Lesson 13: Installing Domain Controllers

MOAC 70-410: Installing and Configuring Windows Server 2012

Microsoft
Official Academic Course

WILEY

Overview

- Exam Objective 5.1: Install Domain Controllers
- Introducing Active Directory
- Deploying Active Directory Domain Services

Introducing Active Directory

Lesson 13: Installing Domain Controllers

Introducing Active Directory

- A directory service is a repository of information about the resources—hardware, software, and human—that are connected to a network.
- Users, computers, and applications throughout the network can access the repository for a variety of purposes:
  - User authentication
  - Storage of configuration data
  - Accessing files and printers

Active Directory Domain Services (AD DS)

- AD DS is a directory service that enables administrators to create organizational divisions called domains
- A **domain** is a logical container of network components, hosted by at least one server designated as a **domain controller**.

Active Directory Functions

- **Authentication** is the process of verifying a user's identity by using:
  - Passwords
  - Smart cards
  - Biometrics (fingerprint scan)
- **Authorization** is the process of granting the user access only to the resources he or she is permitted to use by using:
  - ACLs and ACEs

The Active Directory Architecture

- Active Directory is a hierarchical directory service, based on the domain, which is scalable in both directions.
- You can subdivide a domain into organizational units and populate it with objects.
- You can create multiple domains and group them into sites, trees, and forests.
- AD DS provides a highly flexible architecture that can accommodate the smallest and the largest organizations.

Objects and Attributes

- An AD DS domain is a hierarchical structure that takes the form of a tree, much like a file system.
- Consists of **objects**, each of which represents a logical or physical resource.
- Each object consists of **attributes** which store information about the object.
- Different objects have different attributes, depending on their function.
- The **directory schema** defines the attributes for each object and the information that is required and optional.

Classes of Objects

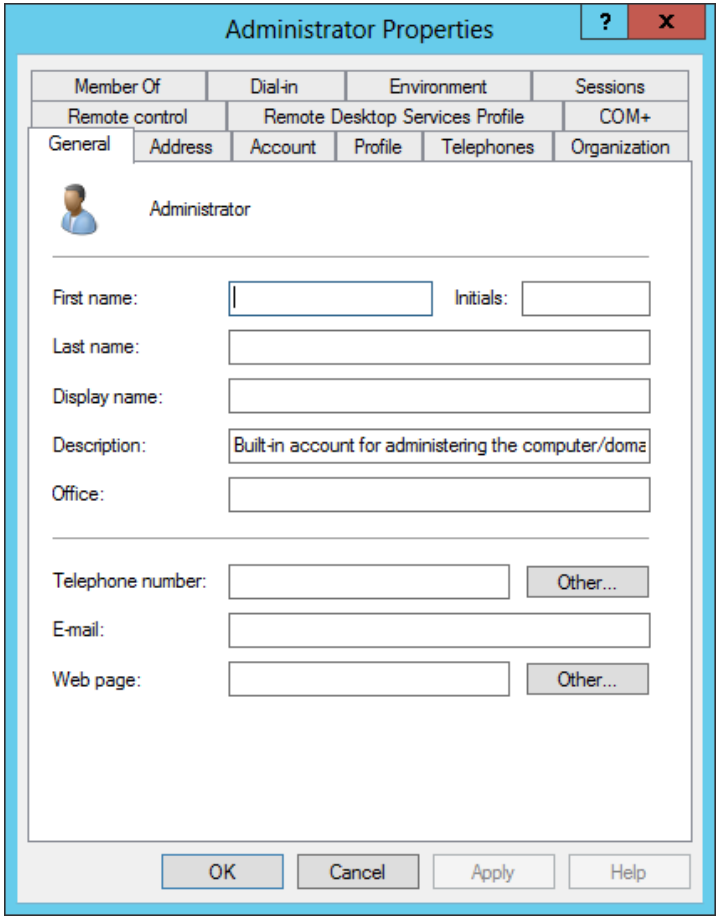
A **container object** can have other objects subordinate to it:

- Domain
- Organizational unit

A **leaf object** cannot have subordinate objects:

- Users
- Computers
- Groups
- Applications
- Network resources

Objects and Attributes



The attributes of a user object, as displayed in its Properties sheet

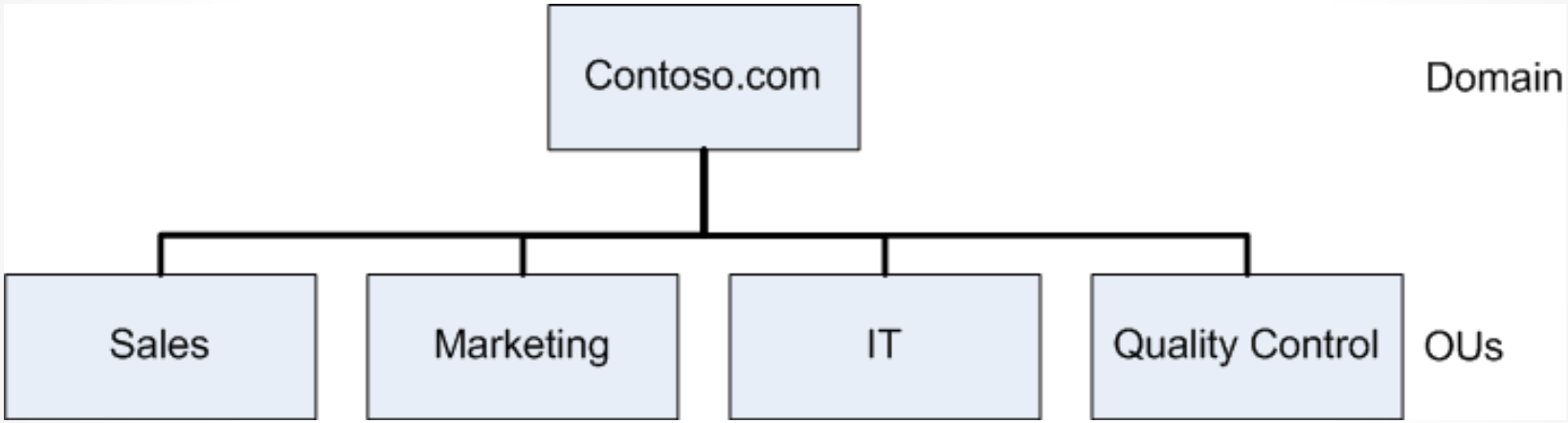
Domains

- You can create a hierarchy within a domain.
- You can create a hierarchy out of multiple domains.
- You begin the process of designing an Active Directory infrastructure by deciding what domains to create and you begin deploying AD DS by creating your first domain.

Organizational Units (OUs)

- Are container objects within a domain, used to divide the security and administrative responsibility among several divisions or departments
- Function in a subordinate capacity to a domain, like a subdomain, but without the complete separation of security policies
- Can contain other OUs, as well as leaf objects
- Can have separate Group Policy settings applied to them

Organizational Units



Organizational units subordinate to a domain

Groups

- Group objects contain users (from a single or multiple domains or OUs) who require similar access to resources or rights to perform tasks.
- Members of a group inherit rights and permissions assigned to the group.

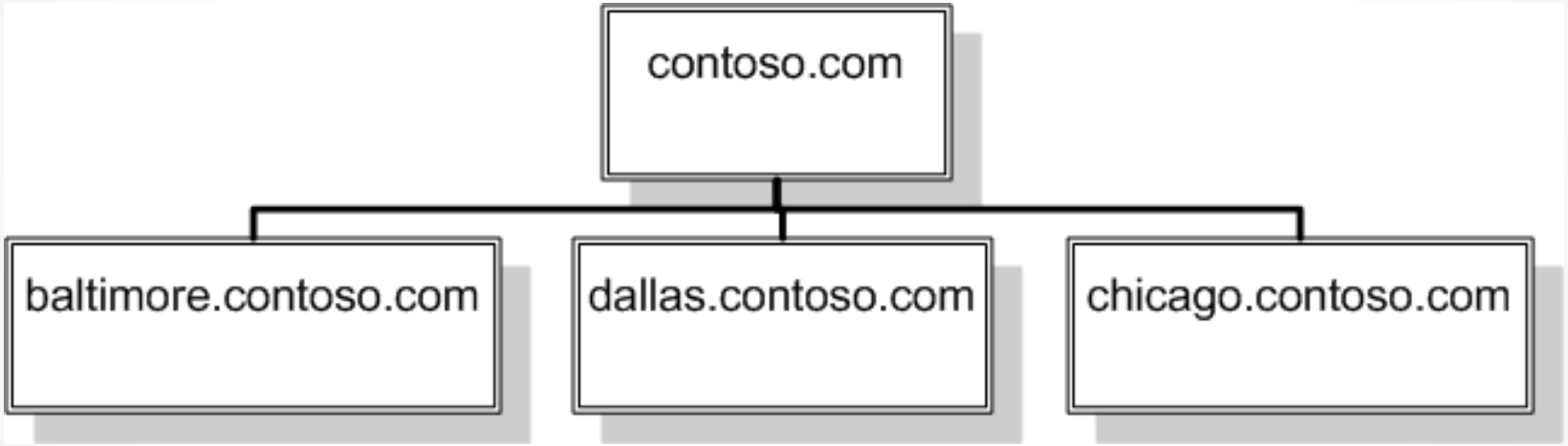
Domain Trees (1)

- When you create your first domain on an Active Directory network, you are creating the root of a **domain tree**.
- You can populate the tree with additional domains, as long as they are part of the same contiguous namespace.
- When using registered Internet domain names, subdomains can be used to create other domains within the domain tree.

Domain Trees (2)

