



Windows Server 2012 2,500-user pooled VDI deployment guide

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Abstract

Microsoft Virtual Desktop Infrastructure (VDI) is a centralized desktop delivery solution that stores and runs desktop workloads, including a Windows client operating system, applications, and data, in a server-based virtual machine in a data center, allowing users to interact with the desktop presented on a user device via Remote Desktop Protocol. VDI is part of an enterprise's cohesive, holistic virtualization strategy across IT infrastructure. It is not an isolated architecture but one of the many technologies available to optimize enterprise desktops.

This guide provides instructions for deploying user pooled VDIs in a production environment running the Windows Server 2012 operating system. It is intended for IT pros who want to implement an end-to-end VDI solution. This guide covers deployment best practices for configuring user pooled VDIs.

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Windows Server 2012 2,500-user pooled VDI deployment guide

About this guide

Microsoft Virtual Desktop Infrastructure (VDI) allows users to seamlessly access their rich, full-fidelity Windows environment running in the data center from any device. The Windows Server 2012 operating system provides a single platform from which to deliver any type of hosted desktop.

To get the most user pooled VDI benefits for your investment, you must consider numerous factors, including the size and scope of your VDI project. In some cases, virtual desktops can reduce desktop costs by 40 percent, and by centrally managing virtual desktops in a data center, you can improve security and spend less time on troubleshooting endpoints.

This deployment guide provides many of the guidelines necessary to successfully design and deploy a Windows Server 2012 VDI environment aimed at supporting 2,500 users.

Introduction

Remote Desktop Services (RDS) in the Windows Server 2012 operating system provides a unified administrative experience for configuring RemoteApp programs and managing virtual desktops. In addition to the deployment and configuration improvements for administrators, RDS benefits remote users by preserving their personalization settings and enhancing their remote graphics and video experiences.

The hardware configuration guidelines for Windows Server 2012 are essentially the same as for the Windows Server 2008 R2 operating system.

Functional characteristics

Using RDS should be just like using a physical desktop for users but with the following improvements for the remote user experience. All features of RDP are available to both sessions and virtual machines (VMs).

The RDP version 8 network protocol performs well even over high-latency connections (for example, satellite links). Through the use of progressive download, H.264 encoding for video compression, and User Datagram Protocol (UDP) as needed to reduce networking overhead, RDP can display bandwidth-intensive content, such as video over high-latency networks. Microsoft RemoteFX over WAN provides automatic detection of network conditions and transport over UDP.

Users can connect to their personal collection of VMs and the RemoteApp programs assigned to them by logging in with their email address and password, simplifying the connection experience. User profile disks allow users to preserve personalization settings across session collections and pooled virtual desktop collections—even for settings not stored in a user profile. This feature is available both for sessions and for VMs.

In Windows Server 2012, RDS supports remoting of a broad range of USB devices (such as all-in-one printers, scanners, biometric readers, webcams, or Voice over IP headsets) both from sessions and from VMs. RDP now also supports Windows Aero Glass user interface remoting in sessions, even when more than one monitor are connected to the client device. Users can also rely on multipoint touchscreens and tablets when connecting to a session or VM.

Windows Server 2008 R2 supported web-based single sign-on for RemoteApp programs so that users could provide their credentials once to authenticate to any RemoteApp program provided in any farm. In Windows Server 2012, this support has been extended to include VMs assigned to a user.

VMs are isolated from each other, but in session virtualization scenarios, all sessions compete for the same server resources. In Windows Server 2012, processor time, disk I/O cycles, and network are shared evenly among all sessions on a Remote Desktop Session Host (RD Session Host) server so that no single user can consume all resources.

RDS provides users the ability to disconnect from their workspaces, and then reconnect from a different location. In Windows Server 2012, users can disconnect, go home, and then reconnect

to the RemoteApp programs and VMs that they were previously using, saving time previously needed to restore the work environment.

The Windows Server 2012 RDS/Virtual Desktop Infrastructure (VDI) platform components (for example, RD Virtualization Host, RD Session Host, RD Connection Broker [RDCB], and Windows PowerShell management application programming interfaces) are expected to scale to support large enterprise configurations (for example, tens of thousands of VDI guest VMs or server-hosted RD sessions).

A two-server, active/active Windows Server 2012 RDCB configuration has been tested for up to 5,000 users. The connection broker can scale out farther by adding additional RDCB servers.

Windows Server 2012 RDS/VDI supports machines running the Windows 8 operating system, the Windows 7 with Service Pack (SP) 1 operating system with the RDP8 update (which includes devices running the Windows Embedded Standard operating system and PCs running the Windows Thin PC operating system), the Windows XP with SP3 operating system (which includes devices running Windows Embedded and PCs running Windows Fundamentals for Legacy PCs), and all non-Microsoft RDP/RemoteFX-logged thin-client devices.

Performance characteristics

Differing component configurations reflect on the performance outcome and loads. See the sections that follow for more detailed information.

Windows Server 2012 VDI components

The following components are required for a Windows Server 2012 VDI environment.

RD Web (NLB)

Multiple RD Web Access servers can be load balanced with Windows Network Load Balancing (NLB) or a physical load-balancing appliance. RD Web Access server VMs can be located on a Hyper-V failover cluster to provide high availability for RD Web Access servers.

RD Gateway (NLB)

To sufficiently support the user base load, 2,500 user-based VMs will require a total of three gateways.

Performance characteristics

Approximately 1,000 connections per second can be obtained per RD Gateway. A minimum of two RD gateways is required for high availability.

Test results indicate that 1,000 connections per second at a data rate of about 60 KB/second can be obtained. The VSI³ medium workloads generate about 62 KB per user. The configuration is four cores² and 8 GB of RAM.

RD Licensing Server (multiple instances—setting up the server and policies to point to activation servers)

RD Licensing manages the licenses required to connect to an RD Session Host server or a virtual desktop. You can use RD Licensing to install, issue, and track the availability of licenses.

RDCB (custom high-availability configuration)

Each gateway supports 5,000 connections in under 5 minutes, but multiple gateways are required for high availability. In terms of connection throughput, about 50 connections can be established in just above 2 seconds on a collection with 1,000 VMs. You configure such a broker with a single core and 4 GB of RAM.

Performance characteristics

Depending on the collection size, you can obtain 5,000 connections in less than 5 minutes. You need a minimum of two RDCB instances for high availability.

Test results indicate that you can obtain 50 concurrent connections in 2.1 seconds in a collection with 1,000 VMs. The broker configuration is one core² and 4 GB per broker.

SQL Server performance characteristics

A 60-MB database is required for a 5,000-seat deployment. Test results indicate that adding 100 VMs equals 1,100 transactions (this is the pooled VM creation and patching cycle). One user connection equals 222 transactions (this is the login cycle). The Microsoft SQL Server configuration is four core² and 8 GB of RAM.

RD Virtualization Host

Storage types for the RD Virtualization Host that you can use are local, Server Message Block, and storage area network. Microsoft recommends that you use local storage for pooled VDI.

CPU usage

Microsoft recommends 150 VSI² medium users per dual Intel Xeon E5-2690 processor (2.9 GHz) at 80 percent CPU and 10 users per core.

Memory

Microsoft recommends 1 GB per Windows 8 VM for memory; 192 GB per host should be sufficient. Enable Dynamic Memory in Hyper-V, which allows you to host more VMs as well as the Cluster Shared Volumes Cache feature, which reduces I/O operations per second (IOPS).

Bandwidth

User pooled VDI requires a strong network and an efficient remote desktop protocol. Otherwise, bandwidth constraints will choke user performance.

