

# Module 2

## Implementing DHCP

# Module Overview

- Overview of the DHCP server role
- Deploying DHCP
- Managing and troubleshooting DHCP

# Lesson 1: Overview of the DHCP server role

- Benefits of using DHCP
- How DHCP allocates addresses
- How DHCP lease generation works
- How DHCP lease renewal works

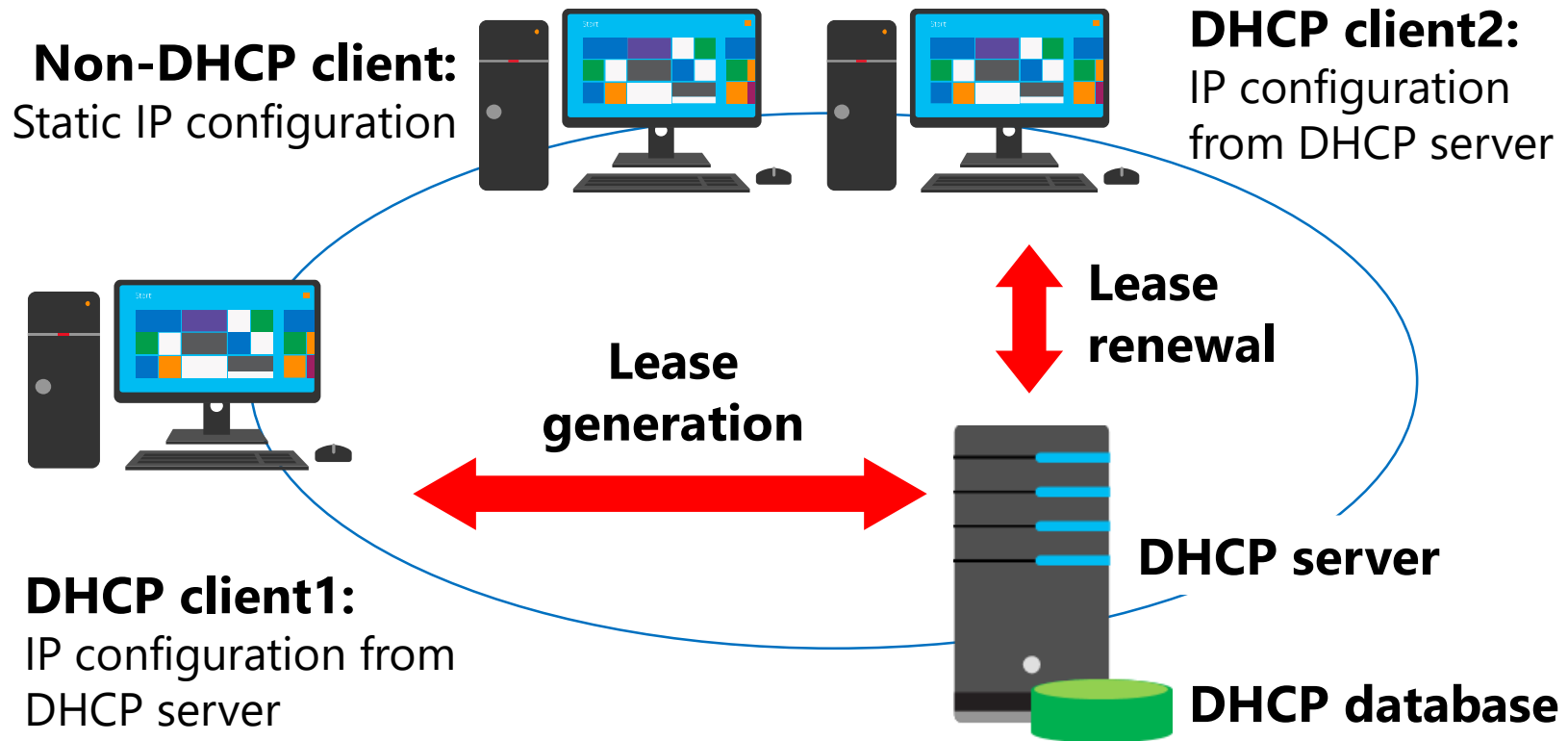
# Benefits of using DHCP

DHCP reduces the complexity and amount of administrative work by using automatic IP configuration