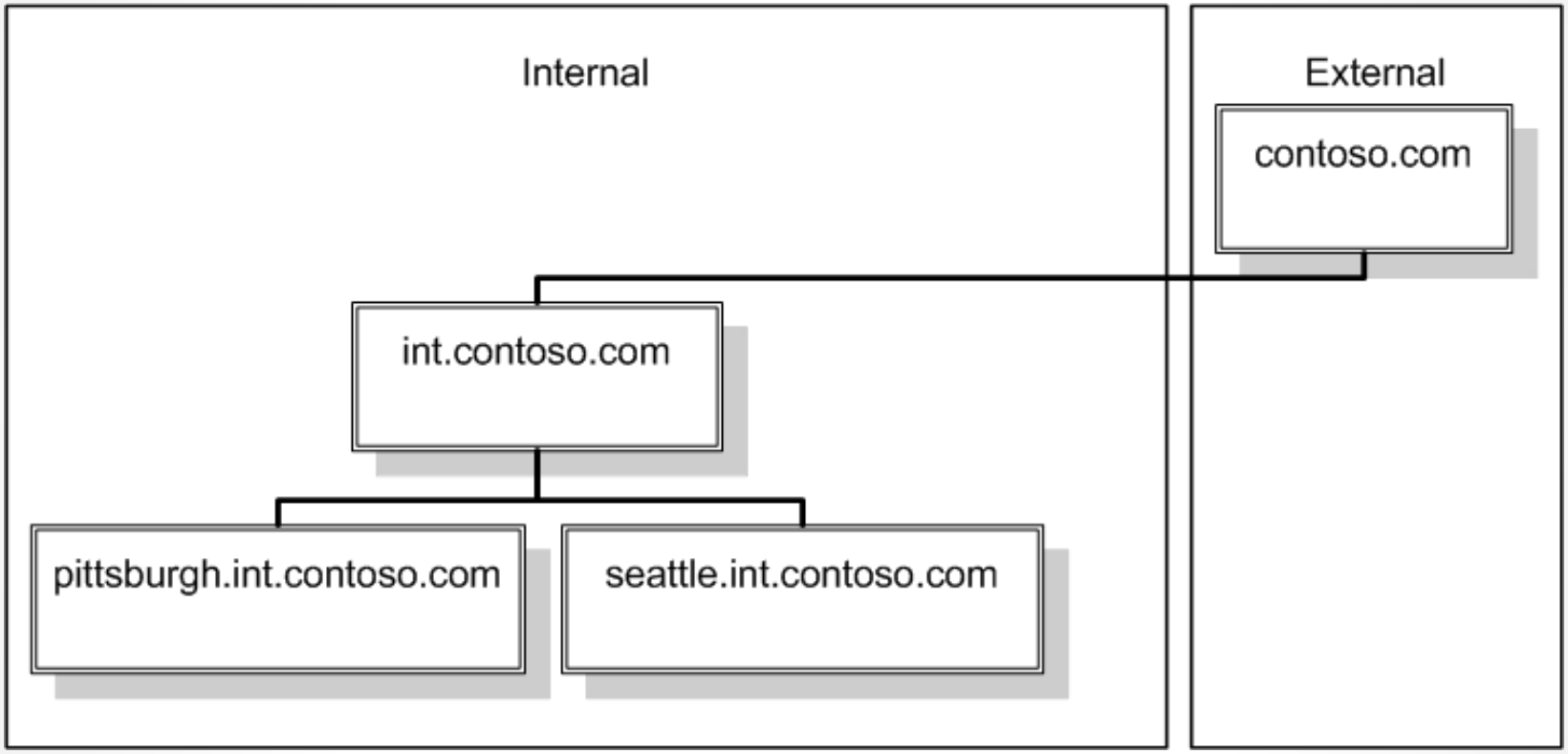
- You can add as many domains to the tree as you need.
- Each domain in a tree is a separate security entity with its own separate Group Policy settings, permissions, and user accounts.
- Unlike OUs, subdomains in a tree do not inherit permissions and policies from their parent domains.
- Domains in the same tree have bidirectional trust relationships between them, which means that an administrator of a particular domain can grant any user in the tree access to that domain's resources.

Domain Trees



An internal Active Directory domain tree

Domain Trees



An Active Directory domain tree using an Internet domain name

Forests

- An Active Directory **forest** consists of one or more separate domain trees, which have the same two-way trust relationships between them as two domains in the same tree.
- When you create the first domain on an Active Directory network, you are creating a new forest, and that first domain becomes the **forest root domain**.

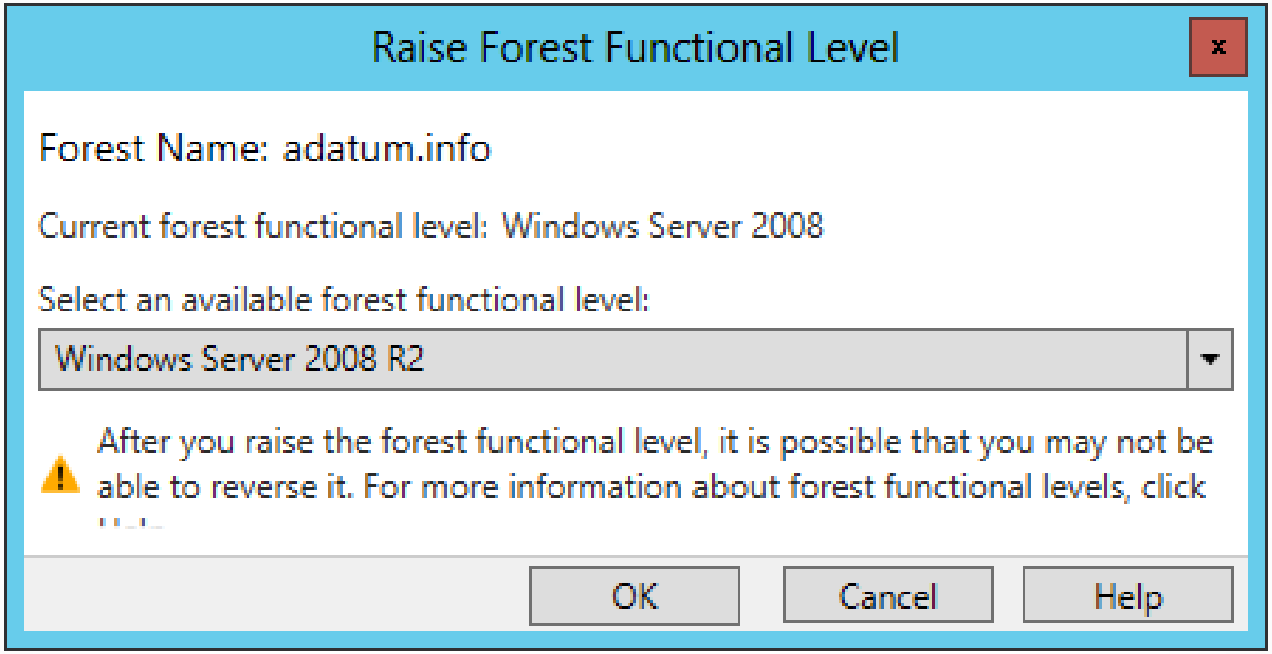
Global Catalog

Each forest has a **global catalog**, which is a list of all of the objects in the forest, along with a subset of each object's attributes.

Functional Levels

- **Functional levels** are designed to provide backwards compatibility in AD DS installations with domain controllers running various versions of the Windows Server operating system.
- By selecting the functional level representing the oldest Windows version running on your domain controllers, you disable the new features so that the various domain controllers can interoperate properly.

Functional Levels



Raising functional levels

Active Directory Communications

- Active Directory services are implemented in the network's domain controllers.
- Each domain controller hosts one domain, storing the domain's objects in a database.
- Users and computers that are members of a domain access the domain controller frequently, as they log on to the domain and access domain resources.
- You should have at least two domain controllers to ensure the Active Directory database is available to clients at all times.

Introducing LDAP

- **Lightweight Directory Access Protocol (LDAP)** has become the standard communications protocol for directory service products, including Active Directory.
- Defines the format of the queries that Active Directory clients send to domain controllers.
- Provides a compound naming structure for uniquely identifying objects in the directory.

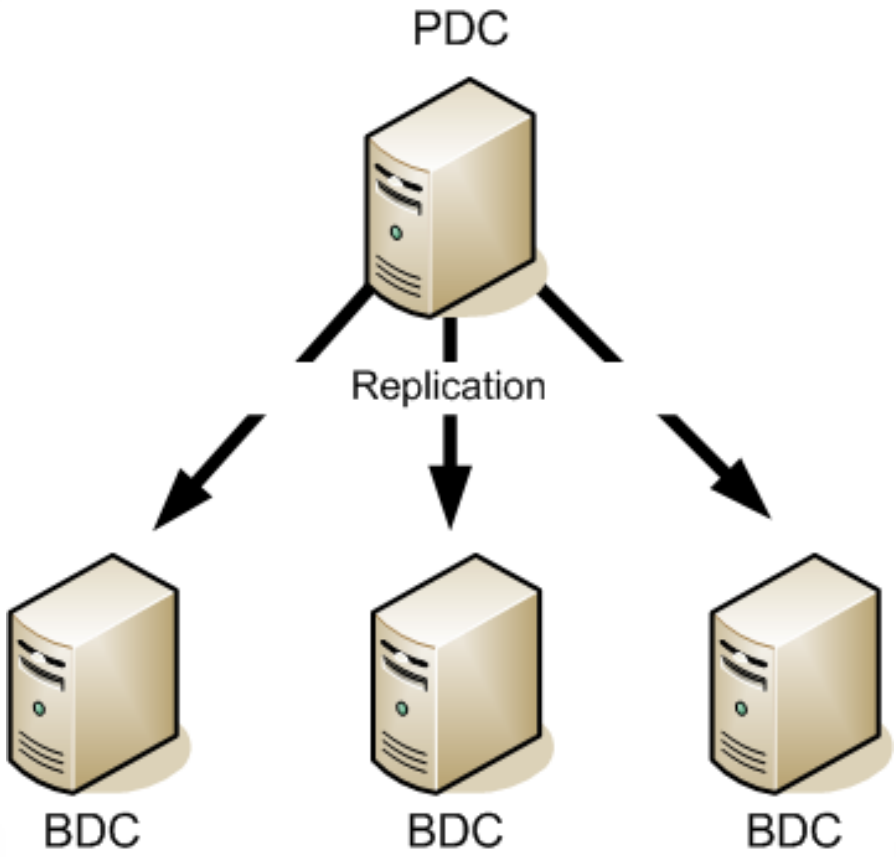
Replication

- **Replication** is when domain controllers within a domain synchronize their database information.
- It is imperative that each domain controller has a database that is identical to the others.

Types of Replication

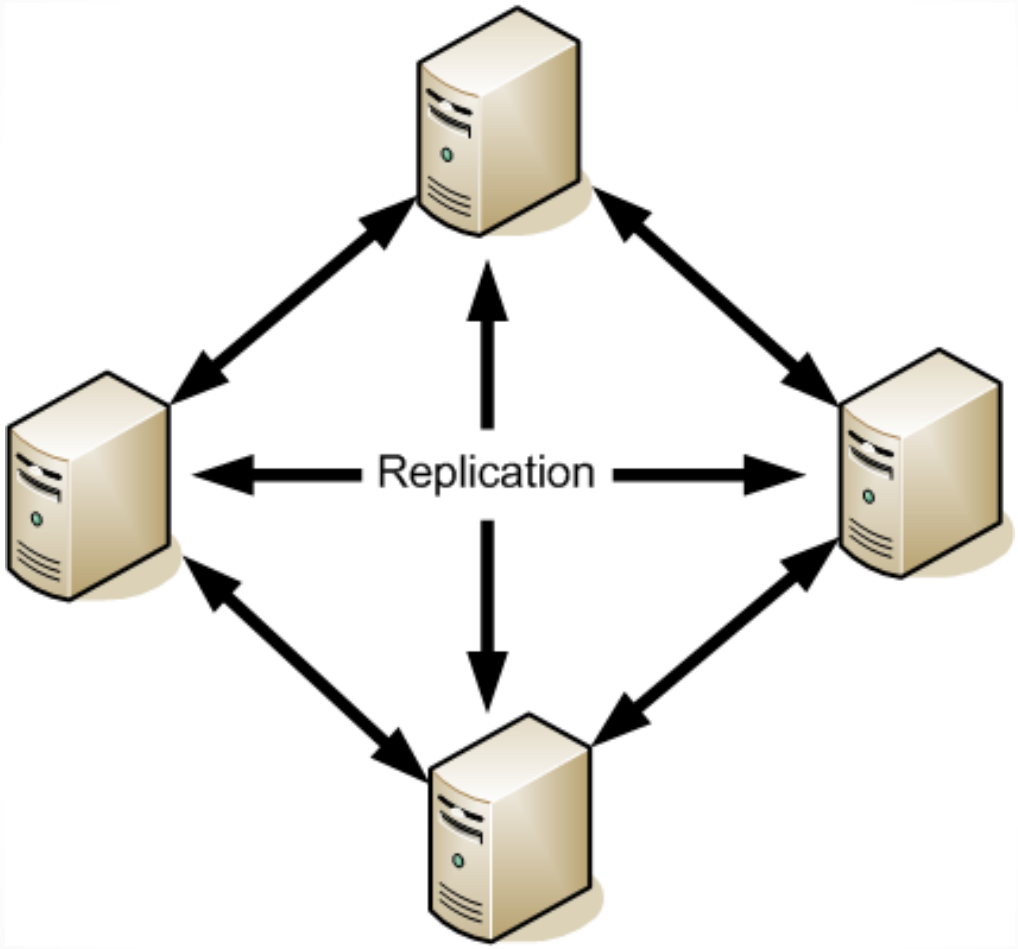
- **Single-master replication**: A single primary system replicates the contents of its database to one or more secondary systems on the network.
- **Multiple-master replication:** It is possible to make changes to domain objects on any domain controller, which replicates those changes to all of the other domain controllers.

