Module 12

Administering AD DS Domain Controllers

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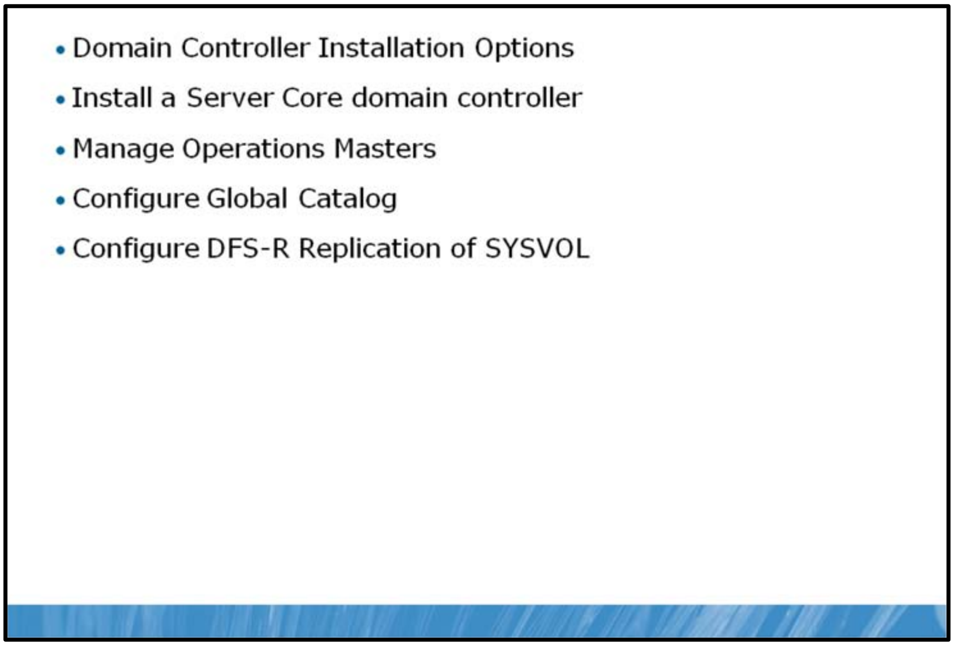
Module Overview



- Domain Controller Installation Options
- Install a Server Core domain controller
- Manage Operations Masters
- Configure Global Catalog
- Configure DFS-R Replication of SYSVOL

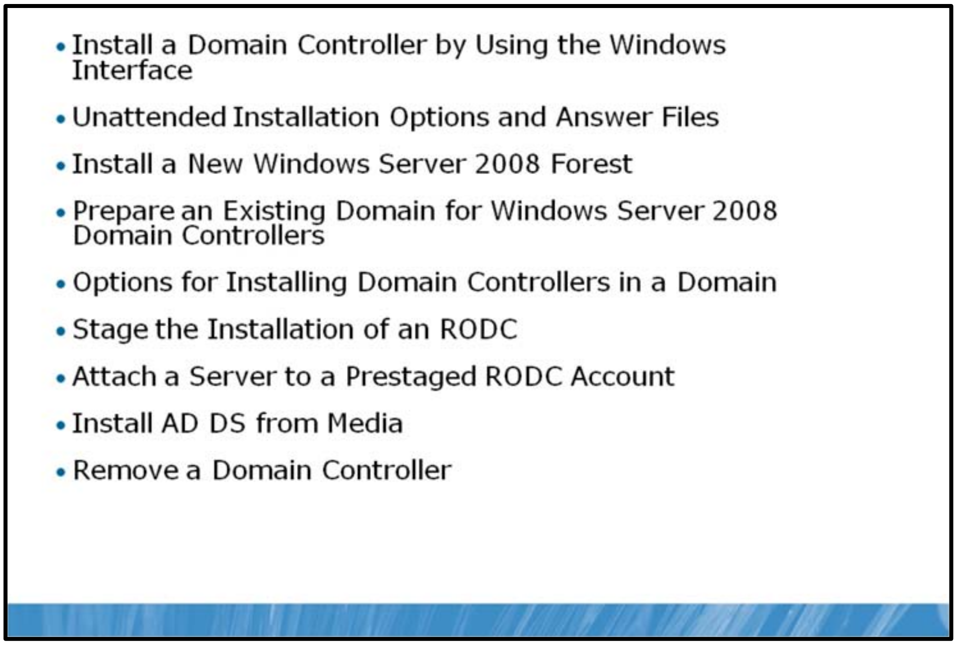
Domain controllers host the Active Directory® Domain Services (AD DS) and perform the services that support identity and access management in a Windows® enterprise. Until now, you saw how you can support the logical and management components of an AD DS infrastructure such as users, groups, computers, and Group Policy. Each of these components is contained in the directory database and in SYSVOL on domain controllers. In this module, you will explore the service-level components of Active Directory, starting with the domain controllers. You will learn how to add Windows Server® 2008 and Windows Server 2008 R2 domain controllers to a forest or domain, how to prepare a Windows Server 2003 forest or domain for its first Windows Server 2008 or Windows Server 2008 R2 domain controller, and how to manage the roles performed by domain controllers. In addition, you will see how to migrate the replication of SYSVOL from the File Replication Service (FRS) used in the previous versions of Windows to the Distributed File System Replication (DFS-R) mechanism that provides more robust and manageable replication.

Objectives

After completing this module, you will be able to:

- Describe the various options for installing domain controllers.
- Install and configure a domain controller on Server Core.
- Manage the placement, transfer, and seizure of operations master roles.
- Migrate SYSVOL replication from FRS to DFS-R.

Lesson 1
Domain Controller Installation Options



- Install a Domain Controller by Using the Windows Interface
- Unattended Installation Options and Answer Files
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- Options for Installing Domain Controllers in a Domain
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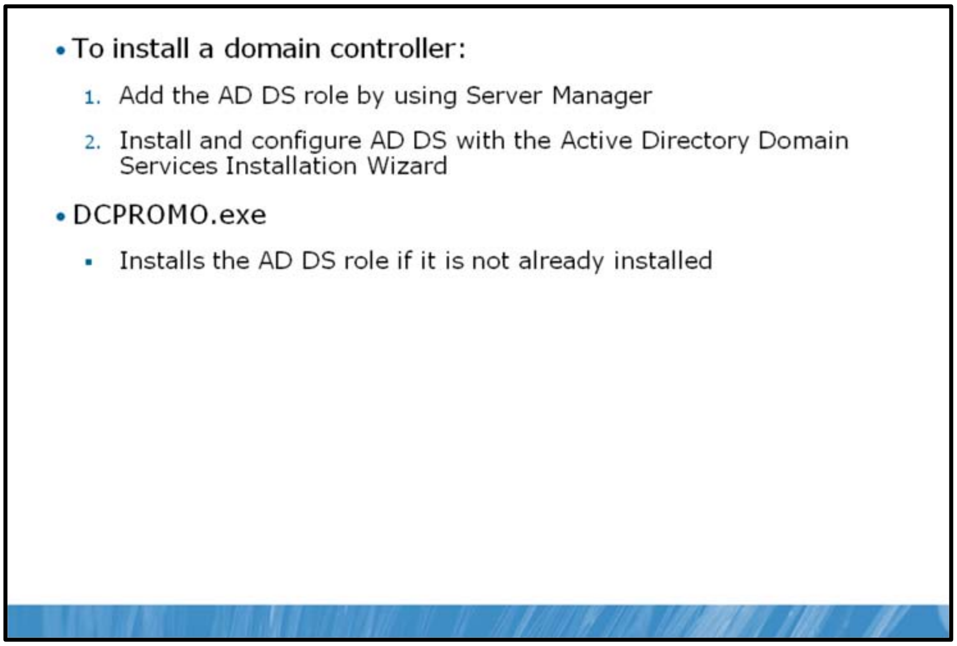
In Module 1, *Introducing Active Directory Domain Services*, you used the Add Roles Wizard in Server Manager to install AD DS. Then, you used the Active Directory Domain Services Installation Wizard to create the first domain controller in the contoso.com forest. Because domain controllers are critical to authentication, you need to maintain at least two domain controllers in each domain in your forest to provide a level of fault tolerance if one domain controller fails. You might also need to add domain controllers to remote sites or create new domains or trees in your Active Directory forest. In this lesson, you will learn user-interface, command-line, and unattended methods for installing domain controllers in various scenarios.

Objectives

After completing this lesson, you will be able to:

- Install a domain controller using the Windows interface, dcpromo.exe command-line parameters, or an answer file for unattended installation.
- Add Windows Server 2008 or Windows Server 2008 R2 domain controllers to a domain or forest with Windows Server 2003 and Windows 2000 Server domain controllers.
- Create new domains and trees.
- Perform a staged installation of a read-only domain controller.
- Install a domain controller from installation media to reduce network replication.
- Remove a domain controller.

Install a Domain Controller by Using the Windows Interface



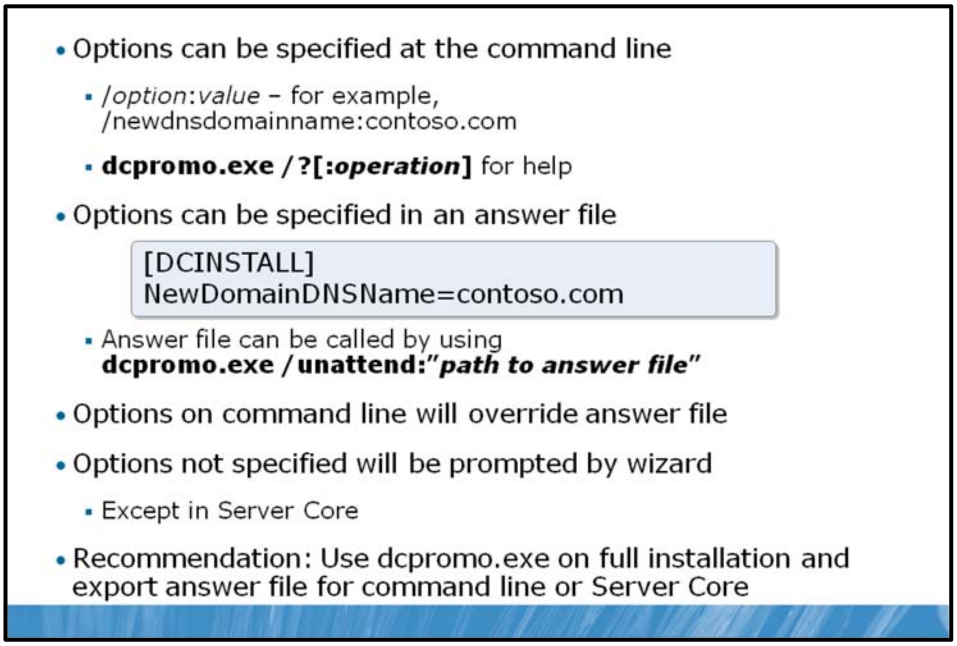
- To install a domain controller:
  1. Add the AD DS role by using Server Manager
  2. Install and configure AD DS with the Active Directory Domain Services Installation Wizard
- DCPROMO.exe
  - Installs the AD DS role if it is not already installed

To use the Windows interface for installing a domain controller, you need to perform two major steps. First, you must install the AD DS role, which can be accomplished by using the Add Roles Wizard in Server Manager. After the AD DS role installation has copied the binaries required for the role to the server, you must install and configure AD DS by launching the Active Directory Domain Services Installation Wizard by using one of these methods:

- Click **Start** and, in the **Start Search** box, type **dcpromo**, and then click **OK**.
- When you complete the Add Roles Wizard, click the link to launch the Active Directory Domain Services Installation Wizard.
- After adding the AD DS role, links appear in Server Manager that remind you to run the Active Directory Domain Services Installation Wizard. Click any of those links.

Note Microsoft documentation for Windows Server 2008 emphasizes the role-based model, so it recommends that you add the AD DS role and then run Dcpromo.exe (the Active Directory Domain Services Installation Wizard). However, you can simply run Dcpromo.exe, and as a first step, the wizard detects that the AD DS binaries are not installed and adds the AD DS role automatically.

Unattended Installation Options and Answer Files



- Options can be specified at the command line
  - */option*:*value* – for example, /newdnsdomainname:contoso.com
  - **dcpromo.exe /?[:*operation*]** for help
- Options can be specified in an answer file

```
[DCINSTALL]
NewDomainDNSName=contoso.com
```

  - Answer file can be called by using **dcpromo.exe /unattend:"*path to answer file*"**
- Options on command line will override answer file
- Options not specified will be prompted by wizard
  - Except in Server Core
- Recommendation: Use dcpromo.exe on full installation and export answer file for command line or Server Core

You can also add or remove a domain controller at the command line by using unattended installation supported by the Windows Server 2008 and Windows Server 2008 R2 version of dcpromo.exe. Unattended installation options provide values to the Active Directory Domain Services Installation Wizard. For example, the NewDomainDNSName option specifies a fully qualified domain name (FQDN) for a new domain.

These options can be provided at the command line by typing dcpromo /*unattendOption*:*value*, such as dcpromo /newdomaindnsname:contoso.com. Alternatively, you can provide the options in an unattended installation answer file. The answer file is a text file that contains a section heading, [DCINSTALL], followed by options and their values in the *option=value* form. For example, the following file provides the NewDomainDNSNameoption.

```
[DCINSTALL]
NewDomainDNSName=contoso.com
```

The answer file is called by adding its path to the unattended parameter, as shown in the following example:

dcpromo /unattend:"path to answer file"

The options in the answer file can be overridden by parameters on the command line. For example, if the NewDomainDNSName option is specified in the answer file, and the /NewDomainDNSName parameter is used on the command line, the value on the command line takes precedence. If any required values are neither in the answer file nor on the command line, the Active Directory Domain Services Installation Wizard prompts for the answers, so you can use the answer file to partially automate an installation, providing a subset of configuration values to be used during an interactive installation.

The wizard is not available when running dcpromo.exe from the command line in Server Core. In that case, the dcpromo.exe command returns with an error code.

For a complete list of parameters that you can specify as part of an unattended installation of AD DS, open an elevated command prompt and type the following command:

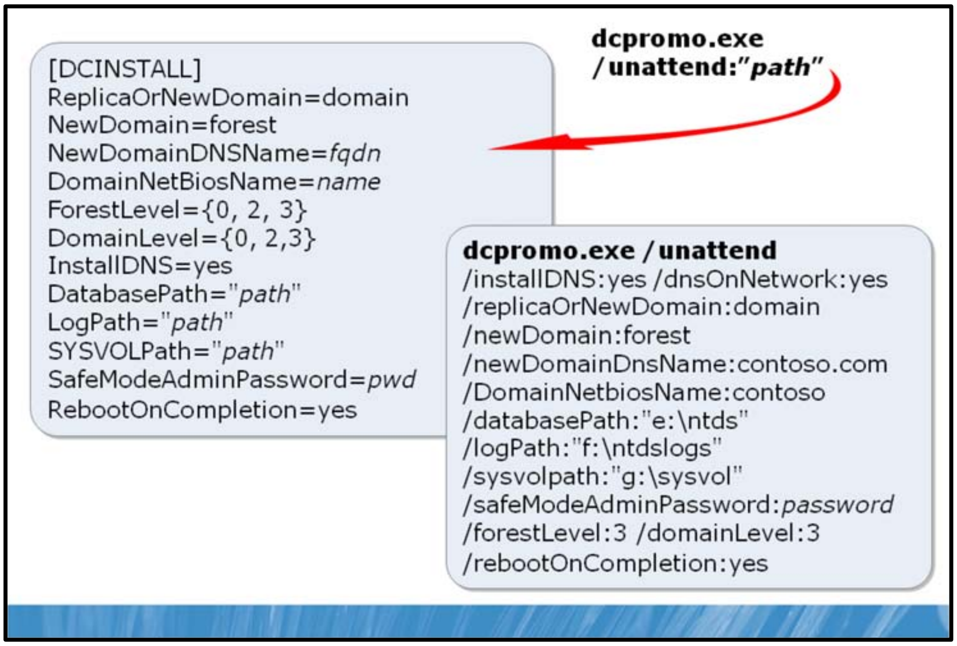
dcpromo /?[:*operation***]**

In the preceding command, *operation* is one of the following:

- **Promotion** returns all parameters that you can use when creating a domain controller.
- **CreateDCAccount** returns all parameters that you can use when creating a prestaged account for a read-only domain controller (RODC).
- **UseExistingAccount** returns all parameters that you can use to attach a new domain controller to a prestaged RODC account.
- **Demotion** returns all parameters that you can use when removing a domain controller.

Note When you use the Windows interface to create a domain controller, the Active Directory Domain Services Installation Wizard gives you the option, on the Summary page, to export your settings to an answer file. If you need to create an answer file for use from the command line—for example, on a Server Core installation—you can use this shortcut to create an answer file with the correct options and values.

Install a New Windows Server 2008 Forest



dcpromo.exe /unattend:"*path*"

```
[DCINSTALL]
ReplicaOrNewDomain=domain
NewDomain=forest
NewDomainDNSName=fqdn
DomainNetBiosName=name
ForestLevel={0, 2, 3}
DomainLevel={0, 2,3}
InstallDNS=yes
DatabasePath="path"
LogPath="path"
SYSVOLPath="path"
SafeModeAdminPassword=pwd
RebootOnCompletion=yes
```

dcpromo.exe /unattend

```
/installDNS:yes /dnsOnNetwork:yes
/replicaOrNewDomain:domain
/newDomain:forest
/newDomainDnsName:contoso.com
/DomainNetbiosName:contoso
/databasePath:"e:\ntds"
/logPath:"f:\ntdslogs"
/sysvolpath:"g:\sysvol"
/safeModeAdminPassword:password
/forestLevel:3 /domainLevel:3
/rebootOnCompletion:yes
```

In Module 1, the installation of the first Windows Server 2008 domain controller in a new forest by using the Windows interface was discussed. You learned the detailed steps to add the AD DS role to a server by using Server Manager and then running Dcpromo.exe to promote the server to a domain controller. When creating a new forest root domain, you must specify the forest root domain name system (DNS) name, its NetBIOS name, and the forest and domain functional levels. The first domain controller cannot be an RODC and must be a global catalog server. If the Active Directory Domain Services Installation Wizard detects that it is necessary to install or configure DNS, it does so automatically.

You can also use an answer file by typing **dcpromo /unattend:"***path to answer file***"** where the answer file contains unattended installation options and values. The following example contains the minimum parameters for an unattended installation of a new Windows Server 2008 domain controller in a new forest.

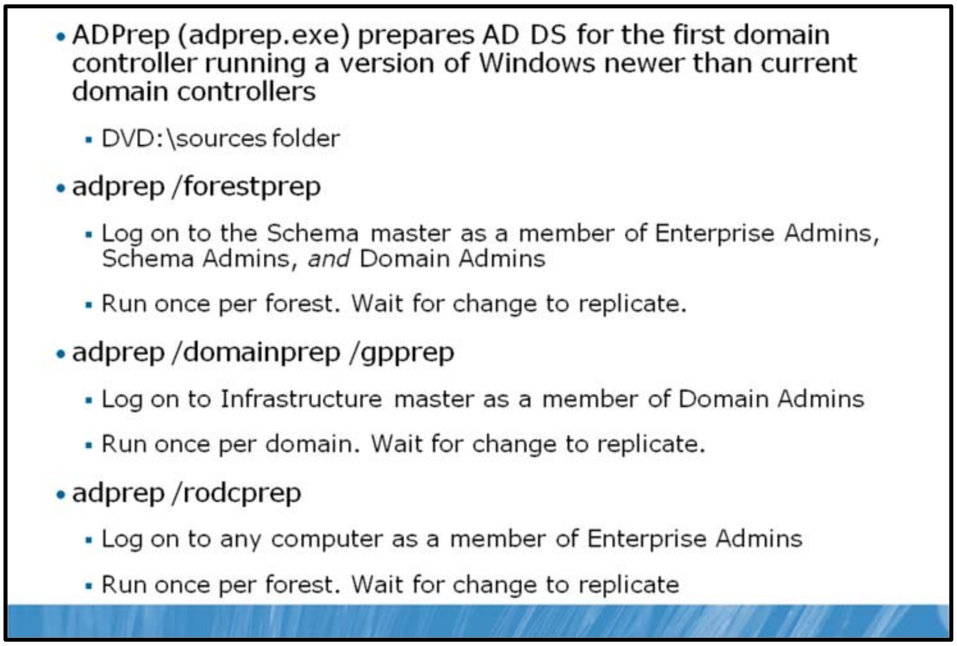
```
[DCINSTALL]
ReplicaOrNewDomain=domain
NewDomain=forest
NewDomainDNSName=fully qualified DNS name
DomainNetBiosName=domain NetBIOS name
ForestLevel={0=Windows 2000 Server Native;
             2=Windows Server 2003 Native;
             3=Windows Server 2008}
DomainLevel={0=Windows Server 2000 Native;
             2=Windows Server 2003 Native;
             3=Windows Server 2008}
InstallDNS=yes
DatabasePath="path to folder on a local volume"
LogPath="path to folder on a local volume"
SYSVOLPath="path to folder on a local volume"
SafeModeAdminPassword=password
RebootOnCompletion=yes
```

You can also specify one or more unattended installation parameters and values at the command line. For example, if you don’t want the Directory Services Restore Mode password in the answer file, leave the entry blank and specify the **/SafeModeAdminPassword:***password* parameter when you run dcpromo.exe.

You can also include all options on the command line itself. The following example creates the first domain controller in a new forest in which you don’t expect to install any Windows Server 2003 domain controllers.

```
dcpromo /unattend /installDNS:yes /dnsOnNetwork:yes
/replicaOrNewDomain:domain /newDomain:forest
/newDomainDnsName:contoso.com /DomainNetbiosName:contoso
/databasePath:"e:\ntds" /logPath:"f:\ntdslogs"
/sysvolpath:"g:\sysvol"
/safeModeAdminPassword:password /forestLevel:3 /domainLevel:3
/rebootOnCompletion:yes
```

Prepare an Existing Domain for Windows Server 2008 Domain Controllers



- ADPrep (adprep.exe) prepares AD DS for the first domain controller running a version of Windows newer than current domain controllers
  - DVD:\sources folder
- adprep /forestprep
  - Log on to the Schema master as a member of Enterprise Admins, Schema Admins, *and* Domain Admins
  - Run once per forest. Wait for change to replicate.
- adprep /domainprep /gpprep
  - Log on to Infrastructure master as a member of Domain Admins
  - Run once per domain. Wait for change to replicate.
- adprep /rodcprep
  - Log on to any computer as a member of Enterprise Admins
  - Run once per forest. Wait for change to replicate

If you have an existing forest with domain controllers running Windows Server 2003 or Windows 2000 Server, you must prepare them before creating your first Windows Server 2008 or Windows Server 2008 R2domain controller.

The ADPrep command is used to prepare Active Directory for a domain controller that is running a version of Windows Server that is newer than the existing domain controllers in the forest or domain. Adprep.exe is a command-line tool that is included in the installation disk of each version of Windows Server. Adprep.exe performs operations that must be completed in an existing Active Directory environment before you can add a domain controller that runs that version of Windows Server.

Adprep.exe has parameters that perform a variety of operations to prepare an existing Active Directory environment for a domain controller that runs a later version of Windows Server. Not all versions of Adprep.exe perform the same operations. However, in general, the different types of operations that Adprep.exe can perform include the following:

- Updating the Active Directory schema
- Updating security descriptors
- Modifying access control lists (ACLs) on Active Directory objects and on files in the SYSVOL shared folder
- Creating new objects, as needed
- Creating new containers, as needed

Note In Windows Server 2008 R2, Adprep.exe is located in the \Support\Adprep folder of the operating system disk. In Windows Server 2008, Adprep.exe is located in the \Sources\Adprep folder. Windows Server 2008 R2 includes a 32-bit version and a 64-bit version of Adprep.exe. The 64-bit version runs by default. If you want to run one of the Adprep.exe commands on a 32-bit computer, use the 32-bit version of Adprep.exe (Adprep32.exe).

