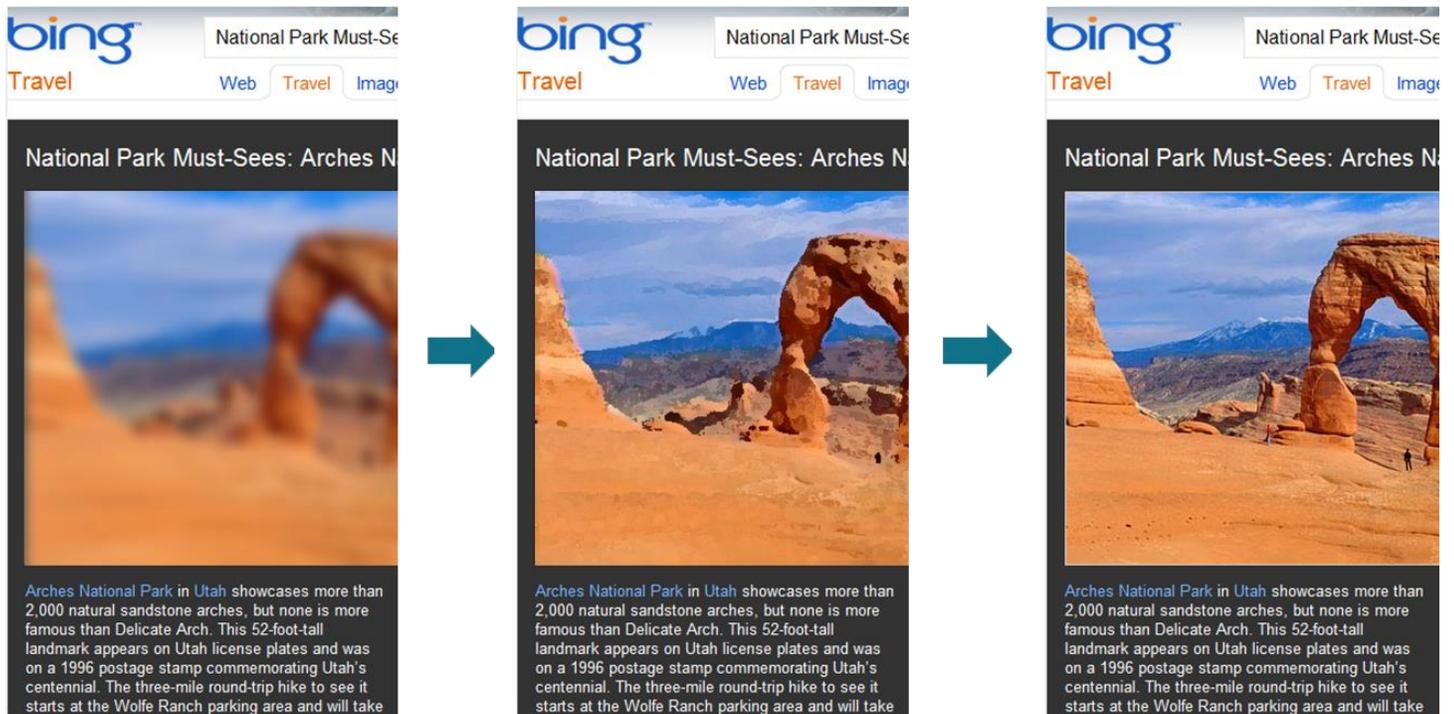
Figure 7. RemoteFX Adaptive Graphics performing progressive rendering of online content

RemoteFX USB redirection

Windows Server 2012 R2 includes several improvements to provide a better experience for remote users who want to connect through a USB

device, such as a USB flash drive or webcam, to the local client device. Users see the device within the remote session; the USB device, desktop, and apps all appear as local, integrated resources, creating a unified experience. In Windows Server 2008 R2 with SP1, RemoteFX USB redirection is supported only within virtual desktops that use the RD Virtualization Host role service. RDP in Windows 8 extends support for RemoteFX USB redirection to include remote sessions through the RD Session Host role service.