Before you commit to a VDI project, evaluate which network protocol and vendor technologies are best suited for your data center.

- RDP traffic is 500 KB per second per user for VSI² medium workload (the average is more than 20 minutes) and 2.5 Gb per second for 5,000 users.
- The network load for 80 percent intranet users and 20 percent Internet connections is 500 MG for a WAN and 2.5 GB for a LAN.

Storage

Gold VM

Storing the “gold” VM image on solid-state disk (SSD) reduces the storage load for pooled VMs. Microsoft recommends using 20 GB for each VM per collection, 200 GB for 10 collections, and 1 TB for 50 collections.

Using SSDs for gold VMs can result in an average reduction of 45 percent in IOPS on the spindle-disks. Example cases include:

- On a host with 150 VMs, the I/O load is about 850 Read operations per second and about 400 Write operations per second.
 - Option 1 (all spindles): 10 x 10,000 RAID 10

- Option 2 (SSD and spindles): 2 SSDs RAID 1 and 6 x 10,000 RAID 10

User VMs

User VMs in a pooled VDI scenario only require about 5 GB per VM, or approximately 12.5 TB total.

Personal User VMs

Personal user VMs require additional storage, because there is a full image for each user. Expect about 100 GB of storage per VM.

User virtual hard disks

The VSI² medium workload creates approximately 10 IOPS per user. I/O distribution for 150 users per host results in the following:

- Gold VM approximately 700 Read operations per second
- Differencing disks approximately 400 Write operations per second and about 150 Read operations per second
- User virtual hard disk approximately 300 Write operations per second (mostly Write operations)

Putting the gold VM and differencing disks in local storage (per host) results in approximately 850 Read operations per second and about 400 Write operations per second.

Storage size results are approximately 5 GB per VM for differencing disks and about 20 GB per gold VM.

Assume a few collections per host (a few gold VMs):

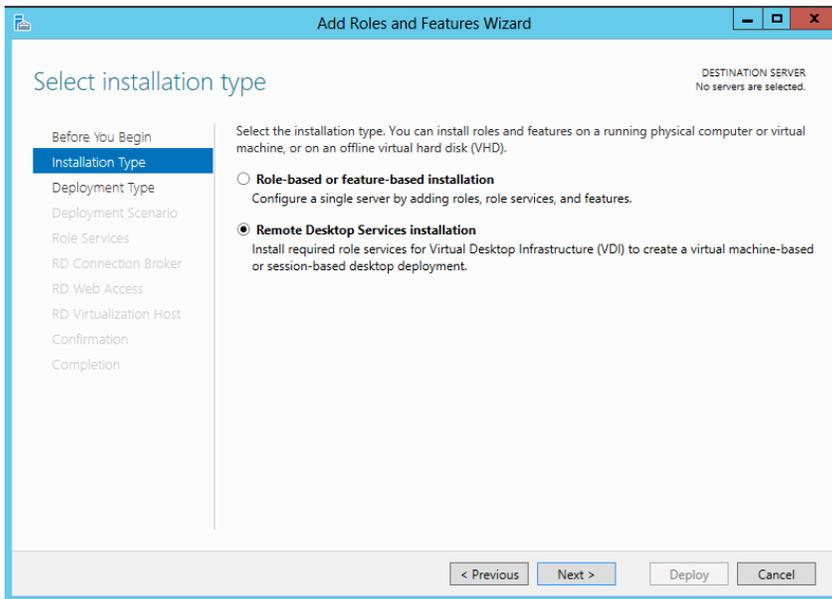
- Two terabytes should be sufficient.
- Use SSDs for gold VMs.
- The average reduction in IOPS on the spindle disks is about 45 percent.

For example, on a host with 150 VMs, the I/O load is approximately 850 Read operations per second and approximately 400 Write operations per second.

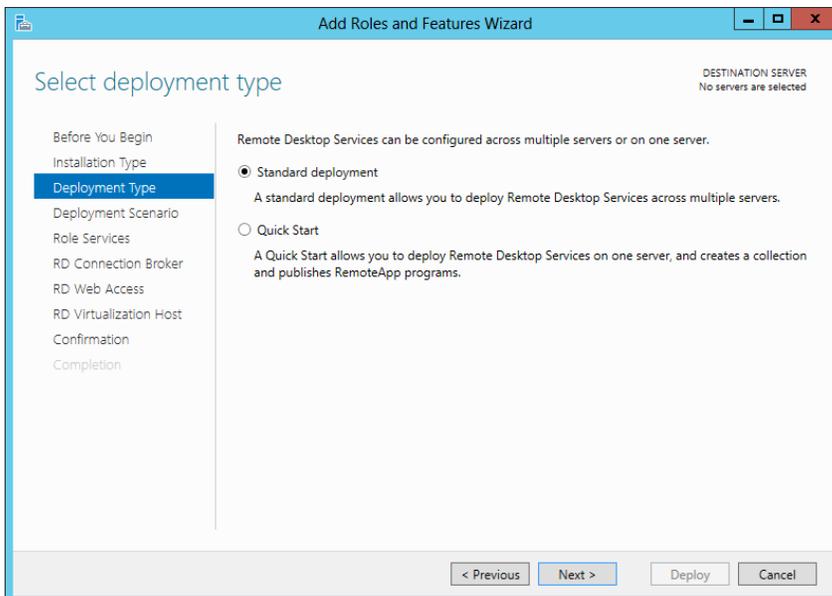
Windows Server 2012 VDI setup

Complete the following steps to install the Add Roles and Features Wizard.

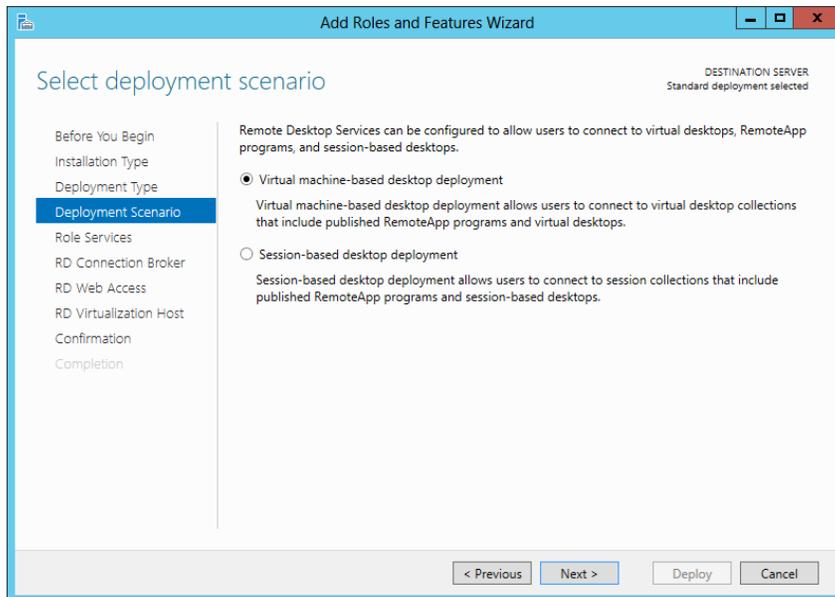
1. Open Server Manager (ideally, from the server on which you want to host the Session Broker role).
2. Click **Add Roles and Features**.
3. On the **Select installation type** page, select **Remote Desktop Services Installation**, and then click **Next**.