To prepare the forest for the first domain controller running Windows Server 2008 or Windows Server 2008 R2, follow these steps:

1. Log on to the schema master as a member of the **Enterprise Admins**, **Schema Admins**, and **Domain Admins** groups.

   Lesson 3 discusses operations masters and provides steps for identifying which domain controller is the schema master.

2. Copy the contents of the **\sources\adprep** folder from the Windows Server 2008 DVD to a folder on the schema master.
3. Open an elevated command prompt, and change directories to the **adprep** folder.
4. Type **adprep /forestprep**, and then press Enter.

You must allow time for the operation to complete. After the changes have replicated throughout the forest, you can continue to prepare the domains for Windows Server 2008.

To prepare a domain for the first domain controller running Windows Server 2008, perform these steps:

1. Log on to the domain infrastructure operations master as a member of **Domain Admins**.

   Lesson 3 provides steps for identifying which domain controller is the infrastructure operations master.

2. Copy the contents of the **\sources\adprep** folder from the Windows Server 2008 DVD to a folder on the infrastructure master.
3. Open a command prompt and change directories to the **adprep** folder.
4. Type **adprep /domainprep /gpprep**, and then press Enter.

On Windows Server 2003, you might receive an error message stating that updates were unnecessary. You can ignore this message.

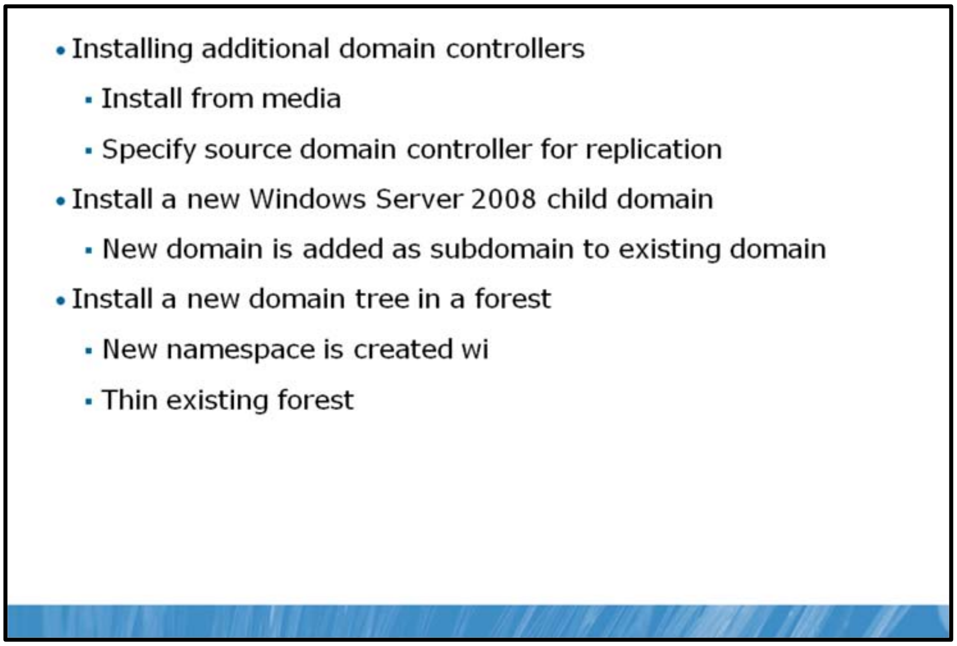
Allow the change to replicate throughout the forest before you install a domain controller that runs Windows Server 2008.

To prepare AD DS for the first RODC, follow these steps:

1. Log on to any computer as a member of the **Enterprise Admins**.
2. Copy the contents of the **\sources\adprep** folder from the Windows Server 2008 DVD to a folder on the computer.
3. Open an elevated command prompt, and change directories to the **adprep** folder.
4. Type **adprep /rodcprep**, and then press Enter.

You can also run adprep /rodcprep at any time in a Windows 2000 Server or Windows Server 2003 forest. It does not have to be run in conjunction with /forestprep. However, you must run adprep /rodcprep and allow its changes to replicate throughout the forest prior to installing the first RODC.

Options for Installing Domain Controllers in a Domain



- Installing additional domain controllers
  - Install from media
  - Specify source domain controller for replication
- Install a new Windows Server 2008 child domain
  - New domain is added as subdomain to existing domain
- Install a new domain tree in a forest
  - New namespace is created wi
  - Thin existing forest

You can install a domain controller in an environment in various scenarios. For example, you can choose to add a new domain controller into an existing domain, or you can create a new domain in an existing forest. If you deploy a new domain, you can also select and make it a subdomain to an existing domain or make a new domain tree. This topic will discuss the various options for installing a domain controller.

Installing Additional Domain controllers

Additional domain controllers can be added by installing AD DS and launching the Active Directory Domain Services Installation Wizard. You are prompted to choose the deployment configuration, enter network credentials, select a domain and site for the new domain controller, and configure the domain controller with additional options such as DNS Server, global catalog (GC), or RODC. The remaining steps are the same as for the first domain controller: configuring file locations and the Directory Services Restore Mode Administrator password.

If you have one domain controller in a domain, and if you select the Use Advanced Mode Installation check box on the Welcome to the Active Directory Domain Services Installation Wizard page, you can configure the following advanced options:

- **Install From Media.** By default, a new domain controller replicates all data for all directory partitions it hosts from other domain controllers during the Active Directory Domain Services Installation Wizard. To improve the performance of installation, particularly over slow links, you can use installation media created by existing domain controllers. Installation media is a form of backup. The new domain controller can read data from the installation media directly and then replicate only updates from other domain controllers. Install From Media (IFM) is further discussed in the *Install AD DS from Media* topic.

- **Source Domain Controller.** If you want to specify the domain controller from which the new domain controller replicates its data, you can click Use This Specific Domain Controller.

Note Dcpromo/adv is still supported. In Windows Server 2003, dcpromo/adv was used to specify advanced installation options. The adv parameter is still supported; it simply preselects the Use Advanced Mode Installation check box on the Welcome page.

To use Dcpromo.exe with command-line parameters to specify unattended installation options, you can use the minimal parameters shown in the following example.

```
dcpromo /unattend /replicaOrNewDomain:replica
    /replicaDomainDNSName:contoso.com /installDNS:yes /confirmGC:yes
/databasePath:"e:\ntds" /logPath:"f:\ntdslogs"
 /sysvolpath:"g:\sysvol"
/safeModeAdminPassword:password /rebootOnCompletion:yes
```

If you are not logged on to the server with domain credentials, specify the *userdomain* and *username* parameters as well. A minimal answer file for an additional domain controller in an existing domain is as follows.

```
[DCINSTALL]
ReplicaOrNewDomain=replica
ReplicaDomainDNSName=FQDN of domain to join
UserDomain=FQDN of domain of user account
UserName=DOMAIN\username (in Administrators group of the domain)
Password=password for user specified by UserName (* to prompt)
InstallDNS=yes
ConfirmGC=yes
DatabasePath="path to folder on a local volume"
LogPath="path to folder on a local volume"
SYSVOLPath="path to folder on a local volume"
SafeModeAdminPassword=password
RebootOnCompletion=yes
```

Installing a New Windows Server 2008 Child Domain

If you have an existing domain, you can create a new child domain by creating a Windows Server 2008 or Windows Server 2008 R2 domain controller. However, before you do this, , you must run adprep/forestprep as described in the earlier section, *Preparing an Existing Domain for Windows Server 2008 DCs*.

Then, install AD DS and launch the Active Directory Domain Services Installation Wizard. On the Choose a Deployment Configuration page, click Existing Forest and Create a new domain in an existing forest. You are prompted to select the domain functional level. Because it is the first domain controller in the domain, it cannot be an RODC, and it cannot be installed from media. If you select the Use Advanced Mode Installation check box on the Welcome page, the wizard presents you with a Source Domain Controller page on which you specify a domain controller from which to replicate the configuration and schema partitions.

Using dcpromo.exe, you can create a child domain with the minimal options shown in the following command.

```
dcpromo /unattend /installDNS:yes
/replicaOrNewDomain:domain /newDomain:child
/ParentDomainDNSName:contoso.com
/newDomainDnsName:subsidiary.contoso.com /childName:subsidiary
    /DomainNetbiosName:subsidiary
    /databasePath:"e:\ntds" /logPath:"f:\ntdslogs"
```

```
/sysvolpath:"g:\sysvol"
/safeModeAdminPassword:password /forestLevel:3 /domainLevel:3
/rebootOnCompletion:yes
```

The following answer file reflects the same minimal parameters.

```
[DCINSTALL]
ReplicaOrNewDomain=domain
NewDomain=child
ParentDomainDNSName=FQDN of parent domain
UserDomain=FQDN of user specified by UserName
UserName= DOMAIN\username (has permissions to add a child domain)
Password=password for user specified by UserName or * for prompt
ChildName=single-label prefix for domain
          (Child domain FQDN will be ChildName.ParentDomainDNSName)
DomainNetBiosName=Domain NetBIOS name
DomainLevel=domain functional level (not lower than current forest level)
InstallDNS=yes
CreateDNSDelegation=yes
DNSDelegationUserName=DOMAIN\username with permissions to create
                      DNS delegation, if different than UserName, above
DNSDelegationPassword=password for DNSDelegationUserName or * for prompt
DatabasePath="path to folder on a local volume"
LogPath="path to folder on a local volume"
SYSVOLPath="path to folder on a local volume"
SafeModeAdminPassword=password
RebootOnCompletion=yes
```

Install a New Domain Tree in a Forest

You learned in Module 1, *Introducing Active Directory Domain Services* that in an Active Directory forest, a tree is composed of one or more domains that share contiguous DNS namespace. So, for example, the contoso.com and subsidiary.contoso.com domains would be in a single tree.

Additional trees are simply additional domains in the same forest that are not in the same namespace. For example, if Contoso, Ltd bought Tailspin Toys, the tailspintoys.com domain would be in a separate tree in the domain. There is very little functional difference between a child domain and a domain in another tree, and the process for creating a new tree is, therefore, very similar to creating a child domain. In both cases, domains in the same forest share the same Active Directory schema and configuration partition, as well as global catalog.

First, you must run adprep/forestprep as described in the earlier section, *Preparing an Existing Domain for Windows Server 2008 DCs*. Then, you can install AD DS and run the Active Directory Domain Services Installation Wizard.

The following options provided as parameters to dcpromo.exe create a new tree for thetailspintoys.com domain within the contoso.com forest.

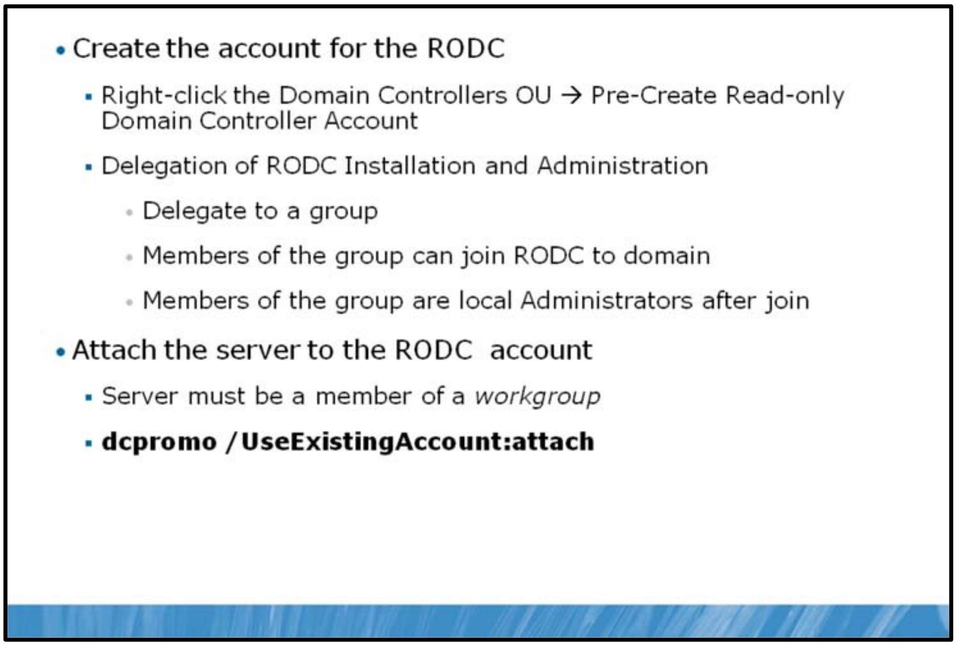
```
dcpromo /unattend /installDNS:yes
/replicaOrNewDomain:domain/newDomain:tree
/newDomainDnsName:tailspintoys.com /DomainNetbiosName:tailspintoys
/databasePath:"e:\ntds" /logPath:"f:\ntdslogs"
/sysvolpath:"g:\sysvol"
/safeModeAdminPassword:password/domainLevel:2
    /rebootOnCompletion:yes
```

The domain functional level is configured at 2—Windows Server 2003 Native—so the domain could include Windows Server 2003 domain controllers.

An unattended installation answer file that creates the same new tree would look similar to the following example.

```
[DCINSTALL]
ReplicaOrNewDomain=domain
NewDomain=tree
NewDomainDNSName=FQDN of new domain
DomainNetBiosName=NetBIOS name of new domain
UserDomain=FQDN of user specified by UserName
UserName= DOMAIN\username (with permissions to create a new domain)
Password=password for user specified by UserName or * for prompt
DomainLevel=domain functional level (not lower than current forest level)
InstallDNS=yes
ConfirmGC=yes
CreateDNSDNSDelegation=yes
DNSDelegationUserName=account with permissions to create DNS delegation
                      required only if different than UserName, above
DNSDelegationPassword=password for DNSDelegationUserName or * for prompt
DatabasePath="path to folder on a local volume"
LogPath="path to folder on a local volume"
SYSVOLPath="path to folder on a local volume"
SafeModeAdminPassword=password
RebootOnCompletion=yes
```

Stage the Installation of an RODC



- Create the account for the RODC
  - Right-click the Domain Controllers OU → Pre-Create Read-only Domain Controller Account
  - Delegation of RODC Installation and Administration
    - Delegate to a group
    - Members of the group can join RODC to domain
    - Members of the group are local Administrators after join
- Attach the server to the RODC account
  - Server must be a member of a *workgroup*
  - **dcpromo /UseExistingAccount:attach**

As you remember from Module 10, *Improving the Security of Authentication in an AD DS Domain*, RODCs are designed to support branch office scenarios by providing authentication local to the site while mitigating the security and data integrity risks associated with placing a domain controller in a less well-controlled environment. Many times, there are few or no IT support personnel in a branch office. How, then, should a domain controller be created in a branch office?

Using Windows Server 2008, you can to create a staged, or delegated, installation of an RODC. The process includes two stages:

- **Create the account for the RODC.** A member of Domain Admins creates an account for the RODC in Active Directory. The parameters related to the RODC are specified at this time: the name, the Active Directory site in which the RODC will be created, and, optionally, the user or group that can complete the next stage of the installation.
- **Attach the server to the RODC account.** After the account has been created, AD DS is installed, and the server—which must be a member of a workgroup and not the domain—is joined to the domain and as an RODC attached to the prestaged account. These steps can be the users or groups specified when the RODC account was prestaged; these users do not require any privileged group membership. A server can also be attached by a member of Domain Admins or Enterprise Admins, but the ability to delegate this stage to a nonprivileged user makes it much easier to deploy RODCs in branches without IT support. The domain controller will replicate its data from another writable domain controller in the domain, or you can use the IFM method discussed in the *Installing AD DS from Media* section.

Creating the Prestaged Account for the RODC

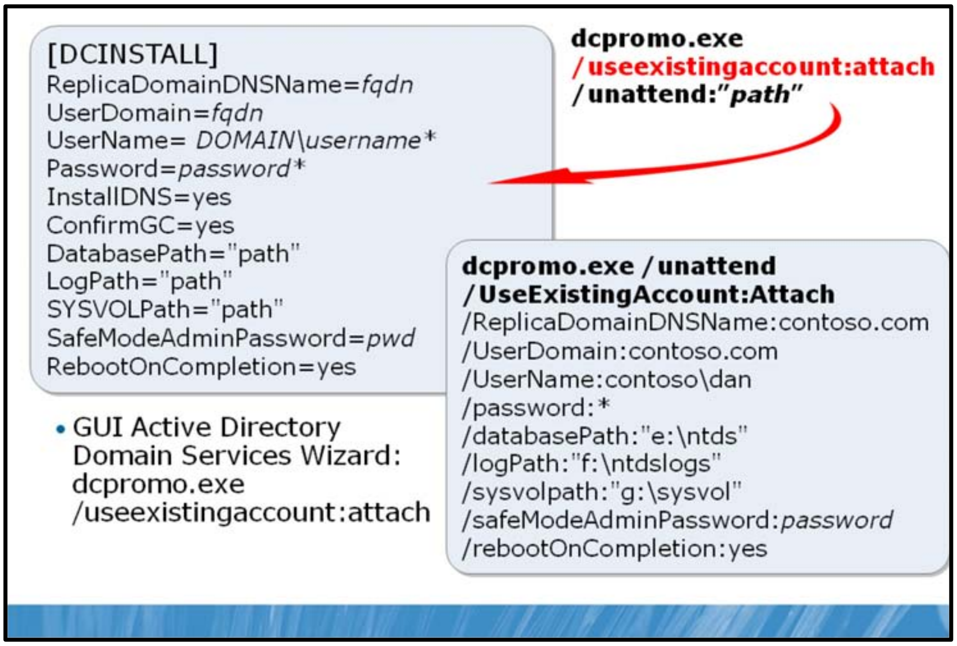
To create the account for the RODC by using the Active Directory Users and Computers snap-in, right-click the Domain Controllers OU and click Pre-Create Read-Only Domain Controller Account. A wizard similar to the Active Directory Domain Services Installation Wizard appears. You prompted to specify the

RODC name and site. You can also configure the password replication policy, as detailed in Module 10, *Improving the Security of Authentication in an AD DS Domain*.

On the Delegation of RODC Installation and Administration page, you can specify one security principal—user or group—that can attach the server to the RODC account you create. The user or group will also have local administrative rights on the RODC after the installation. Delegate to a group rather than to a user. If you do not specify a user or group, only members of the Domain Admins or Enterprise Admins groups can attach the server to the account.

You can create prestaged RODC accounts by using dcpromo.exe with numerous parameters or by creating an answer file for dcpromo.exe. The steps for doing so are detailed at: http://go.microsoft.com/fwlink/?LinkId=168471.

Attach a Server to a Prestaged RODC Account



```
[DCINSTALL]
ReplicaDomainDNSName=fqdn
UserDomain=fqdn
UserName= DOMAIN\username*
Password=password*
InstallDNS=yes
ConfirmGC=yes
DatabasePath="path"
LogPath="path"
SYSVOLPath="path"
SafeModeAdminPassword=pwd
RebootOnCompletion=yes
```

dcpromo.exe
/useexistingaccount:attach
/unattend:*"path"*

- GUI Active Directory Domain Services Wizard: dcpromo.exe /useexistingaccount:attach

```
dcpromo.exe /unattend
/UseExistingAccount:Attach
/ReplicaDomainDNSName:contoso.com
/UserDomain:contoso.com
/UserName:contoso\dan
/password:*
/databasePath:"e:\ntds"
/logPath:"f:\ntdslogs"
/sysvolpath:"g:\sysvol"
/safeModeAdminPassword:password
/rebootOnCompletion:yes
```

After you have prestaged the account, the server can be attached to it.

To attach a server to a prestaged RODC account:

1. Ensure that the server is a member of a workgroup, not a member of the domain.

   Promote from a workgroup. When you create an RODC by using the staged approach—when you attach an RODC to a prestaged account—the server must be a member of a workgroup, not of the domain, when you launch dcpromo.exe or the Active Directory Domain Services Installation Wizard. The wizard will look in the domain for the existing account with its name and will attach to that account.

2. Run dcpromo.exe /UseExistingAccount:attach.

   The wizard prompts for network credentials and then finds the RODC account in the domain indicated by the credentials. Remaining steps are similar to other domain controller promotion operations.

To use an answer file, provide the following options and values.

```
[DCINSTALL]
ReplicaDomainDNSName=FQDN of domain to join
UserDomain=FQDN of user specified by UserName
UserName=DOMAIN\username (in Administrators group of the domain)
Password=password for user specified by UserName
InstallDNS=yes
ConfirmGC=yes
DatabasePath="path to folder on a local volume"
LogPath="path to folder on a local volume"
SYSVOLPath="path to folder on a local volume"
SafeModeAdminPassword=password
RebootOnCompletion=yes
```

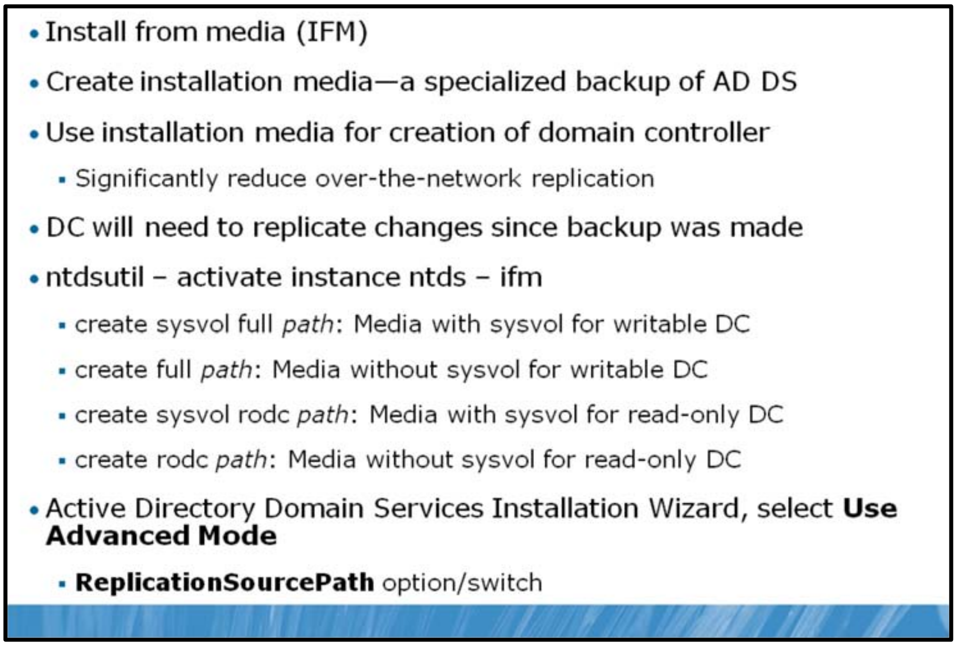
Run dcpromo with the/unattend:"answer file path” and the /UseExistingAccount:Attach options, as shown in the following example.

```
dcpromo /useexistingaccount:attach /unattend:"c:\rodcanswer.txt"
```

All the options just shown in the answer file can also be specified or overridden directly on the command line as shown in the following example.

```
dcpromo /unattend /UseExistingAccount:Attach
/ReplicaDomainDNSName:contoso.com
    /UserDomain:contoso.com /UserName:contoso\dan /password:*
    /databasePath:"e:\ntds" /logPath:"f:\ntdslogs"
/sysvolpath:"g:\sysvol"
    /safeModeAdminPassword:password /rebootOnCompletion:yes
```

Install AD DS from Media



- Install from media (IFM)
- Create installation media—a specialized backup of AD DS
- Use installation media for creation of domain controller
  - Significantly reduce over-the-network replication
- DC will need to replicate changes since backup was made
- ntdsutil – activate instance ntds – ifm
  - create sysvol full *path*: Media with sysvol for writable DC
  - create full *path*: Media without sysvol for writable DC
  - create sysvol rodc *path*: Media with sysvol for read-only DC
  - create rodc *path*: Media without sysvol for read-only DC
- Active Directory Domain Services Installation Wizard, select **Use Advanced Mode**
  - **ReplicationSourcePath** option/switch

When you add domain controllers to a forest, data from the existing directory partitions are replicated to the new domain controller. In an environment with a large directory or where bandwidth is constrained between a new domain controller and a writable domain controller from which to replicate, you can install AD DS more efficiently by using the install-from-media (IFM) option.