Replication



Single-master replication

Replication



Multiple-master replication

Read-Only Domain Controllers (RODCs)

- A domain controller that supports only incoming replication traffic.
- It is not possible to create, modify, or delete Active Directory objects.
- Intended for use in locations that require a domain controller, but which have less physical security or where there are no administrators present who need read/write access to the Active Directory database.

Sites (1)

- A **site** is a collection of subnets that have good connectivity between them.
- Generally speaking, this means that a site consists of all the local area networks (LANs) at a specific location.
- A different site would be a network at a remote location, connected to the other site using a T-1 or a slower WAN technology.

Sites (2)

- Site divisions are wholly independent of domain, tree, and forest divisions:
  - You can have multiple sites that are part of a single domain.
  - You can have separate domains, trees, or forests for each site.
- The primary reason for creating different sites on an Active Directory network is to control the amount of traffic passing over the relatively slow and expensive WAN links between locations.

Site Topology

A site topology consists of three AD DS object types:

- **Sites:** A site object represents the group of subnets at a single location, with good connectivity.
- **Subnets:** A subnet object represents an IP network at a particular site.
- **Site links:** A site link object represents a WAN connection between two sites.

AD DS Regulatory Functions

Once the site topology is in place you can make decisions about:

- Domain controller location
- Replication traffic control

Deploying Active Directory Domain Services

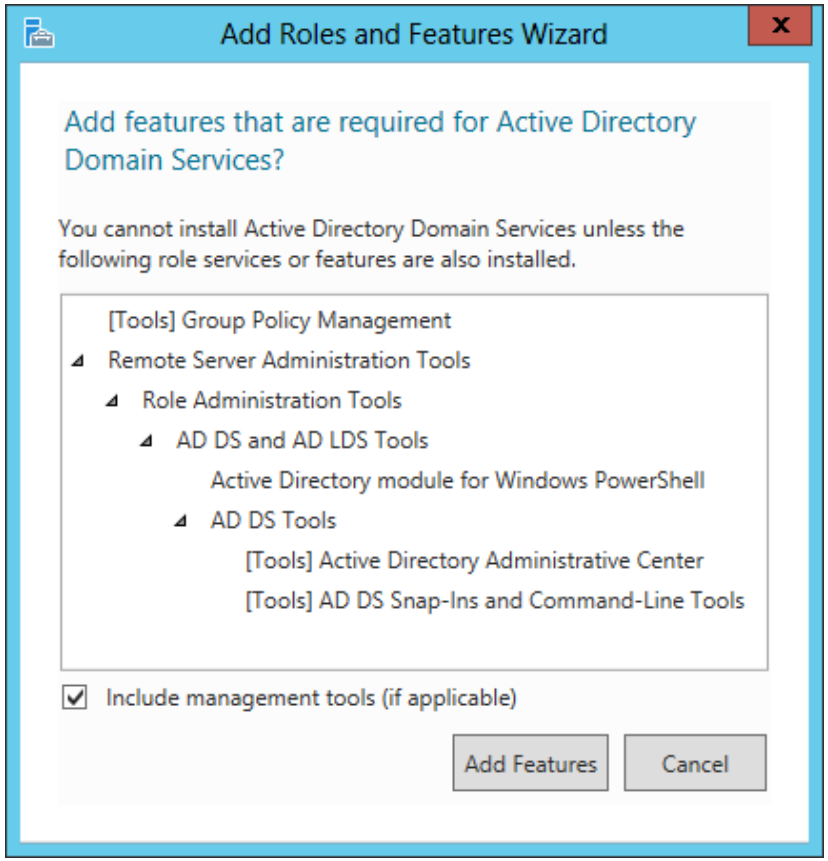
Lesson 13: Installing Domain Controllers

Deploying AD DS

There are many variables that can affect the performance of an Active Directory installation:

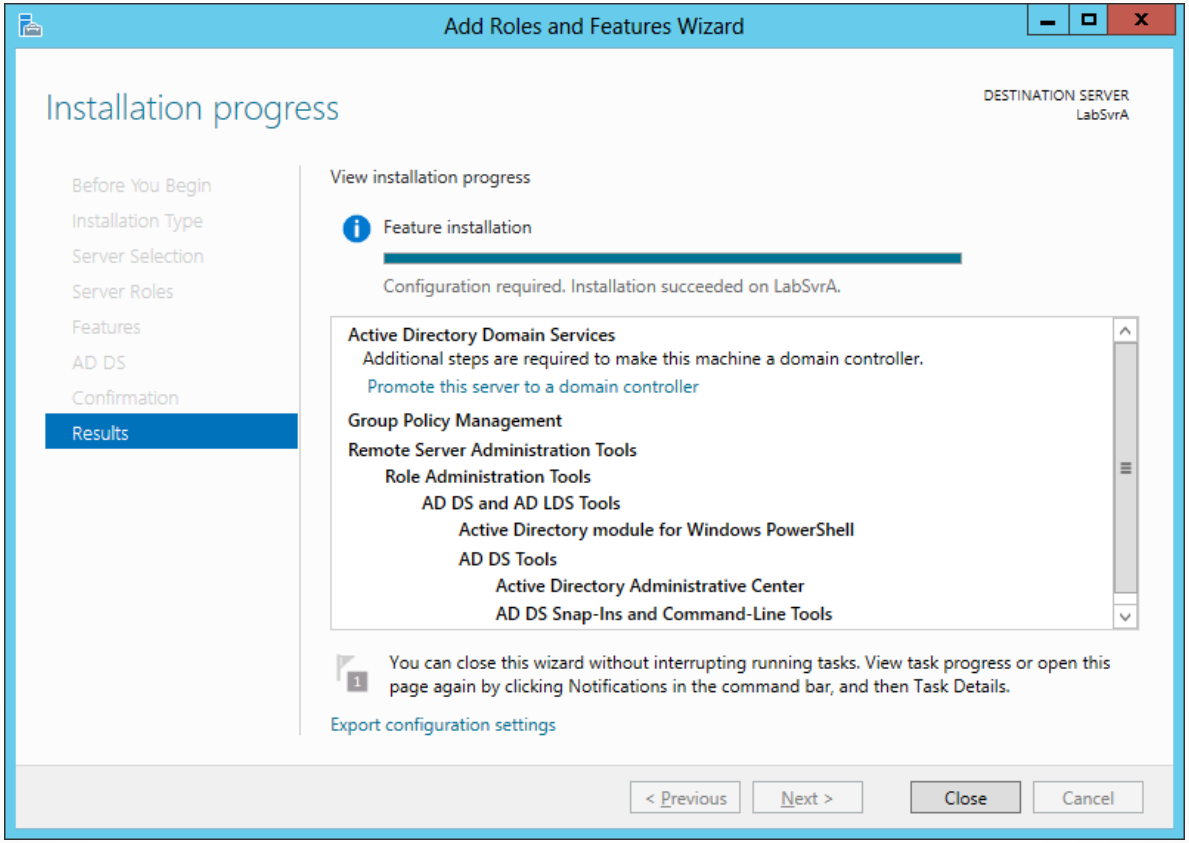
- The hardware you select for your domain controllers
- The capabilities of your network
- The types of WAN links connecting your remote sites

Installing the AD DS Role



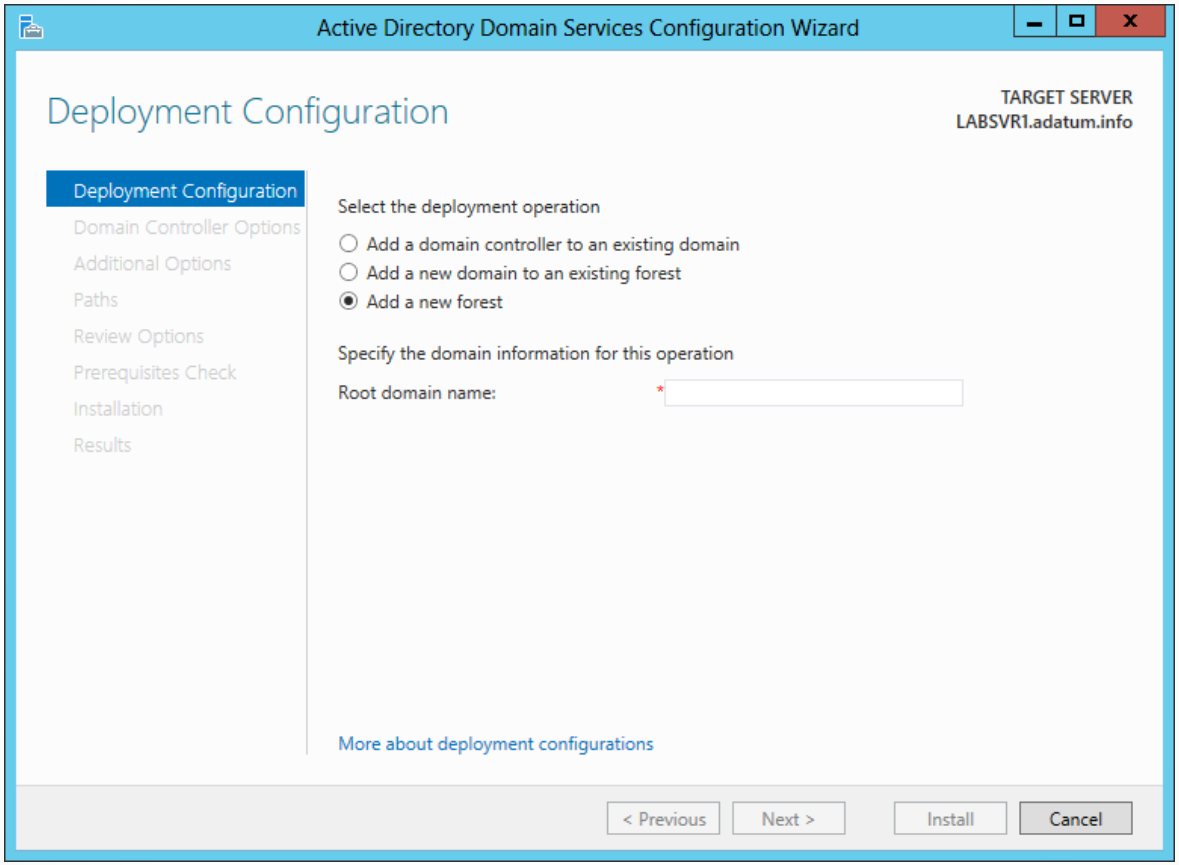
The Add features that are required dialog box in the Add Roles and Features Wizard