When a user plugs in a USB-based resource, it appears only within that user's session and isn't visible to other users who connect to the same server.

RemoteFX USB redirection supports USB flash drives, cameras, all-in-one printers, scanners, biometric readers, webcams, Voice over IP telephones and headsets, and all other standard USB devices. It's configured by enabling the **Allow RDP redirection of other supported RemoteFX USB devices from this computer** setting in the RemoteFX USB Device Redirection Group Policy object.

RemoteFX Media Streaming

RemoteFX Media Streaming enables a smooth multimedia experience on WANs. The key features that are part of RemoteFX Media Streaming include smooth video playback that uses H.264-encoded video streaming and audio video synchronization. RemoteFX Media Streaming requires the Desktop Experience feature.

RemoteFX Multitouch

Windows Server 2012 R2 introduces multitouch and gesture remoting with support for up to 256 simultaneous touch inputs. This feature enables users to employ the new breed of touch-enabled and gesture-enabled apps in remote desktop environments.

Requirements
This feature requires the following:

- Windows Server 2012 R2

- Windows Desktop Experience feature

- Remote Desktop Services role services

Summary
With RemoteFX, you can use Group Policy to configure USB redirection support to allow remote workers to plug in their USB flash drives and portable printers for quicker and easier access in their individual virtual desktop sessions.

DirectX11 Support with vGPU
In Windows Server 2008 R2 with SP1, Microsoft first introduced the RemoteFX vGPU, which provided Microsoft DirectX® 9 application support and Aero theming for VMs running on Server Virtualization servers with physical GPUs. In Windows Server 2012 R2, the vGPU feature is expanded, and all Windows 8 VMs can take advantage of a DirectX 11– capable GPU, either emulated in software (softGPU) when no GPU is present in the host or paravirtualized and hardware-accelerated (vGPU) when a DirectX 11–compatible video card is present in the host. Microsoft now supports multiple GPUs within one server and is seeing greater engagement with original equipment manufacturers to provide systems that support this capability.

The built-in WAN optimizations employ FEC, network auto-detection, and other techniques to compensate for variable network conditions and provide a positive user experience for his remote users.

These and other enhancements in RemoteFX give remote users the same experience they have with locally installed desktops—from USB-connected devices to video streaming and advanced graphics rendering—even while connecting over WANs.

User Profile Disk

Typically, in pooled or session-based VM deployments, personal settings are temporarily stored in a transient VHD that's discarded when the user logs off. This means that after each session, user personalization settings and application cache data are lost.

As a result, apps like Microsoft Outlook® must re-create personalized settings each time a user logs on to the VM or session, which increases the time it takes for the user to be productive with the application.

Windows Server 2012 R2 introduces User Profile Disk to store user profile settings in pooled or session-based VM environments. Any user state changes are stored in the User Profile Disk, and these changes are immediately available to users the next time they log on.

Technical description

Windows Server 2012 R2 solves the problem of lost settings and application cache data with the new User Profile Disk. A User Profile Disk is created for each user and applies to a specific VM pool or session collection. The User Profile Disk stores user personalization and application cache data so that it is maintained across user logon sessions.

When the user logs on to a session or within a pooled VM, the User Profile Disk is mounted and user personalization is quickly made available. Users benefit from faster startup times and personalization even within the shared environment of a VM pool or session.

User Profile Disk can be configured during deployment in the Create Collection Wizard, as shown in Figure 8, or at a later time by using the Remote Desktop Services centralized management console.