Installing from media involves creating installation media—a specialized backup of Active Directory that can be used by the Active Directory Domain Services Installation Wizard as a data source for populating the directory on a new domain controller. Then, the new domain controller replicates only updates from another writable domain controller. So, if the installation media is recent, you can minimize the impact of replication to a new domain controller.

Remember that it is not only the directory that must be replicated to a new domain controller, but also the SYSVOL. When you create your installation media, you can specify whether to include SYSVOL on the installation media.

Using IFM also allows you to control the timing of impact to your network bandwidth. You can, for example, create installation media and transfer it to a remote site during off hours and then create the domain controller during normal business hours. Because the installation media is from the local site, impact to the network is reduced, and only updates will be replicated over the link to the remote site.

To create installation media:

1. Open an elevated command prompt on a writable domain controller, running Windows Server 2008 or Windows Server 2008 R2.

   The installation media can be used to create both writable and read-only domain controllers.

2. Run **ntdsutil.exe**.
3. At the **ntdsutil** prompt, type **activate instance ntds**, and then press Enter.
4. Type **ifm**, and then press Enter.

5. At the **ifm:** prompt, type one of the following commands, based on the type of installation media you want to create:

   - **create sysvol full** *path*. Creates installation media with SYSVOL for a writable domain controller in the folder specified by *path*.

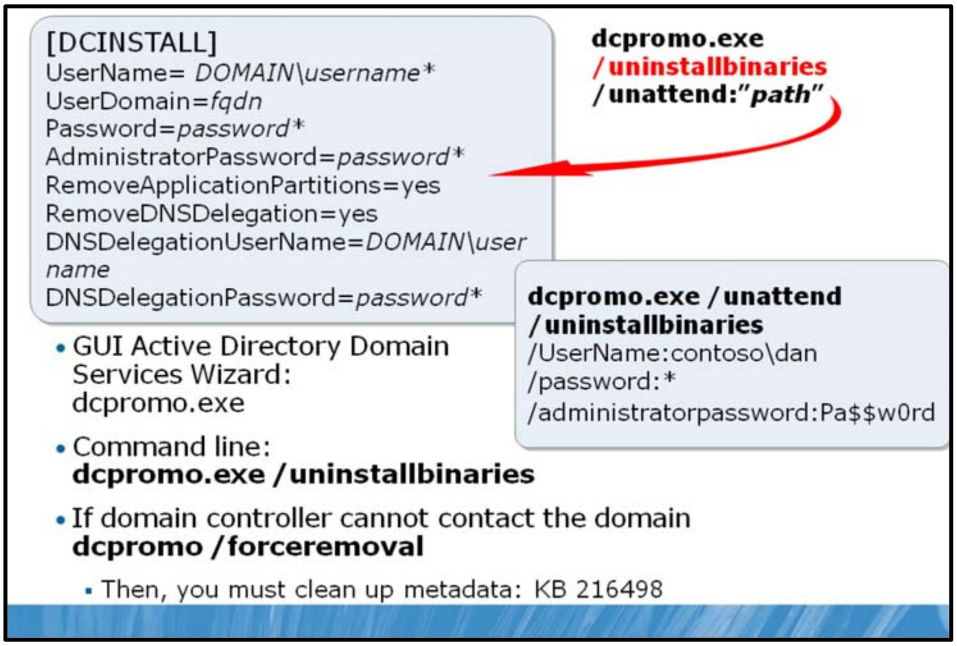
   - **create full** *path.* Creates installation media without SYSVOL for a writable domain controller or an Active Directory Lightweight Directory Services (AD LDS) instance in the folder specified by *path*.

   - **create sysvolrodc** *path*. Creates installation media with SYSVOL for an RODC in the folder specified by *path*.

   - **create rodc** *path*. Creates installation media without SYSVOL for an RODC in the folder specified by *path*.

When you run the Active Directory Domain Services Installation Wizard, select the Use Advanced Mode Installation check box, and you will be presented with the Install From Media page later in the wizard. Select the **Replicate data from media at the following location check box**. You can use the ReplicationSourcePath installation option in an answer file or on the dcpromo.exe command line.

Remove a Domain Controller



```
[DCINSTALL]
UserName= DOMAIN\username*
UserDomain=fqdn
Password=password*
AdministratorPassword=password*
RemoveApplicationPartitions=yes
RemoveDNSDelegation=yes
DNSDelegationUserName=DOMAIN\user
name
DNSDelegationPassword=password*
```

dcpromo.exe
/uninstallbinaries
/unattend:"*path*"

- GUI Active Directory Domain Services Wizard: dcpromo.exe
- Command line: **dcpromo.exe /uninstallbinaries**
- If domain controller cannot contact the domain **dcpromo /forceremoval**
  - Then, you must clean up metadata: KB 216498

dcpromo.exe /unattend /uninstallbinaries
/UserName:contoso\dan
/password:*
/administratorpassword:Pa$$w0rd

You can remove a domain controller by using Dcpromo.exe to launch the Active Directory Domain Services Installation Wizard or from a command prompt, specifying options at the command line or in an answer file. When a domain controller is removed while it has connectivity to the domain, it updates the forest metadata about the domain controller so that the directory knows the domain controller has been removed.

To use an answer file, provide the following options and values.

```
[DCINSTALL]
UserName=DOMAIN\username (in Administrators group of the domain)
UserDomain=FQDN of user specified by UserName
Password=password for user specified by UserName
AdministratorPassword=password will be assigned to local Administrator
RemoveApplicationPartitions=yes
RemoveDNSDelegation=yes
DNSDelegationUserName=DOMAIN\username with permissions to remove
      DNS delegation
DNSDelegationPassword=password for the account
```

Run dcpromo with the /unattend:"answer file path" and the /UninstallBinaries options, as in the following example:

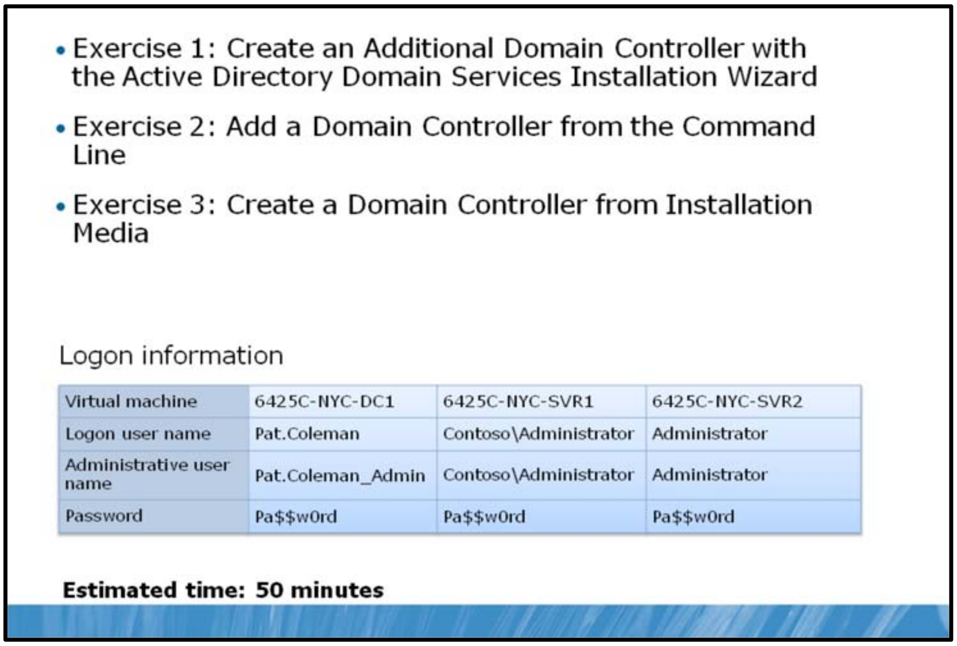
```
dcpromo /uninstallbinaries /unattend:"c:\rodcanswer.txt"
```

All the options just shown in the answer file can also be specified or overridden directly on the command line. Just type a command similar to the following:

```
dcpromo /unattend/uninstallbinaries
 /UserName:contoso\dan
/password:*
/administratorpassword:Pa$$w0rd
```

If a domain controller must be demoted while it cannot contact the domain, you must use the forceremoval option of dcpromo.exe. Type dcpromo /forceremoval, and the Active Directory Domain Services Installation Wizard steps you through the process. You are presented warnings related to any roles the domain controller hosts. Read each warning and, after you have mitigated or accepted the impact of the warning, click **Yes**. You can suppress warnings by using the demotefsmo:yes option of dcpromo.exe. After the domain controller has been removed, you must manually clean up the forest metadata.

Lab A: Install Domain Controllers



- Exercise 1: Create an Additional Domain Controller with the Active Directory Domain Services Installation Wizard
- Exercise 2: Add a Domain Controller from the Command Line
- Exercise 3: Create a Domain Controller from Installation Media

Logon information

Virtual machine	6425C-NYC-DC1	6425C-NYC-SVR1	6425C-NYC-SVR2
Logon user name	Pat.Coleman	Contoso\Administrator	Administrator
Administrative user name	Pat.Coleman_Admin	Contoso\Administrator	Administrator
Password	Pa$$w0rd	Pa$$w0rd	Pa$$w0rd

Estimated time: 50 minutes

Lab Setup

For this lab, you will use the available virtual machine environment. Before you begin the lab, you must complete the following steps:

1. On the host computer, click **Start**, point to **Administrative Tools**, and then click **Hyper-V Manager**.
2. In Hyper-V™ Manager, click 6425C-NYC-DC1, and in the Actions pane, click **Start**.
3. In the Actions pane, click **Connect**. Wait until the virtual machine starts.
4. Log on by using the following credentials:
   - User name: **Pat.Coleman**
   - Password: **Pa$$w0rd**
   - Domain: **Contoso**
5. Repeat steps 2 and 3 for the 6425C-NYC-SVR1 and 6425C-NYC-SVR2 virtual machines.
6. Log on to NYC-SVR1 and NYC-SVR2 by using the following credentials:
   - User name: **Administrator**
   - Password: **Pa$$w0rd**
   - Domain: **Contoso (only for NYC-SVR1)**

Lab Scenario

You decide to add a new domain controller to provide fault tolerance for the directory service. You have already installed new servers named NYC-SVR1 and NYC-SVR2.

Exercise 1: Create an Additional Domain Controller with the Active Directory Domain Services Installation Wizard

In this exercise, you will use the Active Directory Domain Services Installation Wizard (DCPromo.exe) to create an additional domain controller in the contoso.com domain. You will not complete the installation, however. Instead, you will save the settings as an answer file, which will be used in the next exercise.

The main task for this exercise is as follows:

- Promote a domain controller by using the Active Directory Domain Services Installation Wizard.

▶ Task: Promote a domain controller by using the Active Directory Domain Services Installation Wizard.

1. On NYC-SVR1, run **DCPromo.exe**. Accept all of the defaults provided by the Active Directory Administration Wizard except those listed below:
   - Additional domain controller in an existing forest
   - Domain: **contoso.com**
   - Alternate credentials: **Pat.Coleman_Admin** with the password **Pa$$w0rd**.
   - Select domain: **contoso.com**.
   - When a warning appears informing you that a DNS delegation could not be found, click **Yes**.
   - Directory Services Restore Mode Administrator Password: **Pa$$w0rd**
2. Export the settings to a file on your desktop called **AdditionalDC**.
3. Cancel the installation of the domain controller on the **Summary** page. Do not continue with the Active Directory Domain Services Installation Wizard.

Results: In this exercise, you simulated promoting NYC-SVR1 to a domain controller.

Exercise 2: Add a Domain Controller from the Command Line

In this exercise, you will examine the answer file you created in Exercise 1. You will use the installation options in the answer file to create a dcpromo.exe command line to install the additional domain controller.

The main tasks for this exercise are as follows:

1. Create the DCPromo command.
2. Execute the DCPromo command.

▶ Task 1: Create the DCPromo command.

1. Open the **AdditionalDC.txt** file you created in Exercise 1.Examine the answers in the file. Can you identify what some of the options mean?

Tip Lines beginning with a semicolon are comments or inactive lines that have been commented out.

2. Open a second instance of Notepad, as a new text file. Turn on word wrap. Position the windows so you can see both the blank text file and the AdditionalDC.txt file as a reference.
3. In Notepad, type the dcpromo.exe command line just as you would do in a command prompt. Determine the command line to install the domain controller with the same options as those listed in the answer file. Parameters on the command line take the form /option:value, whereas in the answer file, they take the form option=value. Configure both the **Password** and **SafeModeAdminPassword** values as **Pa$$w0rd**. Instruct DCPromo to reboot when complete.
4. As you will learn in Lab B, you can set the Password value to an asterisk (*), and then you will be prompted to enter the password when you run the command.
5. When you have created the command, open the **Exercise2.txt** file, found in the **\\NYC-DC1\d$\Labfiles\Lab11a** folder. Compare the correct command in **Exercise2.txt**with the command you created in the previous step. Make any necessary corrections to your command.

▶ Task 2: Execute the DCPromo command.

1. Open the Command Prompt window.
2. Switch to the Notepad file with the dcpromo.exe command you built in Task 1. Turn off word wrap, copy the command line you created, paste it into the command prompt window, and then press Enter to execute the command.

   NYC-SVR1 is promoted to a domain controller. This takes a few minutes.

Results: In this exercise, you promoted NYC-SVR1 as an additional domain controller in the contoso.com domain and forest.

Exercise 3: Create a Domain Controller from Installation Media

You can reduce the amount of replication required to create a domain controller by promoting the domain controller by using the IFM option. IFM requires that you provide installation media, which is, in effect, a backup of Active Directory. In this exercise, you will create the installation media on NYC-DC1, transfer it to NYC-SVR2, and then simulate the promotion of NYC-SVR2 to a domain controller by using the installation media.

The main tasks for this exercise are as follows:

1. Create installation media.
2. Promote a domain controller by using installation media.

▶ Task 1: Create installation media.

1. On NYC-DC1, run the Command Prompt as an administrator, with the user name **Pat.Coleman_Admin** and the password **Pa$$w0rd**.
2. Use **ntdsutil.exe** to create installation media in a folder named **C:\IFM**.

▶ Task 2: Promote a domain controller by using installation media.

1. Switch to NYC-SVR2, and log on as **Administrator** with the password **Pa$$w0rd**. Change DNS address on primary LAN adapter to 10.0.0.10.
2. Copy the **IFM** folder from the NYC-DC1 drive C to the NYC-SVR2 drive C.
3. On NYC-SVR2, run **DCPromo.exe**. Select the advanced mode installation and then accept all of the defaults provided by the Active Directory Administration Domain Services Installation Wizard except those listed below:
   - Additional domain controller in an existing forest.
   - Domain: **contoso.com.**
   - Select domain: **contoso.com**.
   - Select a site: **Default-First-Site-Name**
   - When a warning appears informing you that a DNS delegation could not be found, click **Yes**.
   - Install from Media: Replicate data from media stored at C:\IFM.
   - After the **Source Domain Controller** page, cancel the wizard without completing the promotion.

Results: In this exercise, you created installation media on NYC-DC1 and simulated the promotion of NYC-SVR2 to a domain controller using the installation media.

▶ To prepare for the next lab

When you finish the lab, revert the virtual machines to their initial state. To do this, complete the following steps:

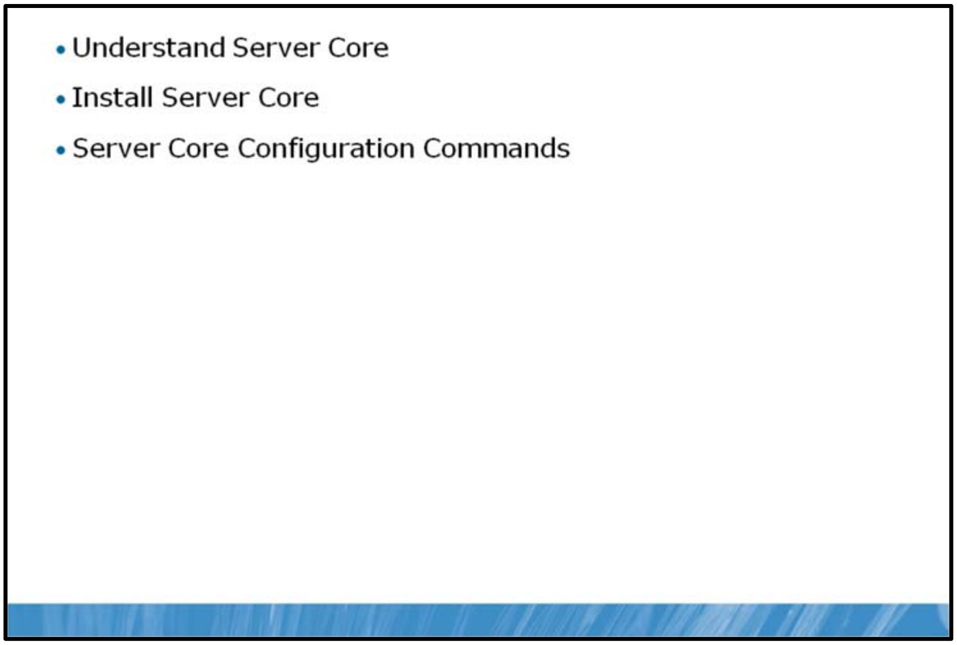
1. On the host computer, start Hyper-V Manager.
2. Right-click 6425C-NYC-DC1 in the **Virtual Machines** list, and then click **Revert**.
3. In the **Revert Virtual Machine** dialog box, click **Revert**.
4. Repeat these steps for 6425C-NYC-SVR1 and 6425C-NYC-SVR2.

Lab Review Questions

Question: Why would you choose to use an answer file or a dcpromo.exe command line to install a domain controller rather than the Active Directory Domain Services Installation Wizard?

Question: In which situations does it make sense to create a domain controller using installation media?

Lesson 2
Install a Server Core Domain Controller



- Understand Server Core
- Install Server Core
- Server Core Configuration Commands

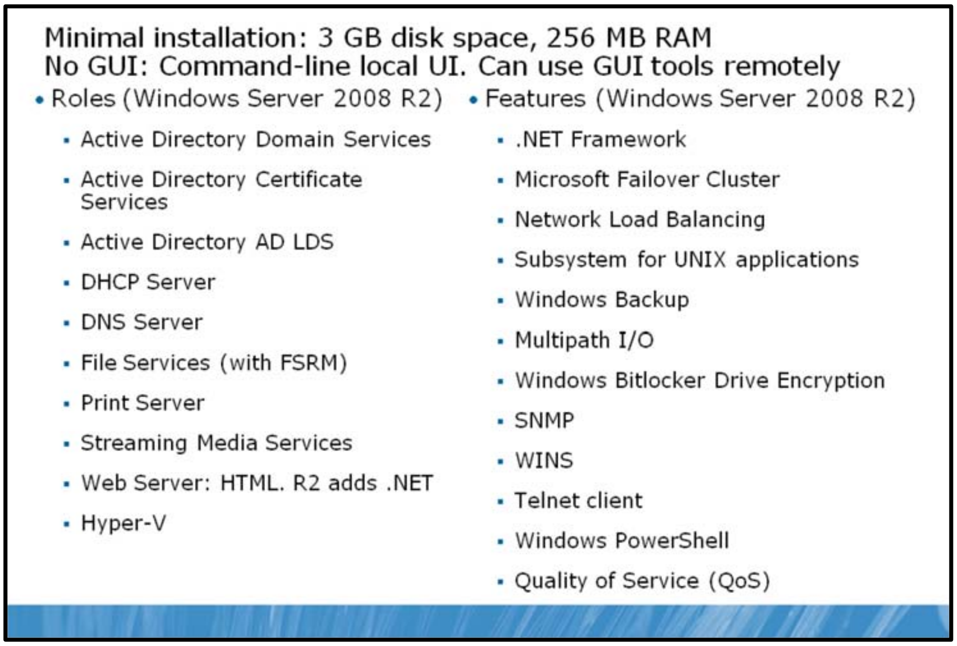
Many organizations want to implement the maximum available security for servers acting as domain controllers because of the sensitive nature of information stored in the directory—particularly user passwords. Although the role-based configuration of Windows Server 2008 reduces the security surface of a server by installing only the components and services required by its roles, it is possible to reduce its servers and security surface further by installing Server Core. A Server Core installation is a minimal installation of Windows that forgoes even the Windows Explorer GUI and the Microsoft .NET Framework. You can administer a Server Core installation remotely by using GUI tools; however, to configure and manage a server locally, you must use command-line tools. In this lesson, you will learn to create a domain controller from the command line within a Server Core installation. You will also learn how to remove domain controllers from a domain.

Objectives

After completing this lesson, you will be able to:

- Identify the benefits and functionality of installing Server Core.
- Install and configure Server Core.
- Add and remove AD DS by using command-line tools.

Understand Server Core



Minimal installation: 3 GB disk space, 256 MB RAM
No GUI: Command-line local UI. Can use GUI tools remotely

- Roles (Windows Server 2008 R2)
  - Active Directory Domain Services
  - Active Directory Certificate Services
  - Active Directory AD LDS
  - DHCP Server
  - DNS Server
  - File Services (with FSRM)
  - Print Server
  - Streaming Media Services
  - Web Server: HTML. R2 adds .NET
  - Hyper-V
- Features (Windows Server 2008 R2)
  - .NET Framework
  - Microsoft Failover Cluster
  - Network Load Balancing
  - Subsystem for UNIX applications
  - Windows Backup
  - Multipath I/O
  - Windows Bitlocker Drive Encryption
  - SNMP
  - WINS
  - Telnet client
  - Windows PowerShell
  - Quality of Service (QoS)

Windows Server 2008 or Windows Server 2008 R2 Server Core Installation, better known as Server Core, is a minimal installation of Windows that consumes about 3 gigabytes (GB) of disk space and less than 256 megabytes (MB) of memory. Server Core installation limits the server roles and features that can be added, but improves the security and manageability of the server by reducing its attack surface. The number of services and components running at any one time are limited, so there are fewer opportunities for an intruder to compromise the server. Server Core also reduces the management burden of the server, which requires fewer updates and less maintenance.

Server Core, in Windows Server 2008, supports nine server roles:

- Active Directory Domain Services (AD DS)
- Active Directory Lightweight Directory Services (AD LDS)
- Dynamic Host Configuration Protocol (DHCP) Server
- DNS Server
- File Services
- Print Server
- Streaming Media Services
- Web Server (IIS) (as a static Web server—ASP.NET cannot be installed)
- Hyper-V (Windows Server Virtualization)

Server core, in Windows Server 2008, also supports these 11 optional features:

- Microsoft Failover Cluster
- Network Load Balancing

- Subsystem for UNIX-based applications
- Windows Backup
- Multipath I/O
- Removable Storage Management
- Windows Bitlocker® Drive Encryption
- Simple Network Management Protocol (SNMP)
- Windows Internet Naming Service (WINS)
- Telnet client
- Quality of Service (QoS)

Note The content in the following section is specific to Windows Server 2008 R2.

The Server Core installation option of Windows Server 2008 R2 includes support for additional server roles and features. Server Core installations of Windows Server 2008 R2 now use the Deployment Image Servicing and Management (DISM) tool to install and uninstall server roles.

