Module 1: Deploying and Managing Windows Server 2012
Lab: Deploying and Managing Windows Server 2012

Exercise 1: Deploying Windows Server 2012

► Task 1: Install the Windows Server 2012 R2 server

1. Open the Hyper-V Manager console.
2. Click 20410D-LON-SVR3.
3. In the Actions pane, click Settings.
4. Under Hardware, click DVD Drive.
5. Click Image file, and then click Browse.
6. Browse to D:\Program Files\Microsoft Learning\20410\Drives, and then click Windows2012R2RTM.iso.
7. Click Open, and then click OK.
8. In the Hyper-V Manager console, double-click 20410D-LON-SVR3.
9. In the Virtual Machine Connection Window, in the Action menu, click Start.
10. In the Windows Setup Wizard, on the Windows Server 2012 R2 page, verify the following settings, and then click Next:
   o Language to install: English (United States)
   o Time and currency format: English (United States)
   o Keyboard or input method: US
12. On the Select the operating system you want to install page, select Windows Server 2012 R2 Datacenter Evaluation (Server with a GUI), and then click Next.
13. On the License terms page, review the operating system license terms, select the I accept the license terms check box, and then click Next.
15. On the Where do you want to install Windows? page, verify that Drive 0 Unallocated Space has enough space for the Windows Server 2012 R2 operating system, and then click Next.

Note: Depending on the speed of the equipment, the installation takes approximately 20 minutes. The virtual machine will restart several times during this process.

16. On the Settings page, in both the Password and Reenter password boxes, enter the password Pa$$w0rd, and then click Finish.
Task 2: Change the server name
1. Sign in to LON-SVR3 as Administrator with the password Pa$$w0rd.
2. In Server Manager, click Local Server.
3. Click the randomly generated name next to Computer name.
4. In the System Properties dialog box, on the Computer Name tab, click Change.
5. In the Computer Name/Domain Changes dialog box, in the Computer name text box, enter the name LON-SVR3, and then click OK.
6. In the Computer Name/Domain Changes dialog box, click OK.
7. Close the System Properties dialog box.
8. In the Microsoft Windows dialog box, click Restart Now.

Task 3: Change the date and time
1. Sign in to server LON-SVR3 as Administrator with the password Pa$$w0rd.
2. On the taskbar, click the time display. A pop-up window with a calendar and a clock appears.
3. In the pop-up window, click Change date and time settings.
4. In the Date and Time dialog box, click Change Time Zone.
5. In the Time Zone Settings dialog box, set the time zone to your current time zone, and then click OK.
6. In the Date and Time dialog box, click Change Date and Time.
7. Verify that the date and time that display in the Date and Time Settings dialog box match those in your classroom, and then click OK.
8. To close the Date and Time dialog box, click OK.

Task 4: Configure the network
1. On LON-SVR3, in the Server Manager console, click Local Server.
2. In the Server Manager console, next to Ethernet, click IPv4 address assigned by DHCP, IPv6 Enabled.
3. In the Network Connections dialog box, right-click Ethernet, and then click Properties.
4. In the Ethernet Properties dialog box, click Internet Protocol Version 4 (TCP/IPv4), and then click Properties.
5. In the Internet Protocol Version 4 (TCP/IPv4) Properties dialog box, click Use the following IP address, enter the following IP address information, and then click OK:
   - IP address: 172.16.0.101
   - Subnet Mask: 255.255.0.0
   - Default Gateway: 172.16.0.1
   - Preferred DNS server: 172.16.0.10
6. Click Close to close the Ethernet Properties dialog box.
7. Close the Network Connections dialog box.
Task 5: Add the server to the domain
1. On LON-SVR3, in the Server Manager console, click Local Server.
2. Next to Workgroup, click WORKGROUP.
3. In the System Properties dialog box, on the Computer Name tab, click Change.
4. In the Computer Name/Domain Changes dialog box, in the Member Of area, click the Domain option.
5. In the Domain box, type adatum.com, and then click OK.
6. In the Windows Security dialog box, enter the following details, and then click OK:
   - Username: Administrator
   - Password: Pa$$w0rd

7. In the Computer Name/Domain Changes dialog box, click OK.
8. When informed that you must restart the computer to apply the changes, click OK.
9. In the System Properties dialog box, click Close.
10. In the Microsoft Windows dialog box, click Restart Now.
11. After LON-SVR3 restarts, sign in as Adatum\Administrator with the password Pa$$w0rd.

Results: After completing this exercise, you should have deployed Windows Server 2012 on LON-SVR3. You also should have configured LON-SVR3, including name change, date and time, and networking.

Exercise 2: Configuring Windows Server 2012 Server Core

Task 1: Set computer name
1. Sign in to LON-CORE as Administrator with the password Pa$$w0rd.
2. At the command prompt, type sconfig.cmd and press Enter.
3. To select Computer Name, type 2, and then press Enter.
4. Enter the computer name LON-CORE, and then press Enter.
5. In the Restart dialog box, click Yes.
6. Sign in to server LON-CORE using the Administrator account with the password Pa$$w0rd.
7. At the command prompt, type hostname, and then press Enter to verify the computer’s name.

Task 2: Change the computer’s date and time
1. Ensure you are signed in to server LON-CORE as Administrator with the password Pa$$w0rd.
2. At the command prompt, type sconfig.cmd, and then press Enter.
3. To select Date and Time, type 9, and then press Enter.
4. In the Date and Time dialog box, click Change time zone. Set the time zone to the same time zone that your classroom uses, and then click OK.
5. In the Date and Time dialog box, click Change Date and Time, and verify that the date and time match those in your location. To dismiss the dialog boxes, click OK two times.
6. In the Command Prompt window, type 15, and then press Enter to exit Server Configuration.
Task 3: Configure the network

1. Ensure that you are signed in to server LON-CORE using the account Administrator and the password Pa$$w0rd.
2. At the command prompt, type sconfig.cmd, and then press Enter.
3. To configure Network Settings, type 8, and then press Enter.
4. Type the index number of the network adapter that you want to configure, and then press Enter.
5. On the Network Adapter Settings page, type 1, and then press Enter. This sets the Network Adapter Address.
6. To select static IP address configuration, type S, and then press Enter.
7. At the Enter static IP address: prompt, type 172.16.0.111, and then press Enter.
8. At the Enter subnet mask prompt, type 255.255.0.0, and then press Enter.
9. At the Enter default gateway prompt, type 172.16.0.1, and then press Enter.
10. On the Network Adapter Settings page, type 2, and then press Enter.

This configures the DNS server address.
11. At the Enter new preferred DNS server prompt, type 172.16.0.10, and then press Enter.
12. In the Network Settings dialog box, click OK.
13. To choose not to configure an alternate DNS server address, press Enter.
14. Type 4, and then press Enter to return to the main menu.
15. Type 15, and then press Enter to exit sconfig.cmd.
16. At the command prompt, type ping lon-dc1.adatum.com to verify connectivity to the domain controller from LON-CORE.

Task 4: Add the server to the domain

1. Ensure that you are signed in to server LON-CORE using the account Administrator with the password Pa$$w0rd.
2. At the command prompt, type sconfig.cmd, and then press Enter.
3. To switch to configure Domain/Workgroup, type 1, and then press Enter.
4. To join a domain, type D, and then press Enter.
5. At the Name of domain to join prompt, type adatum.com, and press Enter.
6. At the Specify an authorized domain\user prompt, type Adatum\Administrator, and then press Enter.
7. At the Type the password associated with the domain user prompt, type Pa$$w0rd, and then press Enter.
8. At the Change Computer Name prompt, click No.
9. In the Restart dialog box, click Yes.
10. Sign in to server LON-CORE with the Adatum\Administrator account and the password Pa$$w0rd.

Results: After you complete this exercise, you should have configured a Windows Server 2012 Server Core deployment and verified the server's name.
Exercise 3: Managing Servers

Task 1: Create a server group
1. Sign in to LON-DC1 with the Administrator account and the password Pa$$w0rd.
2. In the Server Manager console, click Dashboard, and then click Create a server group.
3. In the Create Server Group dialog box, click the Active Directory tab, and then click Find Now.
4. In the server group name box, type LAB-1.
5. Use the arrow to add LON-CORE and LON-SVR3 to the server group. Click OK to close the Create Server Group dialog box.
6. In the Server Manager console, click LAB-1. Press and hold the Ctrl key, and then select both LON-CORE and LON-SVR3.
7. Scroll down, and under the Performance section, select both LON-CORE and LON-SVR3.
8. Right-click LON-CORE, and then click Start Performance Counters.

Task 2: Deploy features and roles to both servers
1. In Server Manager on LON-DC1, click LAB-1.
2. Scroll to the top of the pane, right-click LON-CORE, and then click Add Roles and Features.
3. In the Add Roles and Features Wizard, click Next.
4. On the Select installation type page, click Role-based or feature-based installation, and then click Next.
5. On the Select destination server page, verify that LON-CORE.Adatum.com is selected, and then click Next.
6. On the Select server roles page, select Web Server (IIS), and then click Next.
7. On the Features page, select Windows Server Backup, and then click Next.
8. On the Web Server Role (IIS) page, click Next.
9. On the Select role services page, add the Windows Authentication role service, and then click Next.
10. On the Confirm installation selections page, select the Restart the destination server automatically if required check box, and then click Install.
11. Click Close to close the Add Roles and Features Wizard.
12. In Server Manager, right-click LON-SVR3, and then click Add Roles and Features.
13. In the Add Roles and Features Wizard, on the Before you begin page, Click Next.
14. On the Select installation type page, click Role-based or feature-based installation. Click Next.
15. On the Select destination server page, verify that LON-SVR3.Adatum.com is selected, and then click Next.
17. On the Select features page, click Windows Server Backup, and then click Next.
18. On the Confirm installation selections page, select the Restart the destination server automatically if required check box, and then click Install.
19. Once the install commences, click Close.

20. In Server Manager, refresh the view, click the IIS node, and then verify that LON-CORE is listed.

▶ Task 3: Review services and change a service setting

1. Sign in to LON-CORE with the Adatum\Administrator account and the password Pa$$w0rd.
2. In the Command Prompt window, type the following two commands, and press Enter after each one:

```
netsh.exe advfirewall firewall set rule group="remote desktop" new enable=yes
netsh.exe advfirewall firewall set rule group="remote event log management" new enable=yes
```

3. Sign in to LON-DC1 with the Adatum\Administrator account and the password Pa$$w0rd.
4. In Server Manager, click LAB-1.
5. Right-click LON-CORE, and then click Computer Management.
6. In the Computer Management console, expand Services and Applications, and then click Services.
7. Right-click the World Wide Web Publishing service, and then click Properties. Verify that the Startup type is set to Automatic.
8. In the World Wide Web Publishing Service dialog box, on the Log On tab, verify that the service is configured to use the Local System account.
9. On the Recovery tab, configure the following settings, and then click the Restart Computer Options button:
   - First failure: Restart the Service
   - Second failure: Restart the Service
   - Subsequent failures: Restart the Computer
   - Reset fail count after: 1 days
   - Restart service after: 1 minute
10. In the Restart Computer Options dialog box, in the Restart Computer After box, type 2, and then click OK.
11. Click OK to close the World Wide Web Publishing Services Properties dialog box.

Results: After you complete this exercise, you should have created a server group, deployed roles and features, and configured the properties of a service.
Exercise 4: Using Windows PowerShell to Manage Servers

- Task 1: Use Windows PowerShell to connect remotely to servers and view information
  1. Sign in to LON-DC1 with the `Adatum\Administrator` account and the password `Pa$$w0rd`.
  2. In the Server Manager console, click **LAB-1**.
  3. Right-click **LON-CORE**, and then click **Windows PowerShell**.
  4. At the command prompt, type the following, and then press Enter:

```
Import-Module ServerManager
```

5. To review the roles and features installed on LON-CORE, at the command prompt, type the following, and then press Enter:

```
Get-WindowsFeature
```

6. To review the running services on LON-CORE, at the command prompt, type the following, and then press Enter:

```
Get-service | where-object {$__.status -eq "Running"}
```

7. To view a list of processes on LON-CORE, at the command prompt, type the following, and then press Enter:

```
Get-process
```

8. To review the IP addresses assigned to the server, at the command prompt, type the following, and then press Enter:

```
Get-NetIPAddress | Format-table
```

9. To review the most recent 10 items in the security log, at the command prompt, type the following, and then press Enter:

```
Get-EventLog Security -Newest 10
```


- Task 2: Use Windows PowerShell to remotely install new features
  1. On LON-DC1, on the taskbar, click the **Windows PowerShell** icon.
  2. To verify that the XPS Viewer feature has not been installed on LON-SVR3, type the following command, and then press Enter:

```
Get-WindowsFeature -ComputerName LON-SVR3
```

3. To deploy the XPS Viewer feature on LON-SVR3, type the following command, and then press Enter:

```
Install-WindowsFeature XPS-Viewer -ComputerName LON-SVR3
```

4. To verify that the XPS Viewer feature has now been deployed on LON-SVR3, type the following command, and then press Enter:

```
Get-WindowsFeature -ComputerName LON-SVR3
```
5. In the Server Manager console, from the **Tools** drop-down menu, click **Windows PowerShell ISE**.

6. In the Windows PowerShell ISE window, in the Untitled1.ps1 script pane, type the following, pressing Enter after each line:

   ```powershell
   Import-Module ServerManager
   Install-WindowsFeature WINS -ComputerName LON-SVR3
   Install-WindowsFeature WINS -ComputerName LON-CORE
   ```

7. Click the **Save** icon.

8. Select the root of **Local Disk (C:)**.

9. Create a new folder named **Scripts**, and then save the script in that folder as **InstallWins.ps1**.

10. To run the script, press the F5 key.

**Results**: After you complete this exercise, you should have used Windows PowerShell to perform a remote installation of features on multiple servers.

► **Prepare for the next module**

After you finish the lab, revert the virtual machines to their initial state by completing the following steps:

1. On the host computer, switch to the **Hyper-V Manager** console.

2. In the **Virtual Machines** list, right-click **20410D-LON-DC1**, and then click **Revert**.

3. In the **Revert Virtual Machine** dialog box, click **Revert**.

4. Repeat steps 2 and 3 for **20410D-LON-CORE** and **20410D-LON-SVR3**.
Module 2: Introduction to Active Directory Domain Services
Lab: Installing Domain Controllers

Exercise 1: Installing a Domain Controller

▶ Task 1: Add an Active Directory Domain Services (AD DS) role to a member server
1. On LON-DC1, in Server Manager, in the left column, click All Servers.
2. Right-click All Servers, and then click Add Servers.
3. In the Add Servers dialog box, in the Name (CN) box, type LON-SVR1, and then click Find Now.
4. Under Name, click LON-SVR1, and then click the arrow to add the server to the Selected column.
5. Click OK to close the Add Servers dialog box.
6. In Server Manager, in the Servers pane, right-click LON-SVR1, and then select Add Roles and Features.
7. In the Add Roles and Features Wizard, click Next.
8. On the Select installation type page, ensure that Role-based or feature-based installation is selected, and then click Next.
9. On the Select destination server page, ensure that Select a server from the server pool is selected.
10. Under Server Pool, verify that LON-SVR1.Adatum.com is highlighted, and then click Next.
11. On the Select server roles page, select the Active Directory Domain Services check box, click Add Features, and then click Next.
12. On the Select features page, click Next.
14. On the Confirm installation selections page, select the Restart the destination server automatically if required check box, and then click Install.
   Installation will take several minutes.
15. When the installation completes, click Close to close the Add Roles and Features Wizard.

▶ Task 2: Configure a server as a domain controller
1. On LON-DC1, in Server Manager, on the command bar, click the Notifications icon (it looks like a flag).
2. Under Post-deployment Configuration, click Promote this server to a domain controller.
   The Active Directory Domain Services Configuration Wizard opens.
3. In the Active Directory Domain Services Configuration Wizard, on the Deployment Configuration page, ensure that Add a domain controller to an existing domain is selected, and then, beside the Domain line, click Select.
4. In the Windows Security dialog box, in the Username box, type Administrator, in the Password box, type Pa$$w0rd, and then click OK.
5. In the Select a domain from the forest dialog box, click adatum.com, and then click OK.
6. Beside the Supply the credentials to perform this operation line, click Change.
7. In the **Windows Security** dialog box, in the **Username** box, type `Adatum\Administrator`, and in the **Password** box, type `Pa$$w0rd`, and then click **OK**.

8. On the **Deployment Configuration** page, click **Next**.

9. On the **Domain Controller Options** page, ensure that **Domain Name System (DNS) server** is selected, and then deselect **Global Catalog (GC)**.

   Note that usually, you also want to enable the global catalog, but for the purpose of this lab, this is done in the next lab task.

10. In the **Type the Directory Services Restore Mode (DSRM) password** section, type `Pa$$w0rd` in both text boxes, and then click **Next**.

11. On the **DNS Options** page, click **Next**.

12. On the **Additional Options** page, click **Next**.

13. On the **Paths** page, accept the default folders, and then click **Next**.


15. Close the Notepad window.

16. On the **Review Options** page, click **Next**.

17. On the **Prerequisites Check** page, read any warning messages, and then click **Install**.

18. When the task completes successfully, click **Close**.

19. Wait for LON-SVR1 to restart.

   ▶ **Task 3: Configure a server as a global catalog server**

1. Sign in to LON-SVR1 as `Adatum\Administrator` with the password `Pa$$w0rd`.

2. In Server Manager, click **Tools**, and then click **Active Directory Sites and Services**.

3. When Active Directory Sites and Services opens, expand **Sites**, expand **Default-First-Site-Name**, expand **Servers**, and then expand **LON-SVR1**.

4. In the left column, right-click **NTDS Settings**, and then click **Properties**.

5. In the **NTDS Settings Properties** dialog box, select **Global Catalog (GC)**, and then click **OK**.


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**Results:** After completing this exercise, you will have explored Server Manager and promoted a member server to be a domain controller.
Exercise 2: Installing a Domain Controller by Using IFM

▶ Task 1: Use the ntdsutil tool to generate IFM
1. On LON-DC1, in the lower-left corner of the screen, click the Start button.
2. On the Start screen, type CMD, right click Command Prompt and then click Run as administrator.
3. At a command prompt, type the following, and press Enter after each line:

   ```
   Ntdsutil
   Activate instance ntds
   Ifm
   Create sysvol full c:\ifm
   ```
4. Wait for the IFM command to complete, and then close the command prompt.