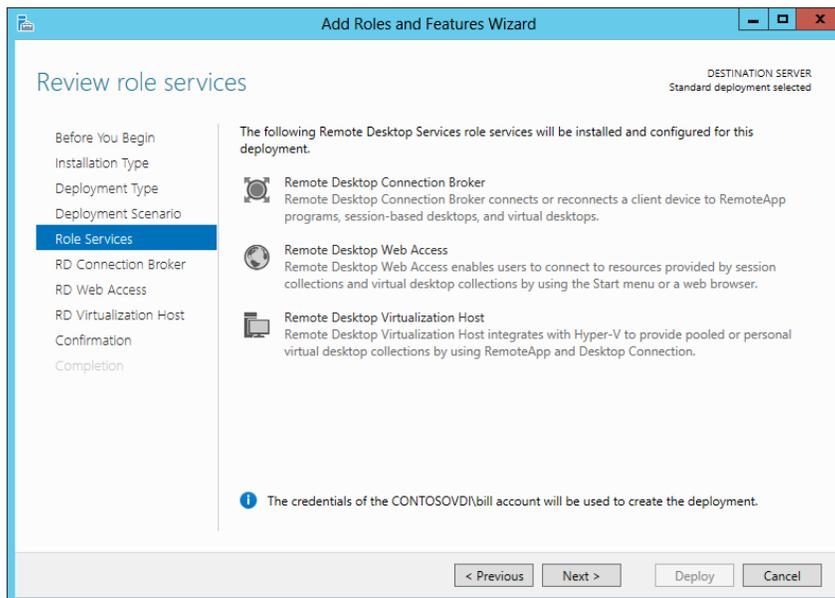
4. On the **Select deployment type** page, select **Standard deployment**, and then click **Next**.



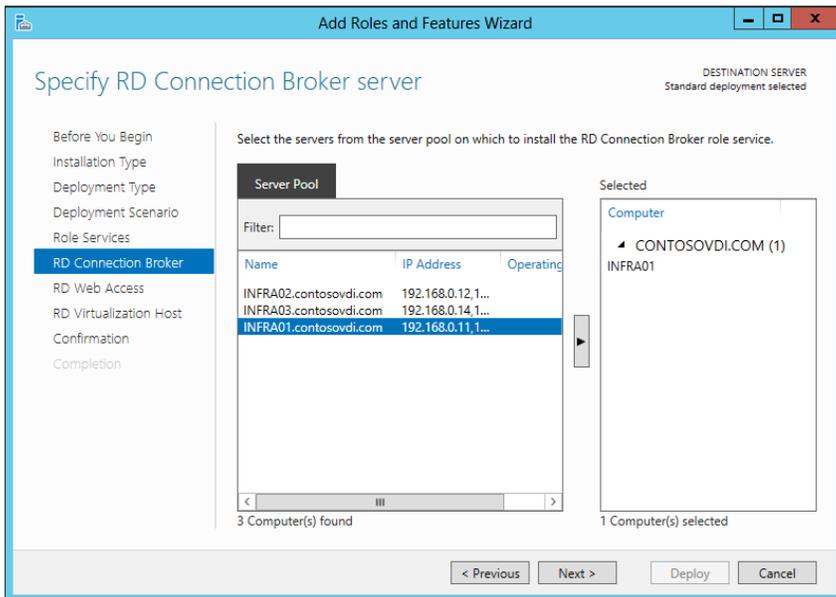
5. On the **Select deployment scenario** page, select **Virtual machine-based desktop deployment**, and then click **Next**.



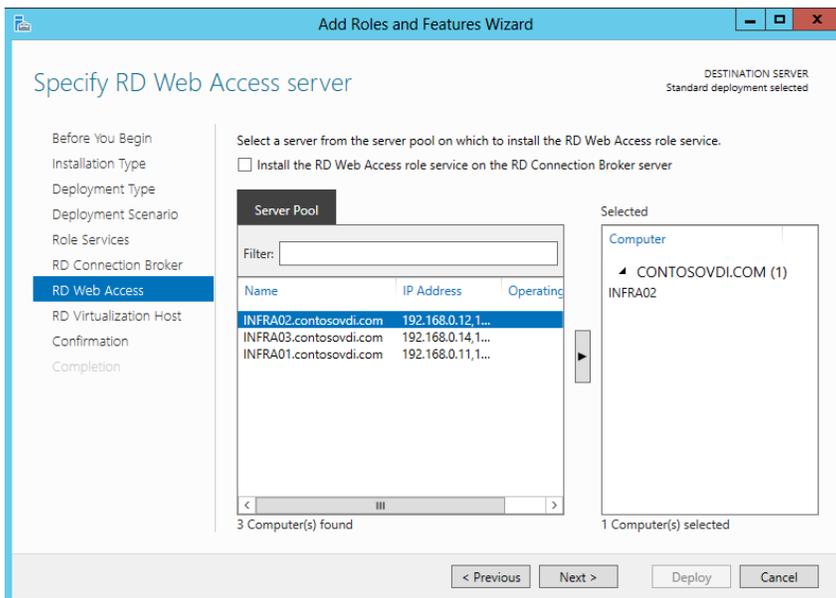
6. On the **Review role services** page, click **Next**.



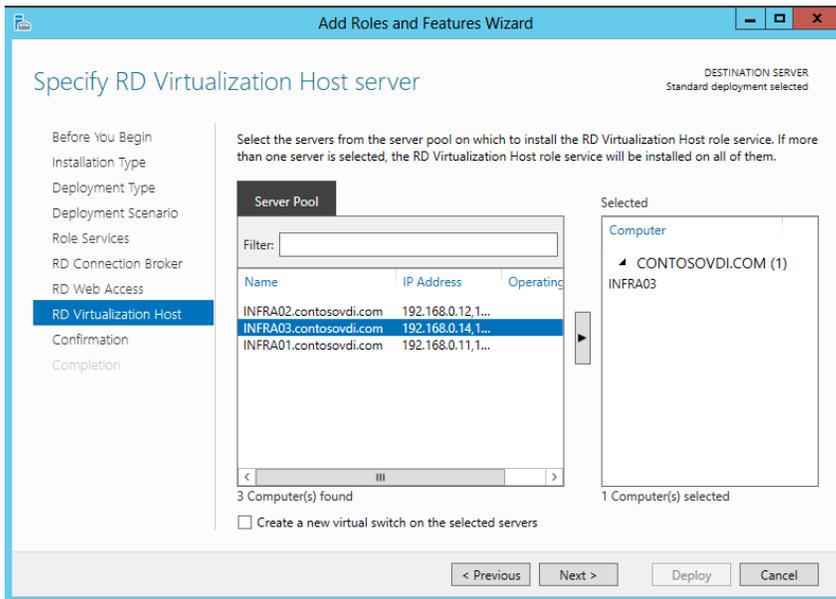
7. On the **Specify RD Connection Broker server** page, select the server that will act as the RD Connection Broker server, and then click **Next**.