In addition to the server roles available in Server Core installations of Windows Server 2008, the following roles are available:

- The Active Directory Certificate Services (AD CS) role
- The File Server Resource Manager(FSRM) component of the File Services role
- A subset of ASP.NET in the Web Server role

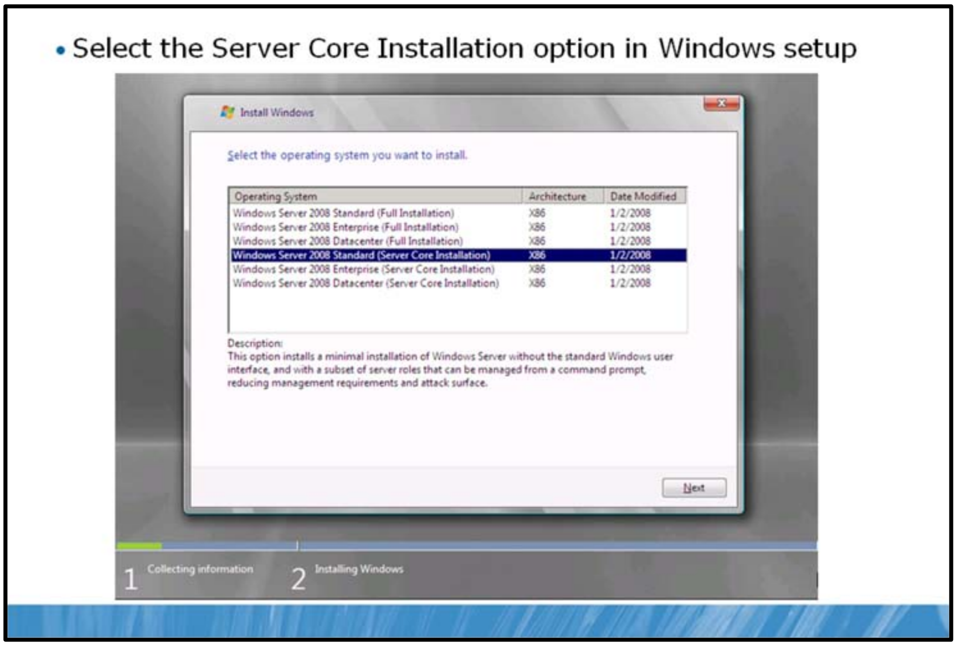
In addition to the Windows features available in Server Core installations of Windows Server 2008, the following features are available in R2 version:

- .NET Framework
- A subset of .NET Framework 2.0
- A subset of .NET Framework 3.0, including Windows Communication Foundation (WCF) and Windows Workflow Foundation (WF)
- A subset of .NET Framework 3.5, including WF additions from .NET Framework 3.5 and .NET Language-Integrated Query (LINQ)
- Windows PowerShell, including cmdlets for Server Manager and the Best Practices Analyzer
- Windows-on-Windows 64-bit (WoW64)

Note The Removable Storage feature has been removed.

You can remotely configure a server running a Server Core installation of Windows Server 2008 R2 by using Server Manager.

Install Server Core



- Select the Server Core Installation option in Windows setup

Select the operating system you want to install.

Operating System	Architecture	Date Modified
Windows Server 2008 Standard (Full Installation)	X86	1/2/2008
Windows Server 2008 Enterprise (Full Installation)	X86	1/2/2008
Windows Server 2008 Datacenter (Full Installation)	X86	1/2/2008
Windows Server 2008 Standard (Server Core Installation)	X86	1/2/2008
Windows Server 2008 Enterprise (Server Core Installation)	X86	1/2/2008
Windows Server 2008 Datacenter (Server Core Installation)	X86	1/2/2008

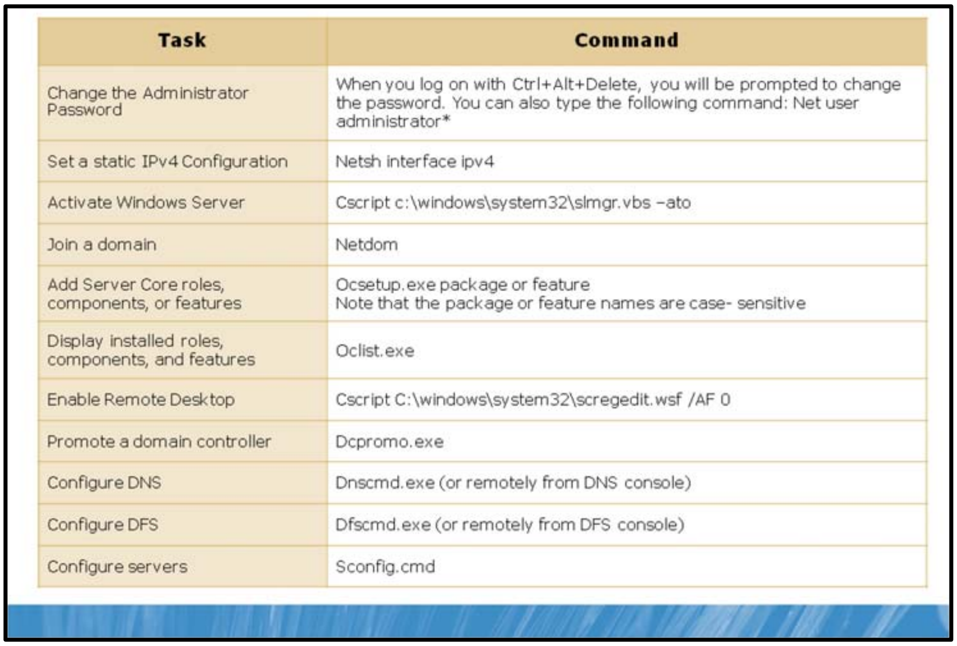
Description:
This option installs a minimal installation of Windows Server without the standard Windows user interface, and with a subset of server roles that can be managed from a command prompt, reducing management requirements and attack surface.

You can install Server Core by using the same procedure as a full installation. The differences between a full installation and a Server Core installation are:

- You select Server Core Installation in the Installing Windows Wizard shown on the following page.
- When the installation is complete and you log on, a command prompt appears.

When you install Windows Server 2008 from the installation DVD, the initial password for the Administrator account is blank. When you log on to the server for the first time, use a blank password. You will be prompted to change the password on first logon.

Server Core Configuration Commands



Task	Command
Change the Administrator Password	When you log on with Ctrl+Alt+Delete, you will be prompted to change the password. You can also type the following command: Net user administrator*
Set a static IPv4 Configuration	Netsh interface ipv4
Activate Windows Server	Cscript c:\windows\system32\slmgr.vbs –ato
Join a domain	Netdom
Add Server Core roles, components, or features	Ocsetup.exe package or feature Note that the package or feature names are case- sensitive
Display installed roles, components, and features	Oclist.exe
Enable Remote Desktop	Cscript C:\windows\system32\scregedit.wsf /AF 0
Promote a domain controller	Dcpromo.exe
Configure DNS	Dnscmd.exe (or remotely from DNS console)
Configure DFS	Dfscmd.exe (or remotely from DFS console)
Configure servers	Sconfig.cmd

On a full installation of Windows Server 2008, the Initial Configuration Tasks window opens to guide you through post-installation configuration of the server. Server Core provides no GUI, so you must complete the tasks by using command-line tools. The following table lists common configuration tasks and the commands you can use. To learn more about any command, open a command prompt and type the name of the command followed by /?.

Server Core Configuration Commands

Task	Command
Change the Administrator password	When you log on with Ctrl+Alt+Delete, you will be prompted to change the password. You can also type the following command: net user administrator *
Set a static IPv4 configuration	netsh interface ipv4
Activate Windows Server	cscript c:\windows\system32\slmgr.vbs –ato
Join a domain	netdom
Add Server Core roles, components, or features	ocsetup.exe package or feature Note that the package or feature names are case-sensitive.
Display installed roles, components, and features	oclist.exe
Enable Remote Desktop	cscript c:\windows\system32\scregedit.wsf /AR 0
Promote a domain controller	dcpromo.exe
Configure DNS	dnscmd.exe

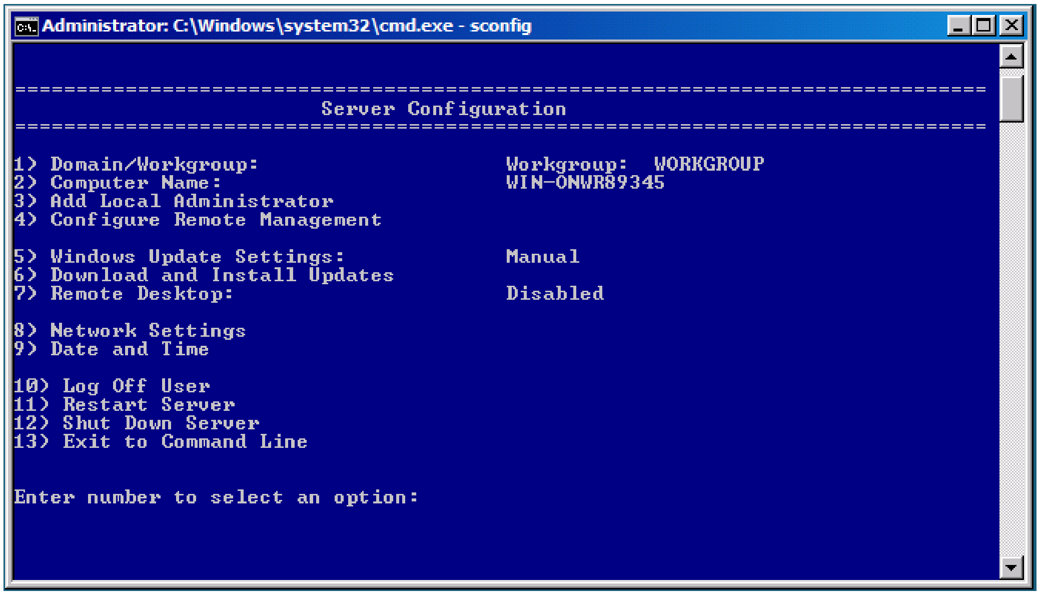
Task	Command
Configure DFS	dfscmd.exe

The Ocsetup.exe command is used to add supported Server Core roles and features to the server. The exception to this rule is AD DS. Do not use Ocsetup.exe to add or remove AD DS. Use Dcpromo.exe instead.

Because there is no Active Directory Domain Services Installation Wizard in Server Core, you must use the command line to run Dcpromo.exe with parameters that configure AD DS. To learn about the parameters of dcpromo.exe, open a command line and type dcpromo.exe /?. Each configuration scenario has additional usage information. For example, type dcpromo.exe /?:Promotion for detailed usage instructions for promoting a domain controller.

In Windows Server 2008 R2 Server Core, you can use a new utility for server configuration known as the Server Configuration tool (Sconfig.cmd). You can use this tool to configure and manage several common aspects of Server Core installations. You must be a member of the Administrators group to use the tool.

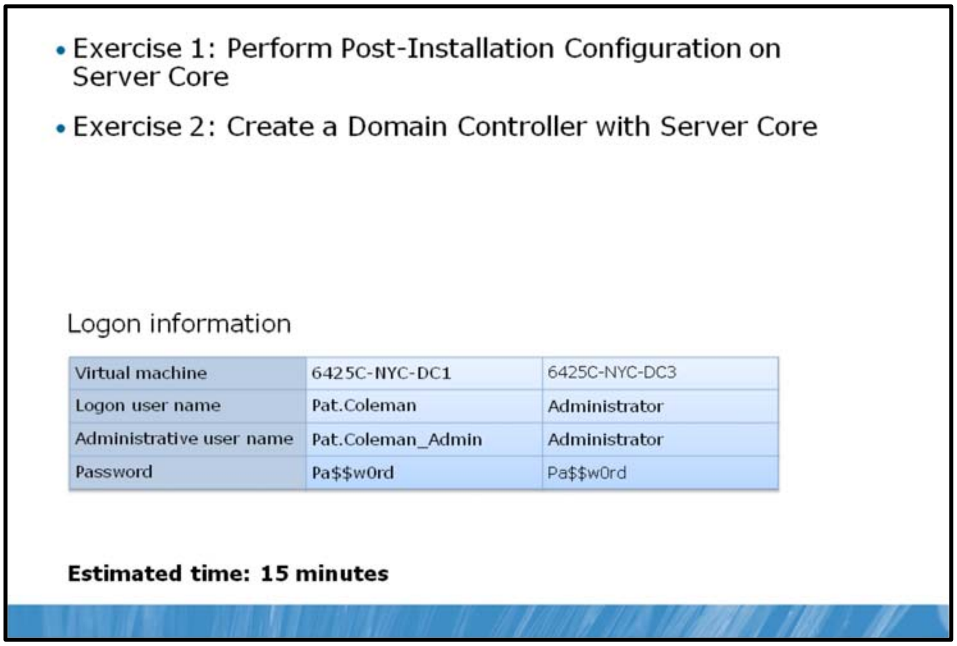
This tool allows you to configure basic settings of your server, without using complicated commands.



```
===============================================================================
                         Server Configuration
===============================================================================

1) Domain/Workgroup:                     Workgroup:  WORKGROUP
2) Computer Name:                        WIN-ONWR89345
3) Add Local Administrator
4) Configure Remote Management

5) Windows Update Settings:              Manual
6) Download and Install Updates
7) Remote Desktop:                       Disabled

8) Network Settings
9) Date and Time

10) Log Off User
11) Restart Server
12) Shut Down Server
13) Exit to Command Line


Enter number to select an option:
```

When you choose an appropriate option by typing the option number, you will be prompted for parameters that will be used to configure the server.

Lab B: Install a Server Core Domain Controller



- Exercise 1: Perform Post-Installation Configuration on Server Core
- Exercise 2: Create a Domain Controller with Server Core

Logon information

Virtual machine	6425C-NYC-DC1	6425C-NYC-DC3
Logon user name	Pat.Coleman	Administrator
Administrative user name	Pat.Coleman_Admin	Administrator
Password	Pa$$w0rd	Pa$$w0rd

Estimated time: 15 minutes

Lab Setup

For this lab, you will use the available virtual machine environment. Before you begin the lab, you must complete the following steps:

1. On the host computer, click **Start**, point to **Administrative Tools**, and then click **Hyper-V Manager**.
2. In Hyper-V Manager, click 6425C-NYC-DC1, and in the Actions pane, click **Start**.
3. In the Actions pane, click **Connect**. Wait until the virtual machine starts.
4. Log on by using the following credentials:
   - User name: **Pat.Coleman**
   - Password: **Pa$$w0rd**
   - Domain: **Contoso**
5. Repeat steps 2 and 3 for the 6425C-NYC-DC3. Do not log on to NYC-DC3 until directed to do so.

Lab Scenario

You are a domain administrator for Contoso, Ltd, and you want to add a domain controller to the AD DS environment. To enhance the security of the new domain controller, you plan to use Server Core. You have already installed Server Core on a new computer, and you are ready to configure the server as a domain controller.

Exercise 1: Perform Post-Installation Configuration on Server Core

In this exercise, you will perform post-installation configuration of the server to prepare it with the name and TCP/IP settings required for the remaining exercises in this Lab.

The main tasks for this exercise are as follows:

- Perform post-installation configuration on Server Core.

Note This exercise uses commands that must be typed in cmd.exe window to configure the server. Alternatively, you can use the sconfig.exe utility to perform these tasks

▶ Task: Perform post-installation configuration on Server Core.

1. Log on to NYC-DC3as **Administrator** with the password **Pa$$w0rd**.
2. Configure the IPv4 address and DNS server by typing each of the following commands.

```
netsh interface ipv4 set address name="Local Area Connection"
source=static address=10.0.0.14 mask=255.255.255.0
gateway=10.0.0.1


netsh interface ipv4 set dns name="Local Area Connection"
source=static address=10.0.0.10 primary
```

3. Confirm the IP configuration you entered previously with the command **ipconfig /all**.
4. Rename the server by typing **netdomrenamecomputer %computername% /newname:NYC-DC3**. You will be prompted to press **Y** to confirm the operation.
5. Restart by typing **shutdown -r -t 0**.
6. Log on as **Administrator** with the password **Pa$$w0rd**.
7. Join the domain using the following command.

```
netdom join %computername% /domain:contoso.com /UserD:CONTOSO\Administrator
/PasswordD:Pa$$w0rd /OU:"ou=servers,dc=contoso,dc=com"
```

8. Restart by typing **shutdown -r -t 0**.

Results: In this exercise, you configured the Server Core installation as a member of the contoso.com domain named NYC-DC3.

Exercise 2: Create a Domain Controller with Server Core

In this exercise, you will add the DNS and AD DS roles to the Server Core installation.

The main tasks for this exercise are as follows:

1. Add the DNS Server role to Server Core.
2. Create a domain controller on Server Core with the dcpromo.exe command.

▶ Task 1: Add the DNS Server role to Server Core.

1. Log on to NYC-DC3as **Contoso\Administrator** with the password **Pa$$w0rd**.
2. Display available server roles by typing **oclist**. What is the package identifier for the DNS server role? What is its status?
3. Type **ocsetup**, and then press Enter. There is a minor amount of GUI in Server Core. Click **OK** to close the window.
4. Type **ocsetup DNS-Server-Core-Role** and then press Enter. Note that package identifiers are case-sensitive.
5. Type **oclist |more** and confirm that the DNS server role is installed.

▶ Task 2: Create a domain controller on Server Core with the dcpromo.exe command.

1. Make sure you are still logged on to NYC-DC3 as **Contoso\Administrator** with the password **Pa$$w0rd**
2. Type **dcpromo.exe /?**, and then press Enter. Review the usage information.
3. Type **dcpromo.exe /?:Promotion**, and then press Enter. Review the usage information.
4. Type the following command to add and configure the AD DS role, and then press Enter.

```
dcpromo /unattend /ReplicaOrNewDomain:replica
/ReplicaDomainDNSName:contoso.com /ConfirmGC:Yes
/UserName:CONTOSO\Administrator /Password:* /safeModeAdminPassword:Pa$$w0rd
```

Results: In this exercise, you promoted the Server Core server, NYC-DC3, to a domain controller in the contoso.com domain.

▶ To prepare for the next lab

When you finish the lab, revert the virtual machines to their initial state. To do this, complete the following steps:

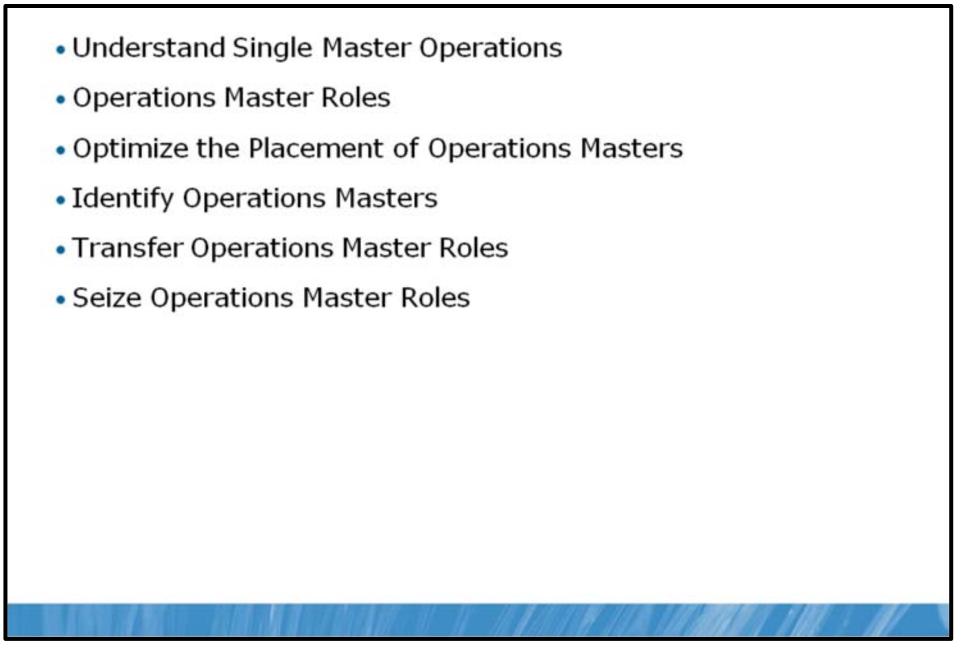
1. On the host computer, start Hyper-V Manager.
2. Right-click 6425C-NYC-DC1 in the **Virtual Machines** list, and then click **Revert**.
3. In the **Revert Virtual Machine** dialog box, click **Revert**.
4. Repeat these steps for 6425C-NYC-DC3.

Lab Review Questions

Question: Did you find the configuration of Server Core to be particularly difficult?

Question: What are the advantages of using Server Core for domain controllers?

Lesson 3
Manage Operations Masters



- Understand Single Master Operations
- Operations Master Roles
- Optimize the Placement of Operations Masters
- Identify Operations Masters
- Transfer Operations Master Roles
- Seize Operations Master Roles

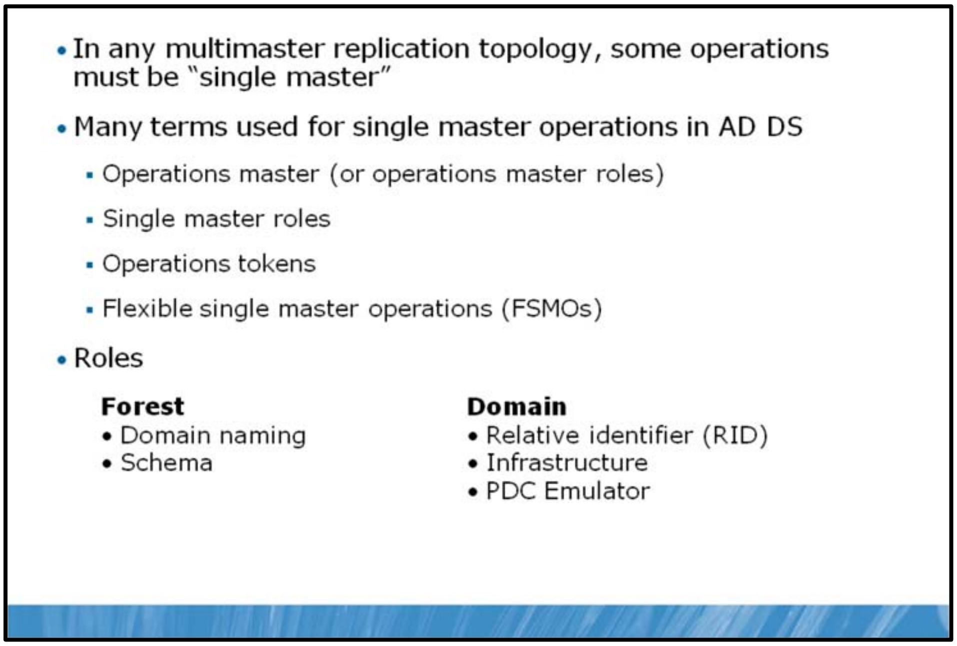
In an Active Directory domain, all domain controllers are equivalent. They are all capable of writing to the database and replicating changes to other domain controllers. Read-Only Domain Controllers are exceptions to this rule because they cannot make changes to the Active Directory database. However, in any multimaster replication topology, certain operations must be performed by only one system. In an Active Directory domain, operations masters are domain controllers that play a specific role. Other domain controllers are capable of playing the role, but do not. This lesson will introduce you to the five operations masters found in Active Directory forests and domains. You will learn their purposes, how to identify the operations masters in your enterprise, and the nuances of administering and transferring roles.

Objectives

After completing this lesson, you will be able to:

- Define the purpose of the five single master operations in Active Directory forests.
- Identify the domain controllers that perform operations master roles.
- Plan the placement of operations master roles.
- Transfer and seize operations master roles.

Understand Single Master Operations



- In any multimaster replication topology, some operations must be "single master"
- Many terms used for single master operations in AD DS
  - Operations master (or operations master roles)
  - Single master roles
  - Operations tokens
  - Flexible single master operations (FSMOs)
- Roles

Forest	Domain
• Domain naming	• Relative identifier (RID)
• Schema	• Infrastructure
	• PDC Emulator

In any replicated database, some changes must be performed by only one replica because they are impractical to perform in a multimaster fashion. Active Directory is no exception. A limited number of operations are not permitted to occur at different places at the same time and must be the responsibility of only one domain controller in a domain or forest. These operations, and the domain controllers that perform them, are referred to by a variety of terms:

- Operations masters
- Operations master roles
- Single master roles
- Operations tokens
- Flexible single master operations (FSMOs)

One domain controller performs a function, and while it does, no other domain controller performs that function.

All Active Directory domain controllers are capable of performing single master operations. The domain controller that actually does perform an operation is the domain controller that currently holds the operation's token.