Installing the AD DS Role



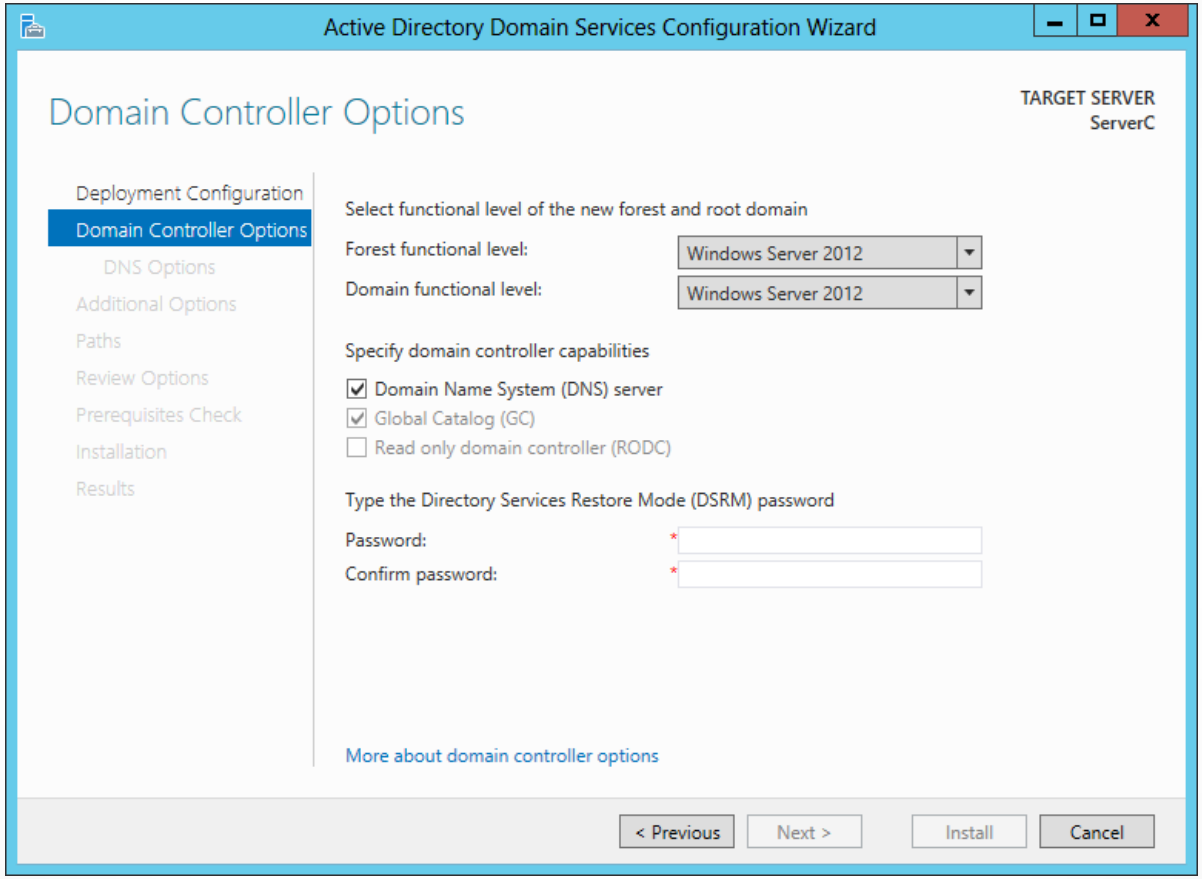
The Installation progress page in the Add Roles and Features Wizard

Creating a New Forest



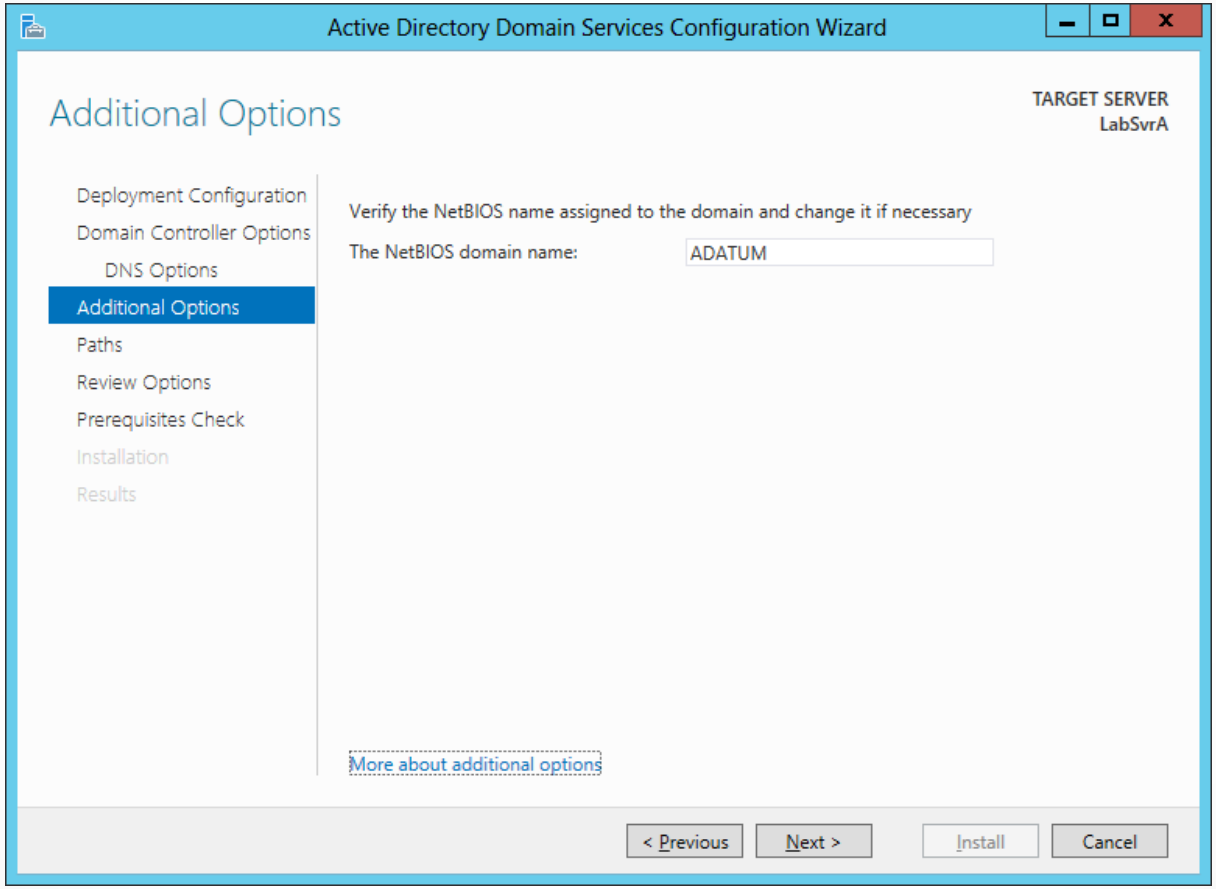
The Deployment Configuration page of the Active Directory Domain Services Configuration Wizard

Creating a New Forest



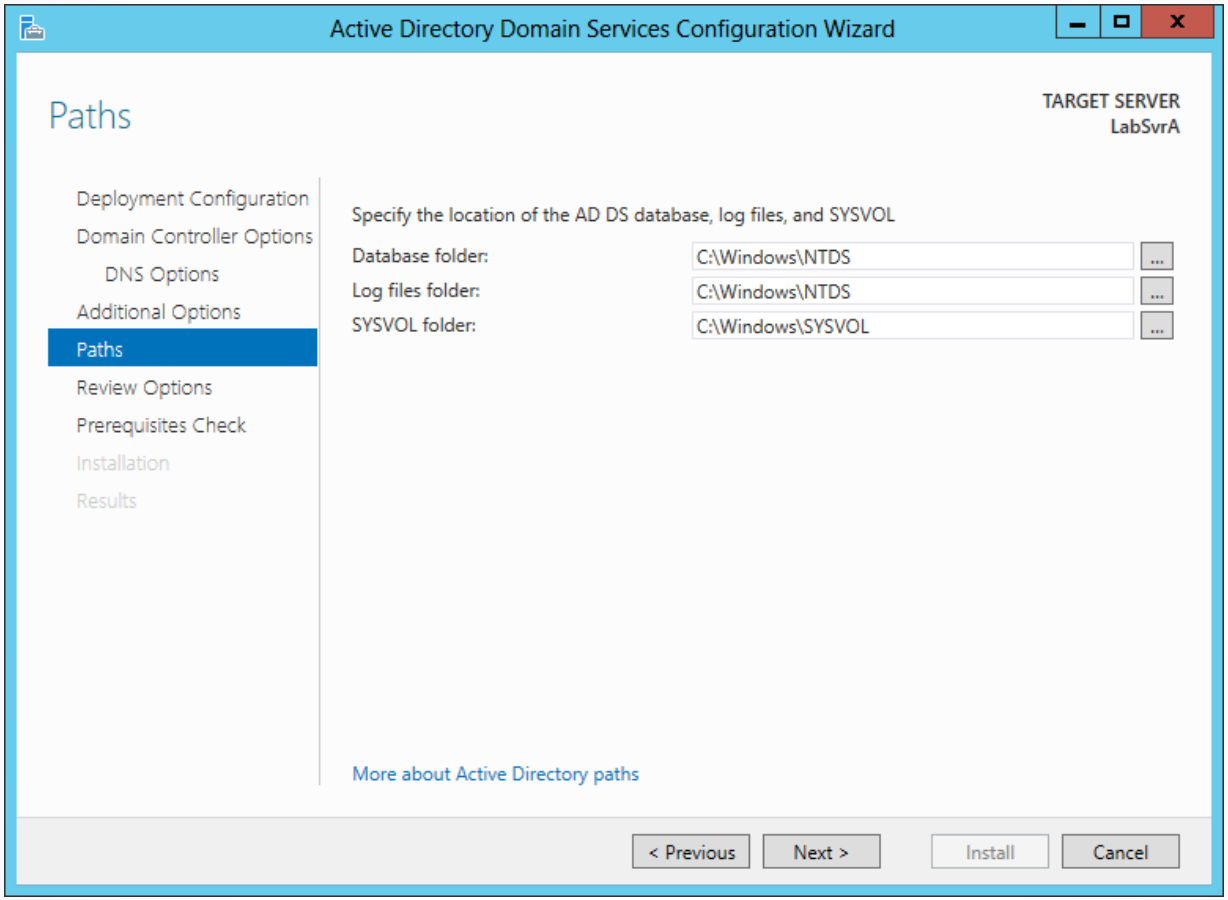
The Domain Controller Options page of the Active Directory Domain Services Configuration Wizard