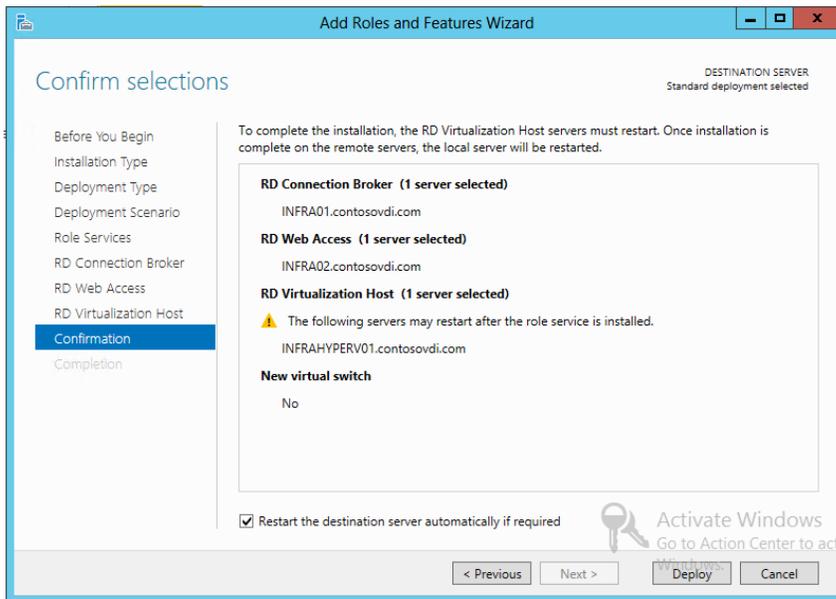
- On the **Specify RD Web Access server** page, select the server that will act as the RD Web Access server, and then click **Next**.

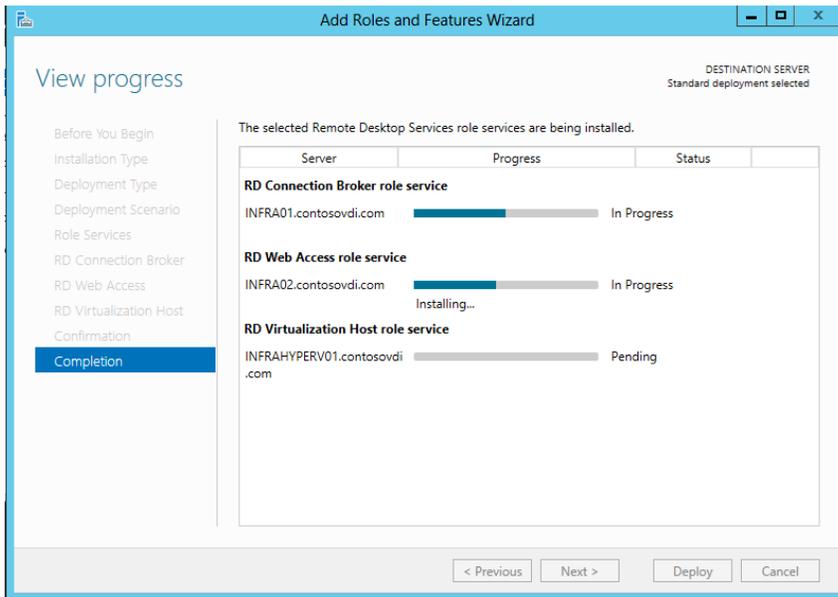


- On the **Specify RD Virtualization Host server** page, select the machine that will be the RD Virtualization Host, and then click **Next**.



10. On the **Confirm selections** page, make sure you are happy with your choices. If you are, select the **Restart the destination server automatically if required** check box, and then click **Deploy**.





After successfully completing this process, the RD Connection Broker, RD Web Access, and RD Virtualization Host are installed.

VM-based desktop deployment (pooled)

This section describes how you deploy virtual desktops and randomly assign users to them. At log-off, virtual desktops are generally rolled back (although the rollback is optional).

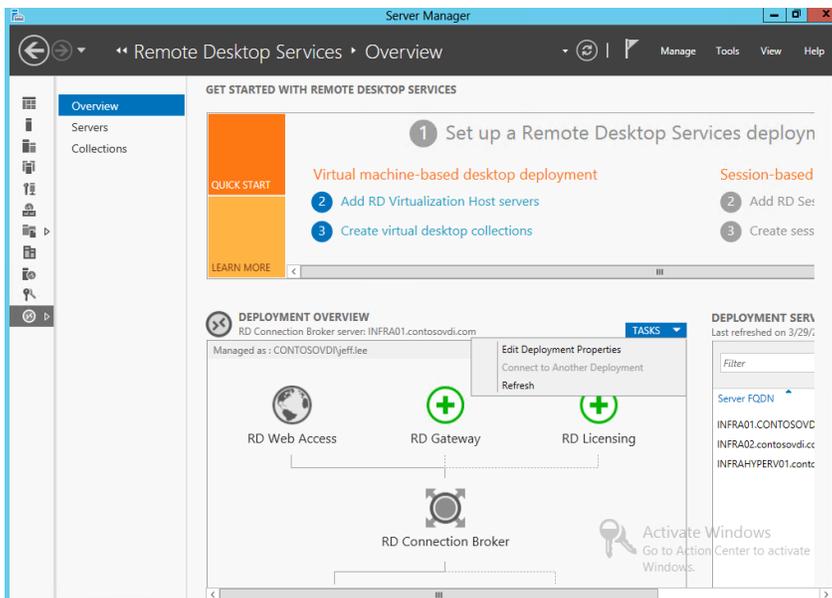
Creating a pooled virtual desktop collection

You create the virtual desktop by using the Windows System Preparation tool (Sysprep) template of a VM. Virtual desktops are created from this image. You can configure the pool to store the user profiles on user profile disks separate from the machines.

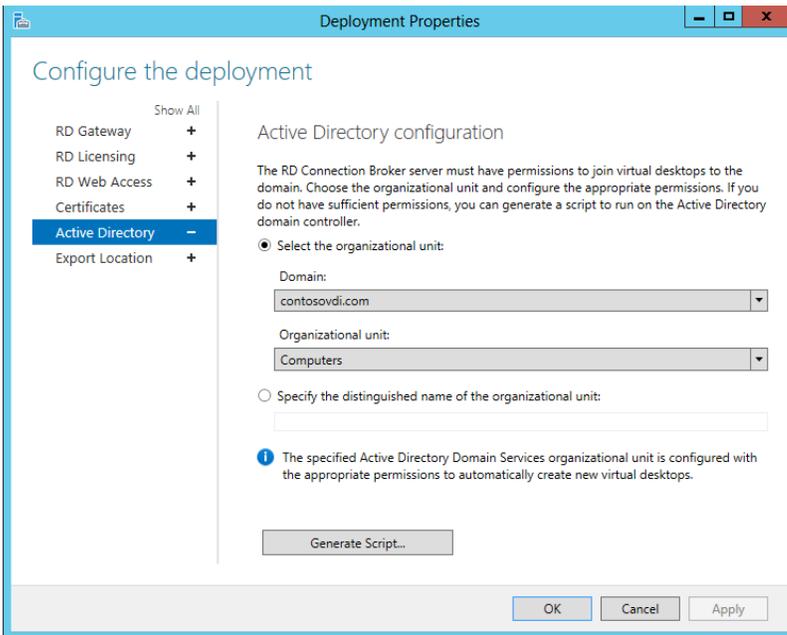
Pooled: managed virtual desktop collection

Complete the following steps to create a pool of managed virtual desktops:

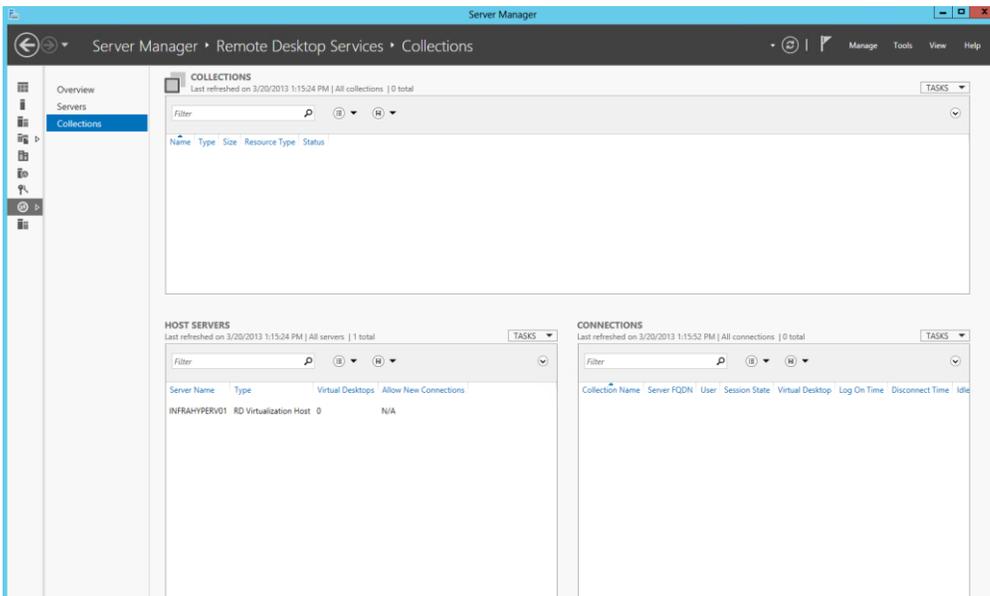
1. In Server Manager, click **Remote Desktop Services**.
2. In the navigation pane, click **Overview**.
3. In the **DEPLOYMENT OVERVIEW** section, click **TASKS**, and then select **Edit Deployment properties**.



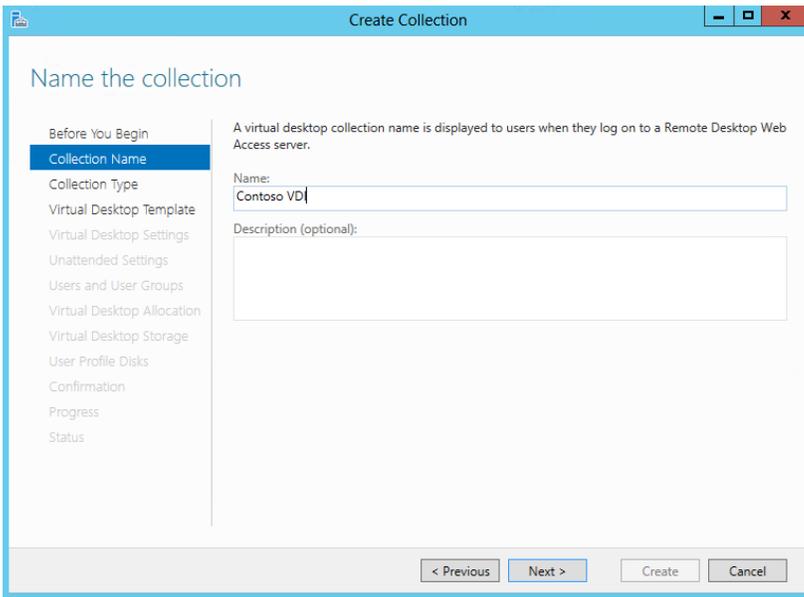
4. On the **Configure the deployment** page, in the navigation pane, click **Active Directory**. Select **Select the organizational unit** if you want to add virtual desktops to the domain, and then click **OK**.



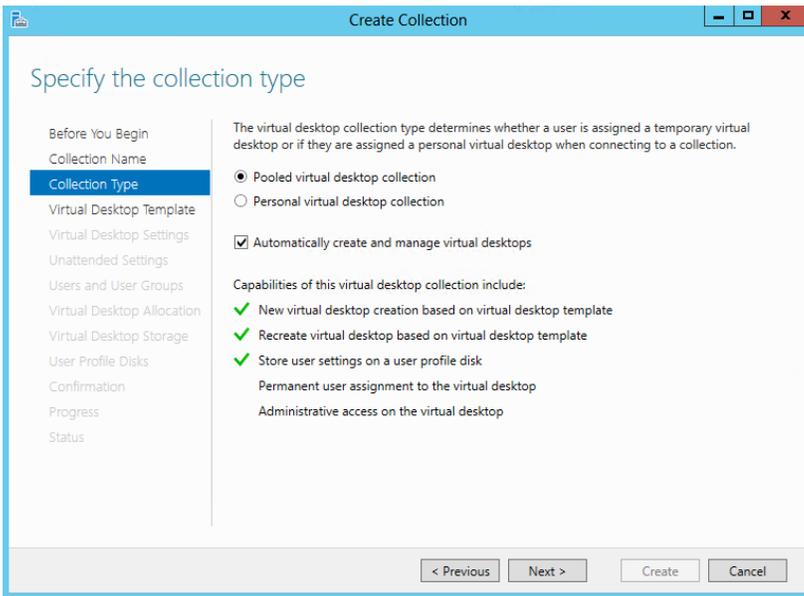
5. In the navigation pane, click **Collections**.
6. In the **COLLECTIONS** area, click **TASKS**, and then click **Create Virtual Desktop Collection**.



7. Click **Next**.
8. On the **Name the collection** page, in the **Name** box, type a name for the collection, and then click **Next**.



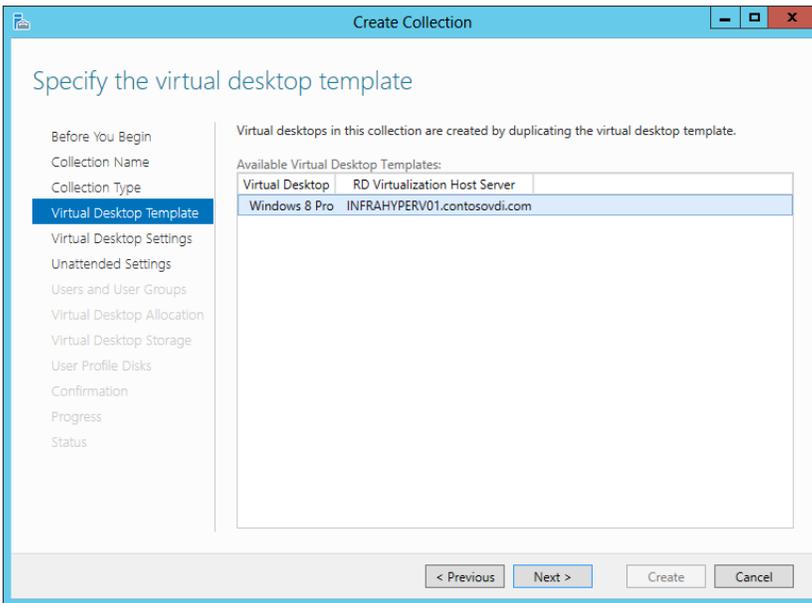
9. On the **Specify the collection type** page, select **Pooled virtual desktop collection**, and then click **Next**.