▶ Task 2: Add the AD DS role to the member server
1. Switch to LON-SVR2, and then, if required, sign in as Adatum\Administrator with the password Pa$$w0rd.
2. In the lower-left corner of the screen, click the Start button.
3. On the Start screen, type CMD, and then press Enter.
4. Type the following command, and then press Enter:

   ```
   Net use k: \LON-DC1\c$\IFM
   ```
5. Switch to Server Manager.
6. From the list on the left, click Local Server.
7. In the toolbar, click Manage, and then click Add Roles and Features.
8. On the Before you begin page, click Next.
9. On the Select installation type page, ensure that Role-based or feature-based installation is selected, and then click Next.
10. On the Select destination server page, verify that LON-SVR2.Adatum.com is highlighted, and then click Next.
12. In the Add Roles and Features Wizard, click Add Features, and then click Next.
13. On the Select Features page, click Next.
15. On the Confirm installation selections page, click Restart the destination server automatically if required. Click Yes at the message box.
16. Click Install.
17. After the installation completes, click Close.

   If you see a message stating that a delegation for the DNS server cannot be created, click OK.
Task 3: Use IFM to configure a member server as a new domain controller
1. On LON-SVR2, at the command prompt, type the following command, and then press Enter:

   ```
   Robocopy k: c:\ifm /copyall /s
   ```

2. Close the Command Prompt window.
3. In Server Manager, on the command bar, click the Notifications icon.
4. Under Post-deployment Configuration, click Promote this server to a domain controller.
   The Active Directory Domain Services Configuration Wizard will open.
5. On the Deployment Configuration page, ensure that Add a domain controller to an existing domain is selected, and then confirm that adatum.com is the target domain. Click Next.
6. On the Domain Controller Options page, ensure that both Domain Name System (DNS) server and Global Catalog (GC) are selected. For the DSRM password, type Pa$$w0rd in both boxes, and then click Next.
7. On the DNS Options page, click Next.
8. On the Additional Options page, select Install from media, in the Install from media path box, type C:\ifm, and then click verify.
9. When the path has been verified, click Next.
10. On the Paths page, click Next.
11. On the Review Options page, click Next, and then observe the Active Directory Domain Services Configuration Wizard as it performs a check for prerequisites.
12. Click Install, and then wait while AD DS is configured.
   While this task is running, read the information messages that display on the screen.
13. Wait for the server to restart.

Results: After completing this exercise, you will have installed an additional domain controller for the branch office by using IFM.

Prepare for the next module
When you have completed 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. In the Virtual Machines list, right-click 20410D-LON-DC1, and then click Revert.
3. In the Revert Virtual Machine dialog box, click Revert.
4. Repeat steps 2 and 3 for 20410D-LON-SVR1, 20410D-LON-RTR, and 20410D-LON-SVR2.
Module 3: Managing Active Directory Domain Services Objects

Lab: Managing Active Directory Domain Services Objects

Exercise 1: Delegating Administration for a Branch Office

- **Task 1: Delegate administration for Branch Administrators**
  1. Switch to LON-DC1.
  2. In Server Manager, click **Tools**, and then click **Active Directory Users and Computers**.
  3. In Active Directory Users and Computers, click **Adatum.com**.
  4. Right-click **Adatum.com**, point to **New**, and then click **Organizational Unit**.
  5. In the **New Object – Organizational Unit** dialog box, in **Name**, type **Branch Office 1**, and then click **OK**.
  6. Right-click **Branch Office 1**, point to **New**, and then click **Group**.
  7. In the **New Object – Group** dialog box, in **Group name**, type **Branch 1 Help Desk**, and then click **OK**.
  8. Repeat steps 6 and 7 using **Branch 1 Administrators** as the new group name.
  9. Repeat steps 6 and 7 using **Branch 1 Users** as the new group name.
  10. In the navigation pane, click **IT**.
  11. In the details pane, right-click **Holly Dickson**, and then click **Move**.
  12. In the **Move** dialog box, click **Branch Office 1**, and then click **OK**.
  13. Repeat steps 10 through 12 for the following OUs and users:
     - Development and the user **Bart Duncan**
     - Managers and the user **Ed Meadows**
     - Marketing and the user **Connie Vrettos**
     - Research and the user **Barbara Zighetti**
     - Sales and the user **Arlene Huff**
  14. In the navigation pane, click **Computers**.
  15. In the details pane, right-click **LON-CL1**, and then click **Move**.
  16. In the **Move** dialog box, click **Branch Office 1**, and then click **OK**.
  17. Switch to LON-CL1.
  18. Point the mouse at the lower-right corner of the screen, and then click **Settings**.
  19. Click **Power**, and then click **Restart**.
  20. When the computer has restarted, sign in as **Adatum\Administrator** with the password **Pa$$w0rd**.
  21. Switch to LON-DC1.
  22. If necessary, switch to **Active Directory Users and Computers**.
23. In the navigation pane, right-click **Branch Office 1**, click **Delegate Control**, and then click **Next**.
24. On the **Users or Groups** page, click **Add**.
25. In the **Select Users, Computers, or Groups** dialog box, in **Enter the object names to select (examples)**, type **Branch 1 Administrators**, and then click **OK**.
26. On the **Users or Groups** page, click **Next**.
27. On the **Tasks to Delegate** page, in the **Delegate the following common tasks** list, select the following check boxes, and then click **Next**:
   - Create, delete, and manage user accounts
   - Reset user passwords and force password change at next logon
   - Read all user information
   - Create, delete and manage groups
   - Modify the membership of a group
   - Manage Group Policy links
28. On the **Completing the Delegation of Control Wizard** page, click **Finish**.
29. In the navigation pane, right-click **Branch Office 1**, click **Delegate Control**, and then click **Next**.
30. On the **Users or Groups** page, click **Add**.
31. In the **Select Users, Computers, or Groups** dialog box, in **Enter the object names to select (examples)**, type **Branch 1 Help Desk**, and then click **OK**.
32. On the **Users or Groups** page, click **Next**.
33. On the **Tasks to Delegate** page, click **Create a custom task to delegate**, and then click **Next**.
34. On the **Active Directory Object Type** page, select **Only the following objects in the folder**, select the following check boxes, and then click **Next**:
   - Computer objects
   - Create selected objects in this folder
   - Delete selected objects in this folder
35. On the **Permissions** page, select both **General** and **Full Control**, and then click **Next**.
36. On the **Completing the Delegation of Control Wizard** page, click **Finish**.

**Task 2: Delegate a user administrator for the Branch Office Help Desk**
1. On LON-DC1, in the navigation pane, right-click **Branch Office 1**, click **Delegate Control**, and then click **Next**.
2. On the **Users or Groups** page, click **Add**.
3. In the **Select Users, Computers, or Groups** dialog box, in **Enter the object names to select (examples)**, type **Branch 1 Help Desk**, and then click **OK**.
4. On the **Users or Groups** page, click **Next**.
5. On the **Tasks to Delegate** page, in the **Delegate the following common tasks** list, select the following check boxes, and then click **Next**:
   - Reset user passwords and force password change at next logon
   - Read all user information
   - Modify the membership of a group

6. On the **Completing the Delegation of Control Wizard** page, click **Finish**.

**Task 3: Add a member to the Branch Administrators**

1. On LON-DC1, in the navigation pane, click **Branch Office 1**.

2. In the details pane, right-click **Holly Dickson**, and then click **Add to a group**.

3. In the **Select Groups** dialog box, in **Enter the object names to select (examples)**, type **Branch 1 Administrators**, and then click **OK**.

4. In the **Active Directory Domain Services** dialog box, click **OK**.

5. In the details pane, right-click **Branch 1 Administrators**, and then click **Add to a group**.

6. In the **Select Groups** dialog box, in **Enter the object names to select (examples)**, type **Server Operators**, and then click **OK**.

7. In the **Active Directory Domain Services** dialog box, click **OK**.

8. On your host computer, in the 20410D-LON-DC1 window, on the **Action** menu, click **Ctrl+Alt+Delete**.

9. On LON-DC1, click **Sign out**.

10. Sign in to LON-DC1 as **Adatum\Holly** with the password **Pa$$w0rd**.
    
    You can sign in locally at a domain controller because Holly belongs indirectly to the Server Operators domain local group.

11. On the taskbar, click the **Server Manager** icon.

12. In the **User Account Control** dialog box, in **User name**, type **Holly**. In **Password**, type **Pa$$w0rd**, and then click **Yes**.

13. In Server Manager, click **Tools**, and then click **Active Directory Users and Computers**.


15. In the navigation pane, click **Sales**.

16. In the details pane, right-click **Aaren Ekelund**, and then click **Delete**.

17. Click **Yes** to confirm.

18. Click **OK** to acknowledge that you do not have permissions to perform this task.

19. In the navigation pane, click **Branch Office 1**.

20. In the details pane, right-click **Ed Meadows**, and then click **Delete**.

21. Click **Yes** to confirm.

    You are successful because you have the required permissions.
Task 4: Add a member to the Branch Help Desk group

1. On LON-DC1, in the details pane, right-click Bart Duncan, and then click Add to a group.
2. In the Select Groups dialog box, in Enter the object names to select (examples), type Branch 1 Help Desk, and then click OK.
3. In the Active Directory Domain Services dialog box, click OK.
5. Close Server Manager.
6. On the desktop, click Server Manager. In the User Account Control dialog box, in User name, type Adatum\Administrator.
7. In Password, type Pa$$w0rd, and then click Yes.
   To modify the Server Operators membership list, you must have permissions beyond those available to the Branch 1 Administrators group.
8. In Server Manager, click Tools.
9. In the Tools list, click Active Directory Users and Computers.
11. In the navigation pane, click Branch Office 1.
12. In the details pane, right-click Branch 1 Help Desk, and then click Add to a group.
13. In the Select Groups dialog box, in Enter the object names to select (examples), type Server Operators, and then click OK.
14. In the Active Directory Domain Services dialog box, click OK.
15. On your host computer, in the 20410D-LON-DC1 window, on the Action menu, click Ctrl+Alt+Delete.
16. On LON-DC1, click Sign out.
17. Sign in as Adatum\Bart with the password Pa$$w0rd.
   You can sign in locally at a domain controller because Bart belongs indirectly to the Server Operators domain local group.
18. On the desktop, click Server Manager.
19. In the User Account Control dialog box, in User name, type Bart. In Password, type Pa$$w0rd, and then click Yes.
20. In Server Manager, click Tools.
23. In the navigation pane, click Branch Office 1.
24. In the details pane, right-click Connie Vrettos, and then click Delete.
25. Click Yes to confirm.
   You are unsuccessful because Bart lacks the required permissions.
26. Click OK.
27. Right-click Connie Vrettos, and then click Reset Password.
28. In the **Reset Password** dialog box, in **New password** and **Confirm password**, type `Pa$$w0rd`, and then click **OK**.

29. Click **OK** to confirm the successful password reset.

30. On your host computer, in the 20410D-LON-DC1 window, on the **Action** menu, click **Ctrl+Alt+Delete**.

31. On LON-DC1, click **Sign out**.

32. Sign in to LON-DC1 as **Adatum\Administrator** with the password `Pa$$w0rd`.

**Results:** After completing this exercise, you will have successfully created an OU, and delegated administration of it to the appropriate group.

---

**Exercise 2: Creating and Configuring User Accounts in AD DS**

**Task 1:** Create a user template for the branch office

1. On LON-DC1, on the taskbar, click the **File Explorer** icon.

2. Double-click **Local Disk (C:)**.

3. On the menu, click **Home**, and then click **New folder**.

4. Type **branch1-userdata**, and then press Enter.

5. Right-click **branch1-userdata**, and then click **Properties**.

6. In the **branch1-userdata Properties** dialog box, on the **Sharing** tab, click **Advanced**.

7. Select **Share this folder**, and then click **Permissions**.

8. In the **Permissions for branch1-userdata** dialog box, for the **Full Control** permission select the **Allow** check box, and then click **OK**.

9. In the **Advanced Sharing** dialog box, click **OK**, and then in the **branch1-userdata Properties** dialog box, click **Close**.

10. In Server Manager, click **Tools**, and then click **Active Directory Users and Computers**, and then expand **Adatum.com**.

11. Right-click **Branch Office1**, point to **New**, and then click **User**.

12. In the **New Object – User** dialog box, in **Full name**, type **_Branch_template**.

13. In **User logon name**, type **_Branch_template**, and then click **Next**.

14. In **Password** and **Confirm password**, type `Pa$$w0rd`.

15. Select the **Account is disabled** check box, and then click **Next**.

16. Click **Finish**.

**Task 2:** Configure the template settings

1. On LON-DC1, from within the **Branch Office 1** OU, right-click **_Branch_template**, and then click **Properties**.

2. In the **_Branch_template Properties** dialog box, on the **Address** tab, in **City**, type **Slough**.

3. Click the **Member Of** tab, and then click **Add**.
4. In the Select Groups dialog box, in Enter the object names to select (examples), type Branch 1 Users, and then click OK.

5. Click the Profile tab.

6. Under Home folder, click Connect, and then in the To box, type \lon-dc1\branch1-userdata\%username%.

7. Click Apply, and then click OK.

8. Task 3: Create a new user for the branch office, based on the template
   1. On LON-DC1, right-click _Branch_template, and then click Copy.
   2. In the Copy Object – User dialog box, in First name, type Ed.
   3. In Last name, type Meadows.
   4. In User logon name, type Ed, and then click Next.
   5. In Password and Confirm password, type Pa$$w0rd.
   6. Clear the User must change password at next logon check box.
   7. Clear the Account is disabled check box, and then click Next.
   8. Click Finish.
   9. Right-click Ed Meadows, and then click Properties.
   10. In the Ed Meadows Properties dialog box, on the Address tab, notice that the City is configured already.
   11. Click the Profile tab.
       Notice that the home folder location is configured already.
   12. Click the Member Of tab.
       Notice that Ed belongs to the Branch 1 Users group. Click OK.
   13. On your host computer, in the 20410D-LON-DC1 window, on the Action menu, click Ctrl+Alt+Delete.
   14. On LON-DC1, click Sign out.

9. Task 4: Sign in as a user to test account settings
   1. Switch to LON-CL1.
   2. On your host computer, in the 20410D-LON-CL1 window, on the menu, click Ctrl+Alt+Delete.
   3. On LON-CL1, click Switch User.
   4. Sign in to LON-CL1 as Adatum\Ed with the password Pa$$w0rd.
   5. On the Start screen, type File Explorer, and then press Enter.
   6. Verify that drive Z is present.
   7. Double-click Ed (\lon-dc1\branch1-userdata) (Z:).
   8. If you receive no errors, you have been successful.
   9. On your host computer, in the 20410D-LON-CL1 window, on the Action menu, click Ctrl+Alt+Delete.
10. On LON-CL1, click **Sign out**.

**Results:** After completing this exercise, you will have successfully created and tested a user account created from a template.

---

**Exercise 3: Managing Computer Objects in AD DS**

► **Task 1: Reset a computer account**

1. On LON-DC1, sign in as **Adatum\Holly** with the password **Pa$$w0rd**.
2. On the taskbar, click the **Server Manager** icon.
3. In the **User Account Control** dialog box, in **User name**, type **Holly**.
4. In **Password**, type **Pa$$w0rd**, and then click **Yes**.
5. In Server Manager, click **Tools**, and then click **Active Directory Users and Computers**.
6. In Active Directory Users and Computers, expand **Adatum.com**.
7. In the navigation pane, click **Branch Office 1**.
8. In the details pane, right-click **LON-CL1**, and then click **Reset Account**.
9. In the **Active Directory Domain Services** dialog box, click **Yes**, and then click **OK**.

► **Task 2: Observe the behavior when a client logs on**

1. Switch to LON-CL1.
2. Sign in as **Adatum\Ed** with the password **Pa$$w0rd**.
   
   A message appears stating that the trust relationship between this workstation and the primary domain failed.
3. Click **OK**.

► **Task 3: Rejoin the domain to reconnect the computer account**

1. On LON-CL1, click the back arrow, and then switch to **Adatum\Administrator** with the password **Pa$$w0rd**.
2. On the Start screen, right-click the display, click **All apps**, and in the **Apps** list, click **Control Panel**.
3. In Control Panel, in the **View by** list, click **Large icons**, and then click **System**.
4. In the navigation list, click **Advanced system settings**.
5. In System Properties, click the **Computer Name** tab, and then click **Network ID**.
6. On the **Select the option that describes your network** page, click **Next**.
7. On the **Is your company network on a domain?** page, click **Next**.
8. On the **You will need the following information** page, click **Next**.
9. On the **Type your user name, password, and domain name for your domain account** page, in **Password**, type **Pa$$w0rd**. Leave the other boxes completed, and then click **Next**.
10. In the **User Account and Domain Information** dialog box, click **Yes**.
11. On the **Do you want to enable a domain user account on this computer?** page, click **Do not add a domain user account**, and then click **Next**.
12. Click **Finish**, and then click **OK**.

13. In the **Microsoft Windows** dialog box, click **Restart Now**.

14. Sign in as **Adatum\Ed** with the password **Pa$$w0rd**.

   You are successful because the computer had been successfully rejoined.