Creating a New Forest



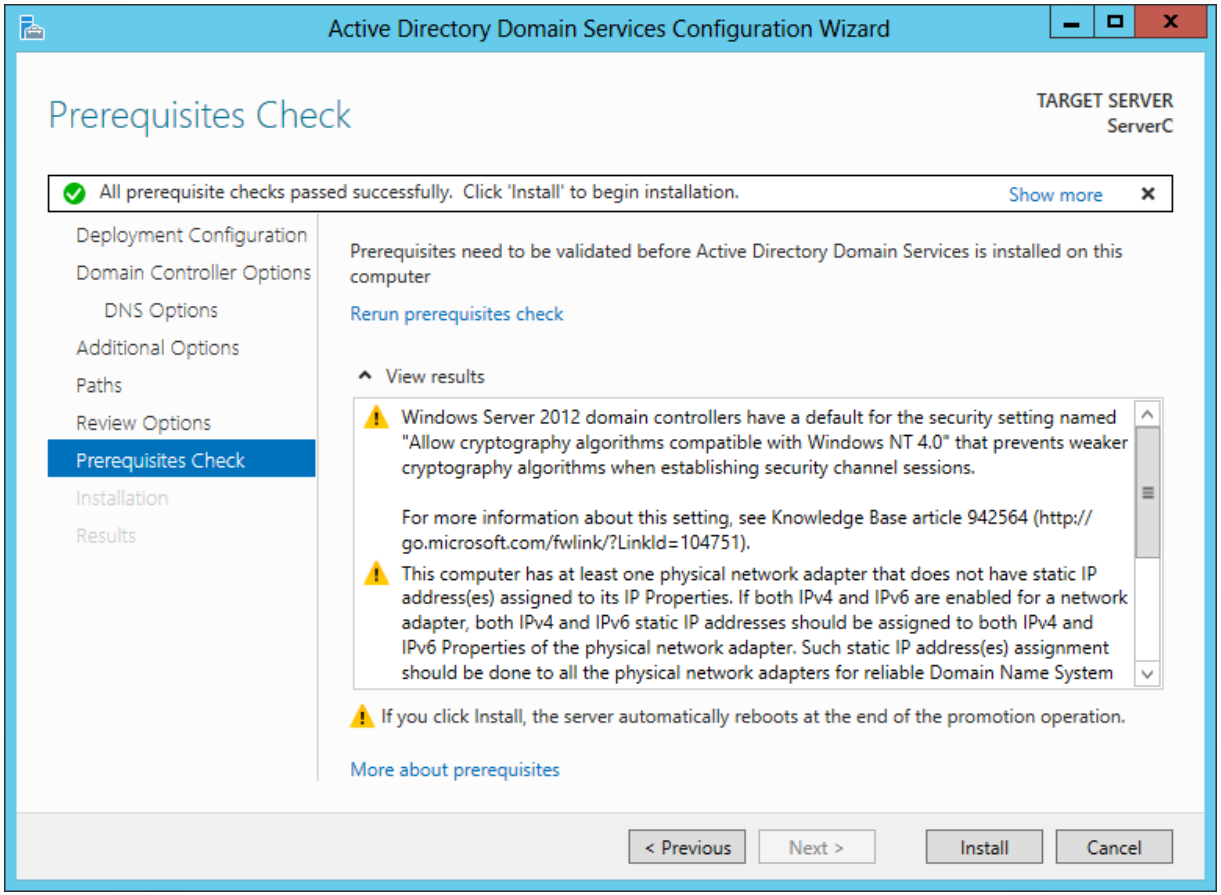
The Additional Options page of the Active Directory Domain Services Configuration Wizard

Creating a New Forest



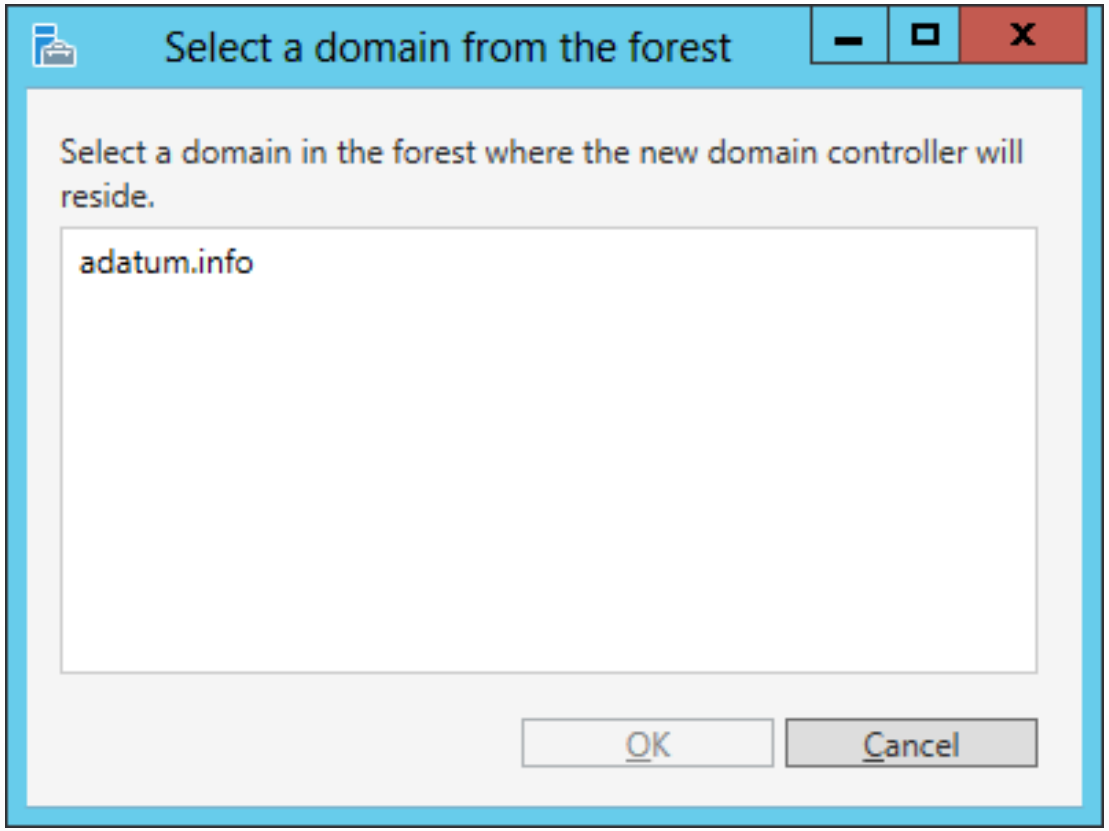
The Paths page of the Active Directory Domain Services Configuration Wizard

Creating a New Forest



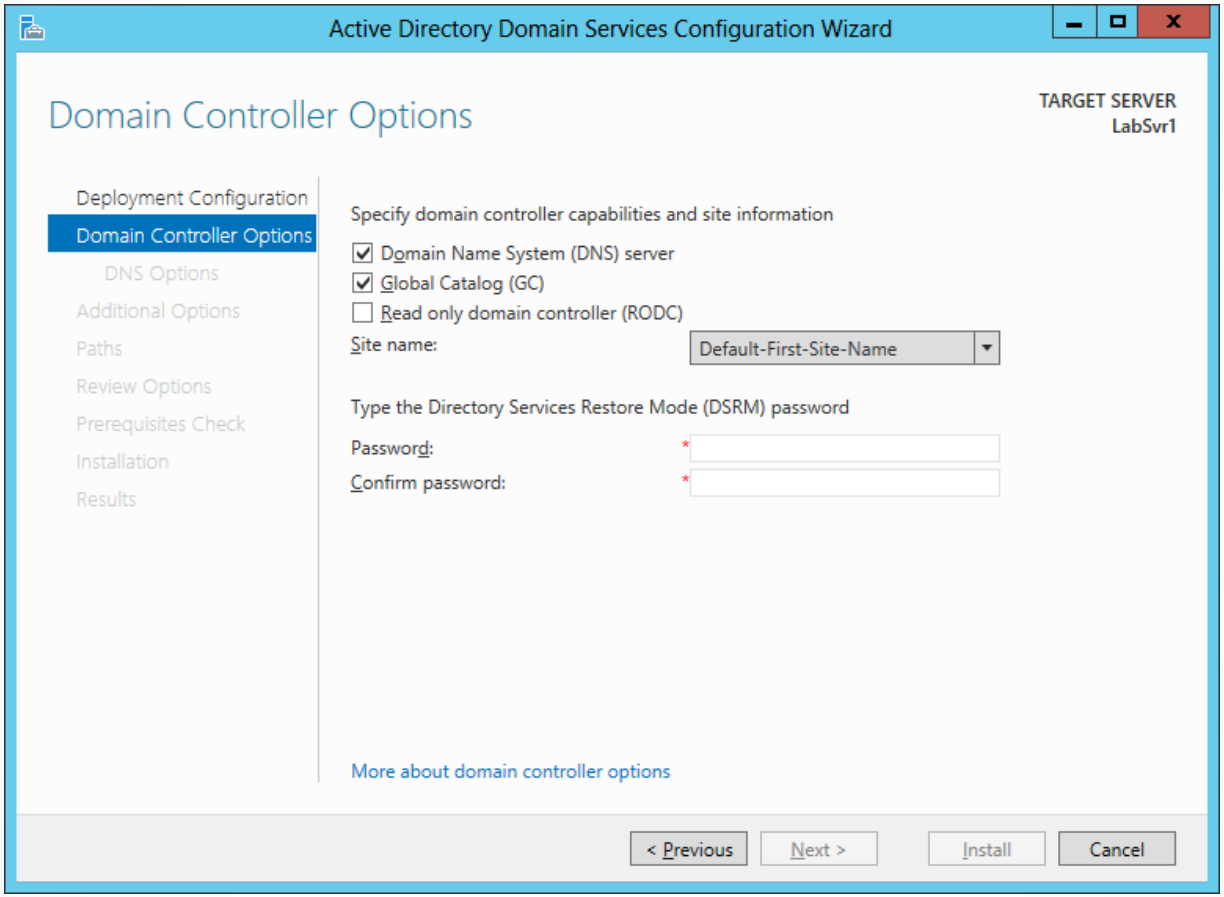
The Prerequisites Check page of the Active Directory Domain Services Configuration Wizard