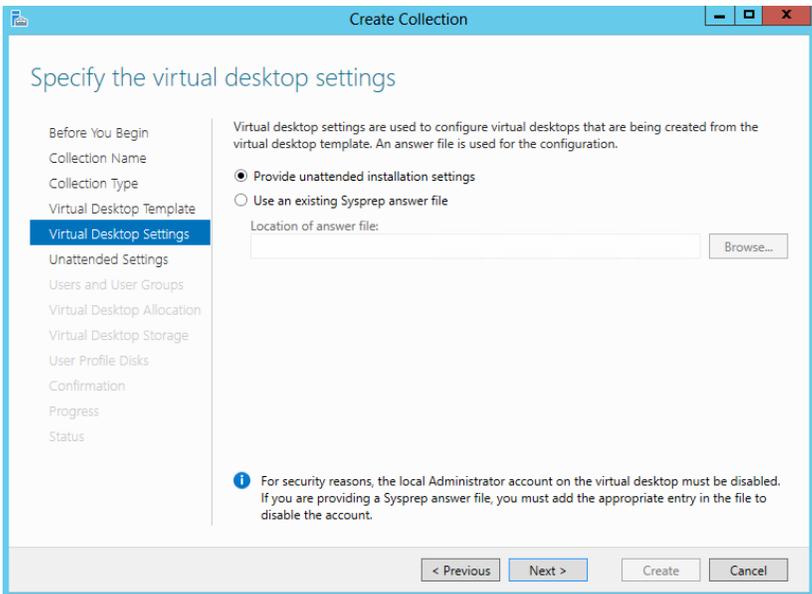
10. On the **Specify the virtual desktop template** page, choose a template that you have already configured in Hyper-V (make sure you have run Sysprep on the VM after installing the software users require), and then click **Next**.

Note If you do not have an image, you can create one by using the following command:

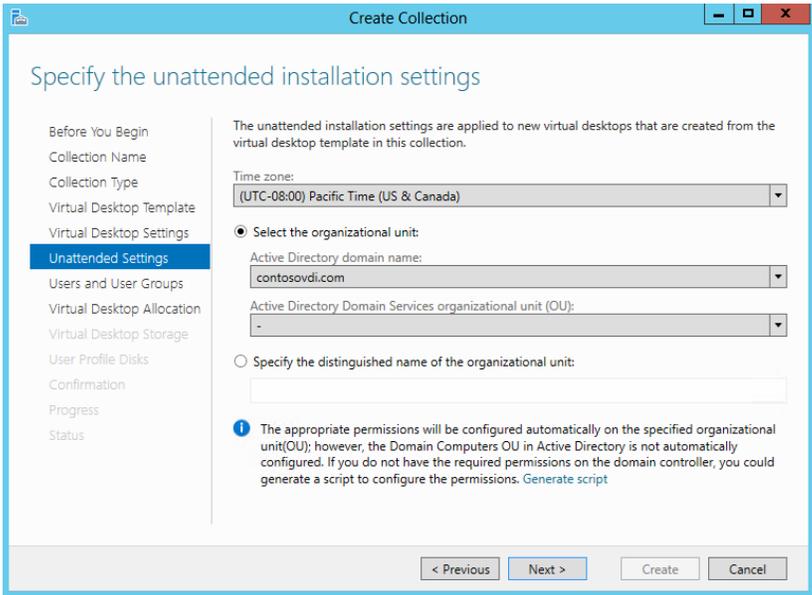
```
%windir%\system32\sysprep\sysprep.exe /generalize /oobe /shutdown /mode:vm
```



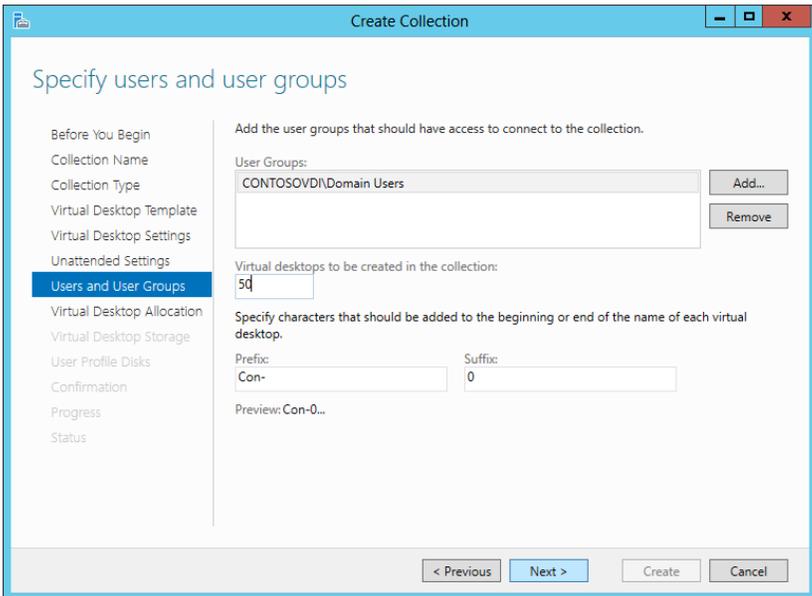
11. On the **Specify the virtual desktop settings** page, click **Next**.



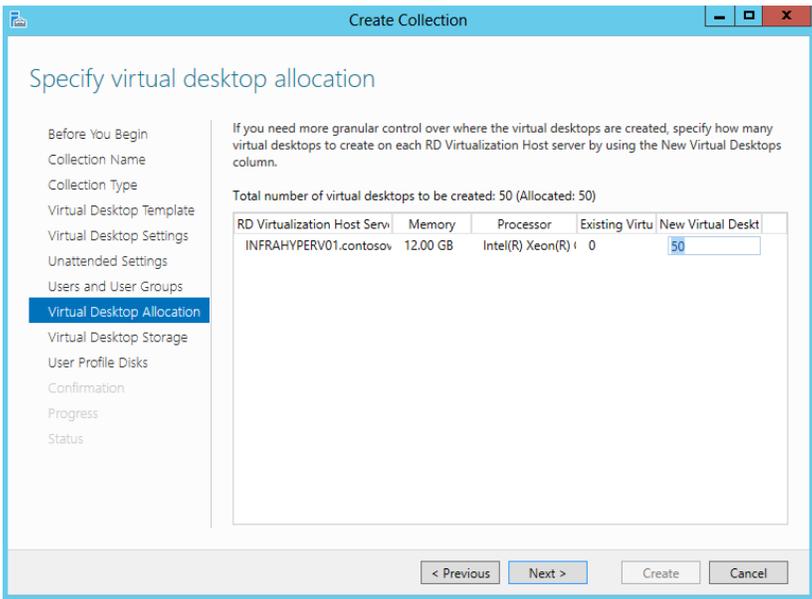
12. On the **Specify the unattended installation settings** page, choose your settings, and then select **Select the organizational unit**. Click **Next**.



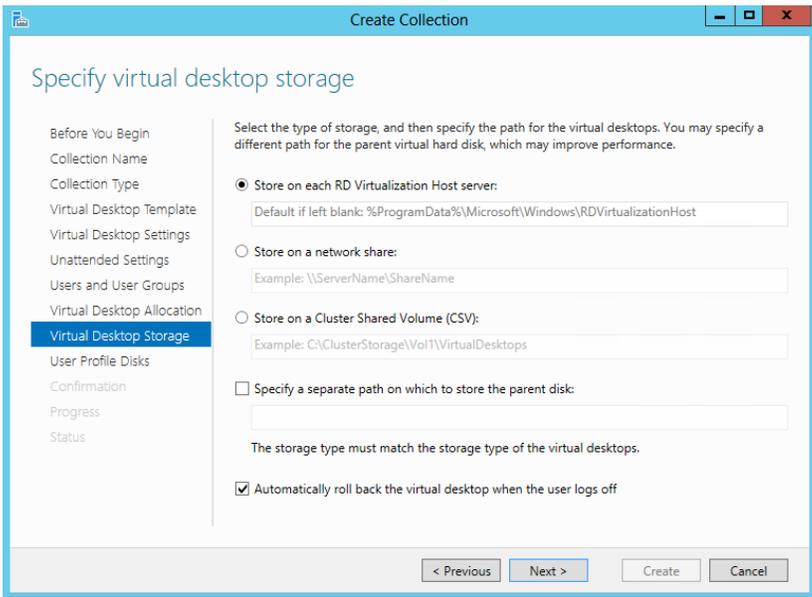
13. On the **Specify users and user groups** page, provide a prefix and suffix for the virtual desktop. Click **Next**.