Note An RODC cannot host any operation master roles.

An operation token, and thus the role, can be transferred easily to another domain controller without a reboot.

To reduce the risk of single points of failure, the operations tokens can be distributed among multiple domain controllers.

AD DS contains five operations master roles. Two roles are performed for the entire forest:

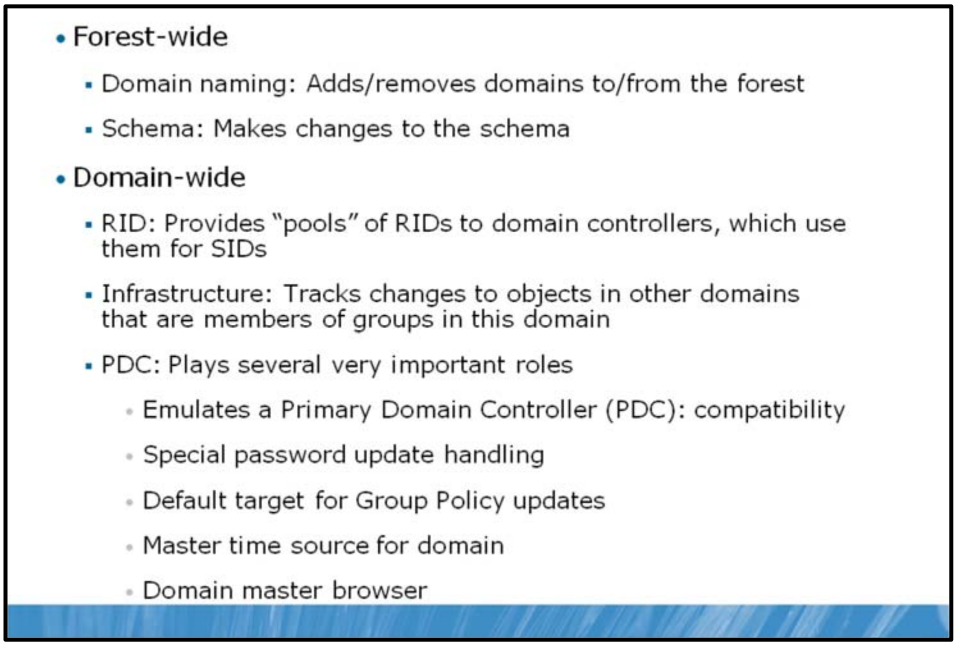
- Domain naming
- Schema

Three roles are performed in each domain:

- Relative identifier (RID)
- Infrastructure
- PDC Emulator

Each of these roles is detailed in the following sections. In a forest with a single domain, there are, therefore, five operations masters. In a forest with two domains, there are eight operations masters because the three domain master roles are implemented separately in each of the two domains.

Operations Master Roles



- Forest-wide
  - Domain naming: Adds/removes domains to/from the forest
  - Schema: Makes changes to the schema
- Domain-wide
  - RID: Provides "pools" of RIDs to domain controllers, which use them for SIDs
  - Infrastructure: Tracks changes to objects in other domains that are members of groups in this domain
  - PDC: Plays several very important roles
    - Emulates a Primary Domain Controller (PDC): compatibility
    - Special password update handling
    - Default target for Group Policy updates
    - Master time source for domain
    - Domain master browser

Windows Server 2008 includes several Operations Master roles, each of which has specific functionality and scope.

Forest-Wide Operations Master Roles

The schema master and the domain naming master must be unique in the forest. Each role is performed by only one domain controller in the entire forest.

Domain Naming Master Role

The domain naming role is used when adding or removing domains in the forest. When you add or remove a domain, the domain naming master must be accessible, or the operation will fail.

Schema Master Role

The domain controller holding the schema master role is responsible for making any changes to the forest's schema. All other domain controllers hold read-only replicas of the schema. If you want to modify the schema or install an application that modifies the schema, do so on the domain controller holding the schema master role. Otherwise, the changes you request must be sent to the schema master to be written into the schema.

Domain-Wide Operations Master Roles

Each domain maintains three single master operations: RID, Infrastructure, and PDC Emulator. Each role is performed by only one domain controller in the domain.

RID Master Role

The RID master plays an integral part in the generation of security identifiers (SIDs) for security principals such as users, groups, and computers. The SID of a security principal must be unique. Because any domain controller can create accounts, and therefore, SIDs, a mechanism is necessary to ensure that the SIDs generated by a domain controller are unique. Active Directory domain controllers generate SIDs by assigning a unique RID to the domain SID. The RID master for the domain allocates pools of unique RIDs to each domain controller in the domain. Thus, each domain controller can be confident that the SIDs it generates are unique.

Note The RID master role is like DHCP for SIDs. If you are familiar with the concept that you allocate a scope of IP addresses for the Dynamic Host Configuration Protocol (DHCP) server to assign to clients, you can draw a parallel to the RID master, which allocates pools of RIDs to domain controllers for the creation of SIDs.

Infrastructure Master Role

In a multidomain environment, it is common for an object to reference objects in other domains. For example, a group can include members from another domain. Its multivalued member attribute contains the distinguished names of each member. If the member in the other domain is moved or renamed, the infrastructure master of the group’s domain updates the group’s member attribute accordingly.

Note You can think of the infrastructure master as a tracking device for group members from other domains. When those members are renamed or moved in the other domain, the infrastructure master identifies the change and makes appropriate changes to group memberships so that the memberships are kept up to date.

PDC Emulator Role

The PDC Emulator role performs multiple, crucial functions for a domain:

- **Emulates a Primary Domain Controller (PDC) for backward compatibility**

  In the days of Windows NT® 4.0 domains, only the PDC could make changes to the directory. Previous tools, utilities, and clients written to support Windows NT 4.0 are unaware that all Active Directory domain controllers can write to the directory, so such tools request a connection to the PDC. The domain controller with the PDC emulator role registers itself as a PDC so that down-level applications can locate a writable domain controller. Such applications are less common now that Active Directory is nearly 10 years old, and if your enterprise includes such applications, work to upgrade them for full Active Directory compatibility.

- **Participates in special password update handling for the domain**

  When a user's password is reset or changed, the domain controller that makes the change replicates the change immediately to the PDC emulator. This special replication ensures that the domain controllers know about the new password as quickly as possible. If a user attempts to log on immediately after changing passwords, the domain controller responding to the user’s logon request might not know about the new password. Before it rejects the logon attempt, that domain controller forwards the authentication request to a PDC emulator, which verifies that the new password is correct and instructs the domain controller to accept the logon request. This function means that any time a user enters an incorrect password, the authentication is forwarded to the PDC emulator for a second opinion. The PDC emulator, therefore, should be highly accessible to all clients in the domain. It should be a well-connected, high-performance domain controller.

- **Manages Group Policy updates within a domain**

  If a Group Policy object (GPO) is modified on two domain controllers at approximately the same time, there could be conflicts between the two versions that could not be reconciled as the GPO replicates. To avoid this situation, the PDC emulator acts as the focal point for all Group Policy changes. When you open a GPO in the Group Policy Management Editor (GPME), the GPME binds to the domain controller performing the PDC emulator role. Therefore, all changes to GPOs are made on the PDC emulator by default.

- **Provides a master time source for the domain**

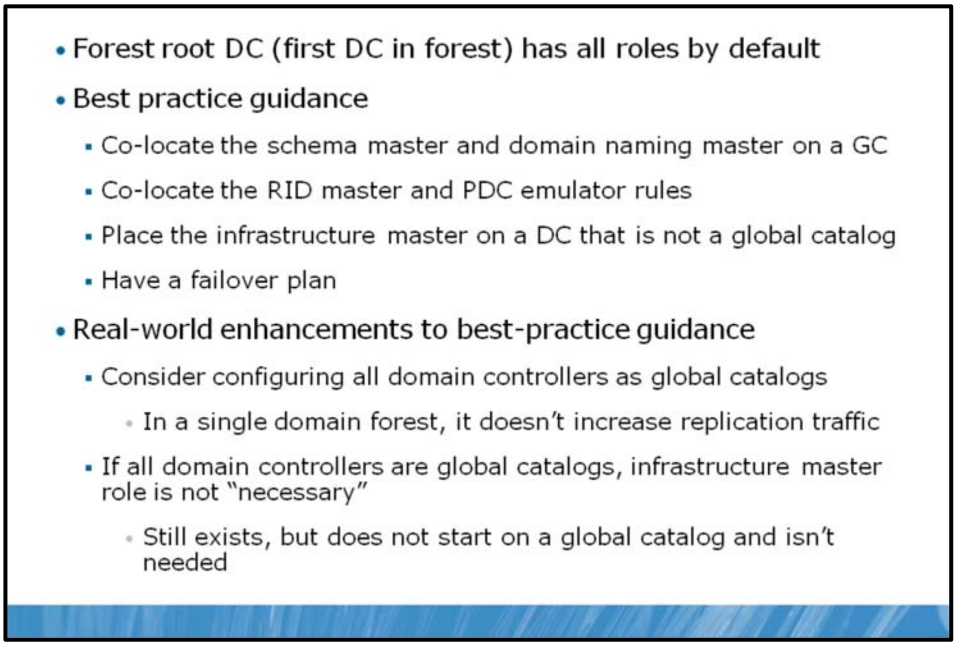
  Active Directory, Kerberos, File Replication Service (FRS), and DFS-R each rely on timestamps, so synchronizing the time across all systems in a domain is crucial. The PDC emulator in the forest root domain is the time master for the entire forest, by default. The PDC emulator in each domain synchronizes its time with the forest root PDC emulator. Other domain controllers in the domain synchronize their clocks against that domain's PDC emulator. All other domain members synchronize their time with their preferred domain controller. This hierarchical structure of time synchronization, all implemented through the Win32Time service, ensures consistency of time. Universal Coordinated Time (UTC) is synchronized, and the time displayed to users is adjusted based on the time zone setting of the computer.

Note Change the time service in only one way. Allow Windows to maintain its native, default time synchronization mechanisms. The only change you should make is to configure the PDC emulator of the forest root domain to synchronize with an extra time source. If you do not specify a time source for the PDC emulator, the System event log will contain errors reminding you to do so. See http://go.microsoft.com/fwlink/?LinkId=91969, and the articles it refers to, for more information.

- **Acts as the domain master browser**

  When you open Network in Windows, you see a list of workgroups and domains, and when you open a workgroup or domain, you see a list of computers. These two lists, called *browse lists*, are created by the Browser service. In each network segment, a master browser creates the browse list: the lists of workgroups, domains, and servers in that segment. The domain master browser serves to merge the lists of each master browser so that browse clients can retrieve a comprehensive browse list.

Optimize the Placement of Operations Masters



- Forest root DC (first DC in forest) has all roles by default
- Best practice guidance
  - Co-locate the schema master and domain naming master on a GC
  - Co-locate the RID master and PDC emulator rules
  - Place the infrastructure master on a DC that is not a global catalog
  - Have a failover plan
- Real-world enhancements to best-practice guidance
  - Consider configuring all domain controllers as global catalogs
    - In a single domain forest, it doesn't increase replication traffic
  - If all domain controllers are global catalogs, infrastructure master role is not "necessary"
    - Still exists, but does not start on a global catalog and isn't needed

When you create the forest root domain with its first domain controller, all five operations master roles are performed by the domain controller. As you add domain controllers to the domain, you can transfer the operations master role assignments to other domain controllers to balance the load among domain controllers or to optimize placement of a single master operation. The best practices for the placement of operations master roles are as follows:

- **Co-locate the schema master and domain naming master**

  The schema master and domain naming master roles should be placed on a single domain controller that is a GC server. These roles are rarely used, and the domain controller hosting them should be tightly secured. The domain naming master must be hosted on a GC server because when a new domain is added, the master must ensure that there is no object of any type with the same name as the new domain. The GC's partial replica contains the name of every object in the forest. The load of these operations master roles is very light unless schema modifications are being made.

- **Co-locate the RID master and PDC emulator rules**

  Place the RID and PDC emulator roles on a single domain controller. If the load mandates that the roles be placed on two separate domain controllers, those two systems should be physically well connected and have explicit connection objects created in Active Directory so that they are direct replication partners. They should also be direct replication partners with domain controllers that you have selected as standby operations masters.

- **Place the infrastructure master on a domain controller that is not a GC**

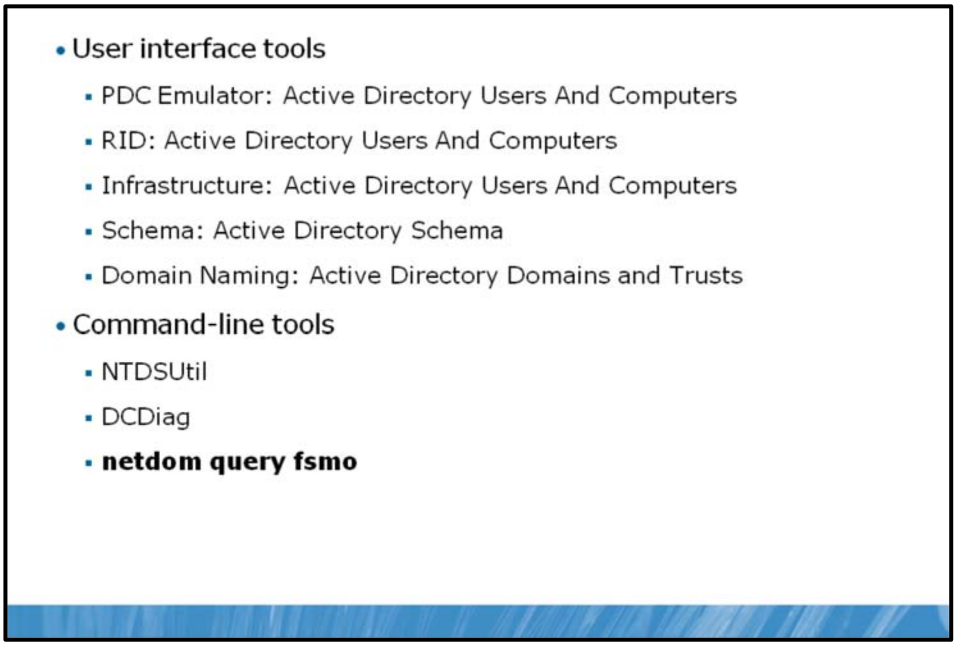
  The infrastructure master should be placed on a domain controller that is not a global catalog server but is physically well connected to a global catalog server. The infrastructure master should have explicit connection objects in Active Directory to that global catalog server so that they are direct replication partners. The infrastructure master can be placed on the same domain controller that acts as the RID master and PDC emulator.

Note If all domain controllers in a domain are global catalog servers—which is indeed a best practice recommendation that will be discussed in Module 13, *Managing Sites and Active Directory Replication*—you do not need to worry about which domain controller is the infrastructure master. When all domain controllers are global catalogs, all domain controllers have up-to-date information about every object in the forest, which eliminates the need for the infrastructure master role.

- **Have a failover plan**

  In the following sections, you will learn to transfer single operations master roles between domain controllers, which is necessary if there is lengthy planned or unplanned downtime of an operations master. Determine, in advance, a plan for transferring operations roles to other domain controllers in the event that one operations master is offline.

Identify Operations Masters



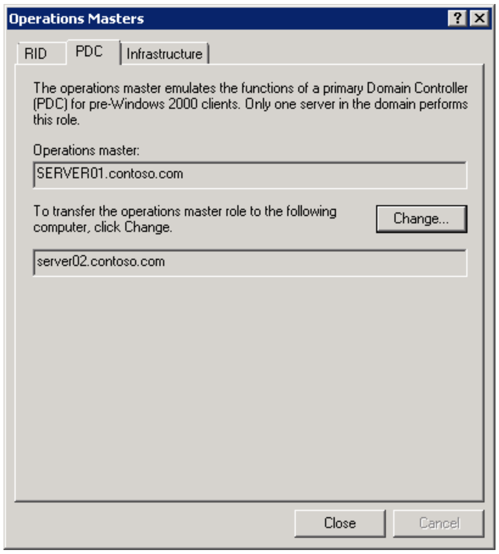
- User interface tools
  - PDC Emulator: Active Directory Users And Computers
  - RID: Active Directory Users And Computers
  - Infrastructure: Active Directory Users And Computers
  - Schema: Active Directory Schema
  - Domain Naming: Active Directory Domains and Trusts
- Command-line tools
  - NTDSUtil
  - DCDiag
  - **netdom query fsmo**

To implement your role placement plan, you must know which domain controllers are currently performing single master operations roles. Each role is exposed in an Active Directory administrative tool as well as in other user interface and command-line tools.

To identify the current master for each role, use the following tools:

- **PDC Emulator: The Active Directory Users And Computers snap-in**

  Right-click the domain and choose Operations Masters. Click the PDC tab. An example is shown on the following page, which indicates that SERVER01.contoso.com is currently the PDC operations master.



Operations Masters

The operations master emulates the functions of a primary Domain Controller (PDC) for pre-Windows 2000 clients. Only one server in the domain performs this role.

Operations master:

SERVER01.contoso.com

To transfer the operations master role to the following computer, click Change.

server02.contoso.com

- **RID Master: The Active Directory Users And Computers snap-in**
- Right-click the domain and click **Operations Masters**. Click the **RID** tab.
- **Infrastructure Master: The Active Directory Users And Computers snap-in**
- Right-click the domain and click **Operations Masters**. Click the Infrastructure tab.
- **Domain Naming: The Active Directory Domains And Trusts snap-in**
- Right-click the root node of the snap-in (**Active Directory Domains And Trusts**) and click **Operations Master**.
- **Schema Master: The Active Directory Schema snap-in**
- Right-click the root node of the snap-in (**Active Directory Schema**) and click **Operations Master**.

Note You must register the Active Directory Schema snap-in before you can create a custom Microsoft Management Console (MMC) with the snap-in. At a command prompt, type regsvr32 schmmgmt.dll.

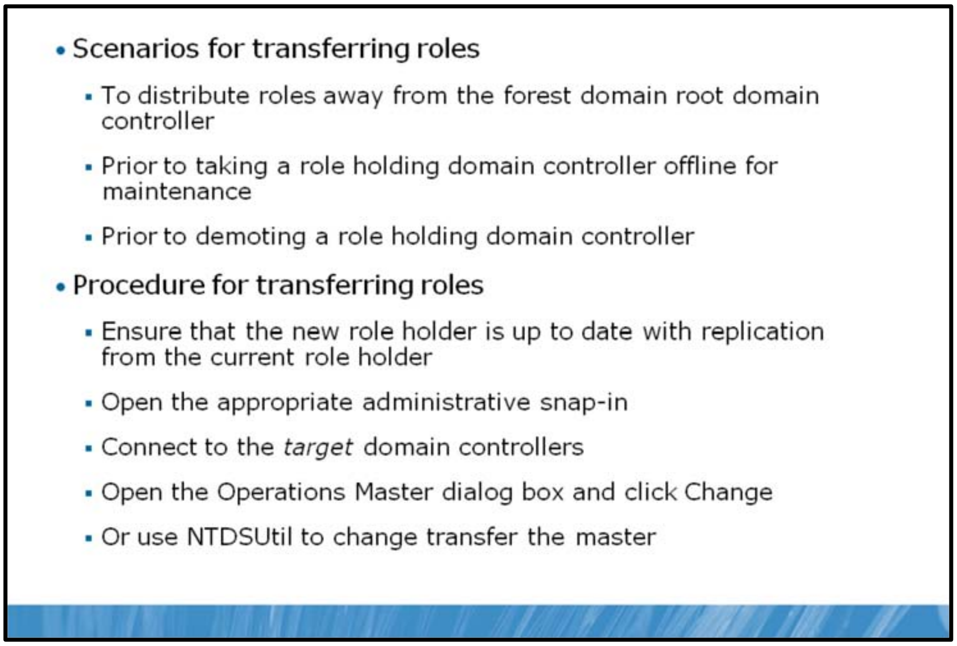
You can also use several other tools to identify operations masters, including the following commands.

- **NTDSUtil**

```
ntdsutil
roles
connections
connect to serverDomainControllerFQDN:portnumber
quit
select operation target
list roles for connected server
quit
quit
quit
```

- **dcdiag /test:knowsofroleholders /v**
- **netdom query fsmo**

Transfer Operations Master Roles



- Scenarios for transferring roles
  - To distribute roles away from the forest domain root domain controller
  - Prior to taking a role holding domain controller offline for maintenance
  - Prior to demoting a role holding domain controller
- Procedure for transferring roles
  - Ensure that the new role holder is up to date with replication from the current role holder
  - Open the appropriate administrative snap-in
  - Connect to the *target* domain controllers
  - Open the Operations Master dialog box and click Change
  - Or use NTDSUtil to change transfer the master

You can transfer a single operations master role easily. You will transfer roles in the following scenarios:

- When you establish your forest, all five roles are performed by the first domain controller you install. When you add a domain to the forest, all three domain roles are performed by the first domain controller in that domain. As you add domain controllers, you can distribute the roles to reduce single-point-of-failure and improve performance.
- If you plan to take a domain controller offline that is currently holding an operations master role, transfer that role to another domain controller prior to taking it offline.
- If you are decommissioning a domain controller that currently holds an operations master role, transfer that role to another domain controller prior to decommissioning. The Active Directory Domain Services Installation Wizard will attempt to do so automatically, but you should prepare for demoting a domain controller by transferring its roles.

To transfer an operations master role, follow these steps:

1. You should ensure that the new role holder is up to date with replication from the former role holder before transferring the role. You can use the skills introduced in Module 13 to force replication between the two systems.
2. Open the administrative tool that exposes the current master.

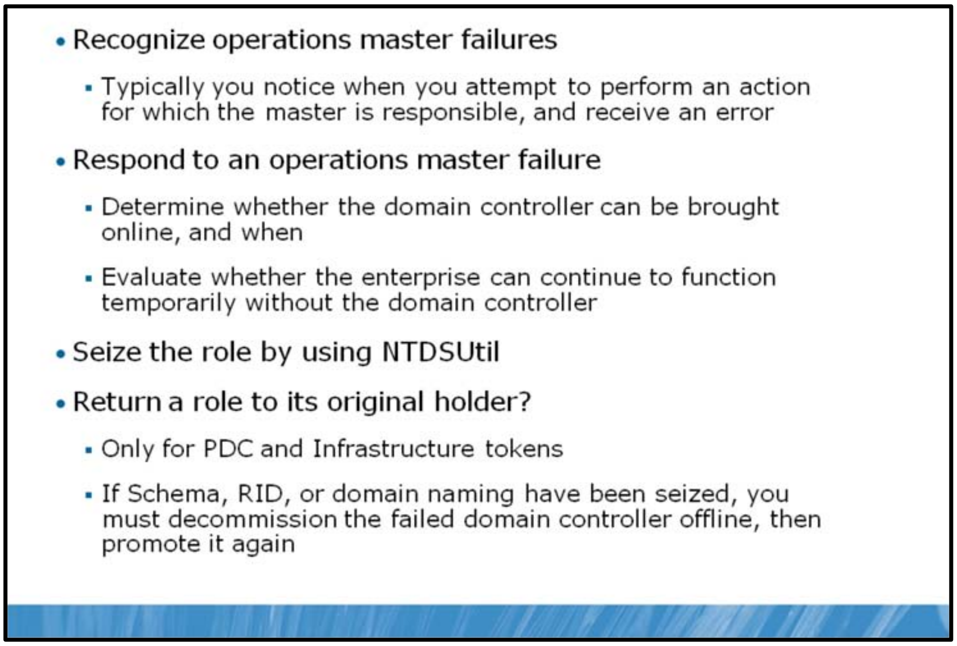
   For example, open the Active Directory Users and Computers snap-in to transfer any of the three domain master roles.
3. Connect to the domain controller to which you are transferring the role.

   This is accomplished by right-clicking the root node of the snap-in and clicking Change Domain Controller or Change Active Directory Domain Controller. (The command differs between snap-ins.)

4. Open the **Operations Master** dialog box, which will show you the domain controller currently holding the role token for the operation. Click the **Change** button to transfer the role to the domain controller to which you are connected.