Adding a Domain Controller to an Existing Domain



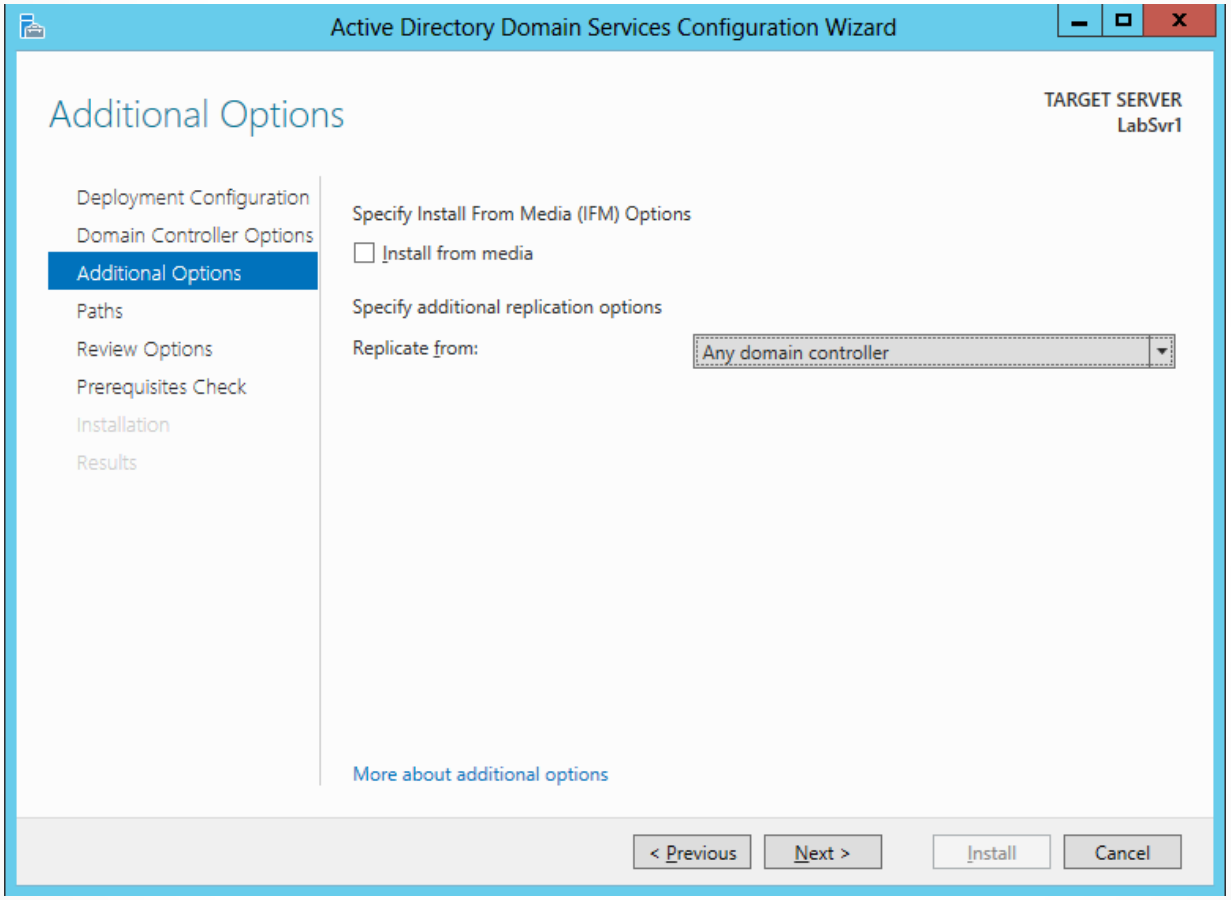
The Select a domain from the forest page of the Active Directory Domain Services Configuration Wizard

Adding a Domain Controller to an Existing Domain



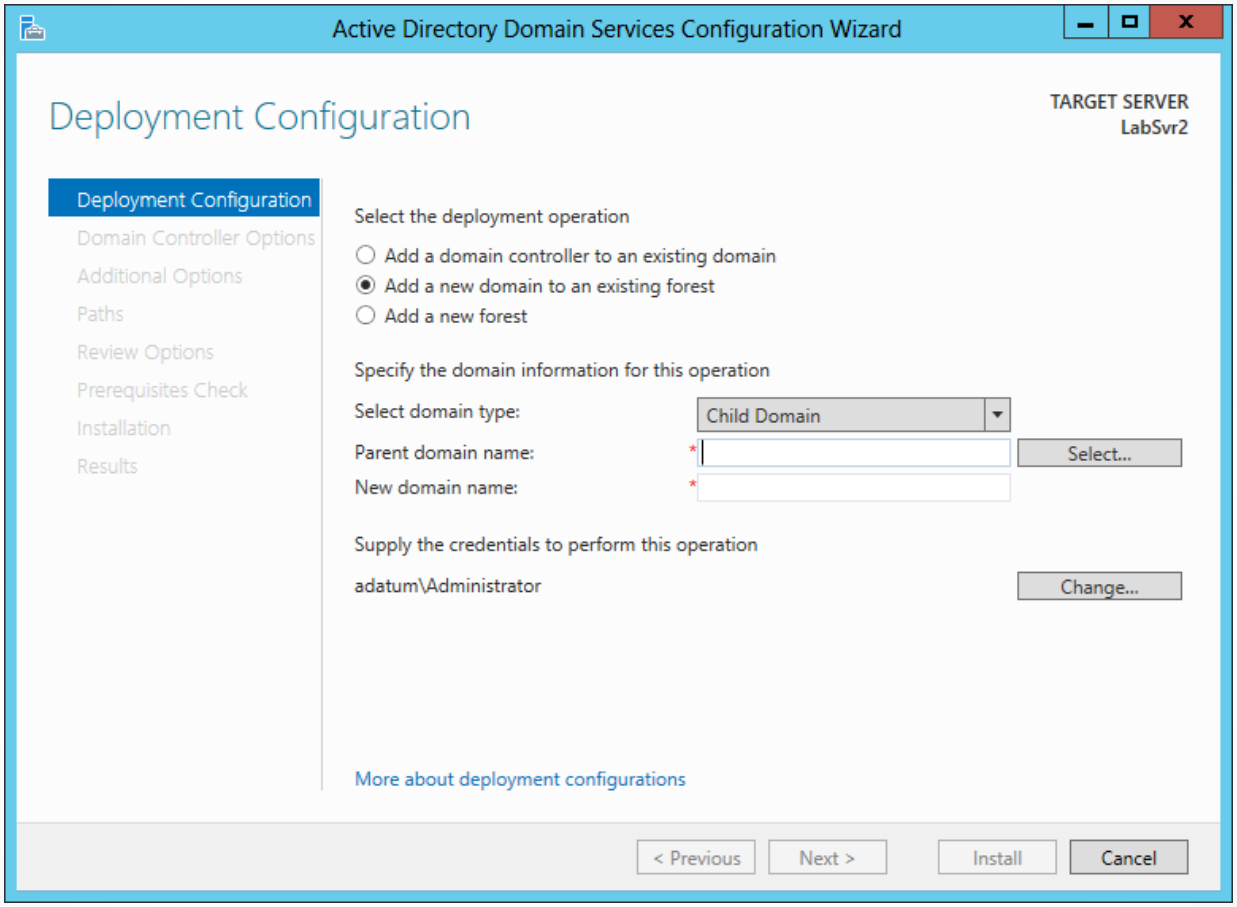
The Domain Controller Options page of the Active Directory Domain Services Configuration Wizard

Adding a Domain Controller to an Existing Domain



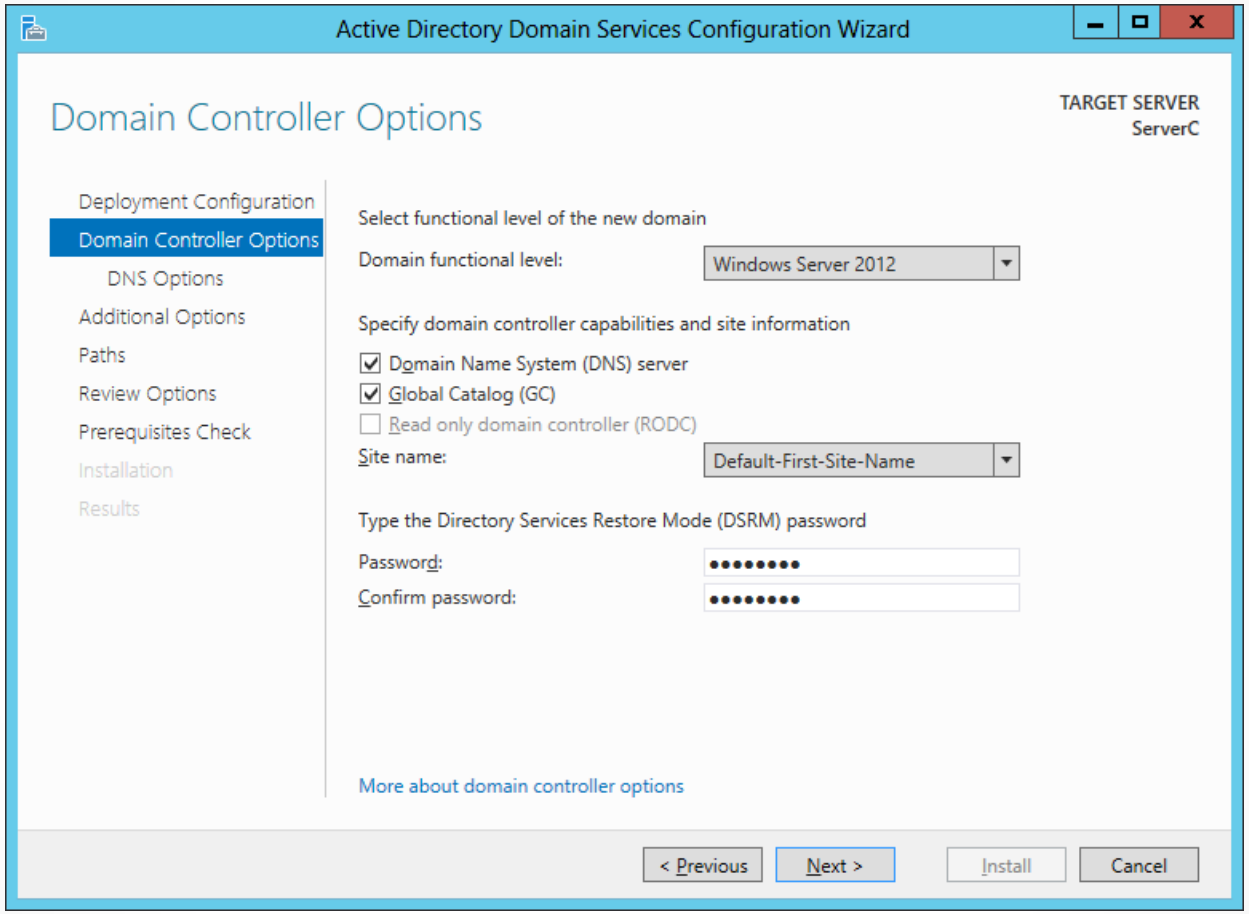
The Additional Options page of the Active Directory Domain Services Configuration Wizard

Creating a New Child Domain in a Forest



The Deployment Configuration page of the Active Directory Domain Services Configuration Wizard

Creating a New Child Domain in a Forest



The Domain Controller Options page of the Active Directory Domain Services Configuration Wizard

Installing AD DS on Server Core

- In Windows Server 2012, it is now possible to install Active Directory Domain Services on a computer running the Server Core installation option and promote the system to a domain controller, all using Windows PowerShell.
- To Install the AD DS role, use the following command:

```
Install-WindowsFeature –name AD-Domain-
  Services -IncludeManagementTools
```

Installing AD DS on Server Core

After installing the role, you must promote the server to a domain controller using the ADDSDeployment PowerShell module.

There are three separate cmdlets for the three deployment configurations:

- Install-AddsForest
- Install-AddsDomainController
- Install-AddsDomain

Installing AD DS on Server Core

Administrator: Windows PowerShell

```
PS C:\Users\Administrator> get-help Install-AddsForest

NAME
    Install-ADDSForest

SYNTAX
    Install-ADDSForest -DomainName <string> [-SkipPreChecks] [-SafeModeAdministratorPassword <securestring>]
    [-CreateDnsDelegation] [-DatabasePath <string>] [-DnsDelegationCredential <pscredential>] [-NoDnsOnNetwork]
    [-DomainMode <DomainMode> {Win2003 | Win2008 | Win2008R2 | Win2012 | Default}] [-DomainNetbiosName <string>]
    [-ForestMode <ForestMode> {Win2003 | Win2008 | Win2008R2 | Win2012 | Default}] [-InstallDns] [-LogPath <string>]
    [-NoRebootOnCompletion] [-SkipAutoConfigureDns] [-SysvolPath <string>] [-Force] [-WhatIf] [-Confirm]
    [<CommonParameters>]
```

Syntax for the Install-AddsForest cmdlet in Windows PowerShell

Installing AD DS on Server Core

Another way to do this is to use a computer running Windows Server 2012 with the full GUI option to generate a script.