Fair Share

Fair Share is a collection of technologies that ensure that no single virtual machine or session consumes more than its fair share of machine resources (memory, CPU, disk I/O, and bandwidth). If a virtual machine or session starts to use more resources than deemed safe by the system, Fair Share automatically throttles the resource in question, thereby dynamically distributing that resource across other virtual machines or sessions. RDS adds Fair Share to manage resources for sessions. Server Virtualization has a collection of technologies to manage bandwidth, I/O and memory, to collectively ensure performance of virtual machines.
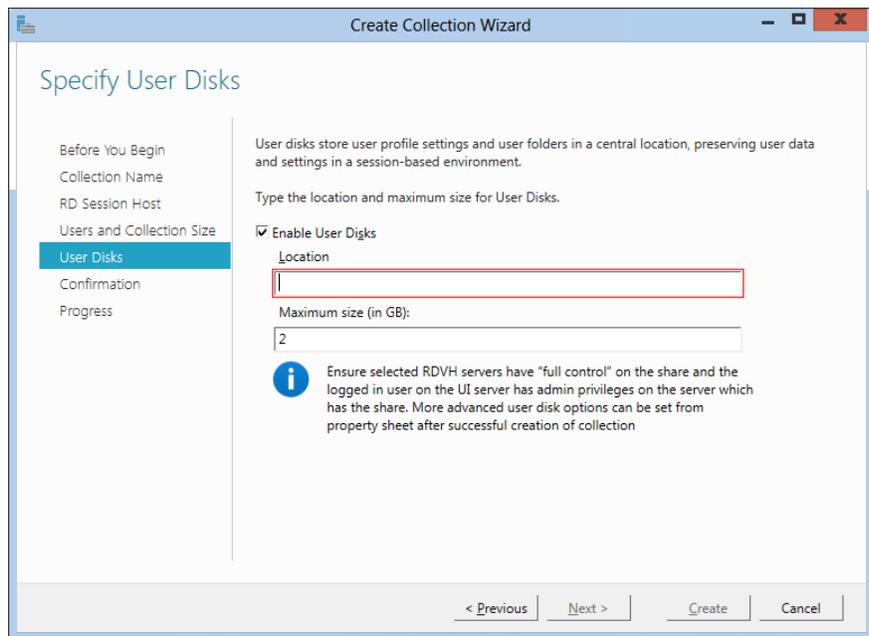
Figure 8. Specifying User Disks

Summary

User Profile Disk provides users with the convenience of having their cached and personalized settings available each time they log on to their VM pools or sessions. IT administrators can quickly and easily deploy User Profile Disk by using less expensive commodity hardware.

Server Virtualization over SMB

Windows Server 2012 R2 lets organizations select affordable SMB-based network-attached storage or DAS devices instead of higher-priced storage area network (SAN) devices to reduce the overall storage costs of virtual desktop deployments. This option is supported through Server Virtualization-over-SMB, which adds support for SMB on a virtualization platform based on Server Virtualization.

Expanded storage options

In earlier versions of Windows, Server Virtualization used three main storage options:

- DAS server

- Internet SCSI SANs

- Fibre Channel SANs

In Windows Server 2012 R2, while continuing to support all of the above storage options, Server Virtualization introduces an additional option: support for SMB-based remote file storage.

Technical description

Server Virtualization can now store VM files (including configuration, VHD files, and snapshots) in shared folders that use the SMB protocol, as shown in Figure 9.
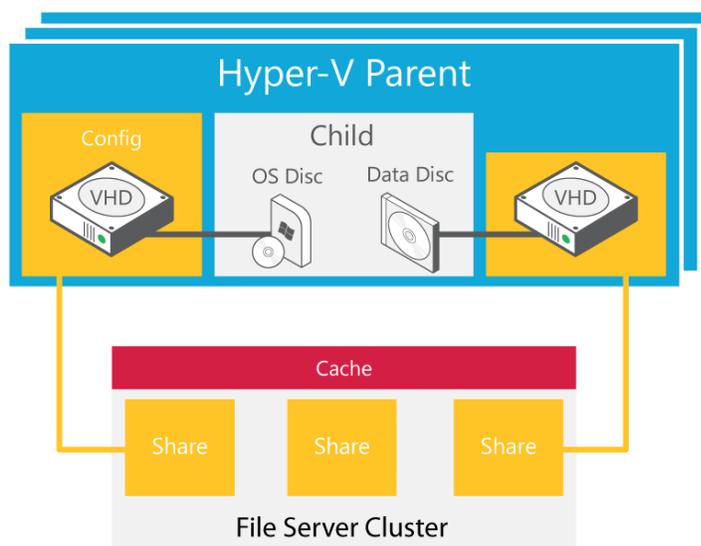