---

**Results:** After completing this exercise, you will have successfully reset a trust relationship.

▶ **Prepare for the next module**

When you have completed 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. In the **Virtual Machines** list, right-click **20410D-LON-CL1**, and then click **Revert**.
3. In the **Revert Virtual Machine** dialog box, click **Revert**.
4. Repeat steps 2 and 3 for **20410D-LON-DC1**.
Module 4: Automating Active Directory Domain Services Administration

Lab: Automating AD DS Administration by Using Windows PowerShell

Exercise 1: Creating User Accounts and Groups by Using Windows PowerShell

► Task 1: Create a user account by using Windows PowerShell

1. On LON-DC1, on the taskbar, click the Windows PowerShell icon.
2. At the Windows PowerShell prompt, type the following command, and then press Enter:
   ```powershell
   New-ADOrganizationalUnit LondonBranch
   ```
3. Type the following command, and then press Enter:
   ```powershell
   New-ADUser -Name Ty -DisplayName "Ty Carlson" -GivenName Ty -Surname Carlson -Path "ou=LondonBranch,dc=adatum,dc=com"
   ```
4. Type the following command, and then press Enter:
   ```powershell
   Set-ADAccountPassword Ty
   ```
5. When prompted for the current password, press Enter.
6. When prompted for the desired password, type Pa$$w0rd, and then press Enter.
7. When prompted to repeat the password, type Pa$$w0rd, and then press Enter.
8. At the Windows PowerShell prompt, type Enable-ADAccount Ty, and then press Enter.
9. On LON-CL1, sign in as Ty with the password Pa$$w0rd.
10. Verify that the sign-in is successful, and then sign out of LON-CL1.

► Task 2: Create a group by using Windows PowerShell

1. To create a new global security group for users in the London branch office, on LON-DC1, at the Windows PowerShell prompt, type the following command, and then press Enter:
   ```powershell
   New-ADGroup LondonBranchUsers -Path "ou=LondonBranch,dc=adatum,dc=com" -GroupScope Global -GroupCategory Security
   ```
2. To add Ty as a member of LondonBranchUsers, type the following command, and then press Enter:
   ```powershell
   Add-ADGroupMember LondonBranchUsers -Members Ty
   ```
3. To confirm that Ty is now a member of LondonBranchUsers, type the following command, and then press Enter:

   Get-ADGroupMember LondonBranchUsers

**Results:** After completing this exercise, you will have created user accounts and groups by using Windows PowerShell.

Exercise 2: Using Windows PowerShell to Create User Accounts in Bulk

**Task 1: Prepare the .csv file**
1. On LON-DC1, on the taskbar, click the File Explorer icon.
2. In File Explorer, expand drive E, expand Labfiles, and then click Mod04.
3. Right-click LabUsers.ps1, and then click Edit.
4. In Windows PowerShell Integrated Scripting Environment (ISE), read the comments at the top of the script, and then identify the requirements for the header in the .csv file.
5. Close Windows PowerShell ISE.
6. In File Explorer, double-click LabUsers.csv.
7. In the **How do you want to open this type of file (.csv)?** message, click Notepad.
8. In Notepad, type the following line at the top of the file:

   FirstName,LastName,Department,DefaultPassword

9. Click File, and then click Save.

**Task 2: Prepare the script**
1. On LON-DC1, in File Explorer, right-click LabUsers.ps1, and then click Edit.
2. In Windows PowerShell ISE, under Variables, replace C:\path\file.csv with E:\Labfiles\Mod04\LabUsers.csv.
3. Under Variables, replace "ou=orgunit,dc=domain,dc=com" with "ou=LondonBranch,dc=adatum,dc=com".
4. Click File, and then click Save.
5. Scroll down, and then review the contents of the script.
6. Close Windows PowerShell ISE.

**Task 3: Run the script**
1. On LON-DC1, on the taskbar, click the Windows PowerShell icon.
2. At the Windows PowerShell prompt, type `cd E:\Labfiles\Mod04`, and then press Enter.
3. Type `.\LabUsers.ps1`, and then press Enter.
4. Type the following command, and then press Enter:

   Get-ADUser -Filter * -SearchBase "ou=LondonBranch,dc=adatum,dc=com"

6. On LON-CL1, sign in as **Luka** with the password **Pa$$w0rd**.

**Results:** After completing this exercise, you will have used Windows PowerShell to create user accounts in bulk.

### Exercise 3: Using Windows PowerShell to Modify User Accounts in Bulk

**Task 1: Force all user accounts in LondonBranch to change their passwords at next sign in**

1. On LON-DC1, on the taskbar, click the **Windows PowerShell** icon.

2. To create a query for user accounts in the LondonBranch OU, at the Windows PowerShell Prompt, type the following command, and then press Enter:

   ```
   Get-ADUser -Filter * -SearchBase "ou=LondonBranch,dc=adatum,dc=com" | Format-Wide DistinguishedName
   ```

3. Verify that only users from the LondonBranch OU are listed.

4. To modify the previous command to force all user to change their password the next time they sign in, at the Windows PowerShell prompt, type the following command, and then press Enter:

   ```
   Get-ADUser -Filter * -SearchBase "ou=LondonBranch,dc=adatum,dc=com" | Set-ADUser -ChangePasswordAtLogon $true
   ```


**Task 2: Configure the address for user accounts in LondonBranch**

1. On LON-DC1, in Server Manager, click **Tools**, and then click **Active Directory Administrative Center**.

2. In the Active Directory Administrative Center, in the navigation pane, expand **Adatum (local)**, and then double-click **LondonBranch**.

3. Click the **Type** column header to sort based on the object type.

4. Select all user accounts, right-click the user accounts, and then click **Properties**.

5. In the Multiple Users pane, under **Organization**, select the **Address** check box.

6. In the **Street** box, type **Branch Office**.

7. In the **City** box, type **London**.

8. In the **Country/Region** box, click **United Kingdom**, and then click **OK**.

9. Close the Active Directory Administrative Center.

**Results:** After completing this exercise, you will have modified user accounts in bulk.
Prepare for the next module

When you finish the lab, revert all virtual machines to their initial state by performing the following steps:

1. On the host computer, start **Hyper-V® Manager**.
2. In the **Virtual Machines** list, right-click **20410D-LON-CL1**, and then click **Revert**.
3. In the **Revert Virtual Machine** dialog box, click **Revert**.
4. Repeat steps 2 and 3 for **20410D-LON-DC1**.
Module 5: Implementing IPv4
Lab: Implementing IPv4

Exercise 1: Identifying Appropriate Subnets

Task 1: Calculate the bits required to support the hosts on each subnet
1. How many bits are required to support 100 hosts on the client subnet?
   Answer: Seven bits are required to support 100 hosts on the client subnet (2^7-2=126, 2^6-2=62).

2. How many bits are required to support 10 hosts on the server subnet?
   Answer: Four bits are required to support 10 hosts on the server subnet (2^4-2=14, 2^3-2=6).

3. How many bits are required to support 40 hosts on the future expansion subnet?
   Answer: Six bits are required to support 40 hosts on the future expansion subnet (2^6-2=62, 2^5-2=30).

4. If all subnets are the same size, can they be accommodated?
   Answer: No. If all subnets are the same size, then all subnets must use 7 bits to support 126 hosts. Only a single class C–sized address with 254 hosts has been allocated. Three subnets of 126 hosts would not fit.

5. Which feature allows a single network to be divided into subnets of varying sizes?
   Answer: Variable length subnet masking allows you to define different subnet masks when subnetting. Therefore, variable length subnet masking allows you to have subnets of varying sizes.

6. How many host bits will you use for each subnet? Use the simplest allocation possible, which is one large subnet and two equal-sized, smaller subnets.
   Answer: The client subnet is 7 host bits. This allocation can accommodate up to 126 hosts and uses half of the allocated address pool.

   The server and future expansion subnets are 6-host bits. This can accommodate up to 62 hosts on each subnet and uses the other half of the address pool.

Task 2: Calculate subnet masks and network IDs

1. Given the number of host bits allocated, what is the subnet mask that you will use for the client subnet? Calculate the subnet mask in binary and decimal.

   The client subnet is using 7 bits for the host ID. Therefore, you can use 25 bits for the subnet mask.

<table>
<thead>
<tr>
<th>Binary</th>
<th>Decimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>11111111.11111111.11111111.10000000</td>
<td>255.255.255.128</td>
</tr>
</tbody>
</table>
2. Given the number of host bits allocated, what is the subnet mask that you can use for the server subnet? Calculate the subnet mask in binary and decimal.
   - The server subnet is using 6 bits for the host ID. Therefore, you can use 26 bits for the subnet mask.

<table>
<thead>
<tr>
<th>Binary</th>
<th>Decimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>11111111.11111111.11111111.11000000</td>
<td>255.255.255.192</td>
</tr>
</tbody>
</table>

3. Given the number of host bits allocated, what is the subnet mask that you can use for the future expansion subnet? Calculate the subnet mask in binary and decimal.
   - The future expansion subnet is using 6 bits for the host ID. Therefore, you can use 26 bits for the subnet mask.

<table>
<thead>
<tr>
<th>Binary</th>
<th>Decimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>11111111.11111111.11111111.11000000</td>
<td>255.255.255.192</td>
</tr>
</tbody>
</table>

4. For the client subnet, define the network ID, first available host, last available host, and broadcast address. Assume that the client subnet is the first subnet allocated from the available address pool. Calculate the binary and decimal versions of each address.

   In the following table, the bits in bold are part of the network ID.

<table>
<thead>
<tr>
<th>Description</th>
<th>Binary</th>
<th>Decimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network ID</td>
<td>11000000.10101000.01100010.0000000</td>
<td>192.168.98.0</td>
</tr>
<tr>
<td>First host</td>
<td>11000000.10101000.01100010.0000001</td>
<td>192.168.98.1</td>
</tr>
<tr>
<td>Last host</td>
<td>11000000.10101000.01100010.0111110</td>
<td>192.168.98.126</td>
</tr>
<tr>
<td>Broadcast</td>
<td>11000000.10101000.01100010.0111111</td>
<td>192.168.98.127</td>
</tr>
</tbody>
</table>

5. For the server subnet, define the network ID, first available host, last available host, and broadcast address. Assume that the server subnet is the second subnet allocated from the available address pool. Calculate the binary and decimal versions of each address.

   In the following table, the bits in bold are part of the network ID.

<table>
<thead>
<tr>
<th>Description</th>
<th>Binary</th>
<th>Decimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network ID</td>
<td>11000000.10101000.1100010.1000000</td>
<td>192.168.98.128</td>
</tr>
<tr>
<td>First host</td>
<td>11000000.10101000.1100010.1000001</td>
<td>192.168.98.129</td>
</tr>
<tr>
<td>Last host</td>
<td>11000000.10101000.1100010.1011111</td>
<td>192.168.98.190</td>
</tr>
<tr>
<td>Broadcast</td>
<td>11000000.10101000.1100010.1011111</td>
<td>192.168.98.191</td>
</tr>
</tbody>
</table>
6. For the future allocation subnet, define the network ID, first available host, last available host, and broadcast address. Assume that the future allocation subnet is the third subnet allocated from the available address pool. Calculate the binary and decimal versions of each address.

In the following table, the bits in bold are part of the network ID.

<table>
<thead>
<tr>
<th>Description</th>
<th>Binary</th>
<th>Decimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network ID</td>
<td>11000000.10101000.1100010.11000000</td>
<td>192.168.98.192</td>
</tr>
<tr>
<td>First host</td>
<td>11000000.10101000.1100010.11000001</td>
<td>192.168.98.193</td>
</tr>
<tr>
<td>Last host</td>
<td>11000000.10101000.1100010.11111110</td>
<td>192.168.98.254</td>
</tr>
<tr>
<td>Broadcast</td>
<td>11000000.10101000.1100010.11111111</td>
<td>192.168.98.255</td>
</tr>
</tbody>
</table>

Results: After completing this exercise, you should have identified a configuration of subnet that will meet the requirements of the lab scenario.

Exercise 2: Troubleshooting IPv4

Task 1: Prepare for troubleshooting
1. On LON-SVR2, on the taskbar, click the Windows PowerShell icon.
2. At the Windows PowerShell® prompt, type the following cmdlet, and then press Enter:

   Test-NetConnection LON-DC1

3. Verify that you receive a reply that contains PingSucceeded:True from LON-DC1.
4. Open a File Explorer window, and then browse to \LON-DC1\E$\Labfiles\Mod05.
5. Right-click Break2.ps1, and then click Run with PowerShell.
   This script creates the problem that you will troubleshoot and repair in the next task.

Task 2: Troubleshoot IPv4 connectivity between LON-SVR2 and LON-DC1
1. On LON-SVR2, at the Windows PowerShell prompt, type the following, and then press Enter:

   Test-NetConnection LON-DC1

2. Verify that you receive a reply that contains PingSucceeded:False from LON-DC1.
3. At the Windows PowerShell prompt, type the following, and then press Enter:

   Test-NetConnection -TraceRoute LON-DC1

Notice that the host is unable to find the default gateway, and that the following warning message appears: "Name resolution of lon-dc1 failed – Status: HostNotFound."
4. At the Windows PowerShell prompt, type the following, and then press Enter:

```
Get-NetRoute
```

Notice that the default route and the default gateway information is missing in the routing table. You should not be able to locate DestinationPrefix 0.0.0.0/0 and NextHop 10.10.0.1.

5. At the Windows PowerShell prompt, type the following, and then press Enter:

```
Test-NetConnection 10.10.0.1
```

6. Notice that the default gateway is responding by verifying that you receive a reply that contains PingSucceeded:True from 10.10.0.1.

7. At the Windows PowerShell prompt, type the following, and then press Enter:

```
New-NetRoute -InterfaceAlias "Ethernet" -DestinationPrefix 0.0.0.0/0 -NextHop 10.10.0.1
```

The New-NetRoute cmdlet will create the default route and the default gateway information that was missing.

8. At the Windows PowerShell prompt, type the following, and then press Enter:

```
Get-NetRoute
```

9. Notice that the default route and the default gateway information is present in the routing table by locating DestinationPrefix 0.0.0.0/0 and NextHop 10.10.0.1.

10. At the Windows PowerShell prompt, type the following, and then press Enter:

```
Test-NetConnection LON-DC1
```

11. Verify that you receive a reply that contains PingSucceeded:True from LON-DC1.

**Results:** After completing this lab, you should have resolved an IPv4 connectivity problem.

**Prepare for the next module**

After you finish the lab, revert the virtual machines back to their initial state by completing the following steps:

1. On the host computer, start Hyper-V Manager.
2. In Microsoft® Hyper-V® Manager, in the Virtual Machines list, right-click 20410D-LON-DC1, and then click Revert.
3. In the Revert Virtual Machine dialog box, click Revert.
4. Repeat steps 2 and 3 for 20410D-LON-RTR and 20410D-LON-SVR2.
Module 6: Implementing Dynamic Host Configuration Protocol

Lab: Implementing DHCP

Exercise 1: Implementing DHCP

► Task 1: Install the Dynamic Host Configuration Protocol (DHCP) server role
1. Sign in to LON-SVR1 as Adatum\Administrator with the password Pa$$w0rd.
2. In Server Manager, click Add roles and features.
3. In the Add Roles and Features Wizard, click Next.
4. On the Select installation type page, click Next.
5. On the Select destination server page, click Next.
6. On the Select server roles page, select the DHCP Server check box.
7. In the Add Roles and Features Wizard, click Add Features, and then click Next.
8. On the Select features page, click Next.
10. On the Confirm installation selections page, click Install.
11. On the Installation progress page, wait until the “Installation succeeded on LON-SVR1.Adatum.com” message appears, and then click Close.

► Task 2: Configure the DHCP scope and options
1. In the Server Manager Dashboard, click Tools, and then click DHCP.
2. In the DHCP console, expand and then right-click lon-svr1.adatum.com, and then click Authorize.
3. In the DHCP console, right-click lon-svr1.adatum.com, and then click Refresh.
   Notice that the icons next to IPv4 IPv6 changes color from red to green, which means that the DHCP server has been authorized in Active Directory® Domain Services (AD DS).
4. In the DHCP console, in the navigation pane, click lon-svr1.adatum.com, expand and right-click IPv4, and then click New Scope.
5. In the New Scope Wizard, click Next.
6. On the Scope Name page, in the Name box, type Branch Office, and then click Next.
7. On the IP Address Range page, complete the page using the following information, and then click Next:
   o Start IP address: 172.16.0.100
   o End IP address: 172.16.0.200
   o Length: 16
   o Subnet mask: 255.255.0.0
8. On the Add Exclusions and Delay page, complete the page using the following information:
   o Start IP address: 172.16.0.190
   o End IP address: 172.16.0.200
9. Click Add, and then click Next.
10. On the Lease Duration page, click Next.
11. On the Configure DHCP Options page, click Next.
12. On the Router (Default Gateway) page, in the IP address box, type 172.16.0.1, click Add, and then click Next.
13. On the Domain Name and DNS Servers page, click Next.
15. On the Activate Scope page, click Next.

Task 3: Configure the client to use DHCP, and then test the configuration
1. Sign in to 20410D-LON-CL1 as Adatum\Administrator with the password Pa$$w0rd.
2. On the Start page, type Control Panel, and then press Enter.
3. In Control Panel, under Network and Internet, click View Network Status and Tasks.
4. In the Network and Sharing Center window, click Change adapter settings.
5. In the Network Connections window, right-click Ethernet, and then click Properties.
6. In the Ethernet Properties window, click Internet Protocol Version 4 (TCP/IPv4), and then click Properties.
7. In the Internet Protocol Version 4 (TCP/IPv4) Properties dialog box, select the Obtain an IP address automatically radio button, select the Obtain DNS server address automatically radio button, click OK, and then click Close.
8. Right-click the Start button, and then click Command Prompt.
9. In the Command Prompt window, at the command prompt, type the following, and then press Enter:
   
   ipconfig /renew

10. To test the configuration and verify that LON-CL1 has received an IP address from the DHCP scope, at a command prompt, type the following, and then press Enter:

   ipconfig /all

   This command returns information such as IP address, subnet mask, and DHCP enabled status, which should be Yes.

Task 4: Configure a lease as a reservation
1. In the Command Prompt window, at a command prompt, type the following, and then press Enter:

   ipconfig /all

2. Write down the Physical Address of LON-CL1 network adapter.
3. Switch to LON-SVR1.
4. In the Server Manager dashboard, click Tools, and then click DHCP.
5. In the DHCP console, expand lon-svr1.adatum.com, expand IPv4, expand Scope [172.16.0.0] Branch Office, select and then right-click Reservations, and then click New Reservation.
6. In the New Reservation window:
   o In the Reservation Name field, type LON-CL1.
   o In the IP address field, type 172.16.0.155.
   o In the MAC address field, type the physical address you wrote down in step 2.
   o Click Add, and then click Close.