When you transfer an operations master role, both the current master and the new master are online. When the token is transferred, the new master immediately begins to perform the role, and the former master immediately ceases to perform the role. This is the preferred method of moving operations master roles.

Seize Operations Master Roles



- Recognize operations master failures
  - Typically you notice when you attempt to perform an action for which the master is responsible, and receive an error
- Respond to an operations master failure
  - Determine whether the domain controller can be brought online, and when
  - Evaluate whether the enterprise can continue to function temporarily without the domain controller
- Seize the role by using NTDSUtil
- Return a role to its original holder?
  - Only for PDC and Infrastructure tokens
  - If Schema, RID, or domain naming have been seized, you must decommission the failed domain controller offline, then promote it again

Although transfer of operations master roles can be performed by using regular consoles and without any service downtime, in some cases you cannot transfer role from previous holder if that holder is offline.

Recognize Operations Master Failures

Several operations master roles can be unavailable for quite some time before their absence becomes a problem. Other master roles play a crucial role in the day-to-day operation of your enterprise. You can identify problems with operations masters by examining the Directory Service event log.

However, you will often discover that an operations master has failed when you attempt to perform a function managed by the master, and the function fails. For example, if the RID master fails, eventually you will be prevented from creating new security principals.

Respond to an Operations Master Failure

If a domain controller performing a single master operation fails, and you cannot bring the system back to service, you can seize the operations token. When you seize a role, you designate a new master without gracefully removing the role from the failed master.

Seizing a role is drastic, so determine the cause and expected duration of the offline operations master. If the operations master can be brought online in sufficient time, wait. Sufficient time depends on the impact of the role that has failed.

PDC Emulator Failure

The PDC Emulator is the operations master that will have the most immediate impact on normal operations and on users if it becomes unavailable. Fortunately, the PDC Emulator role can be seized to another domain controller and then transferred back to the original role holder when the system comes back online.

Infrastructure Master Failure

A failure of the infrastructure master will be noticeable to administrators but not to users. Because the master is responsible for updating the names of group members from other domains, it can appear as if group membership is incorrect although, membership is not actually affected. You can seize the infrastructure master role to another domain controller and then transfer it back to the previous role holder when that system comes online.

RID Master Failure

A failed RID master will eventually prevent domain controllers from creating new SIDs and, therefore, will prevent you from creating new accounts for users, groups, or computers. However, domain controllers receive a sizable pool of RIDs from the RID master, so unless you are generating numerous new accounts, you can often go for some time without the RID master online while it is being repaired. Seizing this role to another domain controller is a significant action. After the RID master role has been seized, the domain controller that had been performing the role cannot be brought back online.

Schema Master Failure

The schema master role is necessary only when schema modifications are being made, either directly by an administrator or by installing an Active Directory integrated application that changes the schema. At other times, the role is not necessary. It can remain offline indefinitely until schema changes are necessary. Seizing this role to another domain controller is a significant action. After the schema master role has been seized, the domain controller that had been performing the role cannot be brought back online.

Domain Naming Master Failure

The domain naming master role is necessary only when you add a domain to the forest or remove a domain from a forest. Until such changes are required to your domain infrastructure, the domain naming master role can remain offline for an indefinite period of time. Seizing this role to another domain controller is a significant action. After the domain naming master role has been seized, the domain controller that had been performing the role cannot be brought back online.

Seize an Operations Master Role

Although you can transfer roles by using the administrative tools, you must use Ntdsutil.exe to seize a role. To seize an operations master role, perform the following steps:

1. At the command prompt, type **ntdsutil**, and then press Enter.
2. At the ntdsutil prompt, type **roles**, and then press Enter.

   The next steps establish a connection to the domain controller you want to perform the single master operation role.
3. At the fsmo maintenance prompt, type **connections**, and then press Enter.
4. At the server connections prompt, type **connect to server** *DomainControllerFQDN*, and then press Enter.

   DomainControllerFQDN is the FQDN of the domain controller you want to perform the role.

   Ntdsutil responds that it has connected to the server.
5. At the server connections prompt, type **quit**, and then press Enter.
6. At the fsmo maintenance prompt, type **seize** *role*, and then press Enter.

   Role is one of the following:

- schema master
- domain naming master
- RID master
- PDC
- infrastructure master

7. At the fsmo maintenance prompt, type **quit**, and then press Enter.
8. At the ntdsutil prompt, type **quit**, and then press Enter.

Returning a Role to Its Original Holder

To provide for planned downtime of a domain controller if a role has been transferred, not seized, the role can be transferred back to the original domain controller.

If, however, a role has been seized and the former master is able to be brought back online, you must be very careful. The PDC emulator and infrastructure master are the only operations master roles that can be transferred back to the original master after having been seized.

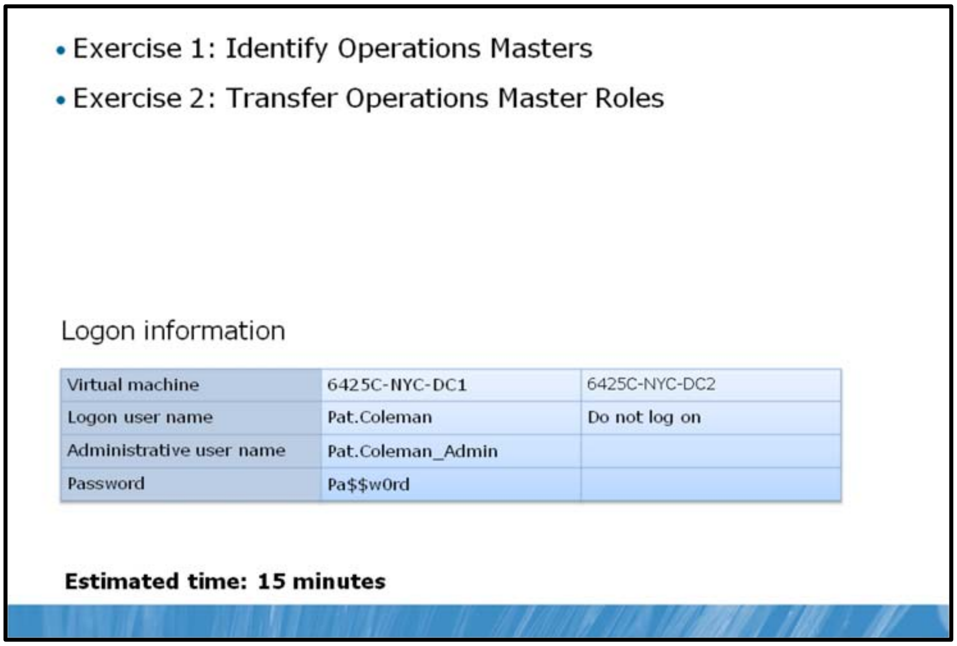
Note Do not return a seized schema, domain naming, or RID master to service. After seizing the schema, domain naming, or RID roles, you must completely decommission the original domain controller.

If you have seized the schema, domain naming, or RID roles to another domain controller, you must not bring the original domain controller back online without first completely decommissioning the domain controller. That means you must keep the original role holder physically disconnected from the network, and you must remove AD DS by using the dcpromo /forceremoval command. You must also clean the metadata for that domain controller as described at http://go.microsoft.com/fwlink/?LinkId=80481.

After the domain controller has been completely removed from Active Directory, if you want the server to rejoin the domain, you can connect it to the network and join the domain. If you want it to be a domain controller, you can promote it. If you want it to resume performing the operations master role, you can transfer the role back to the domain controller.

Note Because of the critical nature of domain controllers, completely reinstall the former domain controller in this scenario.

Lab C: Transfer Operations Master Roles



- Exercise 1: Identify Operations Masters
- Exercise 2: Transfer Operations Master Roles

Logon information

Virtual machine	6425C-NYC-DC1	6425C-NYC-DC2
Logon user name	Pat.Coleman	Do not log on
Administrative user name	Pat.Coleman_Admin	
Password	Pa$$w0rd	

Estimated time: 15 minutes

Lab Setup

For this lab, you will use the available virtual machine environment. Before you begin the lab, you must complete the following steps:

1. On the host computer, click **Start**, point to **Administrative Tools**, and then click **Hyper-V Manager**.
2. In Hyper-V Manager, click 6425C-NYC-DC1, and in the Actions pane, click **Start**.
3. In the Actions pane, click **Connect**. Wait until the virtual machine starts.
4. Log on by using the following credentials:
   - User name: **Pat.Coleman**
   - Password: **Pa$$w0rd**
   - Domain: **Contoso**
5. Start 6425C-NYC-DC2.
6. Wait for NYC-DC2 to complete startup before continuing. Do not log on until directed to do so.

Lab Scenario

You are a domain administrator at Contoso, Ltd. One of the redundant power supplies has failed on NYC-DC1, and you must take the server offline for servicing. You want to ensure that AD DS operations are not interrupted while the server is offline.

Exercise 1: Identify Operations Masters

In this exercise, you will use both user interface and command-line tools to identify operations masters in the contoso.com domain.

The main tasks for this exercise are as follows:

1. Identify operations masters using the Active Directory administrative snap-ins.
2. Identify operations masters by using NetDom.

▶ Task 1: Identify operations masters by using the Active Directory administrative snap-ins.

1. On NYC-DC1, run **Active Directory Users and Computers** as an administrator, with the user name **Pat.Coleman_Admin** and the password **Pa$$w0rd**.
2. Use **Active Directory Users and Computers** to identify the operations master role token holders for RID, PDC and Infrastructure. Which domain controller holds those roles?
3. Close Active Directory Users and Computers.
4. Run **Active Directory Domains and Trusts** as an administrator, with the user name **Pat.Coleman_Admin** and the password **Pa$$w0rd**.
5. Use **Active Directory Domains and Trusts** to identify the operations master role token holders for Domain Naming. Which domain controller holds this role?
6. Close Active Directory Domains and Trusts.
7. Run the Command Prompt as an administrator, with the user name **Pat.Coleman_Admin** and the password **Pa$$w0rd**.
8. Type **regsvr32 schmmgmt.dll**, and then press Enter.
9. Run **mmc.exe** as an administrator, with the user name **Pat.Coleman_Admin** and the password **Pa$$w0rd**.
10. Add the **Active Directory Schema** snap-in to the console.
11. Use **Active Directory Schema** to identify the operations master role token holders for Schema. Which domain controller holds this role?
12. Close the console. You do not need to save any changes.

▶ Task 2: Identify operations masters by using NetDom.

1. Run the **Command Prompt** as an administrator, with the user name **Pat.Coleman_Admin** and the password **Pa$$w0rd**.
2. Type the command **netdom query fsmo**, and press Enter.

Results: In this exercise, you used both administrative snap-ins and NetDom to identify operations masters.

Exercise 2: Transfer Operations Master Roles

In this exercise, you will prepare to take the operations master offline by transferring its role to another domain controller. You will then simulate taking it offline, bringing it back online, and returning the operations master role.

The main tasks for this exercise are as follows:

1. Transfer the PDC role by using the Active Directory Users And Computers snap-in.
2. Consider other roles before taking a domain controller offline.
3. Transfer the PDC role by using NTDSUtil.

▶ Task 1: Transfer the PDC role by using the Active Directory Users And Computers snap-in.

1. Run **Active Directory Users and Computers** as an administrator, with the user name **Pat.Coleman_Admin** and the password **Pa$$w0rd**.
2. Connect to NYC-DC2.
3. Before transferring an operations master, you must connect to the domain controller to which the role will be transferred.
4. The root node of the snap-in indicates the domain controller to which you are connected: Active Directory Users And Computers [NYC-DC2.contoso.com].
5. Transfer the PDC operations master role to NYC-DC2.

▶ Task 2: Consider other roles before taking a domain controller offline.

You are preparing to take NYC-DC1 offline. You have just transferred the PDC operations role to NYC-DC2.

1. List other operations master roles that must be transferred prior to taking NYC-DC1 offline.
2. List other server roles that must be transferred prior to taking NYC-DC1 offline.

▶ Task 3: Transfer the PDC role by using NTDSUtil.

You have finished performing maintenance on NYC-DC1. Now, you need to bring it back online.

Remember you cannot bring a domain controller back online if the RID, schema, or domain naming roles have been seized. But, you can bring it back online if a role was transferred.

1. Run the Command Prompt as an administrator, with the user name **Pat.Coleman_Admin** and the password **Pa$$w0rd**.
2. Use **NTDSUtil** to connect to NYC-DC1 and transfer the PDC role back to it.

Results: In this exercise, you should have transferred the PDC role to NYC-DC2by using the Active Directory Users and Computers snap-in, and then transferred it back to NYC-DC1 using NTDSUtil.

To prepare for the next lab

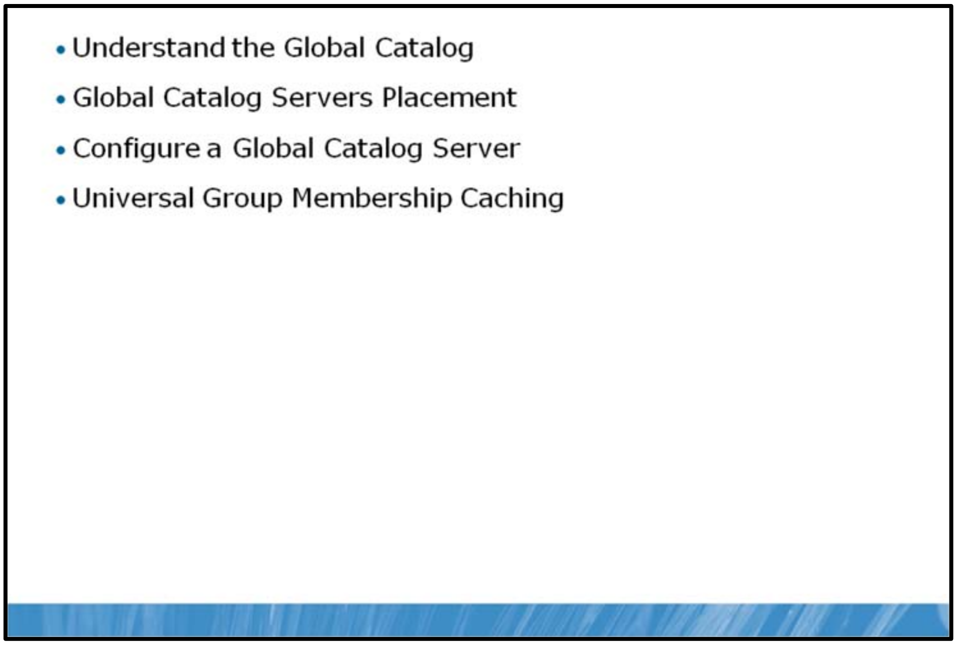
When you finish the lab, revert the virtual machines to their initial state. To do this, complete the following steps:

1. On the host computer, start Hyper-V Manager.
2. Right-click 6425C-NYC-DC1in the **Virtual Machines** list, and then click **Revert**.
3. In the **Revert Virtual Machine** dialog box, click **Revert**.
4. Repeat these steps for 6425C-NYC-DC2.

Lab Review Questions

Question: If you transfer all roles before taking a domain controller offline, is it okay to bring the domain controller back online?

Lesson 4
Configure Global Catalog



- Understand the Global Catalog
- Global Catalog Servers Placement
- Configure a Global Catalog Server
- Universal Group Membership Caching

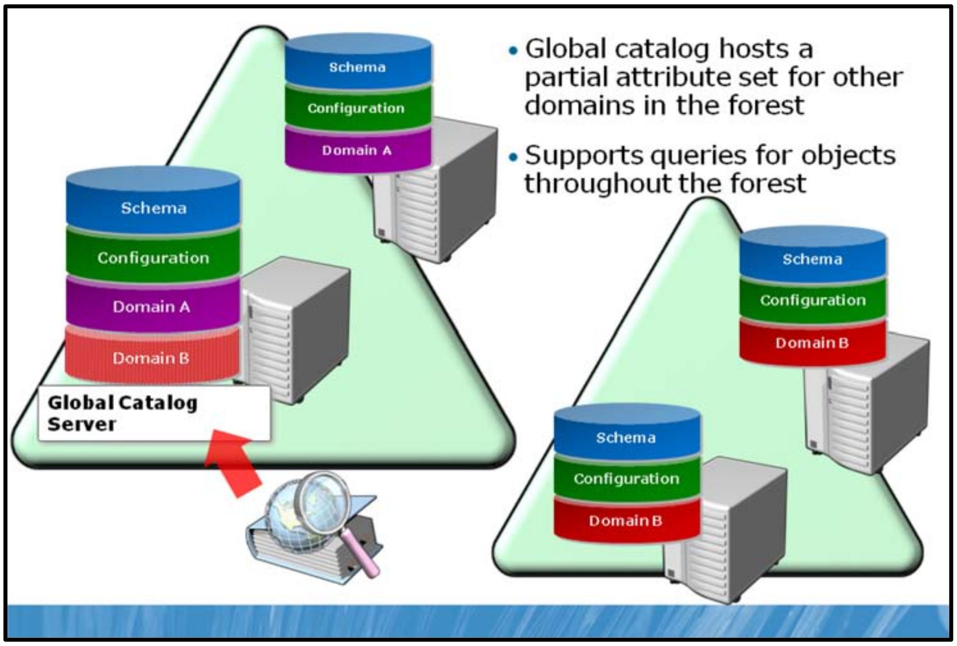
As soon as you have more than one domain controller in your domain, you must consider replication of the directory database between domain controllers. In this lesson, you will learn which directory partitions are replicated to each domain controller in a forest and how to manage the replication of the global catalog and of application partitions.

Objectives

After completing this lesson, you will be able to:

- Define the purpose of the global catalog.
- Configure domain controllers as global catalog servers.
- Implement universal group membership caching.
- Understand the role of application directory partitions.

Understand the Global Catalog



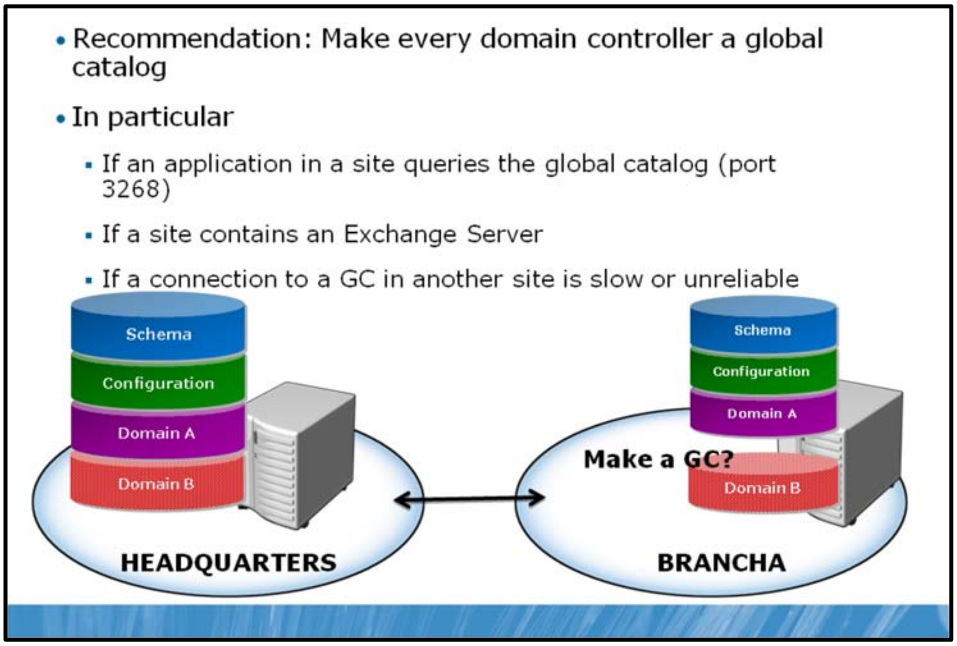
- Global catalog hosts a partial attribute set for other domains in the forest
- Supports queries for objects throughout the forest

Imagine a forest with two domains. Each domain has two domain controllers. All four domain controllers will maintain a replica of the Schema and Configuration NCs for the forest. The domain controllers in Domain A have replicas of the Domain NC for Domain A, and the domain controllers in Domain B have replicas of the Domain NC for Domain B.

What happens if a user in Domain B is searching for a user, computer, or group in Domain A? The Domain B domain controllers do not maintain any information about objects in Domain A, so a domain controller in Domain B could not answer a query about objects in the Domain NC of Domain A.

That’s where the global catalog comes in. The global catalog is a partition that stores commonly used information about every object in the forest. When a user in Domain B looks for an object in Domain A, the global catalog provides the results of the query. To optimize efficiency of the global catalog, it does not contain every attribute of every object in the forest. Instead, it contains a subset of attributes that are useful for searching across domains. That is why the global catalog is also called the partial attribute set. In terms of its role supporting search, you can think of the global catalog as a kind of index for the AD DS data store.

Global Catalog Servers Placement



- Recommendation: Make every domain controller a global catalog
- In particular
  - If an application in a site queries the global catalog (port 3268)
  - If a site contains an Exchange Server
  - If a connection to a GC in another site is slow or unreliable

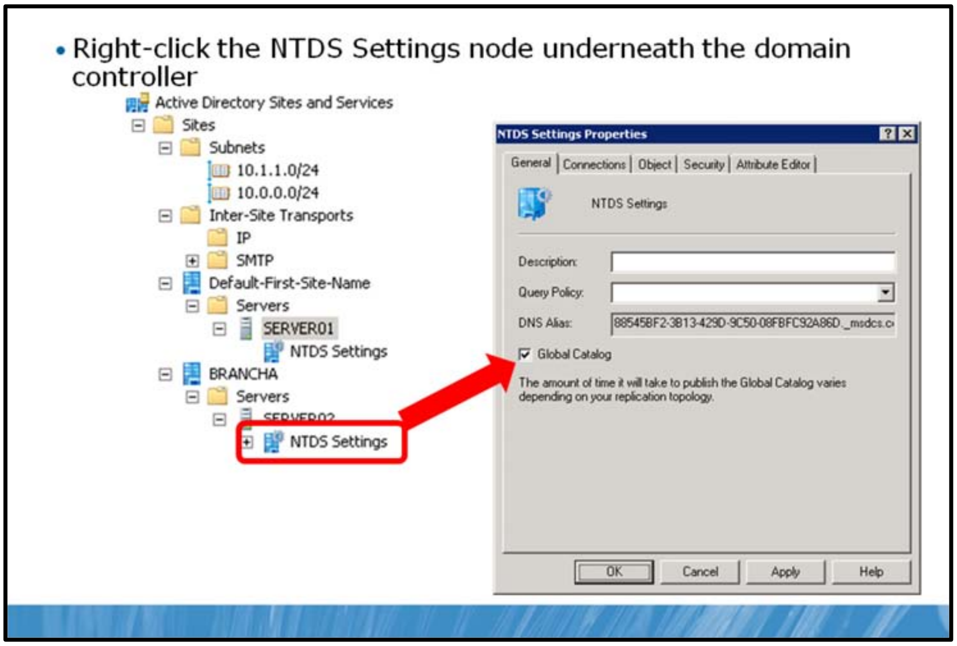
The global catalog improves efficiency of the directory service tremendously and is required for applications such as Microsoft Exchange Server and Microsoft Office Outlook®. Therefore, you want a global catalog to be available to these and other applications. The global catalog can be served only by a domain controller and, in an ideal world, every domain controller would be a global catalog server. In fact, many organizations are now configuring all of their domain controllers as global catalog servers.

The potential downside to such a configuration relates to replication. The global catalog is another partition that must be replicated. In a single domain forest, very little overhead is actually added by configuring all domain controllers as global catalog servers because all domain controllers already maintain a full set of attributes for all domain and forest objects. In a large, multidomain forest, there will be overhead related to replication of changes to the partial attribute set of objects in other domains. However, many organizations are finding that Active Directory replication is efficient enough to replicate the global catalog without significant impact to their networks and that the benefits far outweigh such impact. If you choose to configure all domain controllers as global catalog servers, you no longer need to worry about the placement of the infrastructure operations master; its role is no longer necessary in a domain where all domain controllers are global catalog servers.