Begin by running the **Active Directory Domain Services Configuration Wizard**, configuring all of the options with your desired settings. When you reach the *Review Option* page, click the *View Script* button to display the PowerShell code for the appropriate cmdlet.

Installing AD DS on Server Core

tmpD4C6.tmp - Notepad

File Edit Format View Help

```
#
# Windows PowerShell script for AD DS Deployment
#

Import-Module ADDSDeployment
Install-ADDSDomainController `
-NoGlobalCatalog:$true `
-Credential (Get-Credential) `
-CriticalReplicationOnly:$false `
-DatabasePath "C:\Windows\NTDS" `
-DomainName "adatum.info" `
-InstallDns:$false `
-LogPath "C:\Windows\NTDS" `
-NoRebootOnCompletion:$false `
-SiteName "Default-First-Site-Name" `
-SysvolPath "C:\Windows\SYSVOL" `
-Force:$true
```

An installation script generated by the Active Directory Domain Services Configuration Wizard

Install from Media (IFM)

- **Install from media** is an option that enables administrators to streamline the process of deploying replica domain controllers to remote sites.
- Using a command line tool called **Ndtsutil.exe**, administrators can create domain controller installation media that includes a copy of the AD DS database.
- When using this installation media, the data is installed along with the database structure and no replication is needed.

Install From Media (IFM)

Administrator: Command Prompt - ntdsutil

```
C:\Windows\system32>ntdsutil
ntdsutil: activate instance ntds
Active instance set to "ntds".
ntdsutil: ifm
ifm: create full c:\ifm
Creating snapshot...
Snapshot set {807a3a63-c75e-4ae3-8e4d-d3fd2dd4bfc7} generated successfully.
Snapshot {b350adae-bca3-4ff7-a57a-389727c68c99} mounted as C:\$SNAP_201208171630
_VOLUMEC$\
Snapshot {b350adae-bca3-4ff7-a57a-389727c68c99} is already mounted.
Initiating DEFRAGMENTATION mode...
     Source Database: C:\$SNAP_201208171630_VOLUMEC$\Windows\NTDS\ntds.dit
     Target Database: c:\ifm\Active Directory\ntds.dit

                 Defragmentation  Status (% complete)

          0    10   20   30   40   50   60   70   80   90  100
          |----|----|----|----|----|----|----|----|----|----|
          ..................................................

Copying registry files...
Copying c:\ifm\registry\SYSTEM
Copying c:\ifm\registry\SECURITY
Snapshot {b350adae-bca3-4ff7-a57a-389727c68c99} unmounted.
IFM media created successfully in c:\ifm
ifm: _
```

An Ntdsutil.exe command sequence

Upgrading AD DS

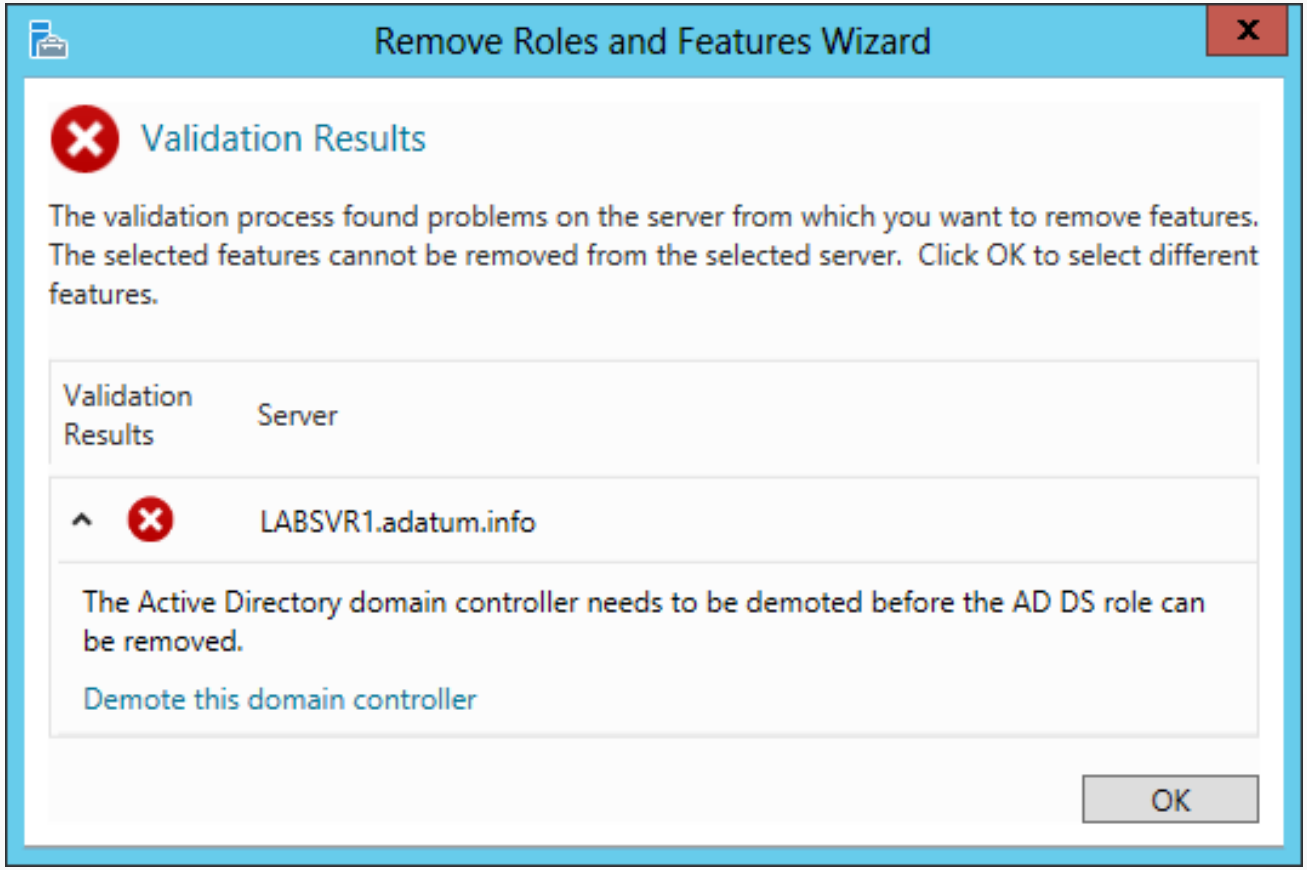
Two ways to upgrade an AD DS infrastructure:

- Upgrade the existing down-level domain controllers to Windows Server 2012.
- Add a new Windows Server 2012 domain controller to your existing installation.

Removing a Domain Controller

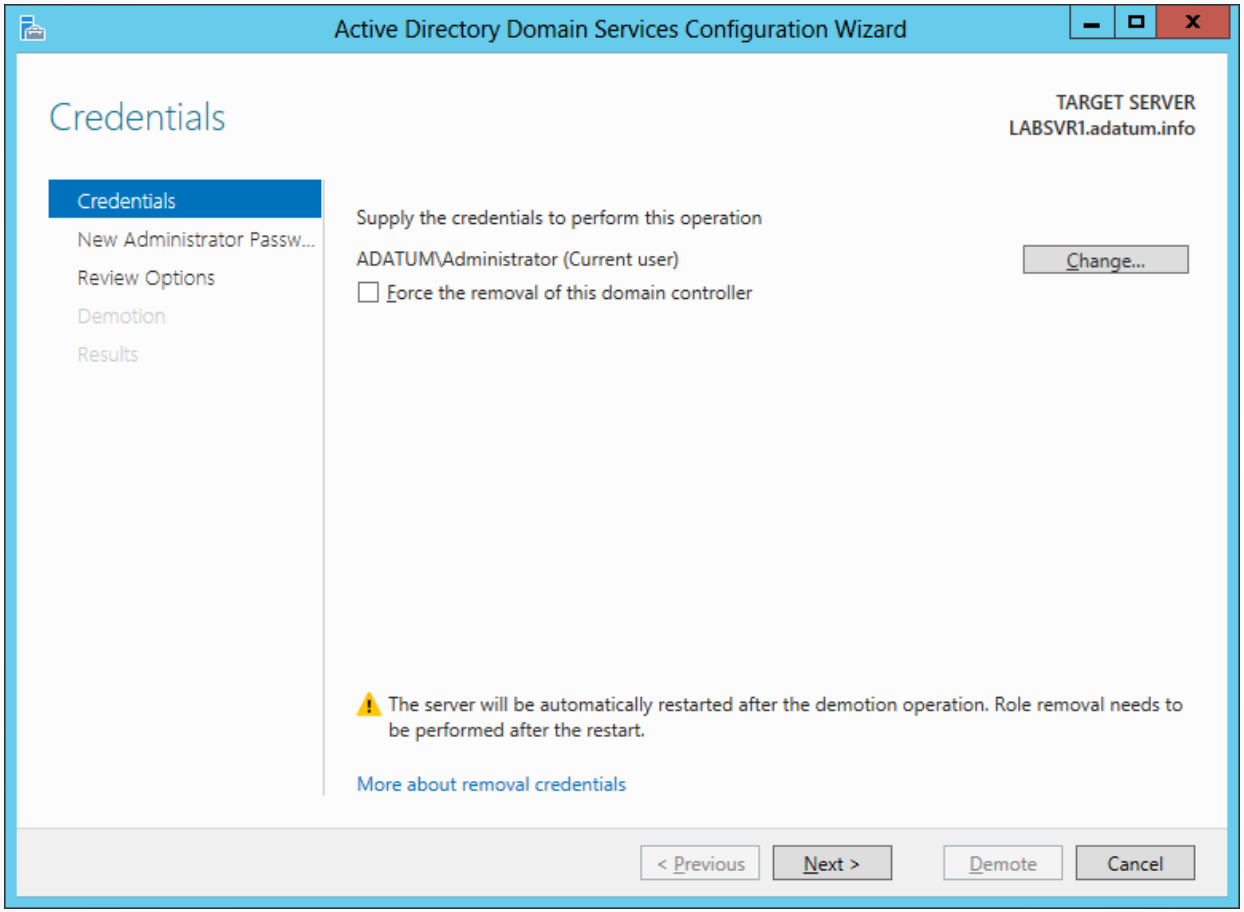
- To remove a domain controller from an AD DS installation, you must begin by running the Remove Roles and Features Wizard.
- Select *Demote this Domain Controller*.