7. Switch to LON-CL1.

8. In the Command Prompt window, at a command prompt, type the following, and then press Enter:
   
```
   ipconfig /release
   ```

   This causes LON-CL1 to release any currently leased IP addresses.

9. At a command prompt, type the following, and then press Enter:
   
```
   ipconfig /renew
   ```

   This causes LON-CL1 to lease any reserved IP addresses.

10. Verify that the IP address of LON-CL1 is now 172.16.0.155.

---

**Results:** After completing this exercise, you should have implemented DHCP, configured DHCP scope and options, and configured a DHCP reservation.

---

**Prepare for the optional exercise**

If you are going to complete the optional lab, revert the 20410D-LON-CL1 and 20410D-LON-SVR1 virtual machines by performing the following steps:

1. On the host computer, start Hyper-V Manager.
2. In the Virtual Machines list, right-click 20410D-LON-CL1, and then click Revert.
3. In the Revert Virtual Machine dialog box, click Revert.
4. Repeat steps 1 through 3 for 20410D-LON-SVR1.
5. Start 20410D-LON-SVR1.

---

**Exercise 2: Implementing a DHCP Relay Agent (Optional Exercise)**

**Task 1: Install a DHCP relay agent**

1. Sign in to LON-RTR as Adatum\Administrator with the password Pa$$w0rd.
2. In Server Manager, click Tools, and then click Routing and Remote Access.
3. Add the DHCP relay agent to the router on LON-RTR by performing the following steps:
   a. In the navigation pane, expand LON-RTR (local), expand IPv4, right-click General, and then click New Routing Protocol.
   b. In the Routing protocols list, click DHCP Relay Agent, and then click OK.
Task 2: Configure a DHCP relay agent
1. In the navigation pane, right-click DHCP Relay Agent, and then click New Interface.
2. In the New Interface for DHCP Relay Agent dialog box, click Ethernet 2, and then click OK.
3. In the DHCP Relay Agent Properties – Ethernet 2 Properties dialog box, click OK.
4. Right-click DHCP Relay Agent, and then click Properties.
5. In the DHCP Relay Agent Properties dialog box, in the Server address box, type 172.16.0.11, click Add, and then click OK.

Task 3: Test the DHCP relay agent with a client
To test how a client receives an IP address from the DHCP relay agent in another subnet, you need to create another DHCP scope.
1. Sign in to LON-SVR1 as Adatum\Administrator with the password Pa$$w0rd.
2. From the desktop, right-click the PowerShell icon and select Run as administrator.
3. At a Windows PowerShell command prompt, type the following, pressing Enter after each line:

```
Add-WindowsFeature -IncludeManagementTools dhcp
netsh dhcp add securitygroups
Restart-service dhcpserver
Add-DhcpServerInDC LON-SVR1 172.16.0.11
Add-DhcpServerv4Scope –Name "Branch Office 2" –StartRange 10.10.0.100 –EndRange 10.10.0.200 –SubnetMask 255.255.0.0
Add-DhcpServerv4ExclusionRange –ScopeID 10.10.0.0 –StartRange 10.10.0.190 –EndRange 10.10.0.200
Set-DhcpServerv4OptionValue –Router 10.10.0.1
Set-DhcpServerv4Scope –ScopeID 10.10.0.0 –State Active
```
4. To test the client, switch to LON-CL2.
5. On the Start screen, type Control Panel, and then press Enter.
6. Under Network and Internet, click View network status and tasks.
7. In the Network and Sharing Center window, click Change Adapter Settings, right-click Ethernet, and then click Properties.
8. In the Ethernet Properties window, click Internet Protocol Version 4 (TCP/IPv4) and then click Properties.
9. In the Internet Protocol Version 4 (TCP/IPv4) Properties dialog box, click Obtain an IP address automatically, click Obtain DNS server address automatically, click OK, and then click Close.
10. Right-click the Start button and then click Command Prompt.
11. In the Command Prompt window, at a command prompt, type the following, and then press Enter:

```
ipconfig /renew
```
12. Verify that IP address and DNS server settings on LON-CL2 are obtained from DHCP Server scope Branch Office 2, installed on LON-SVR1.

The IP address should be in the following range: **10.10.0.100/16** to **10.10.0.200/16**.

**Results:** After completing this exercise, you should have implemented a DHCP relay agent.

**Prepare for the next module**

After you finish the lab, revert the virtual machines to their initial state by completing the following steps:

1. On the host computer, start Hyper-V Manager.
2. In the Virtual Machines list, right-click 20410D-LON-DC1, and then click Revert.
3. In the Revert Virtual Machine dialog box, click Revert.
4. Repeat steps 2 and 3 for 20410D-LON-SVR1, 20410D-LON-RTR, and 20410D-LON-CL2.
Module 7: Implementing DNS

Lab: Implementing DNS

Exercise 1: Installing and Configuring DNS

▶ Task 1: Configure LON-SVR1 as a domain controller without installing the Domain Name System (DNS) server role
1. On LON-SVR1, in the Server Manager console, click Add roles and features.
2. On the Before you begin page, click Next.
3. On the Select installation type page, click Next.
4. On the Select destination server page, ensure that LON-SVR1.Adatum.com is selected, and then click Next.
5. On the Select server roles page, select Active Directory Domain Services.
6. When Add Roles and Features Wizard appears, click Add Features, and then click Next.
7. On the Select features page, click Next.
8. On the Active Directory Domain Services page, click Next.
10. On the Installation progress page, when the Installation succeeded message appears, click Close.
11. In the Server Manager console, on the navigation page, click AD DS.
12. On the title bar where Configuration required for Active Directory Domain Services at LON-SVR1 is visible, click More.
13. On the All Server Task Details and Notifications page, click Promote this server to a domain controller.
14. In the Active Directory Domain Services Configuration Wizard, on the Deployment Configuration page, ensure that Add a domain controller to an existing domain is selected, and then click Next.
15. On the Domain Controller Options page, clear the Domain Name System (DNS) server check box, and leave the Global Catalog (GC) check box selected.
16. Type Pa$$w0rd in both text fields, and then click Next.
17. On the Additional Options page, click Next.
18. On the Paths page, click Next.
20. On the Prerequisites Check page, click Install.
21. On the You’re about to be signed out app bar, click Close.
   The LON-SVR1 server automatically restarts as part of the procedure.
22. After LON-SVR1 restarts, sign in as Adatum\Administrator with the password Pa$$w0rd.
Task 2: Review configuration settings on the existing DNS server to confirm root hints
1. On LON-DC1, in the DNS Manager console, click and then right-click LON-DC1, and then click Properties.
2. In the LON-DC1 Properties dialog box, click the Root hints tab. Ensure that root hints servers display.
3. Click the Forwarders tab. Ensure that the list displays no entries, and that the Use root hints if no forwarders are available option is selected.
4. Click Cancel.
5. Close the DNS Manager console.
6. In the taskbar, click the Windows PowerShell icon.
7. In Windows PowerShell, type the following cmdlets, press Enter after each, and observe the output returned:

```
Get-DnsServerRootHint
Get-DnsServerForwarder
```

Note that both cmdlets are the respective Windows PowerShell equivalents of the DNS Console actions performed in steps 2 and 3 above.

Task 3: Add the DNS server role for the branch office on the domain controller
1. On LON-SVR1, in the Server Manager console, click Add roles and features.
2. On the Before you begin page, click Next.
3. On the Select installation type page, click Next.
4. On the Select destination server page, ensure that LON-SVR1.Adatum.com is selected, and then click Next.
5. On the Select server roles page, select DNS Server.
6. When the Add Roles and Features Wizard appears, click Add Features, and then click Next.
7. On the Select Features page, click Next.
8. On the DNS Server page, click Next.
10. On the Installation progress page, when the “Installation succeeded” message appears, click Close.

Task 4: Verify replication of the Adatum.com Active Directory–integrated zone
1. On LON-SVR1, in the Server Manager console, click Tools.
2. On the list of tools, click DNS.
3. In the DNS Manager console, expand LON-SVR1, and then expand Forward Lookup Zones. This container is probably empty.
4. Switch back to Server Manager, click Tools, and then click Active Directory Sites and Services.
5. In the Active Directory Sites and Services console, expand Sites, expand Default-First-Site-Name, expand Servers, expand LON-DC1, and then click NTDS Settings.
6. In the right pane, right-click the LON-SVR1 replication connection, and select Replicate Now.

Note: If you receive an error message, proceed to the next step, and then retry this step after three to four minutes. If this retry fails, wait a few more minutes, and then try again.

7. In the navigation pane, expand LON-SVR1, and then click NTDS Settings.
8. In the right pane, right-click the LON-DC1 replication connection, click Replicate Now, and then click OK.
9. Switch back to the DNS Manager console, right-click Forward Lookup Zones, and then click Refresh.
10. Ensure that both the _msdcs.Adatum.com and Adatum.com containers display.

11. Close DNS Manager.

Task 5: Create and configure Contoso.com zone on LON-DC1
1. On the LON-DC1 virtual machine, in the Server Manager console, click Tools, and then click DNS.
2. Expand LON-DC1, right-click Forward Lookup Zones, and then select New Zone.
3. In the New Zone Wizard, on the Welcome to the New Zone Wizard page, click Next.
4. On the Zone Type page, clear the Store the zone in Active Directory check box, and then click Next.
5. On the Zone Name page, type Contoso.com, and then click Next.
6. On the Zone File page, click Next.
7. On the Dynamic Update page, click Next.
8. On the Completing the New Zone Wizard page, click Finish.
9. Expand Forward Lookup Zones, and then select and right-click contoso.com zone, and click New Host (A or AAAA).
10. In the New Host window, in the Name textbox type www.
11. In the IP address box, type 172.16.0.100.
12. Click Add Host.
13. Click OK, and then click Done.
14. Leave the DNS Manager console open.

Task 6: Use Windows PowerShell commands to test non-local resolution
1. On LON-SVR1, on the taskbar, click the Windows PowerShell icon.
2. In Windows PowerShell, type the following cmdlet, and then press Enter:

   Get-DnsClient

3. Note the entries labeled Ethernet in the InterfaceAlias column. In the Interface Index column, note the Interface Index number that is in the same row as Ethernet and IPv4. Write this number here:

4. In Windows PowerShell, type the following cmdlet, where X is the specific Interface Index number you wrote down in the last step, and then press Enter:

   Set-DnsClientServerAddress -InterfaceIndex X -ServerAddress 127.0.0.1
5. In Windows PowerShell, type the following, and then press Enter:

```
Resolve-DNSName www.contoso.com
```

You should receive an error message in red text. This is expected.

6. In Windows PowerShell, type the following, and then press Enter:

```
nslookup
```

7. At the `nslookup >` prompt, type the following, and then press Enter:

```
www.contoso.com
```

You should see the following reply:

```
“Server: localhost
Address: 127.0.0.1
DNS request timed out.
  timeout was 2 seconds.
DNS request timed out.
  timeout was 2 seconds.
*** Request to localhost timed-out.”
```

8. Type the following, and then press Enter:

```
Exit
```


► **Task 7: Configure Internet name resolution to forward to the head office**

1. At the Windows PowerShell prompt, type the following cmdlet, and then press Enter:

```
Set-DnsServerForwarder -IPAddress '172.16.0.10' -PassThru
```

2. At the Windows PowerShell prompt, type the following two cmdlets, and press Enter after each one:

```
Stop-Service DNS
Start-Service DNS
```

► **Task 8: Use Windows PowerShell to confirm name resolution**

1. Sign in to LON-SVR1 as `Adatum\Administrator` with the password `Pa$$w0rd`.

2. On LON-SVR1, switch to a Windows PowerShell window.

3. Type the following cmdlet, and then press Enter:

```
nslookup www.contoso.com
```

Ensure that you receive an IP address for this host as a non-authoritative answer.


**Results:** After completing this exercise, you should have installed and configured DNS on 20410D-LON-SVR1.
Exercise 2: Creating Host Records in DNS

Task 1: Configure a client to use LON-SVR1 as a DNS server
1. On LON-CL1, sign in as Adatum\Administrator with the password Pa$$w0rd.
2. On the Start screen, type Control Panel, and then press Enter.
3. In Control Panel, click View network status and tasks.
4. Click Change adapter settings.
5. Right-click Ethernet, and then click Properties.
6. In the Ethernet Properties dialog box, click Internet Protocol Version 4 (TCP/IPv4), and then click Properties.
7. In the preferred DNS server box, overwrite the IP address for preferred DNS server with 172.16.0.11, click OK, and then click Close.

Task 2: Create several host records for web apps in the Adatum.com domain
1. On LON-DC1, in the Server Manager console, click Tools, and then click DNS.
2. In the DNS Manager console, expand LON-DC1, expand Forward Lookup Zones, and then click Adatum.com.
3. Right-click Adatum.com, and then click New Host (A or AAAA).
4. In the New Host window, configure the following settings:
   - Name: www
   - IP address: 172.16.0.200
5. Click Add Host, and then click OK.
6. In the New Host window, configure the following settings:
   - Name: ftp
   - IP address: 172.16.0.201
7. Click Add Host, click OK, and then click Done.

Task 3: Verify replication of new records to LON-SVR1
1. On LON-SVR1, in the Server Manager console, click Tools, and then click DNS.
2. In the DNS Manager console, expand LON-SVR1, expand Forward Lookup Zones, and then click Adatum.com.
3. Ensure that both www and ftp resource records display. It might take several minutes for the records to display.

Note: If the www and ftp resource records do not display within several minutes, right-click Adatum.com, and then click Refresh.
Task 4: Use the ping command to locate new records from LON-CL1
1. On LON-CL1, on the taskbar, right-click the Windows icon, and then click Run.
2. In the Run pop-up window, in the Open text box, type cmd, and then press Enter.
3. In the Command Prompt window, at a command prompt, type the following, and then press Enter:
   ```
   ping www.adatum.com
   ```
4. Ensure that the name resolves to 172.16.0.200.
   You will not receive replies.
5. At a command prompt, type the following, and then press Enter:
   ```
   ping ftp.adatum.com
   ```
6. Ensure that name resolves to 172.16.0.201.
   You will not receive replies.
7. Leave the Command Prompt window open.

Results: After completing this exercise, you should have configured DNS records.

Exercise 3: Managing the DNS Server Cache

Task 1: Use the ping command to locate an Internet record from LON-CL1
1. On LON-CL1, in the Command Prompt window, at a command prompt, type the following, and then press Enter:
   ```
   ping www.contoso.com
   ```
2. Ping does not work. Ensure that the name resolves to the IP address 172.16.0.100.
3. Leave the Command Prompt window open.