Configure a global catalog server on a domain controller in a site where one or more of the following is true:

- A commonly used application performs directory queries by using port 3268, the global catalog.
- The connection to a global catalog server is slow or unreliable.
- The site contains a computer running Exchange Server.

Configure a Global Catalog Server



- Right-click the NTDS Settings node underneath the domain controller

Description:

Query Policy:

DNS Alias: 88545BF2-3B13-429D-9C50-08FBFC92A86D._msdcs.c

☑ Global Catalog

The amount of time it will take to publish the Global Catalog varies depending on your replication topology.

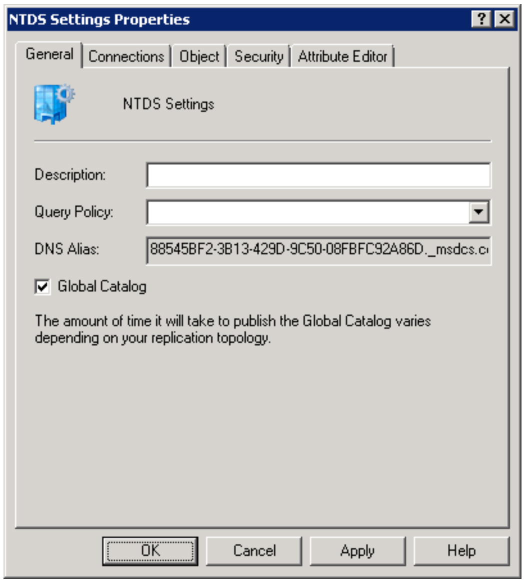
When you create the first domain in the forest, the first domain controller is configured as a global catalog.

You must decide for each additional domain controller whether it should be a global catalog server. The Active Directory Domain Services Installation Wizard and the Dcpromo.exe command each enable you to configure a global catalog server when promoting a domain controller.

You can also add or remove the global catalog from a domain controller by using Active Directory Sites and Services.

To configure a domain controller as a global catalog:

1. Expand the site, the Servers container within the site, and the domain controller’s server object.
2. Right-click the **NTDS Settings** node and click **Properties**.
3. On the **General** tab, shown in the following screen shot, select the **Global Catalog** check box.



NTDS Settings

Description:

Query Policy:

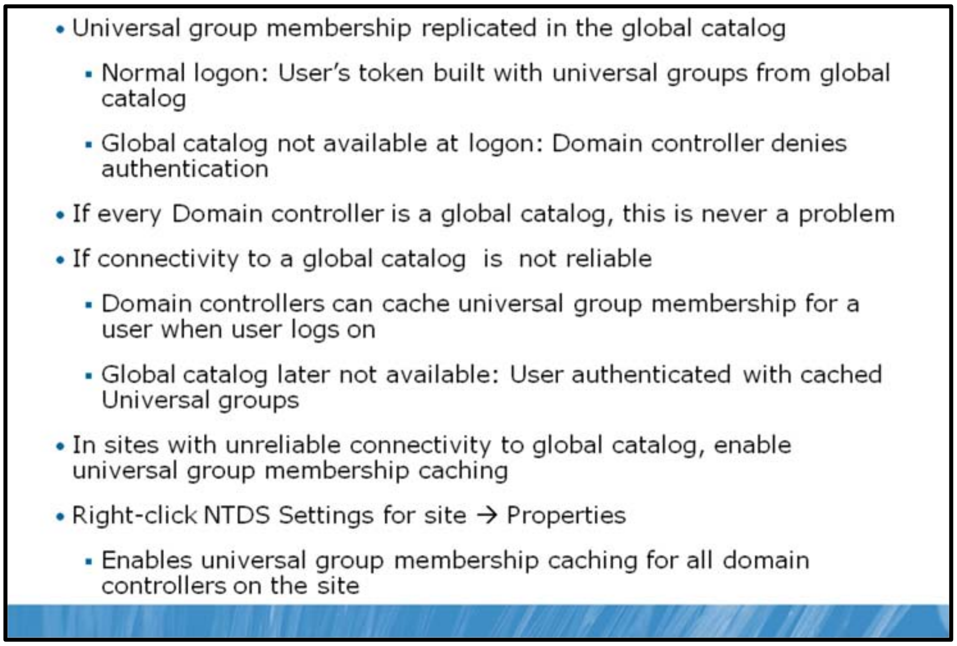
DNS Alias: 88545BF2-3B13-429D-9C50-08FBFC92A86D._msdcs.c

☑ Global Catalog

The amount of time it will take to publish the Global Catalog varies depending on your replication topology.

To remove the global catalog from a domain controller, perform the same steps, and clear the **Global Catalog** check box.

Universal Group Membership Caching



- Universal group membership replicated in the global catalog
  - Normal logon: User's token built with universal groups from global catalog
  - Global catalog not available at logon: Domain controller denies authentication
- If every Domain controller is a global catalog, this is never a problem
- If connectivity to a global catalog is not reliable
  - Domain controllers can cache universal group membership for a user when user logs on
  - Global catalog later not available: User authenticated with cached Universal groups
- In sites with unreliable connectivity to global catalog, enable universal group membership caching
- Right-click NTDS Settings for site → Properties
  - Enables universal group membership caching for all domain controllers on the site

In Module 4, you learned that Active Directory supports groups of universal scope. Universal groups are designed to include users and groups from multiple domains in a forest. The membership of universal groups is replicated in the global catalog. When a user logs on, the user's universal group membership is obtained from a global catalog server. If a global catalog is not available, universal group membership is not available. It's possible that a universal group is used to deny the user access to resources, so Windows prevents a security incident by denying domain authentication to the user. If the user has logged on to his or her computer before, he or she can log on by using cached credentials, but as soon as the user attempts to access network resources, access is denied.

To summarize, if a global catalog server is not available, users will effectively be unable to log on and access network resources.

If every domain controller is a global catalog server, this problem will not arise.

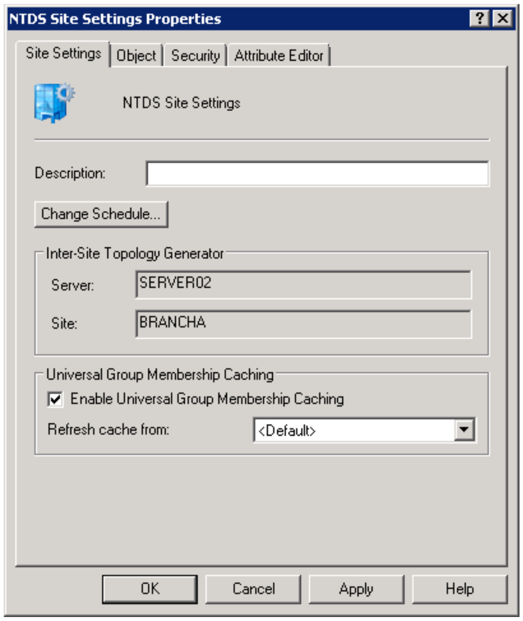
However, if replication is a concern, and if you have, therefore, chosen not to configure a domain controller as a global catalog server, you can facilitate a successful logon by enabling universal group membership caching. For example, when you configure universal group membership caching on a domain controller in a branch office, that domain controller will obtain universal group membership information from a global catalog for a user when the user first logs on to the site, and the domain controller will cache that information indefinitely, updating universal group membership information every eight hours. That way, if the user later logs on and a global catalog server is not accessible, the domain controller can use its cached membership information to permit logon by the user.

In sites with unreliable connectivity to a global catalog server, configure universal group membership caching on the site's domain controllers.

To configure universal group membership caching:

1. Open the **Active Directory Sites and Services** snap-in and select the site in the console tree.
2. In the details pane, right-click **NTDS Site Settings** and click **Properties**.

3. The **NTDS Site Settings Properties** dialog box, shown in the following screen shot, displays the **Enable Universal Group Membership Caching** option. You can select the check box and specify the global catalog from which to refresh the membership cache.



NTDS Site Settings

Description:

Inter-Site Topology Generator

Server: SERVER02

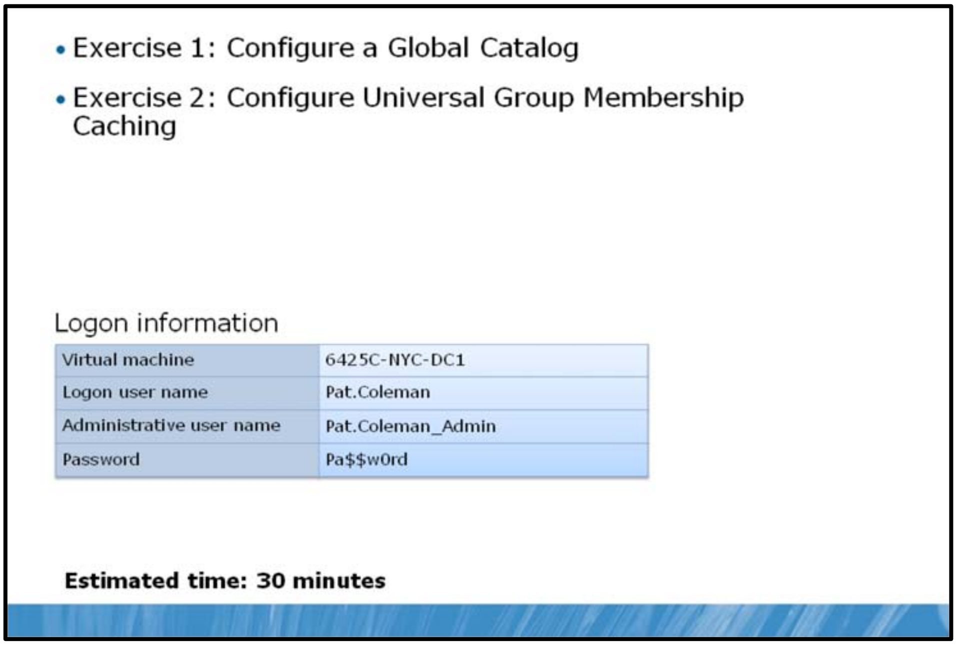
Site: BRANCHA

Universal Group Membership Caching

☑ Enable Universal Group Membership Caching

Refresh cache from: <Default>

Lab D: Configure Global Catalog and Universal Group Membership Caching



- Exercise 1: Configure a Global Catalog
- Exercise 2: Configure Universal Group Membership Caching

Logon information

Virtual machine	6425C-NYC-DC1
Logon user name	Pat.Coleman
Administrative user name	Pat.Coleman_Admin
Password	Pa$$w0rd

Estimated time: 30 minutes

Lab Setup

The virtual machines should already be started and available after completing Lab A. However, if they are not, complete Lab A first.

1. On the host computer, click **Start**, point to **Administrative Tools**, and then click **Hyper-V Manager**.
2. In Hyper-V Manager, click **6425C-NYC-DC1**, and in the Actions pane, click **Start**.
3. In the Actions pane, click **Connect**. Wait until the virtual machine starts.
4. Log on by using the following credentials:
   - User name: **Pat.Coleman**
   - Password: **Pa$$w0rd**
   - Domain: **Contoso**
5. On NYC-DC1, open Windows Explorer and then browse to **D:\Labfiles\Lab12d**.
6. Run **Lab12d_Setup.bat** with administrative credentials. Use the account **Pat.Coleman_Admin** with the password **Pa$$w0rd**.
7. The lab setup script runs. When it is complete, press any key to continue.
8. Close the Windows Explorer window, **Lab12d**.

Lab Scenario

You are an administrator at Contoso, Ltd. To improve the availability and resilience of the directory service, you decide to configure additional global catalog servers and universal group membership caching.

Exercise 1: Configure a Global Catalog

The first domain controller in a forest acts as a global catalog server. You might want to place global catalog servers in additional locations to support directory queries, logon, and applications such as Exchange Server. In this exercise, you will configure NYC-DC2 to host a replica of the partial attribute set—the global catalog.

The main task for this exercise are as follows:

- Configure a global catalog server.

▶ Task: Configure a global catalog server.

1. On NYC-DC1, run **Active Directory Sites and Services** as an administrator, with the user name **Pat.Coleman_Admin** and the password **Pa$$w0rd**.
2. Configure NYC-DC2 in Default-First-Site-Name site to be a global catalog server.
3. Confirm that BRANCHDC02 in BRANCHA site is a global catalog server.

Results: In this exercise, you configured NYC-DC2 to be a global catalog server and confirmed that BRANCHDC02 is already a global catalog server.

Exercise 2: Configure Universal Group Membership Caching

In sites without global catalog servers, user logon might be prevented if the site's domain controller is unable to contact a global catalog server in another site. To reduce the likelihood of this scenario, you can configure a site to cache the membership of universal groups. In this exercise, you will configure BRANCHA to cache universal group membership.

The main tasks for this exercise are as follows:

- Configure universal group membership caching.

▶ Task: Configure universal group membership caching.

- Configure the NTDS Site Settings of BRANCHA site so that domain controllers cache universal group membership.

Results: In this exercise, you configured domain controllers in BRANCHA to cache universal group membership.

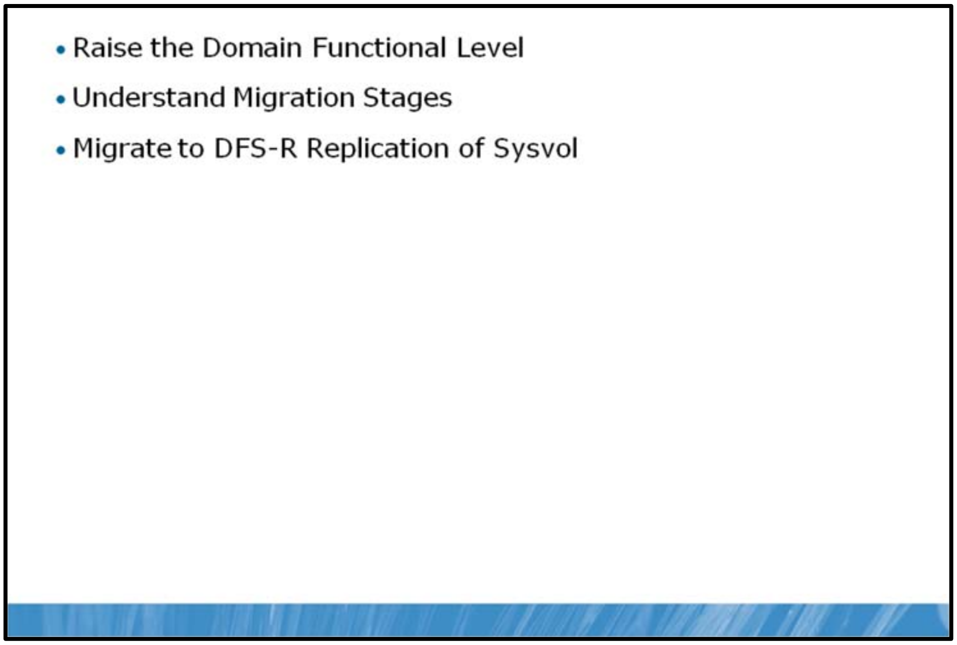
Important Do not shut down the virtual machines after you finish this lab because the settings you have configured here will be used in subsequent labs in this module.

Lab Review Questions

Question: When you enable global catalog, what actually happens on that domain controller?

Question: On which level would you enable Universal Group Membership Caching?

Lesson 5
Configure DFS-R Replication of SYSVOL



- Raise the Domain Functional Level
- Understand Migration Stages
- Migrate to DFS-R Replication of Sysvol

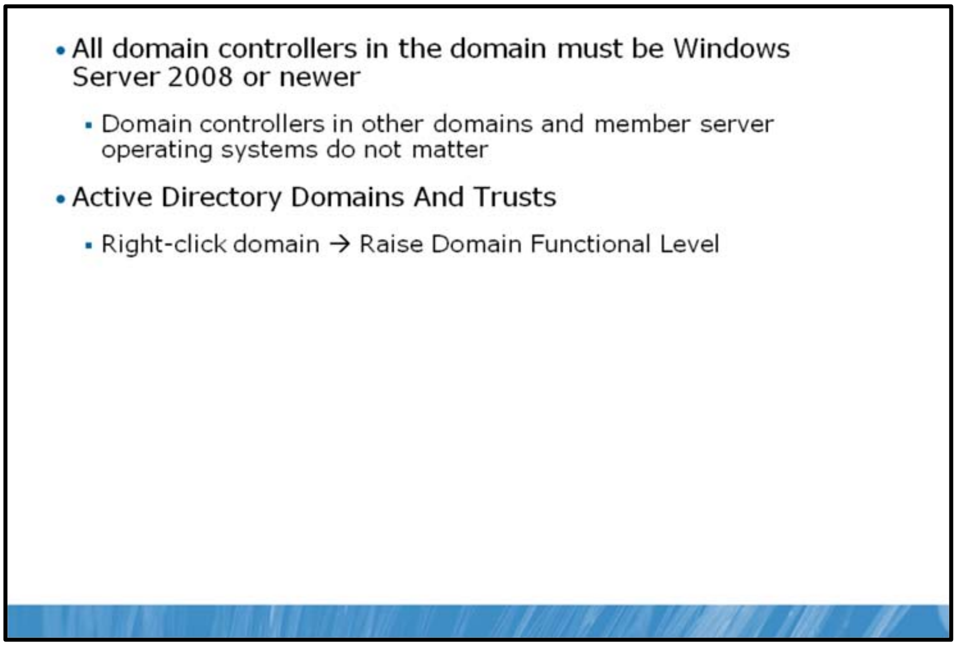
SYSVOL, a folder located at %SystemRoot%\SYSVOL, contains logon scripts, group policy templates (GPTs), and other resources critical to the health and management of an Active Directory domain, by default. Ideally, SYSVOL should be consistent on each domain controller. However, changes to Group Policy objects (GPOs) and logon scripts are made often, so you must ensure that those changes are replicated effectively and efficiently to all domain controllers. In the previous versions of Windows, the FRS was used to replicate the contents of SYSVOL between domain controllers. FRS has limitations in both capacity and performance that causes it to break occasionally. Unfortunately, troubleshooting and configuring FRS is quite difficult. In Windows Server 2008 and Windows Server 2008 R2 domains, you have the option to use DFS-R to replicate the contents of SYSVOL. In this lesson, you will learn how to migrate SYSVOL from FRS to DFS-R.

Objectives

After completing this lesson, you will be able to:

- Raise the domain functional level.
- Migrate SYSVOL replication from FRS to DFS-R.

Raise the Domain Functional Level



- All domain controllers in the domain must be Windows Server 2008 or newer
  - Domain controllers in other domains and member server operating systems do not matter
- Active Directory Domains And Trusts
  - Right-click domain → Raise Domain Functional Level

In Module 1, *Introducing Active Directory Domain Services*, you were introduced to the concept of domain and forest functional levels. In Module 15, *Managing Multiple Domains and Forests*, you will learn about forest and domain functional levels in detail. A domain's functional level is a setting that both restricts the operating systems that are supported as domain controllers in a domain and enables additional functionality in Active Directory. A domain with a Windows Server 2008 R2 domain controller can be at one of four functional levels: Windows 2000 Native, Windows Server 2003 Native, Windows Server 2008, and Windows Server 2008 R2. At the Windows 2000 Native domain functional level, domain controllers can be running Windows 2000 Server or Windows Server 2003. At the Windows Server 2003 Native domain functional level, domain controllers can be running Windows Server 2003. At the Windows Server 2008 domain functional level, all domain controllers must be running Windows Server 2008.At the Windows Server 2008 R2 domain functional level, all domain controllers must be running Windows Server 2008 R2.

As you raise functional levels, new capabilities of Active Directory are enabled. At Windows Server 2008 domain functional level, for example, you can use DFS-R to replicate SYSVOL. If you upgrade domain functional level to Windows Server 2008 R2, you will get authentication mechanism assurance, which packages information about the type of logon method (smart card or user name/password) that is used to authenticate domain users inside each user's Kerberos token. Also, Automatic SPN management will be enabled.

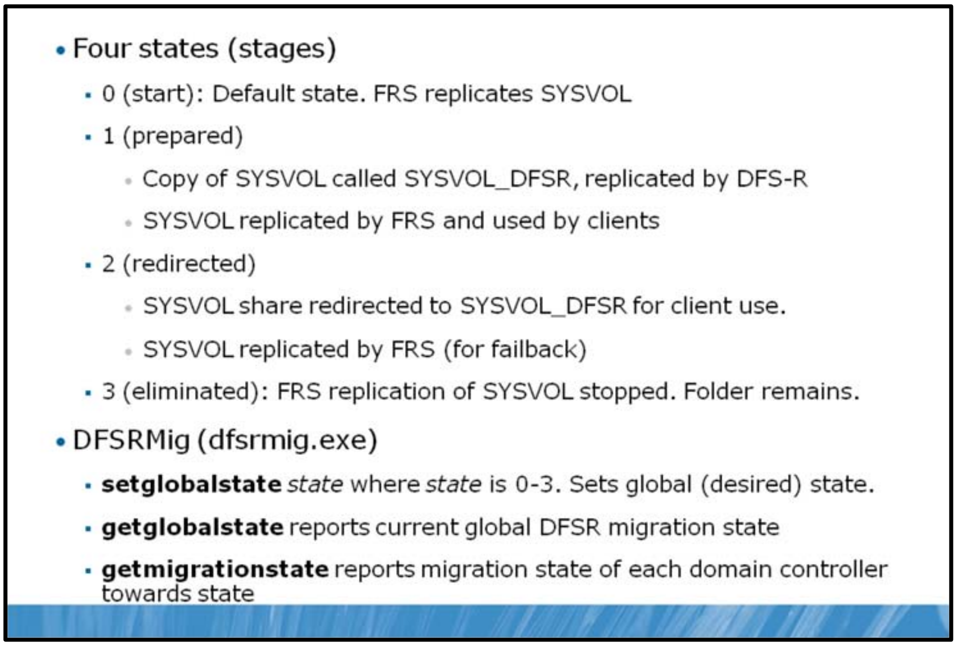
Simply upgrading all domain controllers to Windows Server 2008 or newer is not enough: You must specifically raise the domain functional level. You do this by using Active Directory Domains and Trusts.

To raise the domain functional level:

1. Run the **Active Directory Domains and Trusts** snap-in.
2. Right-click the domain and choose **Raise Domain Functional Level**.
3. Select **Windows Server 2008 or 2008**R2 as the desired functional level, and then click **Raise**.

After you set the domain functional level to Windows Server 2008 R2, you cannot add domain controllers running Windows 2000 Server, Windows Server 2003 or Windows Server 2008. The functional level is associated only with domain controller operating systems; member servers and workstations can be running Windows Server 2003, Windows 2000 Server, Windows 7, Windows Vista®, Windows XP, or Windows 2000 Workstation.

Understand Migration Stages



- Four states (stages)
  - 0 (start): Default state. FRS replicates SYSVOL
  - 1 (prepared)
    - Copy of SYSVOL called SYSVOL_DFSR, replicated by DFS-R
    - SYSVOL replicated by FRS and used by clients
  - 2 (redirected)
    - SYSVOL share redirected to SYSVOL_DFSR for client use.
    - SYSVOL replicated by FRS (for failback)
  - 3 (eliminated): FRS replication of SYSVOL stopped. Folder remains.
- DFSRMig (dfsrmig.exe)
  - **setglobalstate** *state* where *state* is 0-3. Sets global (desired) state.
  - **getglobalstate** reports current global DFSR migration state
  - **getmigrationstate** reports migration state of each domain controller towards state

Because SYSVOL is critical to the health and functionality of your domain, Windows does not provide a mechanism with which to convert from FRS to DFS-R replication of SYSVOL instantly. In fact, migration to DFS-R involves creating a parallel SYSVOL structure. When the parallel structure is successfully in place, clients are redirected to the new structure as the domain's system volume. When the operation has proven successful, you can eliminate FRS.