Figure 9. VM files stored in shared folders in a Server Virtualization environment

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Advantages of Server Virtualization over SMB

Server Virtualization over SMB offers the following benefits:

- You can use your existing investment in a converged network.

- You can reduce capital expenses (acquisition cost) for Server Virtualization storage.

- You can reduce operation expenses (management cost) for Server Virtualization storage.

Configuration options

Figure 10 shows the benefits of different deployment options that use Server Virtualization over SMB, Serial Attached SCSI, and Fibre Channel storage.


Single-Node File Server
- Lowest cost for shared storage
- Shares not continuously available
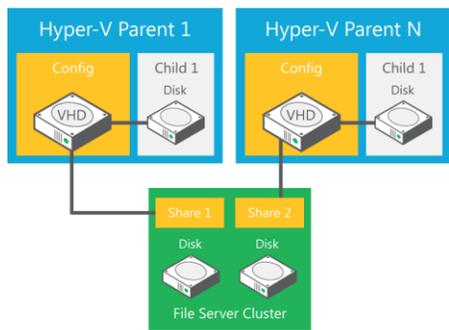
Dual-Node File Server
- Low cost for continuously available shared storage
- Limited scalability (up to a few hundred disks)
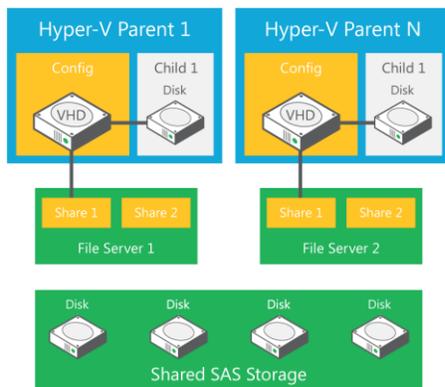
Multi-Node File Server
- Highest scalability (up to thousands of disks)
- Higher cost, but still lower than connecting all Hyper-V hosts with FC
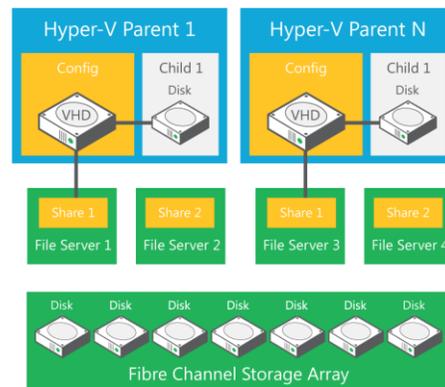
Figure 10. Various Server Virtualization deployment storage options with a single-node, dual-node, and multimode file server

Requirements
Server Virtualization over SMB requires the following:

- One or more computers running the Server Virtualization role

- One or more computers running the File Services role

- A common Active Directory® Domain Services (AD DS) infrastructure (The servers running AD DS do not need to run Windows Server 2012 R2.)

- Failover clustering on the Server Virtualization side or the File Services side or both (Failover clustering is not required.)

Summary
With Server Virtualization over SMB in Windows Server 2012 R2, you can easily provision and manage Server Virtualization storage while taking advantage of the flexibility and scalability that using low-cost SMB storage for VMs offers.

Remote Desktop Services storage configurations

Organizations are faced with high data storage costs for resources, including VMs. Remote Desktop builds on the storage innovations in Windows Server 2012 R2 to help reduce storage costs while allowing you to optimize for efficiency and performance.