<b>Automatic IP configuration</b>	<b>Manual IP configuration</b>
Supplies IP addresses automatically	Type IP addresses manually
Ensures correct configuration information	Typing incorrect IP address is a possibility
Updates client configuration automatically	Can result in possible communication and network issues
Eliminates a common source of network problems	Frequent computer moves increase administrative effort

IPv6 is also supported by Microsoft DHCP service

# How DHCP allocates addresses

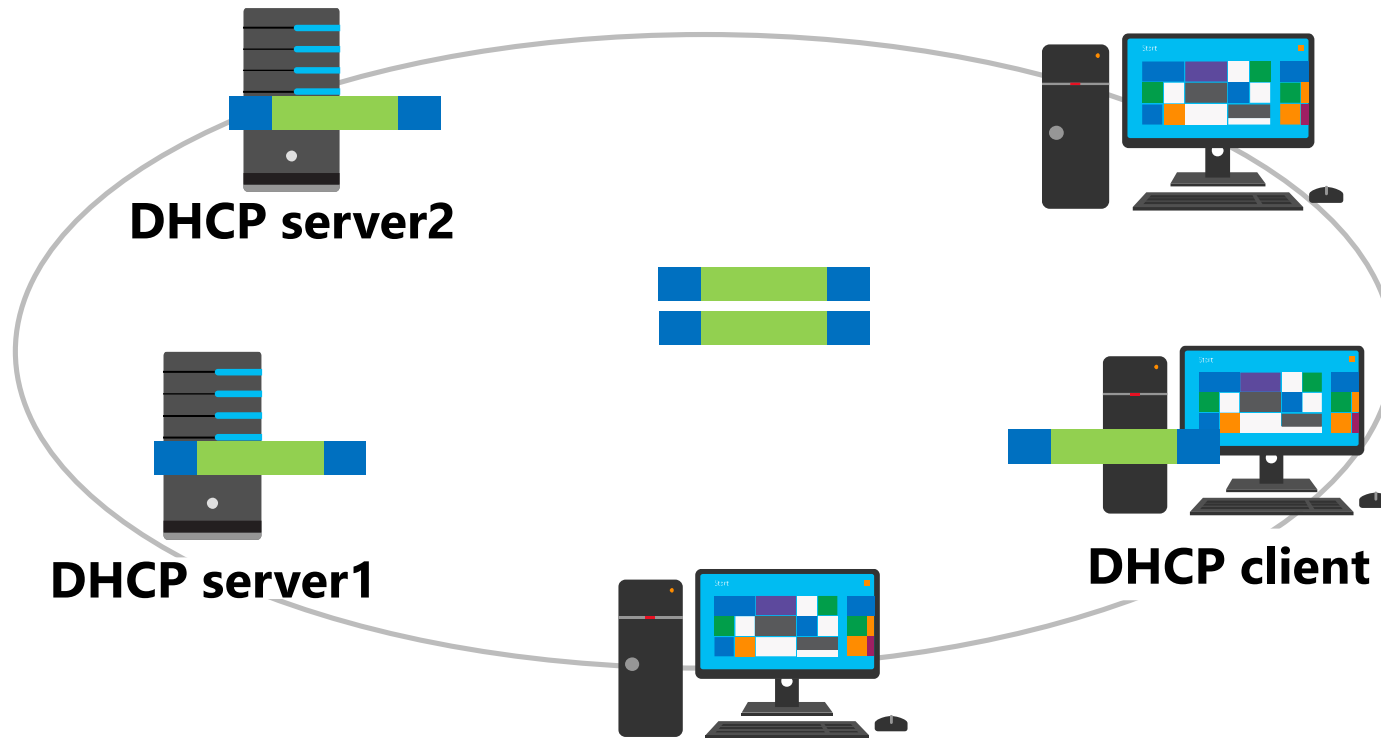


IP Address1: Leased to DHCP Client1

IP Address2: Leased to DHCP Client2

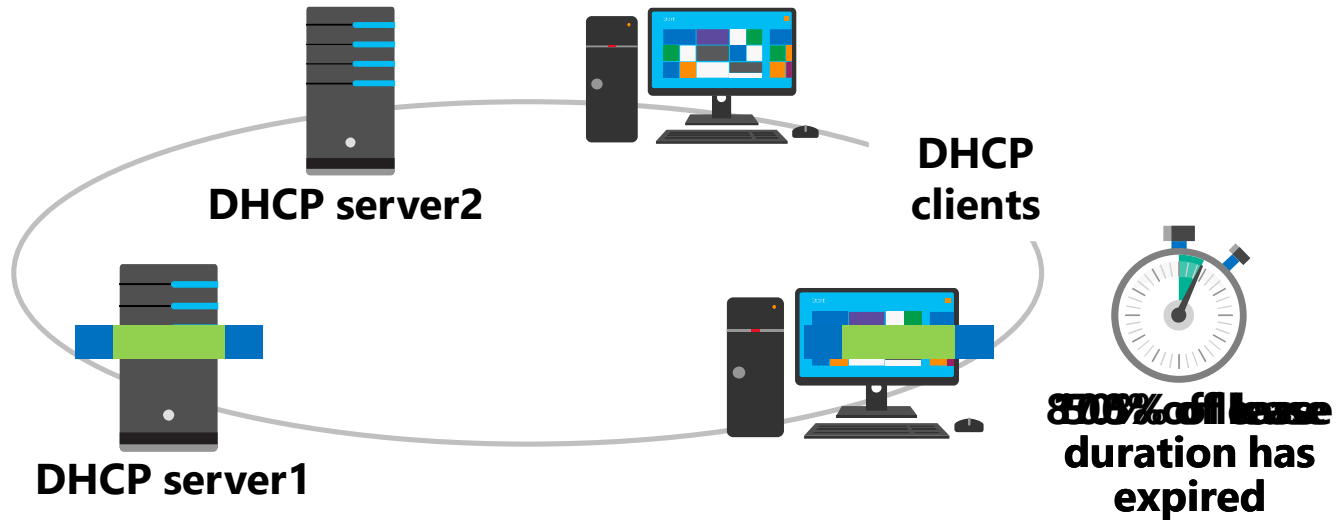
IP Address3: Available for lease

# How DHCP lease generation works



1. DHCP client broadcasts a DHCPDISCOVER packet
2. DHCP servers broadcast a DHCPOFFER packet
3. DHCP client broadcasts a DHCPREQUEST packet
4. DHCP Server1 broadcasts a DHCPACK packet

# How DHCP lease renewal works



1. DHCP client sends a DHCPREQUEST packet
2. DHCP Server1 sends a DHCPACK packet
3. If the client fails to renew its lease after 50% of the lease duration has expired, the DHCP lease renewal process begins again after 87.5% of the lease duration has expired
4. If the client fails to renew its lease after 87.5% of the lease has expired, the DHCP lease generation process starts over again with a DHCP client broadcasting a DHCPDISCOVER



## Lesson 2: Deploying DHCP

- Installing and configuring the DHCP server role
- DHCP server authorization
- Demonstration: Install a DHCP server and performing post-installation tasks
- Allocating and managing IPv4 addresses with DHCP
- Configuring DHCP options
- Demonstration: Configure a DHCP server
- What is a DHCP relay agent?