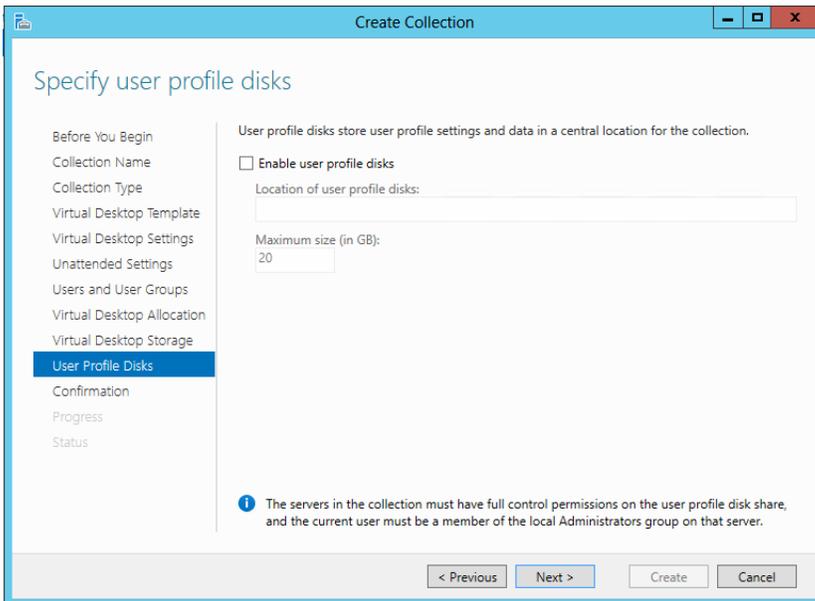
14. On the **Specify virtual desktop allocation** page, enter the number of new virtual desktops to create, and then click **Next**.



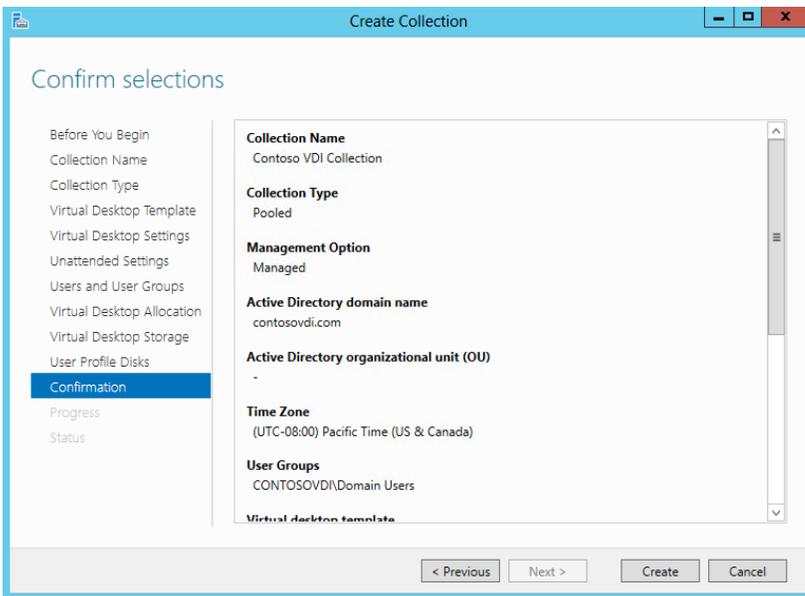
- On the **Specify virtual desktop storage** page, select **Store on each RD Virtualization Host server**, select the **Automatically roll back the virtual desktop when the user logs off** check box, and then click **Next**.



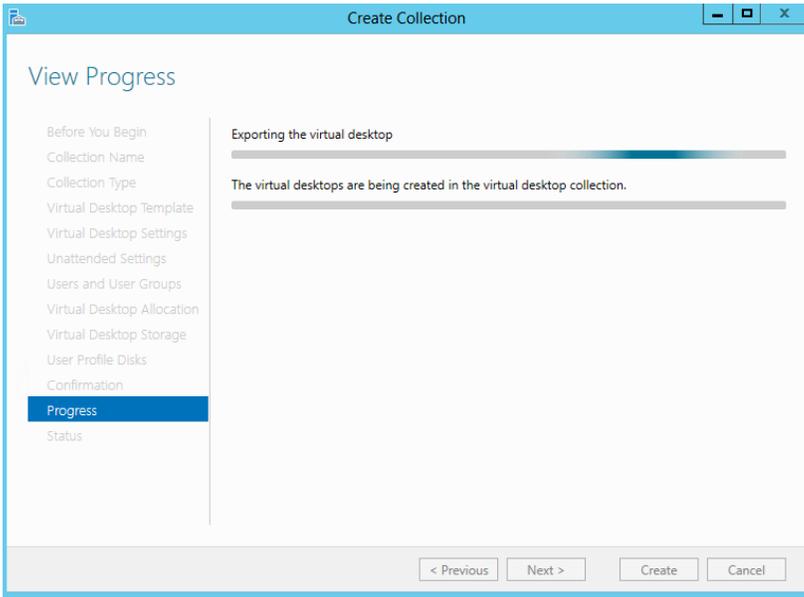
- On the **Specify user profile disks** page, set a maximum size in gigabytes (if desired) with the Universal Naming Convention path, and then click **Next**.



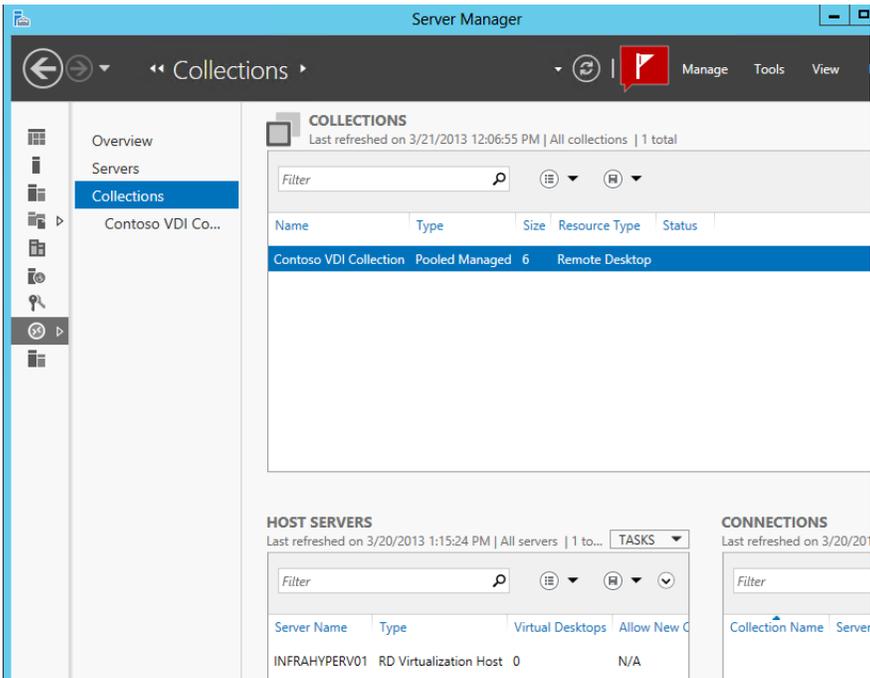
17. On the **Confirm selections** page, review your choices, and then click **Create**.