Migration to DFS-R therefore consists of four stages or states:

- **0 (start).** The default state of a domain controller. Only FRS is used to replicate SYSVOL.
- **1 (prepared).** A copy of SYSVOL is created in a folder called SYSVOL_DFSR and is added to a replication set. DFS-R begins to replicate the contents of the SYSVOL_DFSR folders on all domain controllers. However, FRS continues to replicate the original SYSVOL folders and clients continue to use SYSVOL.
- **3 (eliminated).** Replication of the old SYSVOL folder by FRS is stopped. The original SYSVOL folder is not deleted. Therefore, if you want to remove it entirely, you must do so manually.

  You move your domain controllers through these stages by using the DFSMig command. You will use three options with dfsrmig.exe:

- **Setglobalstate** *state*

  The setglobalstate option configures the current global DFSR migration state, which applies to all domain controllers. The state is specified by the *state* parameter, which is 0–3. Each domain controller will be notified of the new DFSR migration state and will migrate to that state automatically.

- **getglobalstate**

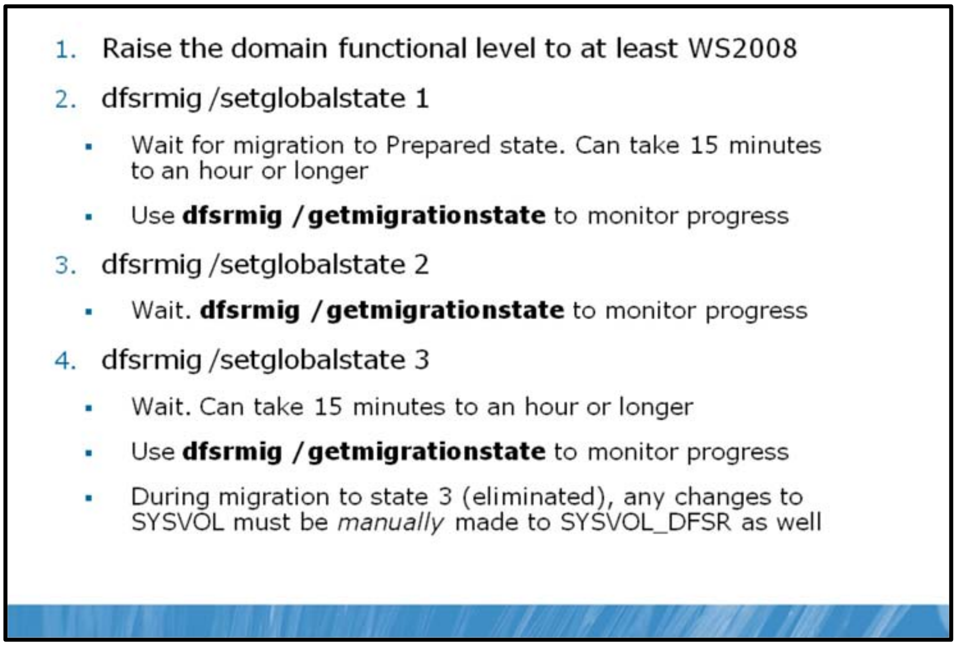
  The getglobalstate option reports the current global DFSR migration state.

- **getmigrationstate**

The getmigrationstate option reports the current migration state of each domain controller. Because it might take time for domain controllers to be notified of the new global DFSR migration state, and because it might take even more time for a domain controller to make the changes required by that state, domain controllers will not be synchronized with the global state instantly. The getmigrationstate option enables you to monitor the progress of domain controllers toward the current global DFSR migration state.

If there is a problem moving from one state to the next higher state, you can revert to previous states by using the setglobalstate option. However, after you have used the setglobalstate option to specify state 3 (eliminated), you cannot revert to the earlier states.

Migrate to DFS-R Replication of SYSVOL



1. Raise the domain functional level to at least WS2008
2. dfsrmig /setglobalstate 1
   - Wait for migration to Prepared state. Can take 15 minutes to an hour or longer
   - Use **dfsrmig /getmigrationstate** to monitor progress
3. dfsrmig /setglobalstate 2
   - Wait. **dfsrmig /getmigrationstate** to monitor progress
4. dfsrmig /setglobalstate 3
   - Wait. Can take 15 minutes to an hour or longer
   - Use **dfsrmig /getmigrationstate** to monitor progress
   - During migration to state 3 (eliminated), any changes to SYSVOL must be *manually* made to SYSVOL_DFSR as well

To migrate SYSVOL replication from FRS to DFS-R, perform the following steps:

1. Open the **Active Directory Domains and Trusts** snap-in.
2. Right-click the domain and choose **Raise Domain Functional Level**.
3. If the **Current domain functional level** box does not indicate Windows Server 2008, select **Windows Server 2008** or Windows Server 2008 R2 from the **Select an available domain functional level** list.
4. Click **Raise**. Click **OK** twice in response to the dialog boxes that appear.
5. Log on to a domain controller and open a command prompt.
6. Type **dfsrmig /setglobalstate 1**.
7. Type **dfsrmig /getmigrationstate** to query the progress of domain controllers toward the Prepared global state. Repeat this step until the state has been attained by all domain controllers.

   This can take 15 minutes to an hour or longer.
8. Type **dfsrmig /setglobalstate 2**.
9. Type **dfsrmig /getmigrationstate** to query the progress of domain controllers toward the Redirected global state. Repeat this step until the state has been attained by all domain controllers.

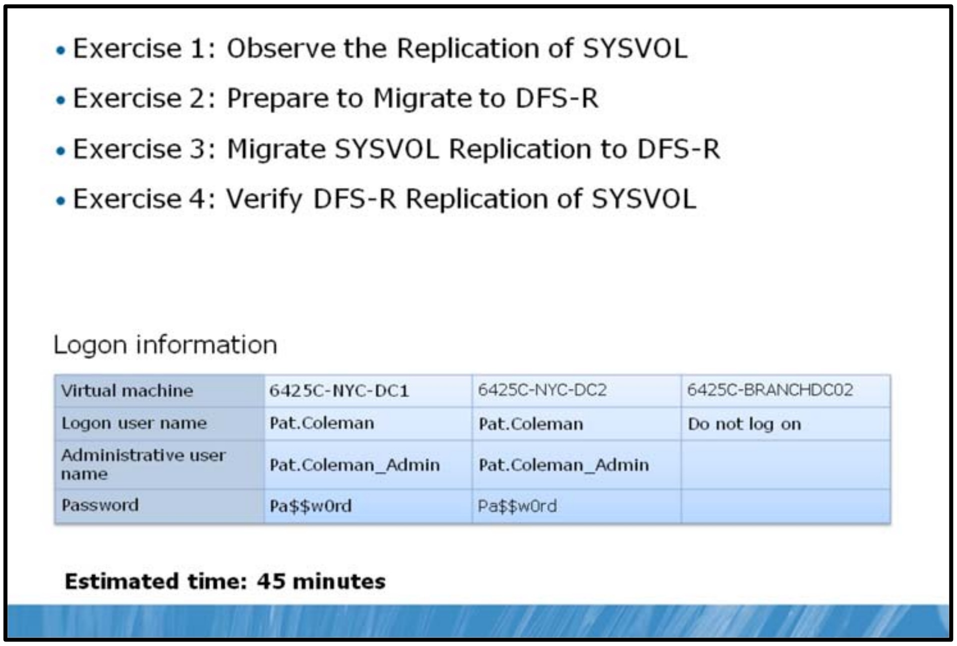
   This can take 15 minutes to an hour or longer.
10. Type **dfsrmig /setglobalstate 3**.

    After you begin migration from state 2 (prepared) to state 3 (replicated), any changes made to the SYSVOL folder will have to be replicated manually to the SYSVOL_DFSR folder.
11. Type **dfsrmig /getmigrationstate** to query the progress of domain controllers toward the Eliminated global state. Repeat this step until the state has been attained by all domain controllers.

This can take 15 minutes to an hour or longer.

12. For more information about the dfsrmig.exe command, type **dfsrmig.exe /?**.

Lab E: Configure DFS-R Replication of SYSVOL



- Exercise 1: Observe the Replication of SYSVOL
- Exercise 2: Prepare to Migrate to DFS-R
- Exercise 3: Migrate SYSVOL Replication to DFS-R
- Exercise 4: Verify DFS-R Replication of SYSVOL

Logon information

Virtual machine	6425C-NYC-DC1	6425C-NYC-DC2	6425C-BRANCHDC02
Logon user name	Pat.Coleman	Pat.Coleman	Do not log on
Administrative user name	Pat.Coleman_Admin	Pat.Coleman_Admin	
Password	Pa$$w0rd	Pa$$w0rd	

Estimated time: 45 minutes

Lab Setup

For this lab, you will use the available virtual machine environment. Before you begin the lab, you must complete the following steps:

1. On the host computer, click **Start**, point to **Administrative Tools**, and then click **Hyper-V Manager**.
2. In Hyper-V Manager, click 6425C-NYC-DC1, and in the Actions pane, click **Start**.
3. In the Actions pane, click **Connect**. Wait until the virtual machine starts.
4. Log on by using the following credentials:
   - User name: **Pat.Coleman**
   - Password: **Pa$$w0rd**
   - Domain: **Contoso**
5. Repeat steps 2–4 for 6425C-NYC-DC2. In Hyper-V Manager, click **6425C-BRANCHDC02**, and in the Actions pane, click **Start.** Do not logon to 6425C-BRANCHDC02.
6. On NYC-DC1, open Windows Explorer and then browse to **D:\Labfiles\Lab12e**.
7. Run **Lab12e_Setup.bat** with administrative credentials. Use the account **Pat.Coleman_Admin** with the password **Pa$$w0rd**.
8. The lab setup script runs. When it is complete, press any key to continue.
9. Close the Windows Explorer window, **Lab12e**.

Lab Scenario

You are an administrator at Contoso, Ltd. You have recently upgraded the last remaining Windows Server 2003 domain controller to Windows Server 2008, and you want to take advantage of the improved replication of SYSVOL by using DFS-R.

Exercise 1: Observe the Replication of SYSVOL

In this exercise, you will observe SYSVOL replication with File Replication Service (FRS) by adding a logon script to the NETLOGON share and observing its replication to another domain controller.

The main task for this exercise are as follows:

1. Observe SYSVOL replication.

▶ Task: Observe SYSVOL replication.

1. On **NYC-DC1**, open **%SystemRoot%\ Sysvol\sysvol\contoso.com\Scripts**.
2. Run Notepad as an administrator, with the user name **Pat.Coleman_Admin** and the password **Pa$$w0rd**.
3. Save a test file as **%SystemRoot%\Sysvol\sysvol\contoso.com\Scripts \TestFRS.txt**.
4. On NYC-DC2, open **%SystemRoot%\Sysvol\sysvol\contoso.com\Scripts**.
5. Confirm that **TestFRS.txt** has replicated to the NYC-DC2 Scripts folder.
6. If the file does not appear immediately, wait. It can take up to 15 minutes for replication to occur. You can, optionally, continue with Exercise 2. Before continuing with Exercise 3, check to ensure that the file has replicated.
7. After you have observed the replication, close the Windows Explorer window showing the Scripts folder on both NYC-DC1 and NYC-DC2.

Results: In this exercise, you observed the replication of a test file between the SYSVOL\Scripts folders of two domain controllers.

Exercise 2: Prepare to Migrate to DFS-R

Before you can migrate to DFS-R of SYSVOL, the domain must contain only Windows Server 2008 domain controllers, and the domain functional level must be raised to Windows Server 2008.

The main tasks for this exercise are as follows:

1. Confirm that the current domain functional level is Windows Server 2008.
2. Confirm that DFS-R replication is available at Windows Server 2008 domain functional level.

▶ Task 1: Confirm that the current domain functional level is Windows Server 2008.

1. On NYC-DC1, run **Active Directory Users and Computers** as an administrator, with the user name **Pat.Coleman_Admin** and the password **Pa$$w0rd**.
2. Confirm that the current domain functional level is Windows Server 2008.

▶ Task 2: Confirm that DFS-R replication is available at the Windows Server 2008 domain functional level.

- Open the command prompt. Use the account **Pat.Coleman_Admin** with the password **Pa$$w0rd**. Type **dfsrmig /getglobalstate**, and then press Enter. A message appears informing you that DFS-R migration has not yet been initialized.

Results: In this exercise, you verified the domain functional level is Windows Server 2008 and confirmed that by doing so you have made it possible to migrate SYSVOL replication to DFS-R.

Exercise 3: Migrate SYSVOL Replication to DFS-R

In this exercise, you will migrate the replication mechanism from FRS to DFS-R.

The main task for this exercise is as follows:

1. Migrate SYSVOL replication to DFS-R

▶ Task: Migrate SYSVOL replication to DFS-R.

1. Switch to the Command Prompt
2. Type **dfsrmig /setglobalstate 0**, and then press Enter.

   The following message appears.

```
Current DFSR global state: 'Start'
New DFSR global state: 'Start'
Invalid state change requested.
```

   The default global state is already 0, 'Start,' so your command is not valid. However, this does serve to initialize DFSR migration.

3. Type **dfsrmig /getglobalstate**, and then press Enter.

   The following message appears.

```
Current DFSR global state: 'Start'
Succeeded.
```

4. Type **dfsrmig /getmigrationstate**, and then press Enter.

   The following message appears.

```
All Domain Controllers have migrated successfully to Global state
('Start').
Migration has reached a consistent state on all Domain Controllers.
Succeeded.
```

5. **Type dfsrmig /setglobalstate 1**, and then press Enter.

   The following message appears.

```
Current DFSR global state: 'Start'
New DFSR global state: 'Prepared'

Migration will proceed to 'Prepared' state. DFSR service will
copy the contents of SYSVOL to SYSVOL_DFSR
folder.

If any DC is unable to start migration then try manual polling.
OR Run with option /CreateGlobalObjects.
Migration can start anytime between 15 min to 1 hour.
Succeeded.
```

6. Type **dfsrmig /getmigrationstate**, and then press Enter.

   A message appears that reflects the migration state of each domain controller. Migration can take up to 20-30 minutes. You can try to speed up migration by forcing replication between NYC-DC1, NYC-DC2 and BRANCHDC02.

7. Repeat step 6. until you receive the following message that indicates migration has progressed to the ‘Prepared’ state and is successful.

```
All Domain Controllers have migrated successfully to Global state
('Prepared').
Migration has reached a consistent state on all Domain Controllers.
Succeeded.
```

When you receive the message just shown, continue to the next step.

During migration to the ‘Prepared’ state, you might see one of these messages.

```
The following Domain Controllers are not in sync with Global state
('Prepared'):


Domain Controller (LocalMigrationState) - DC Type
===================================================

NYC-DC1 ('Start') - Primary DC
NYC-DC2 ('Start') - Writable DC

Migration has not yet reached a consistent state on all Domain Controllers.
State information might be stale due to AD latency.
```

or

```
The following Domain Controllers are not in sync with Global state
('Prepared'):


Domain Controller (LocalMigrationState) - DC Type
===================================================

NYC-DC1 ('Start') - Primary DC
NYC-DC2 ('Waiting For Initial Sync') - Writable DC

Migration has not yet reached a consistent state on all Domain Controllers.
State information might be stale due to AD latency.
```

or

```
The following Domain Controllers are not in sync with Global state
('Prepared'):


Domain Controller (LocalMigrationState) - DC Type
===================================================

NYC-DC2 ('Waiting For Initial Sync') - Writable DC

Migration has not yet reached a consistent state on all Domain Controllers.
State information might be stale due to AD latency.
```

or

```
The following Domain Controllers are not in sync with Global state
('Prepared'):


Domain Controller (LocalMigrationState) - DC Type
===================================================
BRANCHDC02 ('Start') - Read-Only DC

Migration has not yet reached a consistent state on all Domain Controllers.
State information might be stale due to AD latency.
```

8. Click **Start**, point to **Administrative Tools**, right-click **Event Viewer**, and then click **Run as administrator**.
9. Click **Use another account**.
10. In the **User name** box, type **Pat.Coleman_Admin**.
11. In the **Password** box, type **Pa$$w0rd**, and then press Enter.

    Event Viewer opens.

12. In the console tree, expand **Applications and Services Logs**, and select **DFS Replication**.
13. Locate the event with **Event ID 8014** and view its properties.
14. Close Event Viewer.
15. Switch to the Command Prompt.
16. Type **dfsrmig /setglobalstate 2**, and then press Enter.

    The following message appears:

```
Current DFSR global state: 'Prepared'
New DFSR global state: 'Redirected'

Migration will proceed to 'Redirected' state. The SYSVOL share will be
changed to SYSVOL_DFSR folder.

If any changes have been made to the SYSVOL share during the state
transition from 'Prepared' to 'Redirected', please robocopy the changes
from SYSVOL to SYSVOL_DFSR on any replicated RWDC.
Succeeded.
```

17. Type **dfsrmig /getmigrationstate**, and then press Enter.

    A message appears that reflects the migration state of each domain controller. Migration can take up to 15 minutes. You can try to speed up migration by forcing replication between NYC-DC1, NYC-DC2 and BRANCHDC02.

18. Repeat step 17 until you receive the following message that indicates migration has progressed to the 'Prepared' state and is successful.

```
All Domain Controllers have migrated successfully to Global state
('Redirected').
Migration has reached a consistent state on all Domain Controllers.
Succeeded.
```

When you receive the message just shown, continue to the next task.

During migration, you might receive messages like the following.

```
The following Domain Controllers are not in sync with Global state
('Redirected'):
```

```
Domain Controller (LocalMigrationState) - DC Type
===================================================

NYC-DC2 ('Prepared') - Writable DC

Migration has not yet reached a consistent state on all Domain Controllers.
State information might be stale due to AD latency.
```

or

```
The following Domain Controllers are not in sync with Global state
('Redirected'):

Domain Controller (LocalMigrationState) - DC Type
===================================================

BRANCHDC02 ('Prepared') – Read-Only DC

Migration has not yet reached a consistent state on all Domain Controllers.
State information might be stale due to AD latency.
```

Results: In this exercise, you migrated the replication of SYSVOL to DFS-R in the contoso.com domain.

Exercise 4: Verify DFS-R Replication of SYSVOL

In this exercise, you will verify that SYSVOL is being replicated by DFS-R.

The main tasks for this exercise are as follows:

1. Confirm the new location of SYSVOL.
2. Observe SYSVOL replication.

▶ Task 1: Confirm the new location of SYSVOL.

- At the Command Prompt, type **net share**, and then press Enter. Confirm that the NETLOGON share refers to the %SystemRoot%\SYSVOL_DFSR \Sysvol\contoso.com\Scripts folder, and that the SYSVOL share refers to the %SystemRoot%\SYSVOL_DFSR\Sysvol folder.

▶ Task 2: Observe SYSVOL replication.

1. On NYC-DC1, open **%SystemRoot%\SYSVOL_DFSR\Sysvol \contoso.com\Scripts**.

   Note that the TestFRS.txt file created earlier is already in the Scripts folder. While the domain controllers were at the Prepared state, files were replicated between the legacy, FRS SYSVOL folder and the new, DFS-R SYSVOL folder.

2. Run Notepad as an administrator, with the user name **Pat.Coleman_Admin** and the password **Pa$$w0rd**.
3. Save a test file as **%SystemRoot%\SYSVOL_DFSR\Sysvol\contoso.com \Scripts \TestDFSR.txt**.
4. On NYC-DC2, open **%SystemRoot%\SYSVOL_DFSR\Sysvol\contoso.com \Scripts**.
5. Confirm that the TestDFSR.txt file has replicated to the NYC-DC2 Scripts folder.

   If the file does not appear immediately, wait a few moments.

Results: In this exercise, you observed the replication of a test file between the SYSVOL_DFSR Scripts folders of two domain controllers.

▶ To prepare for the next module

When you finish the lab, revert the virtual machines to their initial state. To do this, complete the following steps:

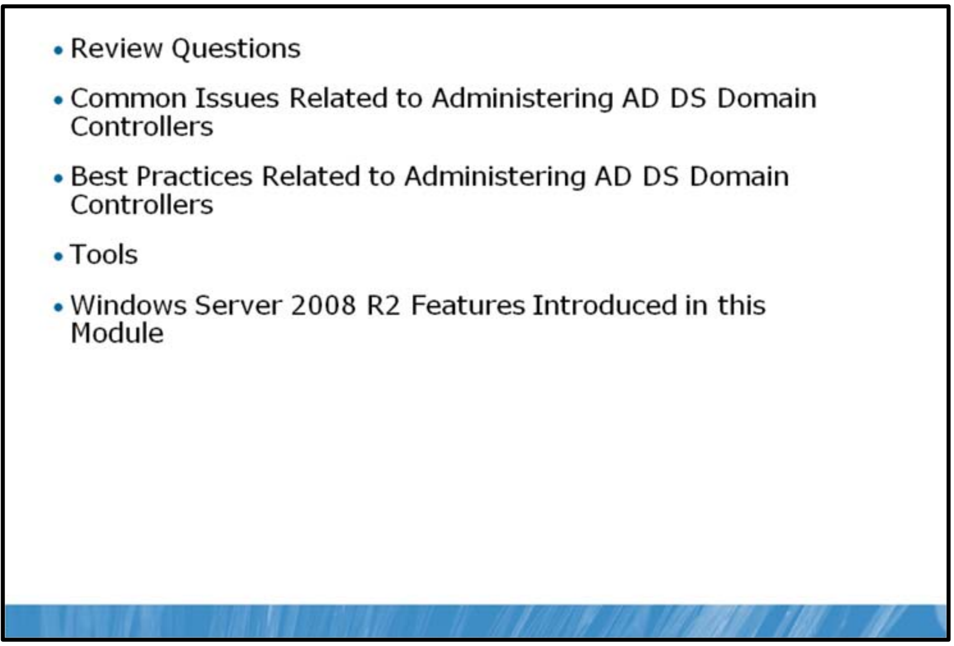
1. On the host computer, start Hyper-V Manager.
2. Right-click 6425C-NYC-DC1in the **Virtual Machines** list, and then click **Revert**.
3. In the **Revert Virtual Machine** dialog box, click **Revert**.
4. Repeat these steps for 6425C-NYC-DC2 and 6425C-BRANCHDC02.

Lab Review Questions

Question: What would you expect to be different between two enterprises, one which created its domain initially with Windows 2008 domain controllers, and one that migrated to Windows Server 2008 from Windows Server 2003?

Question: What must you be aware of while migrating from the Prepared to the Redirected state?

Module Review and Takeaways



- Review Questions
- Common Issues Related to Administering AD DS Domain Controllers
- Best Practices Related to Administering AD DS Domain Controllers
- Tools
- Windows Server 2008 R2 Features Introduced in this Module

Review Questions

Question: In which scenario will you have the option to choose domain and forest functional level during dcpromo wizard?

Question: How can you easily prepare an unattended file for domain controller installation?

Question: How can you say that RID master is not working?

Question: If you seize the operations master role, can you bring online the original operation master?

Common Issues Related to Administering AD DS Domain Controllers

Issue	Troubleshooting tip
Cannot raise domain or forest functional level	
You cannot transfer one or more operation masters roles	
You cannot install role or feature on Server Core	
You cannot add additional domain controller to current AD DS infrastructure	

Best Practices Related to Administering AD DS Domain Controllers

- Always install at least two domain controllers per one domain to achieve high availability.

- Use the Server Core domain controller when using role-centric servers, and to maintain higher security and easier management.
- Distribute operations masters roles on several servers. Be sure to co-locate compatible roles.
- Use DFS-R for SYSVOL replication.

Tools

Tool	Used for	Where to find it
Active Directory Users and Computers	• Managing operation masters • Managing domain functional level • Creating and managing AD objects	Administrative Tools
Active Directory Domains and Trusts	• Managing domain and forest functional level • Trust management	Administrative Tools
Dcpromo.exe	• Installation and configuration of Active Directory Domain Services	You can run it manually
Server Manager	• AD DS role installation	Administrative Tools
Active Directory Schema Management	• Managing schema master role	Must be added as a separate snap-in

Windows Server 2008 R2 Features Introduced in this Module

Windows Server 2008 R2 feature	Description
New Server Core roles and Features	In Windows Server 2008 R2, new roles and features are provided for Server Core installation