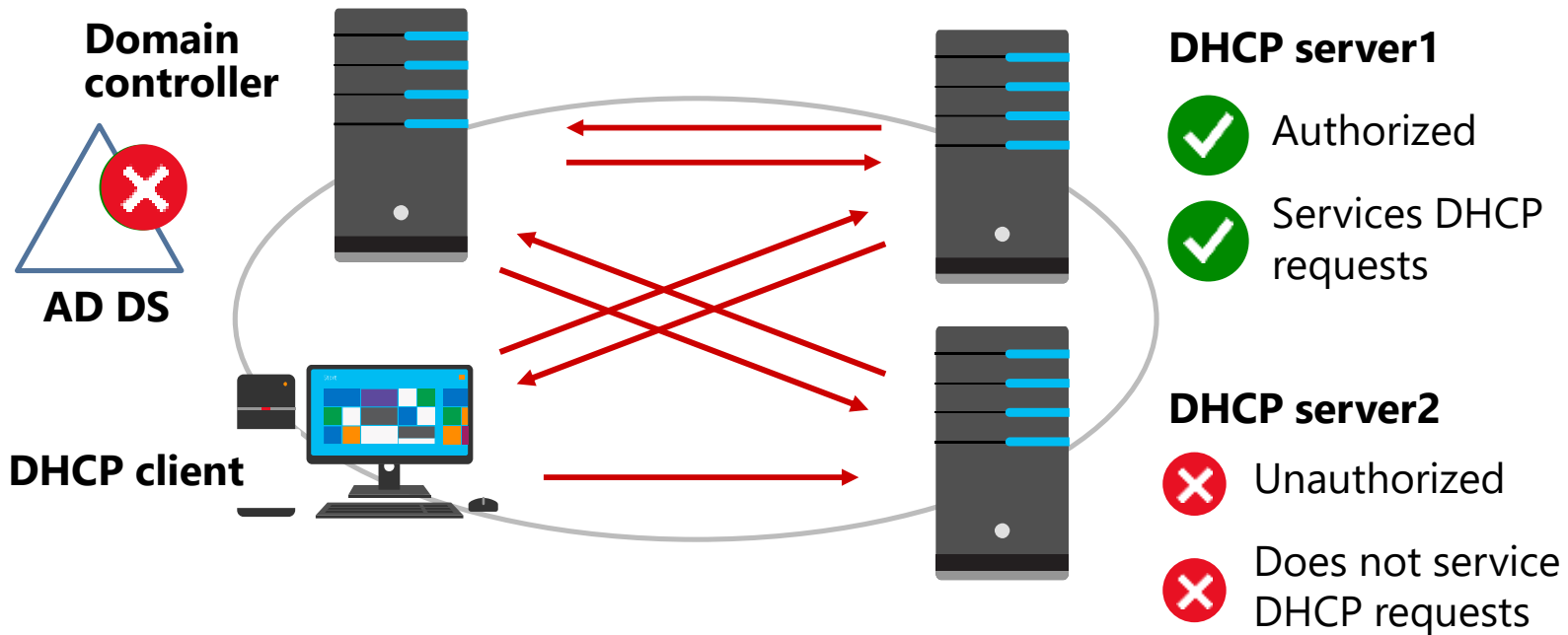
# Installing and configuring the DHCP server role

- You can install the DHCP server role by using:
  - The Add Roles and Features Wizard in server manager
  - Windows PowerShell:
    - **Add-WindowsFeature DHCP**
- The server hosting DHCP requires a static IP address
- Post installation tasks include:
  - Creating DHCP security groups
  - Restarting the DHCP Server service
  - Authorizing the DHCP server in AD DS

# DHCP server authorization

**DHCP authorization registers the DHCP Server service in the Active Directory domain to support DHCP clients**

If DHCP Server1 finds its IP address on the list, the service starts and supports DHCP clients



# Demonstration: Install a DHCP server and perform post-installation tasks

In this demonstration you will learn how to:

- Install the DHCP server role
- Perform post-installation tasks

# Allocating and managing IPv4 addresses with DHCP

- You must create scopes to define the network information that will be distributed to clients
- A scope must contain:
  - A range of IP addresses
  - A subnet mask
  - A lease duration
- A scope might contain:
  - Default gateway address
  - DNS server and suffix
  - Other network options
- IP addresses can be reserved based on the MAC address of the client network interface

# Configuring DHCP options

- DHCP options:
  - Are values for common configuration data
  - Can be applied to the server, scope, class, and reservation level
- Common scope options include:
  - Router (Default gateway)
  - DNS domain name
  - DNS servers

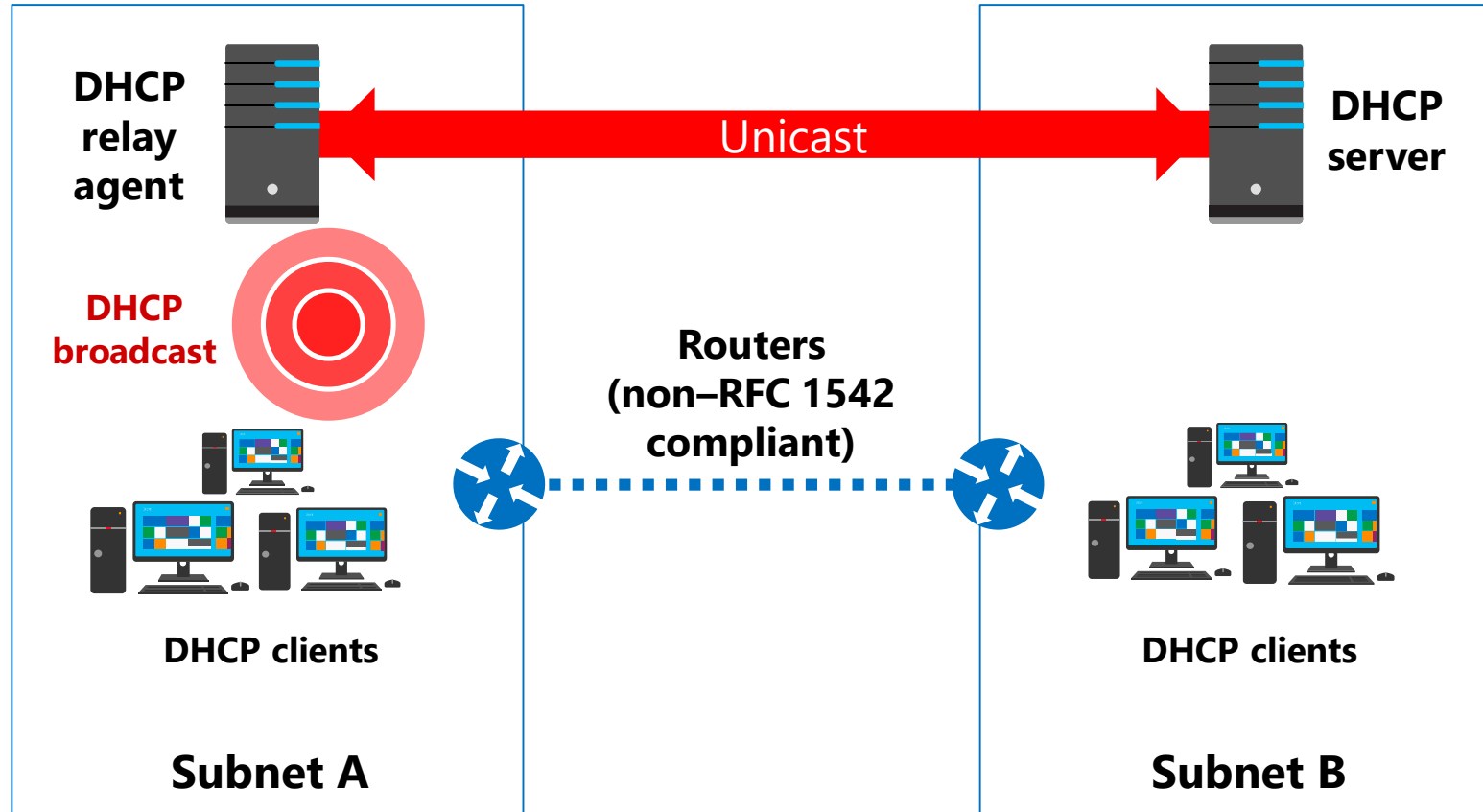
# Demonstration: Configure a DHCP server