Task 2: Update an Internet record to point to the LON-DC1 IP address
1. On LON-DC1, open DNS Manager.
2. In the DNS Manager console, expand LON-DC1, expand Forward Lookup Zones, and then click contoso.com.
3. In the right pane, right-click www, and then click Properties.
4. Change the IP address to 172.16.0.10, and then click OK.
5. Switch back to LON-CL1.
6. In the Command Prompt window, at a command prompt, type the following, and then press Enter:
   ```
   ping www.contoso.com
   ```
   Note that ping does not work, and that the old IP address (which is 172.16.0.100) is still displayed.
Task 3: Examine the content of the DNS cache
1. Switch to LON-SVR1.
2. In the Server Manager console, click Tools, and then click DNS.
3. Click LON-SVR1, click the View menu, and then click Advanced.
4. Expand LON-SVR1, expand the Cached Lookups node, expand .(root), expand com, and then click contoso.
5. In the right pane, examine the cached content and note that the www record has the IP address: 172.16.0.100.
7. In the Command Prompt window, at a command prompt, type the following, and then press Enter:
   ```cmd
ipconfig /displaydns```
8. Look for cached entries, and notice that www.contoso.com is resolving to 172.16.0.100.

Task 4: Clear the cache, and retry the ping command
1. On LON-SVR1, on the taskbar, click the Windows PowerShell icon.
2. At the Windows PowerShell prompt, type Clear-DNSServerCache, and then press Enter.
3. Type y, and then press Enter.
4. Switch to LON-CL1.
5. In a Command Prompt window, at a command prompt, type the following, and then press Enter:
   ```cmd
   ping www.contoso.com
   ```
The result still returns the old IP address.
6. In the Command Prompt window, at a command prompt, type the following, and then press Enter:
   ```cmd
   ipconfig /flushdns
   ```
7. In the Command Prompt window, type the following, and then press Enter:
   ```cmd
   ping www.contoso.com
   ```
Ping now should work on address 172.16.0.10.

Results: After completing this exercise, you should have examined the DNS server cache.

Prepare for the next module
After you finish the lab, revert the virtual machines to their initial state.
1. On the host computer, start Hyper-V Manager.
2. In the Virtual Machines list, right-click 20410D-LON-DC1, and then click Revert.
3. In the Revert Virtual Machine dialog box, click Revert.
4. Repeat steps 2 and 3 for 20410D-LON-SVR1 and 20410D-LON-CL1.
Module 8: Implementing IPv6

Lab: Implementing IPv6

Exercise 1: Configuring an IPv6 Network

▶ Task 1: Verify IPv4 routing
1. On LON-SVR2, on the taskbar, click the Windows PowerShell icon.
2. At the Windows PowerShell prompt, type ping lon-dc1, and then press Enter.
   Notice that there are four replies from 172.16.0.10.
3. Type ipconfig, and then press Enter.
   Verify that the only IPv6 address listed is a link-local address that cannot be routed.
4. Type Get-NetIPAddress, and then press Enter.
   Notice that Get-NetIPAddress cmdlet returns a link-local IPv6 address.

▶ Task 2: Disable IPv6 on LON-DC1
1. On LON-DC1, in Server Manager, click Local Server.
2. In the local server’s Properties pane, next to Ethernet, click 172.16.0.10, IPv6 enabled.
3. In the Network Connections dialog box, right-click Ethernet, and then click Properties.
4. In the Ethernet Properties dialog box, clear the Internet Protocol Version 6 (TCP/IPv6) check box, and then click OK.
5. Close the Network Connections dialog box.
6. In Server Manager, verify that Ethernet lists only 172.16.0.10. You may need to refresh the view.
   LON-DC1 is now an IPv4-only host.

▶ Task 3: Disable IPv4 on LON-SVR2
1. On LON-SVR2, in Server Manager, click Local Server.
2. In the local server’s Properties pane, next to Ethernet, click 10.10.0.11, IPv6 enabled.
3. In the Network Connections dialog box, right-click Ethernet, and then click Properties.
4. In the Ethernet Properties dialog box, clear the Internet Protocol Version 4 (TCP/IPv4) check box, and then click OK.
5. Close the Network Connections dialog box.
6. In Server Manager, verify that Ethernet now lists only IPv6 enabled. You may need to refresh the view.
   LON-SVR2 is now an IPv6-only host.
Task 4: Configure an IPv6 network on LON-RTR

1. On LON-RTR, on the taskbar, click the Windows PowerShell icon.

2. Configure a network address that will be used on the IPv6 network. At the Windows PowerShell prompt, type the following cmdlet, and then press Enter:

   ```
   New-NetRoute -InterfaceAlias "Ethernet 2" -DestinationPrefix 2001:db8:0:1::/64 -Publish Yes
   ```

3. Allow clients to obtain the IPv6 network address automatically from LON-RTR. At the Windows PowerShell prompt, type the following cmdlet, and then press Enter:

   ```
   Set-NetIPInterface -InterfaceAlias "Ethernet 2" -AddressFamily IPv6 -Advertising Enabled
   ```

4. Type `ipconfig`, and then press Enter.

   Notice that Ethernet 2 now has an IPv6 address on the 2001:db8:0:1::/64 network. This address is used for communication on the IPv6-only network.

Task 5: Verify IPv6 on LON-SVR2

1. On LON-SVR2, on the taskbar, click the Windows PowerShell icon.

2. At the Windows PowerShell prompt, type `ipconfig`, and then press Enter.

   Notice that the Ethernet now has an IPv6 address on the 2001:db8:0:1::/64 network. The network address was obtained from the router through stateless configuration.

Results: After completing the exercise, you will have configured an IPv6-only network.

Exercise 2: Configuring an ISATAP Router

Task 1: Add an ISATAP host record to DNS

1. On LON-DC1, in Server Manager, click Tools, and then click DNS.

2. In DNS Manager, expand LON-DC1, expand Forward Lookup Zones, and then click Adatum.com.

3. Right-click Adatum.com, and then click New Host (A or AAAA).

4. In the New Host window, in the Name box, type ISATAP.

5. In the IP address box, type 172.16.0.1, and then click Add Host. ISATAP clients resolve this host name to find the ISATAP router.

6. Click OK to clear the success message.

7. Click Done to close the New Host window.

8. Close DNS Manager.
### Task 2: Enable the ISATAP router on LON-RTR

1. On LON-RTR, configure the IP address of the Ethernet adapter as the ISATAP router. At the Windows PowerShell prompt, type the following cmdlet, and then press Enter:

   ```
   Set-NetIsatapConfiguration -Router 172.16.0.1
   ```

2. Type the following command, and then press Enter:

   ```
   Get-NetIPAddress | Format-Table InterfaceAlias,InterfaceIndex,IPv6Address
   ```

3. Record the InterfaceIndex of the ISATAP interface that has an IPv6 address that includes **172.16.0.1**.

   Interface index:

4. Type the following command, and then press Enter:

   ```
   Get-NetIPInterface -InterfaceIndex IndexYouRecorded -PolicyStore ActiveStore | Format-List
   ```

5. Verify that **Forwarding** is enabled for the interface and that **Advertising** is disabled.

6. The ISATAP interface for an ISATAP router must have forwarding enabled and advertising enabled. Type the following command, and then press Enter:

   ```
   Set-NetIPInterface -InterfaceIndex IndexYouRecorded -Advertising Enabled
   ```

7. Create a new IPv6 network that will be used for the ISATAP network. Type the following command, and then press Enter:

   ```
   New-NetRoute -InterfaceIndex IndexYouRecorded -DestinationPrefix 2001:db8:0:2::/64 -Publish Yes
   ```

8. View the IP address configuration for the ISATAP interface. Type the following command, and then press Enter:

   ```
   Get-NetIPAddress -InterfaceIndex IndexYouRecorded
   ```

9. Verify that an IPv6 address is listed on the 2001:db8:0:2::/64 network.

### Task 3: Remove ISATAP from the Global Query Block List

1. On LON-DC1, at the Windows PowerShell prompt, type the following command, and then press Enter:

   ```
   dnscmd /config /globalqueryblocklist wpad
   ```

2. At the Windows PowerShell prompt, type **Restart-Service DNS -Verbose**, and then press Enter.

3. Type **ping isatap**, and then press Enter.

   The name should resolve, and you should receive four replies from 172.16.0.1.

### Task 4: Enable LON-DC1 as an ISATAP client

1. On LON-DC1, at the Windows PowerShell prompt, type the following command, and then press Enter:

   ```
   Set-NetIsatapConfiguration -State Enabled
   ```
2. Type `ipconfig`, and then press Enter.

3. Verify that the Tunnel adapter for ISATAP has an IPv6 address on the 2001:db8:0:2/64 network. Notice that this address includes the IPv4 address of LON-DC1.

▶ Task 5: Test connectivity
1. On LON-SVR2, at the Windows PowerShell prompt, type the following command, and then press Enter:
   ```powershell
   ping 2001:db8:0:2:0:5efe:172.16.0.10
   ```
2. In Server Manager, if necessary, click Local Server.
3. In the local server’s Properties pane, next to Ethernet, click IPv6 enabled.
4. In the Network Connections dialog box, right-click Ethernet, and then click Properties.
5. In the Ethernet Properties dialog box, click Internet Protocol Version 6 (TCP/IPv6), and then click Properties.
6. In the Internet Protocol Version 6 (TCP/IPv6) Properties dialog box, click Use the following DNS server addresses.
7. In the Preferred DNS server box, type 2001:db8:0:2:0:5efe:172.16.0.10, and then click OK.
8. In the Ethernet Properties dialog box, click Close.
9. Close the Network Connections dialog box.
10. At the Windows PowerShell prompt, type `ping LON-DC1`, and then press Enter.
    Notice that four replies are received from LON-DC1.
    A ping from LON-DC1 to LON-SVR2 does not respond, because the firewall configuration on LON-SVR2 blocks ping requests.

Results: After completing this exercise, you will have configured an ISATAP router on LON-RTR to allow communication between an IPv6-only network and an IPv4-only network.

▶ Prepare for the next module
After 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. In the Virtual Machines list, right-click 20410D-LON-DC1, and then click Revert.
3. In the Revert Virtual Machine dialog box, click Revert.
4. Repeat steps 2 and 3 for 20410D-LON-RTR and 20410D-LON-SVR2.
Module 9: Implementing Local Storage
Lab: Implementing Local Storage

Exercise 1: Installing and Configuring a New Disk

► Task 1: Initialize a new disk
1. Sign in to LON-SVR1 with the username Adatum\Administrator and the password Pa$$w0rd.
2. In Server Manager, click the Tools menu, and then click Computer Management.
3. In the Computer Management console, under the Storage node, click Disk Management.
4. In the Disks pane, right-click Disk2, and then click Online.
5. Right-click Disk2, and then click Initialize Disk.
6. In the Initialize Disk dialog box, select the Disk 2 check box, click GPT (GUID Partition Table), and then click OK.

► Task 2: Create and format two simple volumes on the disk
1. In the Computer Management console, in Disk Management, right-click the black marked box right of Disk 2, and then click New Simple Volume.
2. In the New Simple Volume Wizard, on the Welcome to the New Simple Volume Wizard page, click Next.
3. On the Specify Volume Size page, in the Simple volume size MB field, type 4000, and then click Next.
4. On the Assign Drive Letter or Path page, ensure that the Assign the following drive letter check box is selected, and that F is selected from the drop-down menu, and then click Next.
5. On the Format Partition page, from the File system drop-down menu, click NTFS, and in the Volume label text box, type Volume1, and then click Next.
7. In the Disk Management window, right-click the black box right of Disk 2, and then click New Simple Volume.
8. In the New Simple Volume Wizard, on the Welcome to the New Simple Volume Wizard page, click Next.
9. On the Specify Volume Size page, in the Simple volume size in MB field, type 5000, and then click Next.
10. On the Assign Drive Letter or Path page, ensure that the Assign the following drive letter check box is selected, verify that G is listed as the drive letter, and then click Next.
11. On the Format Partition page, from the File system drop-down menu, click ReFS, and in the Volume label text box, type Volume2, and then click Next.
Task 3: Verify the drive letter in a File Explorer window
1. On the taskbar, open a File Explorer window, expand This PC, and then click Volume1 (F:).
2. In File Explorer, click Volume2 (G:), right-click Volume2 (G:), point to New, and then click Folder.
3. In the New folder field, type Folder1, and then press Enter.

Results: After completing this exercise, you should have initialized a new disk, created two simple volumes, and then formatted them. Additionally, you should have verified that the drive letters you assigned are available in File Explorer.

Exercise 2: Resizing Volumes

Task 1: Shrink Volume1
1. On LON-SVR1, switch to the Computer Management console.
2. In the Computer Management console, in Disk Management, in the middle-pane, right-click Volume1 (F:), and then click Shrink Volume.
3. In the Shrink F: window, in the Enter the amount of space to shrink in MB field, type 1000, and then click Shrink.

Task 2: Extend Volume2
1. On LON-SVR1, in Disk Management, in the middle-pane, right-click Volume2 (G:), and then click Extend Volume.
2. In Extend Volume Wizard, on the Welcome to the Extended Volume Wizard page, click Next.
3. On the Select Disks page, in the Select the amount of space in MB field, type 1000, and then click Next.
5. In a File Explorer window, click Volume2 (G:), and then verify that Folder1 is available on the volume.

Results: After completing this exercise, you should have made one volume smaller and extended another.

Exercise 3: Configuring a Redundant Storage Space

Task 1: Create a storage pool from five disks that are attached to the server
1. On LON-SVR1, on the taskbar, click the Server Manager icon.
2. In Server Manager, in the left pane, click File and Storage Services, and then in the Servers pane, click Storage Pools.
3. In the STORAGE POOLS pane, click TASKS, and then in the TASKS drop-down menu, click New Storage Pool.
4. In the New Storage Pool Wizard window, on the Before you begin page, click Next.
5. On the Specify a storage pool name and subsystem page, in the Name box, type StoragePool1, and then click Next.
6. On the Select physical disks for the storage pool page, click the following physical disks, and then click Next:
   - PhysicalDisk3
   - PhysicalDisk4
   - PhysicalDisk5
   - PhysicalDisk6
   - PhysicalDisk7

7. On the Confirm selections page, click Create.

8. On the View results page, wait until the task completes, and then click Close.

Task 2: Create a three-way mirrored virtual disk
1. On LON-SVR1, in Server Manager, in the Storage Spaces pane, click StoragePool1.
2. In the VIRTUAL DISKS pane, click TASKS, and then from the TASKS drop-down menu, click New Virtual Disk.
3. In the New Virtual Disk Wizard window, on the Before you begin page, click Next.
4. On the Select the storage pool page, click StoragePool1, and then click Next.
5. On the Specify the virtual disk name page, in the Name box, type Mirrored Disk, and then click Next.
6. On the Select the storage layout page, in the Layout list, click Mirror, and then click Next.
7. On the Configure the resiliency settings page, click Three-way mirror, and then click Next.
8. On the Specify the provisioning type page, click Thin, and then click Next.
9. On the Specify the size of the virtual disk page, in the Specify Size box, type 10, and then click Next.
10. On the Confirm selections page, click Create.
11. On the View results page, wait until the task completes.
12. Ensure that the Create a volume when this wizard closes check box is selected, and then click Close.
13. In the New Volume Wizard window, on the Before you begin page, click Next.
14. On the Select the server and disk page, in the Disk pane, click the Mirrored Disk virtual disk, and then click Next.
15. On the Specify the size of the volume page, click Next to confirm the default selection.
16. On the Assign to a drive letter or folder page, in the Drive letter drop-down menu, ensure that H is selected, and then click Next.
17. On the Select file system settings page, in the File system drop-down menu, click ReFS, in the Volume label box, type Mirrored Volume, and then click Next.
18. On the Confirm selections page, click Create.
19. On the Completion page, wait until the creation completes, and then click Close.
Task 3: Copy a file to the volume, and verify that it is visible in File Explorer
1. On the Start screen, type command prompt, and then press Enter.
2. At the command prompt, type the following command, and then press Enter:
   ```command prompt
   Copy C:\windows\system32\write.exe H:\
   ```
3. Close the Command Prompt window.
4. On the taskbar, click the File Explorer icon.
5. In the File Explorer window, click Mirrored Volume (H:).
6. Verify that write.exe is visible in the file list.

Task 4: Remove a physical drive
1. On the host computer, start Hyper-V Manager.
2. In the Virtual Machines pane, right-click 20410D-LON-SVR1, and then click Settings.
3. In Settings for 20410D-LON-SVR1, in the Hardware pane, click the hard drive that begins with 20410D-LON-SVR1-Disk5.
4. In the Hard Drive pane, click Remove, click OK, and then click Continue.

Task 5: Verify that the write.exe file is still accessible
1. Switch to LON-SVR1.
2. On the taskbar, click the File Explorer icon.
3. In the File Explorer window, click Mirrored Volume (H:).
4. In the file list pane, verify that write.exe is still available.
5. Close File Explorer.
6. In Server Manager, in the STORAGE POOLS pane, on the menu bar, click the Refresh “Storage Pools” button.
   Notice the warning that is visible next to Mirrored Disk.
7. In the VIRTUAL DISK pane, right-click Mirrored Disk, and then click Properties.
8. In the Mirrored Disk Properties dialog box, in the left pane, click Health.
   Notice that the Health Status indicates a Warning. The Operational Status should indicate Incomplete, Unknown, or Degraded.
9. Click OK to close the Mirrored Disk Properties dialog box.

Task 6: Add a new disk to the storage pool and remove a broken disk
1. On LON-SVR1, in Server Manager, in the STORAGE POOLS pane, on the menu bar, click the Refresh “Storage Pools” button.
2. In the STORAGE POOLS pane, right-click StoragePool1, and then click Add Physical Disk.
3. In the Add Physical Disk window, click PhysicalDisk8 (LON-SVR1), and then click OK.
4. Click Windows Powershell on the Task Bar.
5. Type Get-PhysicalDisk, and then press Enter.
6. Note the FriendlyName for the disk that shows an OperationalStatus of Lost Communication.

7. Type $Disk = Get-PhysicalDisk -FriendlyName diskname, and then press Enter.
   Replace diskname with the name of the disk that you noted in Step 6.

8. Type Remove-PhysicalDisk -PhysicalDisks $disk -StoragePoolFriendlyName StoragePool1, and then press Enter.

9. Type Y, and then press Enter.

10. If you get a warning that the disk cannot be removed, wait five minutes, and then run the last command again. It can take some time for the mirrored disk to resynchronize after a disk is removed and another is added. If you cannot remove the disk after five minutes, restart LON-SVR1, sign in as Adatum\Administrator by using the password Pa$$w0rd, and then repeat steps 4 through 10.

11. In Server Manager, in the STORAGE POOLS pane, on the menu bar, click the Refresh “Storage Pools” button to see the warnings disappear.

Results: After completing this exercise, you should have created a storage pool and added five disks to it. Additionally, you should have created a three-way mirrored, thinly provisioned virtual disk from the storage pool; copied a file to the new volume; and then verified that it is accessible. Next, after removing a physical drive, you should have verified that the virtual disk was still available and that you could access it. Finally, you should have added another physical disk to the storage pool.

Prepare for the next module

After you finish the lab, revert the virtual machines to their initial state by completing the following steps:

1. On the host computer, start Hyper-V Manager.

2. In the Virtual Machines list, right-click 20410D-LON-DC1, and then click Revert.

3. In the Revert Virtual Machine dialog box, click Revert.

4. Repeat steps 2 and 3 for 20410D-LON-SVR1.
Module 10: Implementing File and Print Services
Lab: Implementing File and Print Services

Exercise 1: Creating and Configuring a File Share

▶ Task 1: Create the folder structure for the new share
1. On LON-SVR1, on the taskbar, click the File Explorer icon.
2. In File Explorer, in the navigation pane, expand This PC, and then click Allfiles (E:).
3. On the menu toolbar, click Home, click New folder, type Data, and then press Enter.
4. Double-click the Data folder.
5. On the menu toolbar, click Home, click New folder, type Development, and then press Enter.
6. Repeat step 5 to create a new folder named Marketing.

▶ Task 2: Configure file permissions on the folder structure
To restrict access to the departmental folders, you must prevent inherited file permissions from the Data folder from being applied to each department folder. To do this, perform the following steps.
1. In File Explorer, double-click the E:\Data folder.
2. Right-click the Development folder, and then click Properties.
3. In the Development Properties dialog box, click Security, and then click Advanced.
4. In the Advanced Security Settings for Development dialog box, click Disable Inheritance.
5. In the Block Inheritance dialog box, click Convert inherited permissions into explicit permissions on this object.
6. Remove the two permissions entries for Users (LON-SVR1\Users), and then click OK.
8. In the Permissions for Development dialog box, click Add.
9. Type Development, click Check names, and then click OK.
10. In the Permissions for Development dialog box, under Allow, select Modify permission.
11. Click OK to close the Permissions for Development dialog box.
12. Click OK to close the Development Properties dialog box.
13. Repeat steps 2 through 12 for the Marketing folder, assigning Modify permissions to the Marketing group for their folder.

▶ Task 3: Create the shared folder
1. In File Explorer, navigate to drive E, right-click the Data folder, and then click Properties.
2. In the Data Properties dialog box, click the Sharing tab, and then click Advanced Sharing.