Technical description

VM-based collections in Windows Server 2012 R2 RDS build on Hyper-V; therefore, they support all the storage types that Hyper-V supports:

- Locally attached (DAS) storage

- Central SAN storage

- SMB storage

The storage configuration of a collection in RDS lets you select which type of storage you want to use for each collection. You can also specify exactly how you want VMs, master images, and User Profile Disk to be stored on a per-collection basis. This tiered model allows you to match the capacity and I/O per second (IOPS) of your storage infrastructure to your needs with a high degree of granularity. For example, you can place the master VM parent disks on a storage location optimized for high IOPS while using a different storage location for User Profile Disk optimized for reliability and backup. This flexibility allows you to optimize storage performance while reducing overall cost (see Figure 11).
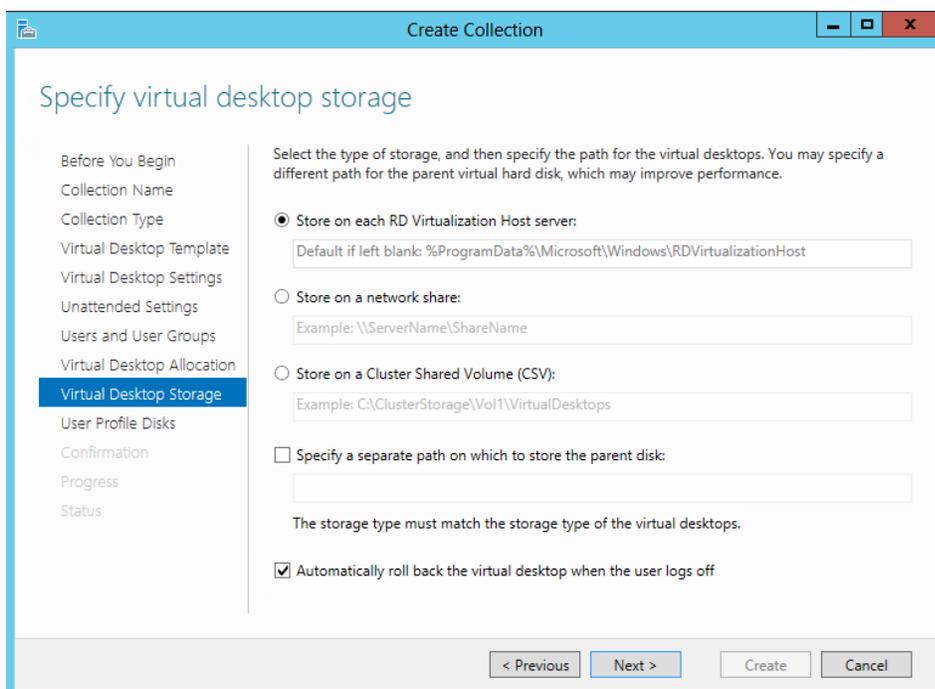
Figure 11. Configuring virtual desktop storage options

Summary

Remote Desktop Services builds on Hyper-V support for a wide range of storage options. For each collection, you can choose from different types of storage, and you can specify a unique storage collection for the master VM parent disk, individual VMs, and User Profile Disk. This allows you to achieve the optimal performance and end user productivity while reducing your overall storage costs.

Conclusion

Modern workers need access to files and applications at any time and from any location, including branch offices, airports, hotels, and homes. Whether they are using PCs, phones, tablets, or all of these devices, Microsoft technologies provide the flexibility required to meet the unique needs of individual users. For administrators, the enterprise-grade solutions are designed to help you maintain security, streamline management, and reduce costs.

With Windows Server 2012 R2, IT pros can provide users with more convenient, personalized, and secure access to data and applications while taking advantage of unified configuration and management, simplified deployments options, and performance enhancements for lower-bandwidth, higher-latency networks.