Remove a Domain Controller



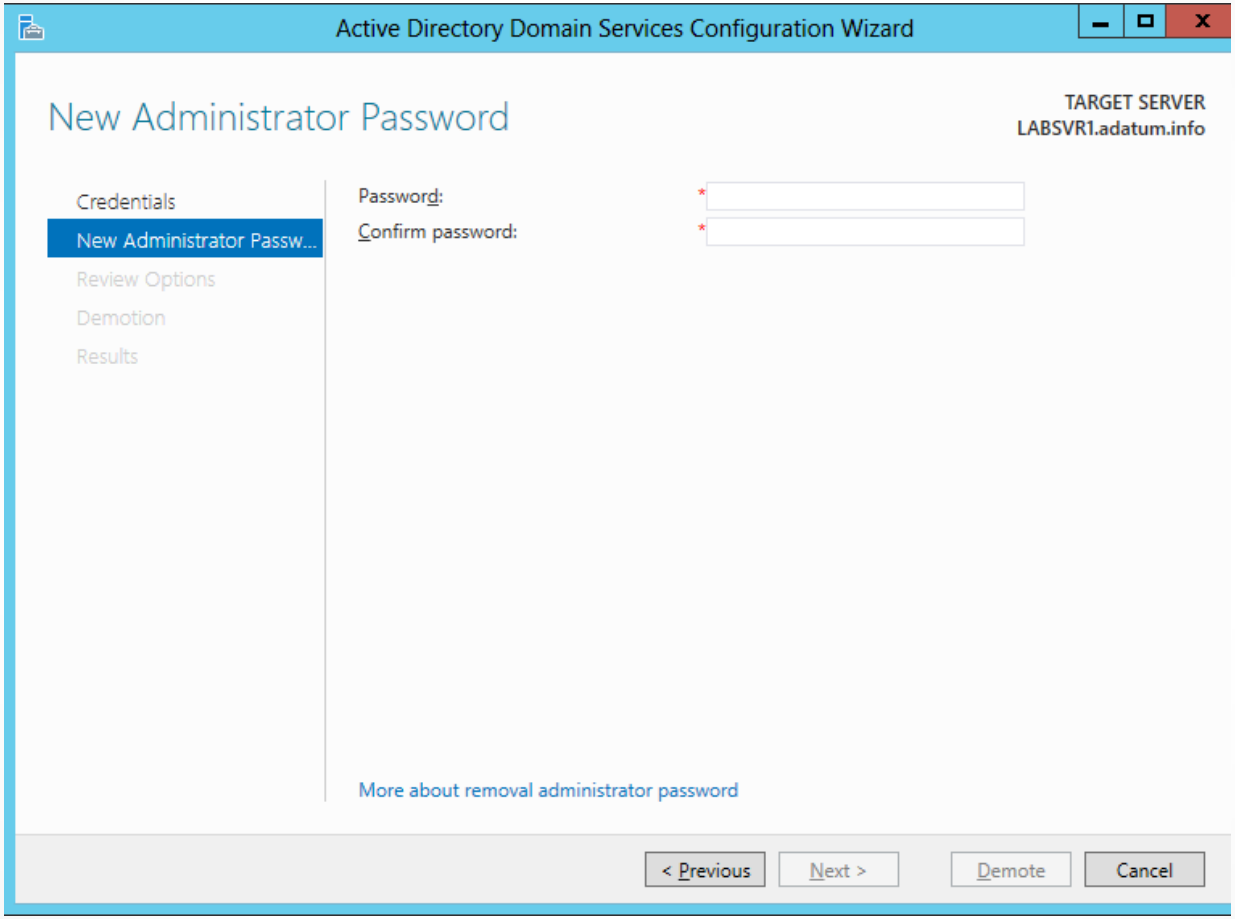
The Validation Results dialog box of the Remove Roles and Features Wizard

Remove a Domain Controller



The Credentials page of the Active Directory Domain Services Configuration Wizard

Remove a Domain Controller

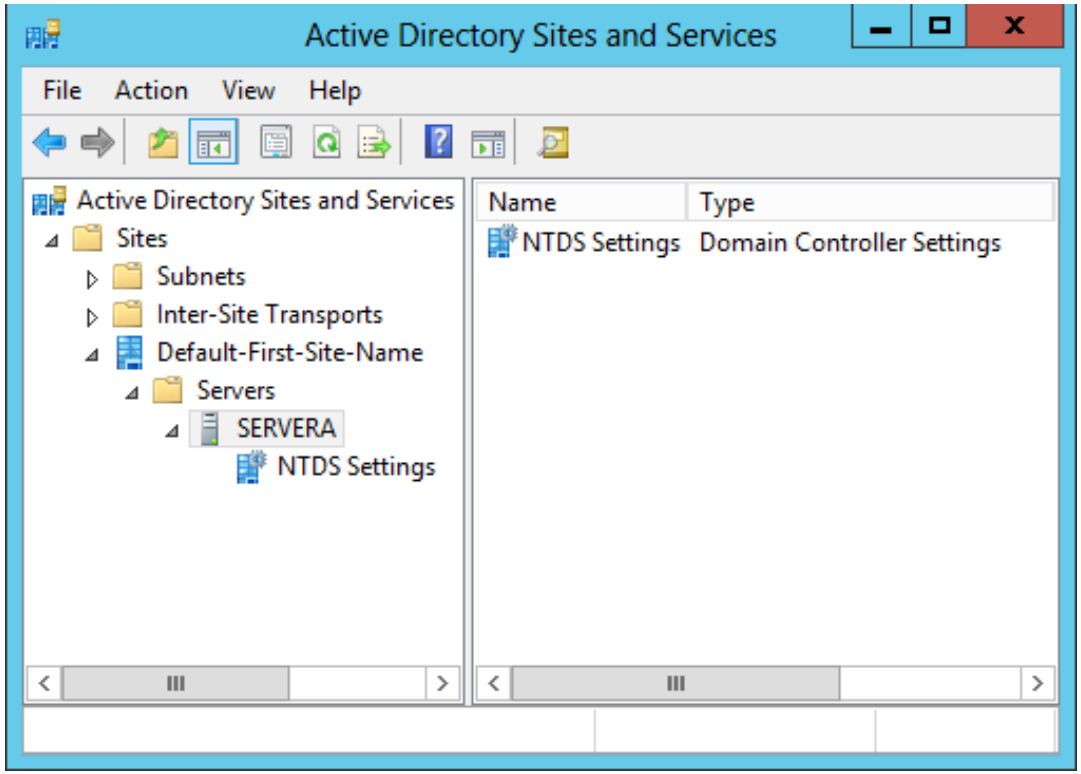


The New Administrator Password page of the Active Directory Domain Services Configuration Wizard

Configuring the Global Catalog

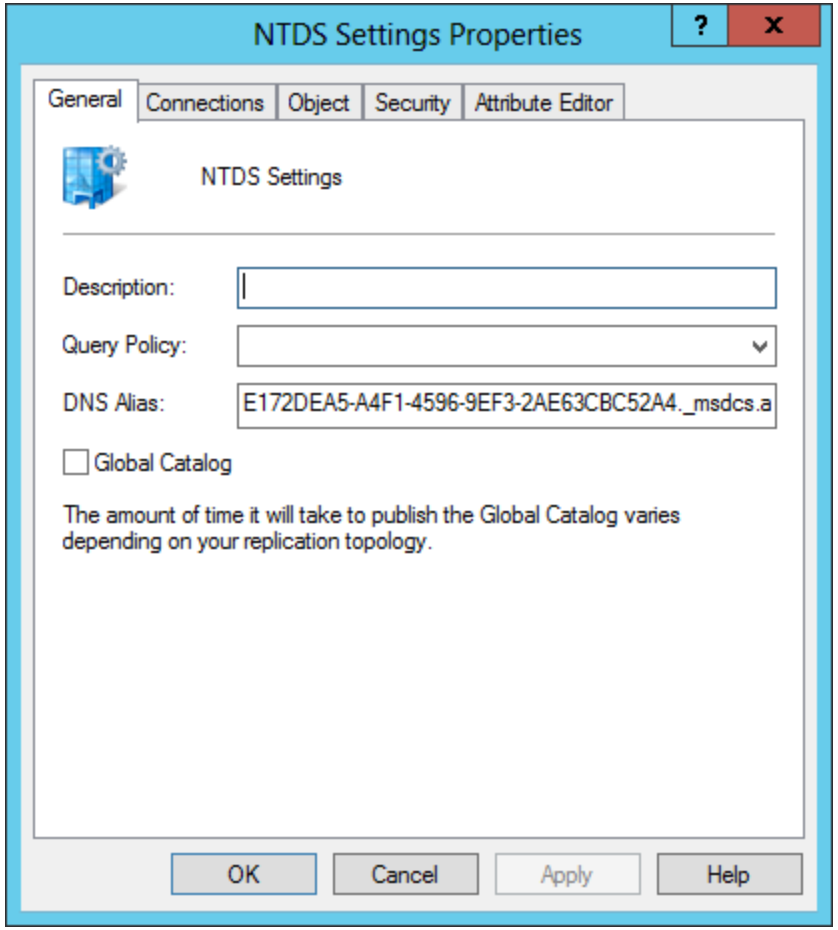
- The importance of the global catalog varies depending on the size of your network and its site configuration.
- You can make a domain controller a global catalog server when you promote a server to a domain controller, or you can do it afterward.

Create a Global Catalog Server



The Active Directory Sites and Services console

Create a Global Catalog Server



The NTDS Settings Properties sheet

Troubleshooting DNS SRV Registration Failure

- The Domain Name System (DNS) is essential to the operating of Active Directory Domain Services.
- A special DNS resource record (SRV) was created that enables clients to locate domain controllers and other vital AD DS services.
- The **dcdiag** command can be used to confirm that a domain controller has been registered in the DNS.

Troubleshooting DNS SRV Registration Failure

Administrator: Command Prompt

```
C:\Windows\system32>dcdiag /test:registerindns /dnsdomain:adatum.info /v
   Starting test: RegisterInDNS
      DNS configuration is sufficient to allow this domain controller to
      dynamically register the domain controller Locator records in DNS.

      The DNS configuration is sufficient to allow this computer to dynamically
      register the A record corresponding to its DNS name.

      ......................... LabSvrA passed test RegisterInDNS

C:\Windows\system32>
```

A successful dcdiag test

Lesson Summary

- A directory service is a repository of information about the resources—hardware, software, and human—which are connected to a network. Microsoft first introduced the Active Directory directory service in Windows 2000 Server, and they have upgraded it in each successive server operating system release, including Windows Server 2012.
- When you create your first domain on an Active Directory network, you are, in essence, creating the root of a domain tree. You can populate the tree with additional domains, as long as they are part of the same contiguous name space.
- When beginning a new AD DS installation, the first step is to create a new forest, which you do by creating the first domain in the forest, the forest root domain.

Lesson Summary

- In Windows Server 2012, it is now possible to install AD DS on a computer running the Server Core installation option and promote the system to a domain controller, all using Windows PowerShell.
- Install from media (IFM) is an option that enables administrators to streamline the process of deploying replica domain controllers to remote sites.
- There are two ways to upgrade an AD DS infrastructure. You can upgrade the existing down-level domain controllers to Windows Server 2012, or add a new Windows Server 2012 domain controller to your existing installation.

Lesson Summary

- The global catalog is an index of all the AD DS objects in a forest that prevents systems from having to perform searches among multiple domain controllers.
- The Domain Name System (DNS) is essential to the operating of Active Directory Domain Services. To accommodate directory services such as AD DS, a special DNS resource record was created that enables clients to locate domain controllers and other vital AD DS services.