18. View progress, and then click **Close**.



19. In the **Collections** section, right-click *VDI_collection_name*, and then click **Task Status details**.



This completes the virtual desktop managed pooled deployment.

Deploy the VDI

To deploy your VDI, follow the instructions in this section.

Add RD Gateway servers for high availability and scaling

Complete the following step to add RD Gateway servers:

- In the **DEPLOYMENT SERVERS** area, click **TASKS**, and then click **Add RD Gateway Servers**.

The screenshot displays the 'GET STARTED WITH REMOTE DESKTOP SERVICES' wizard. It features a 'QUICK START' sidebar with 'LEARN MORE' and a main area with a progress indicator '1 Set up a Remote Desktop Services deployment'. Two deployment paths are shown: 'Virtual machine-based desktop deployment' (steps: 2 Add RD Virtualization Host servers, 3 Create virtual desktop collections) and 'Session-based desktop deployment' (steps: 2 Add RD Session Host servers, 3 Create session collections).

Below the wizard, the 'DEPLOYMENT OVERVIEW' section shows a diagram of the RDS architecture. At the top are 'RD Web Access', 'RD Gateway', and 'RD Licensing'. These connect to the 'RD Connection Broker'. The 'RD Connection Broker' then connects to 'RD Virtualization Host' and 'RD Session Host'.

The 'DEPLOYMENT SERVERS' table lists the installed role services for various servers:

Server FQDN	Installed Role Service
INFRA01.CONTOSOVDI.COM	RD Connection Broker
INFRA02.contosovdi.com	RD Web Access
INFRA03.contosovdi.com	RD Gateway
INFRA04.contosovdi.com	RD Gateway
INFRA04.contosovdi.com	RD Licensing
INFRAHYPERV01.contosovdi.com	RD Virtualization Host

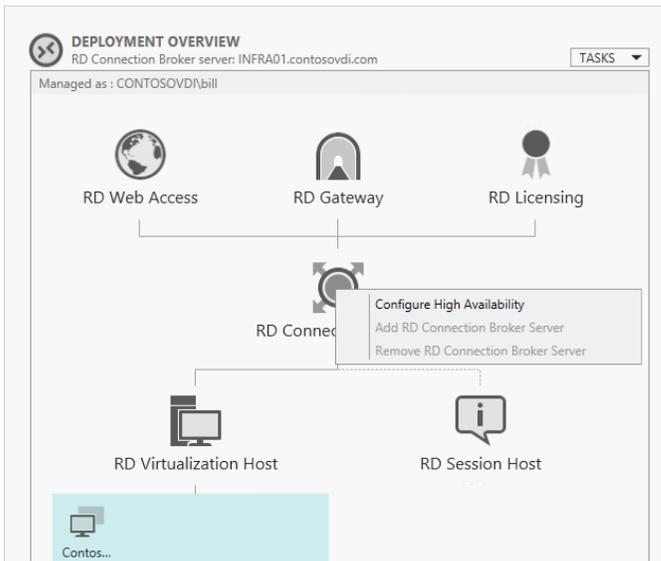
The 'TASKS' menu is open, showing options: 'Add RD Virtualization Host Servers', 'Add RD Session Host Servers', 'Add RD Web Access Servers', 'Add RD Licensing Servers', 'Add RD Gateway Servers', and 'Refresh'.

Add Brokers for high availability

Complete the following step to add brokers for high availability:

- In the **DEPLOYMENT OVERVIEW** area, right-click **RD Connection Broker**, then click **Configure High Availability**.

Doing so opens a wizard that helps you set up a SQL Server failover cluster.



Add RD Web Access for high availability

Complete the following step to add an RD Web Access server for high availability:

- In the **DEPLOYMENT SERVERS** area, click **TASKS**, and then click **Add RD Web Access Servers**.

GET STARTED WITH REMOTE DESKTOP SERVICES

1 Set up a Remote Desktop Services deployment

QUICK START

Virtual machine-based desktop deployment

- 2 Add RD Virtualization Host servers
- 3 Create virtual desktop collections

LEARN MORE

Session-based desktop deployment

- 2 Add RD Session Host servers
- 3 Create session collections

DEPLOYMENT SERVERS

Last refreshed on 3/20/2013 1:43:23 PM | All RDS role services | 6 total

Server FQDN	Installed Role Service
INFRA01.CONTOSOVDI.COM	RD Connection Broker
INFRA02.contosovdi.com	RD Web Access
INFRA03.contosovdi.com	RD Gateway
INFRA04.contosovdi.com	RD Gateway
INFRA04.contosovdi.com	RD Licensing
INFRAHYPERV01.contosovdi.com	RD Virtualization Host

TASKS

- Add RD Virtualization Host Servers
- Add RD Session Host Servers
- Add RD Web Access Servers
- Add RD Licensing Servers
- Add RD Gateway Servers
- Refresh

Add RD Licensing for high availability

Complete the following step to add an RD Licensing server for high availability:

- In the **DEPLOYMENT SERVERS** area, click **TASKS**, and then click **Add RD Licensing Servers**.

The screenshot displays the Remote Desktop Services console interface. At the top, there is a section titled "GET STARTED WITH REMOTE DESKTOP SERVICES" with a "1 Set up a Remote Desktop Services deployment" step. Below this, there are two deployment options: "Virtual machine-based desktop deployment" and "Session-based desktop deployment". The "Virtual machine-based desktop deployment" option is selected, showing steps: "2 Add RD Virtualization Host servers" and "3 Create virtual desktop collections".

The main area is divided into two panes. The left pane, titled "DEPLOYMENT OVERVIEW", shows a diagram of the Remote Desktop Services architecture. It includes "RD Web Access", "RD Gateway", and "RD Licensing" at the top, connected to "RD Connection Broker" in the center. Below the broker are "RD Virtualization Host" and "RD Session Host".

The right pane, titled "DEPLOYMENT SERVERS", shows a list of servers and their roles. The roles listed are "RD Connection Broker", "RD Web Access", "RD Gateway", "RD Licensing", and "RD Virtualization Host". A "TASKS" dropdown menu is open, showing options: "Add RD Virtualization Host Servers", "Add RD Session Host Servers", "Add RD Web Access Servers", "Add RD Licensing Servers", "Add RD Gateway Servers", and "Refresh".

Add RD Virtualization Hosts for scale

Complete the following step to add an RD Virtualization Hosts for scale:

- In the **DEPLOYMENT SERVERS** area, click **TASKS**, and then click **Add RD Virtualization Host Servers**.

This screenshot is identical to the one above, showing the Remote Desktop Services console. The "DEPLOYMENT OVERVIEW" diagram and the "DEPLOYMENT SERVERS" list are the same. However, the "TASKS" dropdown menu is open, and the first option, "Add RD Virtualization Host Servers", is highlighted in blue, indicating it is the selected action.

Summary

Microsoft technologies provide the flexibility required to meet the unique needs of individual users. For administrators, the enterprise-grade solutions are designed to assist you in maintaining security, streamlining management, and reducing costs. With Windows Server 2012, 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 deployment options, and performance enhancements for lower-bandwidth, higher-latency networks.

RDS builds on Hyper-V support for a wide range of storage options. For each collection, you can choose from different types of storage, and then specify a unique storage collection for the master VM parent disk, individual VMs, and the user profile disk. Doing so lets you achieve the optimal performance and user productivity while reducing your overall storage costs. The VDI components add flexibility for your enterprise in relation to the user experience, which will be nothing short of “golden” for your infrastructure and its manageability.