3. In the Advanced Sharing dialog box, select Share this folder, and then click Permissions.
4. In the Permissions for Data dialog box, click Add.
5. Type Authenticated Users, click Check names, and then click OK.
6. In the Permissions for Data dialog box, click Authenticated Users, and then under Allow, select Change permission.
7. Click OK to close the Permissions for Data dialog box.
8. Click OK to close the Advanced Sharing dialog box.
9. Click Close to close the Data Properties dialog box.

► Task 4: Test access to the shared folder
1. Sign in to LON-CL1 as Adatum\Bernard with the password Pa$$w0rd.
   Notice that Bernard is a member of the Development group.
2. On the Start screen, click Desktop.
3. On the taskbar, click the File Explorer icon.
4. In File Explorer, in the address bar, type LON-SVR1\Data, and then press Enter.
5. Double-click the Development folder.
   Bernard should have access to the Development folder.
6. Attempt to access the Marketing folder.
   File permissions on this folder prevent you from doing this.
   Bernard can still see the Marketing folder, even though he does not have access to its contents.
7. Sign out of LON-CL1.

► Task 5: Enable access-based enumeration
1. Switch to LON-SVR1.
2. On the taskbar, click the Server Manager icon.
3. In Server Manager, in the navigation pane, click File and Storage Services.
4. In the File and Storage Services window, in the navigation pane, click Shares.
5. In the Shares pane, right-click Data, and then click Properties.
6. In the Data Properties dialog box, click Settings, and then select Enable access-based enumeration.
7. Click OK to close the Data Properties dialog box.
8. Close Server Manager.

► Task 6: Test access to the share
1. Sign in to LON-CL1 as Adatum\Bernard with the password Pa$$w0rd.
2. Click the Desktop tile.
3. On the taskbar, click the File Explorer icon.
4. In File Explorer, in the address bar, type LON-SVR1\Data, and then press Enter.
   Bernard can now view only the Development folder, the folder for which he has permissions.
5. Double-click the Development folder.
   Bernard should have access to the Development folder.
Task 7: Disable offline files for the share
1. Switch to LON-SVR1.
2. On the taskbar, click the File Explorer icon.
3. In File Explorer, navigate to drive E, right-click the Data folder, and then click Properties.
4. In the Data Properties dialog box, click the Sharing tab, click Advanced Sharing, and then click Caching.
5. In the Offline Settings dialog box, click No files or programs from the shared folder are available offline, and then click OK.
6. Click OK to close the Advanced Sharing dialog box.
7. Click Close to close the Data Properties dialog box.

Results: After completing this exercise, you will have created a new shared folder for use by multiple departments.

Exercise 2: Configuring Shadow Copies

Task 1: Configure shadow copies for the file share
1. On LON-SVR1, open File Explorer.
2. Navigate to drive E, right-click Allfiles (E:), and then click Configure Shadow Copies.
3. In the Shadow Copies dialog box, click drive E, and then click Enable.
4. In the Enable Shadow Copies dialog box, click Yes.
5. In the drive Shadow Copies dialog box, click Settings.
6. In the Settings dialog box, click Schedule.
   This opens the drive E:\ dialog box.
7. In drive E:\ dialog box, change Schedule Task to Daily, change Start time to 12:00 AM, and then click Advanced.
8. In the Advanced Schedule Options dialog box, select Repeat task, and then set the frequency to every 1 hours.
9. Select Time, and then change the time value to 11:59 PM.
10. Click OK twice, and then click OK to close the Settings dialog box.
11. Leave the drive Shadow Copies dialog box open.

Task 2: Create multiple shadow copies of a file
1. On LON-SVR1, open File Explorer.
2. Navigate to E:\Data\Development.
3. On the menu toolbar, click Home, click New item, and then click Text Document.
4. Type Report, and then press Enter.
5. Switch back to the Shadow Copies dialog box. It should be opened on the Shadow Copies tab.
6. Click Create Now.
Task 3: Recover a deleted file from a shadow copy
1. On LON-SVR1, switch back to File Explorer.
2. Right-click Report.txt, and then click Delete.
3. In File Explorer, right-click the Development folder, and then click Properties.
4. In the Development Properties dialog box, click the Previous Versions tab.
5. Click the most recent folder version for Development, and then click Open.
6. Confirm that Report.txt is in the folder, right-click Report.txt, and then click Copy.
7. Close the File Explorer window that just opened.
8. In the other File Explorer window, right-click the Development folder, and then click Paste.
10. Click OK, and then close all open windows.

Results: After completing this exercise, you will have enabled shadow copies on the file server.

Exercise 3: Enabling and Configuring Work Folders

Task 1: Install the Work Folders role service
1. On LON-SVR1, on the taskbar, click the Windows PowerShell icon.
2. At the command prompt, type the following command, and then press Enter:

   Add-WindowsFeature FS-SyncShareService

   Note that the name of the feature is case-sensitive.

Task 2: Create a sync share on the file server
1. On LON-SVR1, at the Windows PowerShell command prompt, type the following command, and then press Enter:

   New-SyncShare Corp –path C:\CorpData –User “Adatum\Domain Users”

2. If required, on the taskbar, click the Server Manager icon to open Server Manager.
3. Click File and Storage Services.
4. Click Work Folders, and then ensure the Corp sync share exists.

Task 3: Automate settings for users by using Group Policy
1. On LON-DC1, in Server Manager, click Tools, and then click Group Policy Management.
2. In the Group Policy Management Console, go to Forest:Adatum.com\Domains\Adatum.com.
3. Right-click Adatum.com, and then click Create a GPO in this domain, and Link it here.
4. In the New GPO dialog box, in Name, type Work Folders, and then click OK.
5. Right-click the Work Folders GPO, and then click Edit.
6. In the Group Policy Management Editor window, go to User Configuration\Policies \Administrative Templates\Windows Components\Work Folders.
7. In the details pane, double-click **Specify Work Folders settings**.
9. Select **Force automatic setup**, and then click **OK**.
10. Close all open windows.

**Task 4: Test synchronization**
1. Sign in to LON-CL1 as **Adatum\Administrator** with the password **Pa$$w0rd**.
2. On the Start screen, click **Desktop**.
3. On the taskbar, click the **File Explorer** icon.
4. Navigate to **C:\Labfiles\Mod10**, and then double-click **WorkFolders.bat**.
   This adds a registry entry to allow unsecured connections to the work folders.
5. In the lower-left corner of the screen, click the **Start** button.
7. Sign in to LON-CL1 as **Adatum\Administrator** with the password **Pa$$w0rd**.
8. Click the **Desktop** tile, and then click **File Explorer**.
9. Double-click the **Work Folders** folder.
10. In the **Work Folders** folder, right-click an empty space, point to **New**, and then click **Text Document**.
11. Name the new text document **TestFile2**, and then press Enter.
12. Switch to LON-SVR1, and then click **File Explorer**.
13. Navigate to **C:\CorpData\Administrator**. Ensure the new text file named TestFile2 exists.
14. Close all open windows.

**Results:** After completing this exercise, you will have installed the Work Folders role service, created a sync share, and created a GPO to deliver the settings to the users automatically. Additionally, you will have tested the settings.

**Exercise 4: Creating and Configuring a Printer Pool**

**Task 1: Install the Print and Document Services server role**
1. On LON-SVR1, on the taskbar, click the **Server Manager** icon.
2. In Server Manager, on the menu toolbar, click **Manage**.
3. Click **Add Roles and Features**, click **Next**.
4. Click **Role-based or feature-based Installation**, click **Next**.
5. On the **Select destination server** page, click the server on which you want to install the Print and Document Services, and then click **Next**.
   The default server is the local server.
6. On the **Select Server Roles** page, select **Print and Document Services**.
7. In the Add Roles and Features Wizard, click **Add Features**.
8. On the Select server roles page, click Next.
10. On the Print and Document Services page, review the Notes for the administrator, and then click Next.
11. On the Select role services page, click Next until the Confirm Installation Selections page appears.
12. Click Install to install the required role services.
13. Click Close.

► Task 2: Install a printer
1. On LON-SVR1, in the Server Manager, click Tools, and then click Print Management.
2. Expand Printer Servers, expand LON-SVR1 (local), right-click Printers, and then click Add Printer. The Network Printer Installation Wizard starts.
3. On the Network Printer Installation Wizard page, click Add a TCP/IP or Web Services Printer by IP address or hostname, and then click Next.
4. Change the Type of Device to TCP/IP Device.
5. In Host name or IP address, type 172.16.0.200, clear Auto detect the printer driver to use, and then click Next.
6. Under Device Type, click Generic Network Card, and then click Next.
7. Click Install a new driver, and then click Next.
8. Click Microsoft as the Manufacturer, under Printers, click Microsoft XPS Class Driver, and then click Next.
9. Change the Printer Name to Branch Office Printer, and then click Next.
10. Click Next two times to accept the default printer name and share name, and to install the printer.
11. Click Finish to close the Network Printer Installation Wizard.
12. In the Print Management console, right-click the Branch Office Printer, and then select Properties.
13. Click the Sharing tab, select List in the directory, and then click OK.

► Task 3: Configure printer pooling
1. In the Print Management console, under LON-SVR1, right-click Ports, and then click Add Port.
2. In the Printer Ports dialog box, click Standard TCP/IP Port, and then click New Port.
3. In the Add Standard TCP/IP Printer Port Wizard, click Next.
4. In Printer Name or Address, type 172.16.0.201, and then click Next.
5. In the Additional port information required dialog box, click Next.
6. Click Finish to close the Add Standard TCP/IP Printer Port Wizard.
7. Click Close to close the Printer Ports dialog box.
8. In the Print Management console, click Printers, right-click Branch Office Printer, and then click Properties.
9. In the **Branch Office Printer Properties** dialog box, click the **Ports** tab, select **Enable printer pooling**, and then click the **172.16.0.201** port to select it as the second port.

10. Click **OK** to close the **Branch Office Printer Properties** dialog box.

11. Close the Print Management Console.

**Task 4: Install a printer on a client computer**

1. On LON-CL1, in the lower-left corner of the screen, right-click the **Start** button, and then click **Control Panel**.

2. In Control Panel, under **Hardware and Sound**, click **Add a device**.

3. In the **Add a device** dialog box, click **Branch Office Printer on LON-SVR1**, and then click **Next**.
   
The device installs automatically.

**Results:** After completing this exercise, you will have installed the Print and Document Services server role and installed a printer with printer pooling.

**Prepare for the next module**

After 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. In the **Virtual Machines** list, right-click **20410D-LON-SVR1**, and then click **Revert**.

3. In the **Revert Virtual Machine** dialog box, click **Revert**.

4. Repeat steps 2 and 3 for **20410D-LON-CL1** and **20410D-LON-DC1**.
Module 11: Implementing Group Policy
Lab: Implementing Group Policy

Exercise 1: Configuring a central store

► Task 1: View the location of administrative templates in a GPO
1. Sign in to LON-DC1 as Administrator with the password Pa$$w0rd.
2. In Server Manager, click Tools, and then click Group Policy Management.
3. In the Group Policy Management Console, expand Forest: Adatum.com, expand Domains, expand Adatum.com, and then expand the Group Policy Objects folder.
4. Right-click the Default Domain Policy, and then click Edit. This opens the Group Policy Management Editor window.
5. In the Group Policy Management Editor window, expand the Default Domain Policy, under User Configuration, expand Policies, and then click Administrative Templates.
6. Point to the Administrative Templates folder, and then note that the location is Administrative Templates: Policy definitions (.admx files) retrieved from the local computer.
7. Close the Group Policy Management Editor window.

► Task 2: Create a central store
1. On the taskbar, click the File Explorer icon.
2. In the File Explorer window, expand Local Disk (C:), expand Windows, expand SYSVOL, expand sysvol, expand Adatum.com, and then double-click Policies.
3. In the details pane, right-click a blank area, click New, and then click Folder.
4. Name the folder PolicyDefinitions.

► Task 3: Copy administrative templates to the central store
1. In File Explorer, go to C:\Windows, and open the PolicyDefinitions folder.
2. Select the entire contents of the PolicyDefinitions folder.
   Hint: To select all content, click in the details pane, and then press Ctrl+A.
3. Right-click the selection, and then click Copy.
4. Expand Local Disk (C:), expand Windows, expand SYSVOL, expand sysvol, expand Adatum.com, expand Policies, and then open the PolicyDefinitions folder.
5. Right-click in the empty folder area, and then click Paste.

► Task 4: Verify the administrative template location in GPMC
1. In the GPMC, right-click the Default Domain Policy, and then click Edit.
2. In the Group Policy Management Editor window, expand Policies, point to the Administrative Templates folder and read the local information text, which reads: “Administrative Templates: Policy definitions (ADMX files) retrieved from the central store.”
3. Close the Group Policy Management Editor window.

Results: After completing this exercise, you should have configured a central store.
Exercise 2: Creating GPOs

► Task 1: Create a Windows Internet Explorer Restriction default starter GPO
1. In the GPMC, right-click the Starter GPOs folder, and then click New.
2. In the New Starter GPO dialog box, in the Name field, type Internet Explorer Restrictions, in the Comment field, type This GPO disables the General page in Internet Options, and then click OK.

► Task 2: Configure the Internet Explorer Restriction starter GPO
1. In the GPMC, under the Starter GPOs folder, right-click the Internet Explorer Restrictions GPO, and then click Edit.
2. In the Group Policy Management Editor window, expand User Configuration, Administrative Templates, and then click All Settings.
3. Right-click All Settings, and then click Filter Options.
4. In the Filter Options dialog box, select the Enable Keyword Filters check box.
5. In the Filter for word(s) field, type General page.
6. Beside Within, clear the Help Text and the Comment check boxes.
7. Beside the Filter for word(s) field, click the drop-down list box, click Exact, and then click OK.
8. Double-click the Disable the General page setting, click Enabled, and then click OK.
9. Close the Group Policy Starter GPO Editor window.

► Task 3: Create an Internet Explorer Restrictions GPO from the Internet Explorer Restrictions starter GPO
1. In the GPMC, right-click the Adatum.com domain, and then click Create a GPO in this domain, and Link it here.
2. In the New GPO dialog box, in the Name field, type IE Restrictions.
3. Under Source Starter GPO, click the drop-down box, select Internet Explorer Restrictions, and then click OK.

► Task 4: Test the GPO for Domain Users
1. Sign in to LON-CL1 as Adatum\Brad with the password Pa$$w0rd.
2. Point the mouse at the lower-right edge of the screen, and then click the Search charm when it appears.
3. In the Everywhere search box, type Control Panel.
4. In the search results, click Control Panel.
5. In Control Panel, click Control Panel.
6. In the Network and Internet dialog box, click Change your homepage.
7. Read the message box that appears informing you that this feature has been disabled, and then click OK.
8. In the Control Panel, click Internet Options. Notice that in the Internet Properties dialog box the General tab does not display.
9. Close all open windows, and then sign out from LON-CL1.
Task 5: Use security filtering to exempt the IT Department from the Internet Explorer Restrictions policy
1. Switch to LON-DC1.
2. In the GPMC, expand the Group Policy Objects folder, and then in the left pane, click the IE Restrictions policy.
3. In the details pane, click the Delegation tab.
4. On the Delegation tab, click the Advanced button.
5. In the IE Restrictions Security Settings dialog box, click Add.
6. In the Select Users, Computers, Service Accounts, or Groups window, in the Enter the object names to select (examples) box, type IT, and then click OK.
7. In the IE Restrictions Security Settings dialog box, click the IT (Adatum\IT) group, next to the Apply group policy permission, select the Deny check box, and then click OK.
8. Click Yes to acknowledge the Windows Security dialog box.

Task 6: Test the GPO app for IT department users
1. Switch to LON-CL1.
2. Sign in to LON-CL1 as Brad with the password Pa$$w0rd.
3. Point the mouse at the lower-right edge of the screen, and then click the Search charm when it appears.
4. In the Everywhere search box, type Control Panel.
5. In the search results window, click Control Panel.
6. In Control Panel, click Network and Internet.
7. In the Network and Internet dialog box, click Change your homepage. The Internet Properties dialog box opens to the General tab, and all settings are available.
8. Close all open windows, and sign out from LON-CL1.

Task 7: Test the Application of the GPO for other domain users
1. Sign in to LON-CL1 as Boris with the password Pa$$w0rd.
2. Point the mouse at the lower-right edge of the screen, and then click the Search charm when it appears.
3. In the Everywhere search box, type Control Panel.
4. In the search results window, click Control Panel.
5. In Control Panel, click Network and Internet.
6. In the Network and Internet dialog box, click Change your homepage. A message box appears informing you that this feature has been disabled.
7. Click OK to acknowledge the message.
8. Click Internet Options. In the Internet Properties dialog box, notice that the General tab does not display.
9. Close all open windows, and sign out from LON-CL1.

Results: After completing this lab, you should have created a GPO.
Prepare for the next module
After you finish the lab, revert the virtual machines to their initial state by completing the following steps:

1. On the host computer, start **Hyper-V Manager**.
2. In the **Virtual Machines** list, right-click **20410D-LON-DC1**, and then click **Revert**.
3. In the **Revert Virtual Machine** dialog box, click **Revert**.
4. Repeat steps 2 and 3 for **20410D-LON-CL1**.
Module 12: Securing Windows Servers by Using Group Policy Objects

Lab A: Increasing Security for Server Resources

Exercise 1: Using Group Policy to Secure Member Servers

▶ Task 1: Create a Member Servers organizational unit (OU) and move servers into it
1. On LON-DC1, in Server Manager, click **Tools**, and then click **Active Directory Users and Computers**.
2. In Active Directory Users and Computers, in the navigation pane, right-click **Adatum.com**, click **New**, and then click **Organizational Unit**.
3. In the New Object - Organizational Unit window, in the **Name** box, type **Member Servers OU**, and then click **OK**.
4. In Active Directory Users and Computers, in the navigation pane, click **Computers** container.
5. Press and hold the Ctrl key. In the details pane, click both **LON-SVR1** and **LON-SVR2**, right-click the selection, and then click **Move**.
6. In the Move window, click **Member Servers OU**, and then click **OK**.

▶ Task 2: Create a Server Administrators group
1. On LON-DC1, in Active Directory Users and Computers, in the navigation pane, right-click the **Member Servers OU**, click **New**, and then click **Group**.
2. In the New Object – Group window, in **Group Name**, type **Server Administrators**, and then click **OK**.

▶ Task 3: Create a Member Server Security Settings Group Policy Object (GPO) and link it to the Member Servers OU
1. On LON-DC1, in the Server Manager window, click **Tools**, and then click **Group Policy Management**.
2. In the Group Policy Management Console, expand **Forests: Adatum.com**, expand **Domains**, expand **Adatum.com**, right-click **Group Policy Objects**, and then click **New**.
3. In the New GPO window, in **Name**, type **Member Server Security Settings**, and then click **OK**.
4. In the Group Policy Management Console, right-click **Member Servers OU**, and then click **Link an Existing GPO**.
5. In the Select GPO window, in the **Group Policy Objects** window, click **Member Server Security Settings**, and then click **OK**.

▶ Task 4: Configure group membership for local administrators to include Server Administrators and Domain Admins
1. In the Group Policy Management Console, if necessary, expand the Group Policy Objects container. Right-click **Default Domain Policy**, and then click **Edit**.
2. In the Group Policy Management Editor window, go to **Computer Configuration\Policies\Windows Settings\Security Settings\Restricted Groups**.
3. Right-click **Restricted Groups**, and then click **Add Group**.
4. In the Add Group dialog box, in Group name, type Administrators, and then click OK.
5. In the Administrators Properties dialog box, next to Members of this group, click Add.
6. In the Add Member dialog box type Adatum\Server Administrators, and then click OK.
7. Next to Members of this group, click Add.
8. In the Add Member dialog box type Adatum\Domain Admins, and then click OK twice.
9. Close the Group Policy Management Editor window.

► Task 5: Verify that Computer Administrators has been added to the local Administrators group
1. Switch to LON-SVR1.
2. On the taskbar, click the Windows PowerShell® icon.
3. At the Windows PowerShell prompt, type the following command, and then press Enter:

```
Gpupdate /force
```
4. In the Server Manager window, click Tools, and then click Computer Management.
5. In the Computer Management console, expand Local Users and Groups, click Groups, and then in the right-hand pane, double-click Administrators.
6. Confirm that the Administrators group contains both ADATUM\Domain Admins and ADATUM\Server Administrators as members. Click Cancel.

► Task 6: Modify the Member Server Security Settings GPO to remove Users from Allow Log On Locally
1. On LON-DC1, in the Group Policy Management Console, click Group Policy Objects.
2. In the right-hand pane, right-click Member Server Security Settings, and then click Edit.
3. In the Group Policy Management Editor window, go to Computer Configuration\Policies \Windows Settings\Security Settings\Local Policies\User Rights Assignment.
4. In the right-hand pane, right-click Allow log on locally, and then click Properties.
5. In the Allow log on locally Properties dialog box, select the Define these policy settings check box, and then click Add User or Group.
6. In the Add User or Group window, type Domain Admins, and then click OK.
7. Click Add User or Group.
8. In the Add User or Group window, type Administrators, and then click OK twice.
Task 7: Modify the Member Server Security Settings GPO to enable User Account Control: Admin Approval Mode for the Built-in Administrator account
1. On LON-DC1, in the Group Policy Management Editor window, go to Computer Configuration \Policies\Windows Settings\Security Settings\Local Policies\Security Options.
2. In the right-hand pane, right-click User Account Control: Admin Approval Mode for the Built-in Administrator account, and then click Properties.
3. In the User Account Control: Admin Approval Mode for the Built-in Administrator account Properties dialog box, select the Define this policy settings check box, ensure that Enabled is selected, and then click OK.
4. Close the Group Policy Management Editor window.

Task 8: Verify that a nonadministrative user cannot sign in to a member server
1. Switch to LON-SVR1.
2. On the taskbar, click the Windows PowerShell icon.
3. At the Windows PowerShell prompt, type the following command, and then press Enter:
   `Gpupdate /force`
5. Try to sign in to LON-SVR1 as Adatum\Adam with the password Pa$$w0rd.
   Verify that you cannot sign in to LON-SVR1, and that a logon error message is displayed.
6. To prepare for the next exercise, sign out of LON-SVR1, and then sign back in to LON-SVR1 as Adatum\Administrator with the password Pa$$w0rd.

Results: After completing this exercise, you will have used Group Policy to secure member servers.

Exercise 2: Auditing File System Access

Task 1: Modify the Member Server Security Settings GPO to enable object access auditing
1. Switch to LON-DC1.
2. In the Group Policy Management Console, go to Forest: Adatum.com\Domains\Adatum.com.
3. Click Group Policy Objects.
4. In the right-hand pane, right-click Member Server Security Settings, and then click Edit.
5. In the Group Policy Management Editor window, go to Computer Configuration\Policies \Windows Settings\Security Settings\Local Policies.
6. Click Audit Policy.
7. In the right-hand pane, right-click Audit object access, and then click Properties.
8. In the Audit object access Properties dialog box, select the Define these policy settings check box, select both the Success and Failure check boxes, and then click OK.
Task 2: Create and share a folder
1. Switch to LON-SVR1.
2. On LON-SVR1, on the taskbar, click the File Explorer icon.
3. In File Explorer, in the navigation pane, double-click Local Disk (C), and then click Home.
4. Click New folder, type Marketing, and then press Enter.
5. In the Computer window, right-click the Marketing folder, click Share with, and then click Specific people.
6. In the File Sharing window, type Adam, and then click Add.
7. Change the Permission Level to Read/Write, click Share, and then click Done.

Task 3: Enable auditing on the Marketing folder for Domain Users
1. On LON-SVR1, in the Local Disk (C:) window, right-click the Marketing folder, and then click Properties.
2. In the Marketing Properties window, click the Security tab, and then click Advanced.
3. In the Advanced Security Settings for Marketing window, click the Auditing tab, click Continue, and then click Add.
4. In the Auditing Entry for Marketing window, click Select a principal.
5. In the Select User, Computer, Service Account or Group window, in Enter the object name to select, type Domain Users, and then click OK.
6. In the Auditing Entry for Marketing window, from the Type drop-down menu, select All.
7. In the Auditing Entry for Marketing window, under the Permission list, select the Write check box, and then click OK three times.
8. On the taskbar, click the Windows PowerShell icon.
9. At the Windows PowerShell prompt, type the following command, and then press Enter:
   ```
   gpupdate /force
   ```

Task 4: Create a new file in the file share from LON-CL1
1. Sign in to LON-CL1 as Adatum\Administrator with the password Pa$$w0rd.
2. Point to the lower-right corner of the screen, and then click the Search charm when it appears.
3. In the Search box type cmd, and then press Enter.
4. Open the Command Prompt window, and at the command prompt, type the following command, and then press Enter:
   ```
   gpupdate /force
   ```
5. Close the Command Prompt window.
6. Sign out from LON-CL1, and then sign in again as Adatum\Adam with the password Pa$$w0rd.
7. Point to the lower-right corner of the screen, and then click the Search charm when it appears.
8. In the Search box, type \LON-SVR1\Marketing, and then press Enter.

10. Sign out from LON-CL1.

**Task 5: View the results in the security log on the domain controller**

1. Switch to LON-SVR1.

2. In the Server Manager window, click **Tools**, and then click **Event Viewer**.

3. In the Event Viewer window, expand **Windows Logs**, and then click **Security**.

4. Verify that the following event and information is displayed:
   - Source: **Microsoft Windows Security Auditing**
   - Event ID: **4663**
   - Task category: **File System**
   - An attempt was made to access an object

**Results:** After completing this exercise, you will have enabled file system access auditing.

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### Exercise 3: Auditing Domain Logons

**Task 1: Modify the Default Domain Policy GPO**

1. Sign in to LON-DC1 as **Adatum\Administrator** with the password **Pa$$w0rd**.

2. On LON-DC1, on the taskbar, click the **Server Manager** icon.

3. In the Server Manager window, click **Tools**, and then click **Group Policy Management**.

4. On LON-DC1, in the Group Policy Management Console, go to **Forest: Adatum.com\Domains \Adatum.com**.

5. Click **Group Policy Objects**.

6. In the right-hand pane, right-click **Default Domain Policy**, and then click **Edit**.

7. In the Group Policy Management Editor window, go to **Computer Configuration\Policies \Windows Settings\Security Settings\Local Policies**.

8. Click **Audit Policy**.

9. In the right-hand pane, right-click **Audit account logon events**, and then click **Properties**.

10. In the **Audit account logon events Properties** dialog box, select the **Define these policy settings** check box, select both the **Success** and **Failure** check boxes, and then click **OK**.

11. Point to the lower-right corner of the screen, and then click the **Search** charm when it appears.

12. In the **Search** box, type **cmd**, and then press Enter.

13. At the command prompt, type the following command, and then press Enter:

```
gpupdate /force
```
Task 2: Run gpupdate
1. Sign in to LON-CL1 as Adatum\Administrator with the password Pa$$w0rd.
2. Point to the lower-right corner of the screen, and then click the Search charm when it appears.
3. In the Search box, type cmd, and then press Enter.
4. At the command prompt, type the following command, and then press Enter:
   ```
   gpupdate /force
   ```
5. Close the Command Prompt window, and then sign out from LON-CL1.

Task 3: Sign in to LON-CL1 with an incorrect password
- Sign in to LON-CL1 as Adatum\Adam with the password password.
  This password is intentionally incorrect to generate a security log entry that shows that an unsuccessful sign-in attempt has been made.

Task 4: Review event logs on LON-DC1
1. On LON-DC1, in Server Manager, click Tools, and then click Event Viewer.
2. In the Event Viewer window, expand Windows Logs, and then click Security.

Task 5: Sign in to LON-CL1 with the correct password
1. Sign in to LON-CL1 as Adatum\Adam with the password Pa$$w0rd.
   This password is correct, and you should be able to sign in successfully as Adam.
2. Sign out of LON-CL1.

Task 6: Review event logs on LON-DC1
1. Switch to LON-DC1.
2. In the Server Manager window, click Tools, and then click Event Viewer.
3. In the Event Viewer window, expand Windows Logs, and then click Security.
4. Review the event logs for the following message: “Event ID 4624 An account was successfully logged on. New Logon: Security ID: ADATUM\Adam”.

Task 7: Prepare for the next lab
- To prepare for the next lab, leave the virtual machines running.

Results: After completing this exercise, you will have enabled domain logon auditing.
Lab B: Configuring AppLocker and Windows Firewall

Exercise 1: Configuring AppLocker Policies

▶ Task 1: Create an OU for client computers
1. Switch to LON-DC1.
2. In Server Manager, click Tools, and then click Active Directory Users and Computers.
3. In Active Directory Users and Computers, in the navigation pane, right-click Adatum.com, click New, and then click Organizational Unit.
4. In the New Object - Organizational Unit window, type Client Computers, and then click OK.

▶ Task 2: Move LON-CL1 to the Client Computers OU
1. On LON-DC1, in Active Directory Users and Computers, in the navigation pane, click Computers container.
2. In the details pane, right-click LON-CL1, and then click Move.
3. In the Move window, click Client Computers, and then click OK.

▶ Task 3: Create a Software Control GPO and link it to the Client Computers OU
1. On LON-DC1, in Server Manager, click Tools, and then click Group Policy Management.
2. In the Group Policy Management Console, go to Forests: Adatum.com\Domains\Adatum.com.
3. Right-click Group Policy Objects, and then click New.
4. In New GPO window, in the Name text box, type Software Control, and then click OK.
5. In the right-hand pane, right-click Software Control, and then click Edit.
6. In the Group Policy Management Editor window, go to Computer Configuration\Policies \Windows Settings\Security Settings\Application Control Policies\AppLocker.
7. Under AppLocker, right-click Executable Rules, and then click Create Default Rules.
9. In the navigation pane, click AppLocker, and then in the right-hand pane, click Configure rule enforcement.
10. In the AppLocker Properties dialog box, under Executable rules, select the Configured check box, and then from the drop-down menu, select Audit only.
11. Repeat the previous step for Windows Installer Rules, Script Rules, and Packaged app Rules, and then click OK.
12. In the Group Policy Management Editor window, go to Computer Configuration\Policies \Windows Settings\Security Settings.
13. Click System Services, and then double-click Application Identity.
14. In the Application Identity Properties dialog box, click Define this policy setting.
15. Under Select service startup mode, click Automatic, and then click OK.
16. Close the Group Policy Management Editor window.
17. In the Group Policy Management Console, right-click **Client Computers**, and then click **Link an Existing GPO**.

18. In the Select GPO window, in the **Group Policy Objects** list, click **Software Control**, and then click **OK**.

**Task 4: Run gpupdate**

1. Switch to LON-CL1.

2. Point to the lower-right corner of the screen, and then click the **Search** charm when it appears.

3. In the **Search** box, type **cmd**, and then press Enter.

4. In the Command Prompt window, type following command, and then press Enter:

   `gpupdate /force`

5. Close the Command Prompt window.

6. Point to the lower-right corner of the screen, and then click the **Settings** charm when it appears.

7. Click **Power**, and then click **Restart**.

**Task 5: Run app1.bat in the C:\CustomApp folder**

1. Sign in to LON-CL1 as Adatum\Administrator with the password **Pa$$w0rd**.

2. Point to the lower-right corner of the screen, and then click the **Search** charm when it appears.

3. In the **Search** box, type **cmd**, and then press Enter.

4. At the command prompt, type following command, and then press Enter:

   `gpresult /R`

   Review the result of the command, and ensure that Software Control is displayed under Computer Settings, Applied Group Policy Objects.

5. If Software Control is not displayed, restart LON-CL1, and then repeat steps 1 through 4.

6. Point to the lower-right corner of the screen, and then click the **Search** charm when it appears.

7. In the **Search** box, type **cmd**, and then press Enter.

8. At the command prompt, type the following command, and then press Enter:

   `C:\CustomApp\app1.bat`

**Task 6: View AppLocker events in an event log**

1. On LON-CL1, point to the lower-right corner of the screen, and then click the **Search** charm when it appears.

2. In the **Search** box type **eventvwr.msc**, and then press Enter.

3. In the Event Viewer window, expand **Application and Services Logs**, expand **Microsoft**, expand **Windows**, and then expand **AppLocker**.

4. Click **MSI and Scripts**, and then review event log 8005 that contains the following text:

   `%OSDRIVE%\CUSTOMAPP\APP1.BAT was allowed to run`.

   If no events are displayed, ensure that the Application Identity service has started, and then try again.
Task 7: Create a rule that allows software to run from a specific location

1. On LON-DC1, in Server Manager, click **Tools**, and then click **Group Policy Management**.
2. In the Group Policy Management Console, expand the **Group Policy Objects** node, right-click **Software Control**, and then click **Edit**.
3. In the Group Policy Management Editor window, go to **Computer Configuration\Policies \Windows Settings\Security Settings\Application Control Policies\AppLocker**.
4. Right-click **Script rules**, and then click **Create New Rule**.
5. On the **Before You Begin** page, click **Next**.
6. On the **Permissions** page, click **Allow**, and then click **Next**.
7. On the **Conditions** page, click **Path**, and then click **Next**.
8. On the **Path** page, in **Path**, type the path `%OSDRIVE%\CustomApp\app1.bat`, and then click **Next**.
9. On the **Exception** page, click **Next**.
10. On the **Name and Description** page, in **Name**, type **Custom Application Rule**, and then click **Create**.

Task 8: Modify the Software Control GPO to enforce rules

1. In the Group Policy Management Editor window, in the navigation pane, click **AppLocker**, and then in the right-hand pane, click **Configure rule enforcement**.
2. In **AppLocker Properties** dialog box, under **Executable rules**, select the **Configured** check box, and then from drop-down menu, click **Enforce rules**.
3. Repeat the previous step for **Windows Installer Rules**, **Script Rules**, and **Packaged app Rules**, and then click **OK**.
4. Close the Group Policy Management Editor window.

Task 9: Verify that an application can still be run

1. Switch to LON-CL1.
2. Point to the lower-right corner of the screen, and then click the **Search** charm when it appears.
3. In the **Search** box type **cmd**, and then press Enter.
4. In the Command Prompt window, type the following command, and then press Enter:

   ```cmd
gpupdate /force
```
5. Close the Command Prompt window.
6. Point to the lower-right corner of the screen, and then click the **Settings** charm when it appears.
7. Click **Power**, and then click **Restart**.
8. Sign in to LON-CL1 as **Adatum\Tony** with the password **Pa$$w0rd**.
9. Point to the lower-right corner of the screen, and then click the **Search** charm when it appears.
10. In the **Search** box, type **cmd**, and then press Enter.
11. In the Command Prompt window, type following command, and then press Enter:

   ```cmd
   C:\customapp\app1.bat
   ```
Task 10: Verify that an application cannot be run
1. On LON-CL1, on the taskbar, click the File Explorer icon.
2. In File Explorer, in the navigation pane, click Computer.
3. In the Computer window, double-click Local Disk (C), double-click the CustomApp folder, right-click app1.bat, and then click Copy.
4. In the CustomApp window, on the navigation pane, right-click the Documents folder, and then click Paste.
5. In the Command Prompt window, type C:\Users\Tony\Documents\app1.bat, and then press Enter.
6. Verify that applications cannot be run from the Documents folder, and that the following message is displayed: “This program is blocked by Group Policy. For more information, contact your system administrator.”
7. Close all open windows, and then sign out from LON-CL1.

Results: After completing this exercise, you will have configured AppLocker policies for all users whose computer accounts are located in the Client Computers OU. The policies you configured should allow these users to run applications that are located in the folders C:\Windows and C:\Program Files, and run the custom-developed application app1.bat in the C:\CustomApp folder.

Exercise 2: Configuring Windows Firewall

Task 1: Create a group named Application Servers
1. Switch to LON-DC1.
2. In the Server Manager window, click Tools, and then click Active Directory Users and Computers.
3. In Active Directory Users and Computers, in the navigation pane, right-click the Member Servers OU, click New, and then click Group.
4. In the New Object – Group window, in Group Name, type Application Servers, and then click OK.

Task 2: Add LON-SVR1 as a group member
1. In Active Directory Users and Computers, in the navigation pane, right-click the Member Servers OU, and in the details pane, right-click Application Servers group, and then click Properties.
2. In the Application Server Properties dialog box, click the Members tab, and then click Add.
3. In Select Users, Computers, Service Accounts or Groups, click Object Types, click Computers, and then click OK.
4. In the Enter the object names to select box, type LON-SVR1, and then click OK.
5. In the Application Server Properties dialog box, click OK.

Task 3: Create a new Application Servers GPO
1. On LON-DC1, in Server Manager, click Tools, and then click Group Policy Management.
2. In the Group Policy Management Console, expand Forests: Adatum.com, expand Domains, expand Adatum.com, right-click Group Policy Objects, and then click New.
3. In the New GPO window, in Name, type Application Servers GPO, and then click OK.
4. In the Group Policy Management Console, right-click Application Servers GPO, and then click Edit.
5. In the Group Policy Management Editor window, go to Computer Configuration\Policies \Windows Settings\Security Settings\Windows Firewall with Advanced Security.
6. Click Windows Firewall with Advanced Security - LDAP://CN={GUID}.
7. In the Group Policy Management Editor window, click Inbound Rules.
8. Right-click Inbound Rules, and then click New Rule.
9. In the New Inbound Rule Wizard, on the Rule Type page, click Custom, and then click Next.
10. On the Program page, click Next.
11. On the Protocol and Ports page, in the Protocol type list, click TCP.
12. In the Local port list, click Specific Ports, in the text box type 8080, and then click Next.
14. On the Action page, click Allow the connection, and then click Next.
15. On the Profile page, clear both the Private and Public check boxes, and then click Next.
16. On the Name page, in the Name box, type Application Server Department Firewall Rule, and then click Finish.
17. Close the Group Policy Management Editor window.

► Task 4: Link the Application Servers GPO to the Member Servers OU
1. On LON-DC1, in the Group Policy Management Console, right-click Member Servers OU, and then click Link an Existing GPO.
2. In the Select GPO window, in the Group Policy objects list, click Application Servers GPO, and then click OK.

► Task 5: Use security filtering to limit the Application Server GPO to members of Application Server group
1. On LON-DC1, in the Group Policy Management Console, click Member Servers OU.
2. Expand the Member Servers OU, and then click the Application Servers GPO link.
3. In the Group Policy Management Console message box, click OK.
4. In the right-hand pane, under Security Filtering, click Authenticated Users, and then click Remove.
5. In the Confirmation dialog box, click OK.
6. In the details pane, under Security Filtering, click Add.
7. In the Select User, Computer, or Group dialog box, type Application Servers, and then click OK.

► Task 6: Run gpupdate on LON-SVR1
1. Switch to LON-SVR1, and then sign in as Adatum\Administrator with the password Pa$$w0rd.
2. Point to the lower-right corner of the screen, and then click the Search charm when it appears.
3. In the Search box, type cmd, and then press Enter.
4. In the Command Prompt window, type the following command, and then press Enter:
   
   \gpupdate /force

5. Close the Command Prompt window.
6. Restart LON-SVR1, and then sign back in as Adatum\Administrator with the password Pa$$w0rd.
Task 7: View the firewall rules on LON-SVR1

1. Switch to LON-SVR1.

2. In Server Manager, click **Tools**, and then click **Windows Firewall with Advanced Security**.

3. In the Windows Firewall with Advanced Security window, click **Inbound rules**.

4. In the right-hand pane, verify that the **Application Server Department Firewall Rule** that you created earlier by using Group Policy is configured.

5. Verify that you cannot edit the **Application Server Department Firewall Rule**, because it is configured through Group Policy.

**Results**: After completing this exercise, you will have used Group Policy to configure Windows Firewall with Advanced Security to create rules for application servers.

Prepare for the next module

When you finish the lab, revert the virtual machines to their initial state by performing the following steps:

1. On the host computer, start **Hyper-V® Manager**.

2. In the **Virtual Machines** list, right-click **20410D-LON-DC1**, and then click **Revert**.

3. In the **Revert Virtual Machine** dialog box, click **Revert**.

4. Repeat steps 2 and 3 for **20410D-LON-SVR1** and **20410D-LON-CL1**.
Module 13: Implementing Server Virtualization with Hyper-V

Lab: Implementing Server Virtualization with Hyper-V

Exercise 1: Installing the Hyper-V Role onto a Server

Task 1: Install the Hyper-V role onto a server

1. On LON-HOST1, in Server Manager, click Local Server.
2. In the Properties pane, click the IPv4 address assigned by DHCP, IPv6 enabled link.
3. In the Network Connections dialog box, right-click the network object, and then click Properties.
4. In the Properties dialog box, click Internet Protocol Version 4 (TCP/IPv4), and then click Properties.
5. In the Properties dialog box, on the General tab, click Use the following IP address, and then configure the following:
   - IP Address: 172.16.0.31
   - Subnet mask: 255.255.0.0
   - Default gateway: 172.16.0.1
6. On the General tab, click Use the following DNS server addresses, and then configure the following:
   - Preferred DNS server: 172.16.0.10
7. Click OK to close the Properties dialog box.
8. In the Properties dialog box of the network object, click Close.
9. Close the Network Connections dialog box.
10. In the Server Manager console, from the Manage menu, click Add Roles and Features.
11. In the Add Roles and Features Wizard, on the Before you begin page, click Next.
12. On the Select installation type page, click Role-based or feature-based installation, and then click Next.
13. On the Select destination server page, ensure that LON-HOST1 is selected, and then click Next.
14. On the Select server roles page, select Hyper-V.
15. In the Add Roles and Features Wizard, click Add Features.
16. On the Select server roles page, click Next.
17. On the Select features page, click Next.
18. On the Hyper-V page, click Next.
19. On the Virtual Switches page, verify that no selections have been made, and then click Next.
21. On the Default Stores page, review the location of the Default Stores, and then click Next.
22. On the **Confirm installation selections** page, click **Restart the destination server automatically if required**.

23. In the Add Roles and Features Wizard, review the message regarding automatic restarts, and then click **Yes**.

24. On the **Confirm Installation Selections** page, click **Install**.

   After a few minutes, the server restarts automatically. Ensure that you restart the machine from the boot menu as **20410D-LON-HOST1**. The computer will restart several times.

**Task 2: Complete the Hyper-V role installation, and verify the settings**

1. Sign in to LON-HOST1 by using the account **Administrator** with the password **Pa$$word**.

2. When the installation of the Hyper-V tools is complete, click **Close** to close the Add Roles and Features Wizard.

3. In the Server Manager console, click the **Tools** menu, and then click **Hyper-V Manager**.

4. In the Hyper-V Manager console, click **LON-HOST1**.

5. In the Hyper-V Manager console, in the Actions pane, with **LON-HOST1** selected, click **Hyper-V Settings**.

6. In the **Hyper-V Settings for LON-HOST1** dialog box, click the **Keyboard** item. Verify that the Keyboard is set to the **Use on the virtual machine** option.

7. In the **Hyper-V Settings for LON-HOST1** dialog box, click the **Virtual Hard Disks** item.

8. Verify that the location of the default folder to store Virtual Hard Disk files is **C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks**, and then click **OK**.

**Results:** After completing this exercise, you should have installed the Hyper-V role onto a physical server.

**Exercise 2: Configuring Virtual Networking**

**Task 1: Configure the external network**

1. In the Hyper-V Manager console, click **LON-HOST1**.

2. From the **Actions** menu, click **Virtual Switch Manager**.

3. In the **Virtual Switch Manager for LON-HOST1** dialog box, click **New virtual network switch**. Ensure that **External** is selected, and then click **Create Virtual Switch**.

4. In the Virtual Switch Properties area, enter the following information, and then click **OK**:
   - **Name:** **Switch for External Adapter**
   - **External Network:** Mapped to the host computer’s physical network adapter. (This varies depending on the host computer.)

5. In the **Apply Networking Changes** dialog box, review the warning, and then click **Yes**.

**Task 2: Create a private network**

1. In Hyper-V Manager click **LON-HOST1** and from the **Actions** menu, click **Virtual Switch Manager**.

2. Under **Virtual Switches**, click **New virtual network switch**.

3. Under **Create virtual switch**, click **Private**, and then click **Create Virtual Switch**.
4. In the **Virtual Switch Manager** dialog box, in the **Virtual Switch Properties** section, configure the following settings, and then click **OK**:  
   - Name: **Private Network**  
   - Connection type: **Private network**

   ► **Task 3: Create an internal network**
   1. In Hyper-V Manager click **LON-HOST1**, and from the **Actions** menu, click **Virtual Switch Manager**.  
   2. Under **Virtual Switches**, click **New virtual network switch**.  
   3. Under **Create virtual switch**, click **Internal** and then click **Create Virtual Switch**.
   4. In the **Virtual Switch Manager** dialog box, in the **Virtual Switch Properties** section, configure the following settings, and then click **OK**:
      - Name: **Internal Network**  
      - Connection type: **Internal network**

   ► **Task 4: Configure the MAC address range**
   1. In Hyper-V Manager, click **LON-HOST1** and from the **Actions** menu, click **Virtual Switch Manager**.  
   2. Under **Global Network Settings**, click **MAC Address Range**.  
   3. On MAC Address Range settings, configure the following values, and then click **OK**:
      - Minimum: **00-15-5D-0F-AB-A0**  
      - Maximum: **00-15-5D-0F-AB-EF**  
   4. Close the Hyper-V Manager console.

**Results:** After completing this exercise, you should have configured virtual switch options on a physically deployed Windows Server 2012 server that is running the Hyper-V role.

**Exercise 3: Creating and Configuring a Virtual Machine**

► **Task 1: Create differencing virtual hard disks**
   1. On the taskbar, click the **File Explorer** icon.  
   2. Expand **This PC**, expand drive **E**, expand **Program Files**, expand **Microsoft Learning**, and then expand **Base**.

   ![Note: The drive letter may depend upon the number of drives on the physical host computer.](image)

   3. In the **Base** folder, verify that the **Base14A-WS12R2.vhd** hard disk image file is present.  
   4. Click the **Home** tab, and then click the **New Folder** icon twice to create two new folders. Right-click each folder, and then rename the folders as follows:
      - **LON-GUEST1**  
      - **LON-GUEST2**  
   5. Close File Explorer.
6. In the Server Manager console, click **Tools**, and then click **Hyper-V Manager**.

7. In the Hyper-V Manager console, in the Actions pane, click **New**, and then click **Hard Disk**.

8. In the New Virtual Hard Disk Wizard, on the **Before You Begin** page, click **Next**.

9. On the **Choose Disk Format** page, click **VHD**, and then click **Next**.

10. On the **Choose Disk Type** page, click **Differencing**, and then click **Next**.

11. On the **Specify Name and Location** page, specify the following details, and then click **Next**:
   - Name: **LON-GUEST1.vhd**
   - Location: `E:\Program Files\Microsoft Learning\Base\LON-GUEST1\`

   **Note:** The drive letter may depend upon the number of drives on the physical host computer.

12. On the **Configure Disk** page, type the location: `E:\Program Files\Microsoft Learning\Base\Base14A-WS12R2.vhd`, and then click **Finish**.

13. On the desktop, on the taskbar, click the **Windows PowerShell** icon.

14. At the Windows PowerShell prompt, type the following command to create a new differencing virtual hard disk to be used with LON-GUEST2, and then press Enter:

   ```bash
   New-VHD "E:\Program Files\Microsoft Learning\Base\LON-GUEST2\LON-GUEST2.vhd"
   -ParentPath "E:\Program Files\Microsoft Learning\Base\Base14A-WS12R2.vhd"
   ```


16. In the Hyper-V Manager console, in the Actions pane, click **Inspect Disk**.

17. In the **Open** dialog box, browse to `E:\Program Files\Microsoft Learning\Base\LON-GUEST2\`, click **LON-GUEST2.vhd**, and then click **Open**.

18. In the **Virtual Hard Disk Properties** dialog box, verify that **LON-GUEST2.vhd** is configured as a differencing virtual hard disk with `E:\Program Files\Microsoft Learning\Base\Base14A-WS12R2.vhd` as a parent, and then click **Close**.

<table>
<thead>
<tr>
<th>Task 2: Create virtual machines</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In Hyper-V Manager click <strong>LON-HOST1</strong> and from the <strong>Actions</strong> pane, click <strong>New</strong>, and then click <strong>Virtual Machine</strong>.</td>
</tr>
<tr>
<td>2. In the New Virtual Machine Wizard, on the <strong>Before You Begin</strong> page, click <strong>Next</strong>.</td>
</tr>
<tr>
<td>3. On the <strong>Specify Name and Location</strong> page, click <strong>Store the virtual machine in a different location</strong>, enter the following values, and then click <strong>Next</strong>:</td>
</tr>
<tr>
<td>- Name: <strong>LON-GUEST1</strong></td>
</tr>
</tbody>
</table>
|   - Location: `E:\Program Files\Microsoft Learning\Base\LON-GUEST1\`

| Note: The drive letter may depend upon the number of drives on the physical host computer. |

4. On the **Specify Generation** page, select **Generation 1**, and then click **Next**.
5. On the **Assign Memory** page, enter a value of **1024 MB**, select the **Use Dynamic Memory for this virtual machine** option, and then click **Next**.

6. On the **Configure Networking** page, for the connection, click **Private Network**, and then click **Next**.

7. On the **Connect Virtual Hard Disk** page, click **Use an existing virtual hard disk**. Click **Browse**, browse to **E:\Program Files\Microsoft Learning\Base\LON-GUEST1\LON-GUEST1.vhd**, click **Open**, and then click **Finish**.

8. On the desktop, on the taskbar, click the **Windows PowerShell** icon.

9. At the Windows PowerShell prompt, type the following command to create a new virtual machine named **LON-GUEST2**, and then press Enter:

   ```powershell
   New-VM -Name LON-GUEST2 -MemoryStartupBytes 1024MB -VHDPath "E:\Program Files\Microsoft Learning\Base\LON-GUEST2\LON-GUEST2.vhd" -SwitchName "Private Network"
   ```


11. In the Hyper-V Manager console, click **LON-GUEST2**.

12. In the Actions pane, under **LON-GUEST2**, click **Settings**.

13. In the **Settings for LON-GUEST2 on LON-HOST1** dialog box, click **Automatic Start Action**, and set the Automatic Start Action to **Nothing**.

14. In the **Settings for LON-GUEST2 on LON-HOST1** dialog box, click **Automatic Stop Action**, and set the Automatic Stop Action to **Shut down the guest operating system**.

15. Click **OK** to close the **Settings for LON-GUEST2 on LON-HOST1** dialog box.

▶ **Task 3: Enable resource metering**

1. On the taskbar, click the **Windows PowerShell** icon.

2. At the Windows PowerShell prompt, enter the following commands to enable resource metering on the virtual machines, pressing Enter at the end of each line:

   ```powershell
   Enable-VMResourceMetering LON-GUEST1
   Enable-VMResourceMetering LON-GUEST2
   ```

**Results:** After completing this exercise, you should have deployed two separate virtual machines by using a sysprepped virtual hard disk file as a parent disk for two differencing virtual hard disks.

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**Exercise 4: Using Virtual Machine Checkpoints**

▶ **Task 1: Deploy Windows Server 2012 in a virtual machine**

1. In the Hyper-V Manager console, click **LON-GUEST1**.

2. In the Actions pane, click **Start**.

3. Double-click **LON-GUEST1** to open the Virtual Machine Connection Window.
4. In the LON-GUEST1 on LON-HOST1 - Virtual Machine Connection window, perform the following steps:
   o On the Settings page, click Next to accept the Region and Language settings.
   o On the Settings page, click I accept.
   o On the Settings page, type the password Pa$$w0rd twice, and then click Finish.
5. In the LON-GUEST1 on LON-HOST1 - Virtual Machine Connection window, from the Action menu, click CTRL+Alt+Delete.
6. Sign in to the virtual machine by using the account Administrator and the password Pa$$w0rd.
7. On the virtual machine, in the Server Manager console, click Local Server, and then click the randomly assigned name next to the computer name.
8. In the System Properties dialog box, on the Computer Name tab, click Change.
9. In the Computer Name field, type LON-GUEST1, and then click OK.
10. In the Computer Name/Domain Changes dialog box, click OK.
11. Click Close to close the System Properties dialog box.
12. In the Microsoft Windows dialog box, click Restart Now.

► Task 2: Create a virtual machine checkpoint
1. Sign in to the LON-GUEST1 virtual machine by using the Administrator account and the password Pa$$w0rd.
2. In the Server Manager console, click the Local Server node, and verify that the name of the computer is set to LON-GUEST1.
3. In the Virtual Machine Connection window, from the Action menu, click Checkpoint.
4. In the Checkpoint Name dialog box, type the name Before Change, and then click Yes.

► Task 3: Modify the virtual machine
1. In the Server Manager console, click Local Server, and then next to Computer name, click LON-GUEST1.
2. In the System Properties dialog box, on the Computer Name tab, click Change.
3. In the Computer Name field, type LON-Computer1, and then click OK.
4. In the Computer Name/Domain Changes dialog box, click OK.
5. Close the System Properties dialog box.
6. In the Microsoft Windows dialog box, click Restart Now.
7. Sign back in to the LON-GUEST1 virtual machine by using the Administrator account and the password Pa$$w0rd.
8. In the Server Manager console, click Local Server, and then verify that the server name is set to LON-Computer1.
Task 4: Revert to the existing virtual machine checkpoint
1. In the Virtual Machine Connection window, from the Action menu, click Revert.
2. In the Revert Virtual Machine dialog box, click Revert.
3. In the Server Manager console, in the Local Server node, in the Virtual Machines list, verify that the Computer Name now is set to LON-GUEST1.

Task 5: View resource metering data
1. On LON-HOST1, on the taskbar, click the Windows PowerShell icon.
2. To retrieve resource metering information, at the Windows PowerShell prompt, enter the following command, and then press Enter:
   \[\text{Measure-VM LON-GUEST1}\]
   Note the average central processing unit (CPU), average random access memory (RAM), and total disk usage figures.

Results: After completing this exercise, you should have used virtual machine checkpoints to recover from a virtual machine misconfiguration.

Revert the virtual machines
After you finish the lab, restart the computer in Windows Server 2012 by performing the following steps:
1. On the taskbar, click the Windows PowerShell icon.
2. At the Windows PowerShell command prompt, type the following command, and then press Enter:
   \[\text{Shutdown /r /t 5}\]
3. From the Windows Boot Manager, select Windows Server 2012.