In this demonstration you will learn how to:

- Create a DHCP scope
- Configure DHCP options
- Create a DHCP reservation

# What is a DHCP relay agent?

**A DHCP relay agent listens for DHCP broadcasts from DHCP clients, and then relays them to DHCP servers in different subnets**



# Lesson 3: Managing and troubleshooting DHCP

- What are DHCP security options?
- Advanced options for configuring DHCP
- Configuring superscopes and multicast scopes
- High availability options for DHCP
- What is DHCP failover?
- Demonstration: Configure DHCP failover
- Maintaining the DHCP database
- Migrating the DHCP server
- Discussion: Troubleshooting DHCP



# What are DHCP security options?

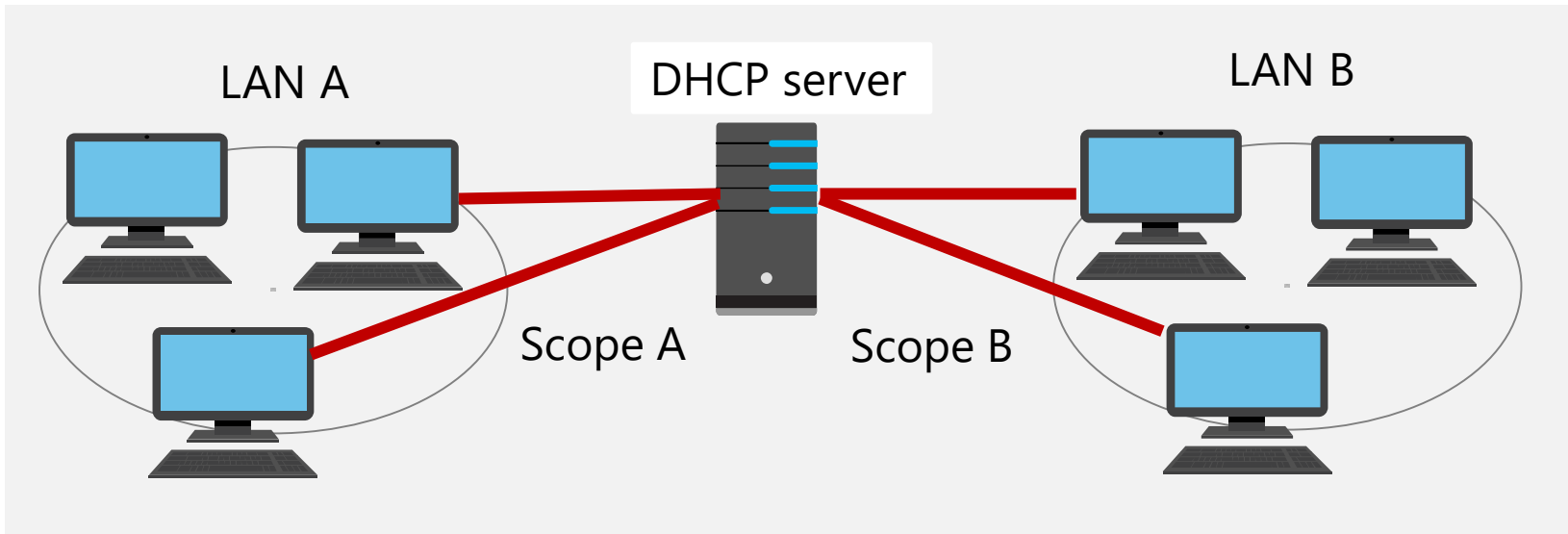
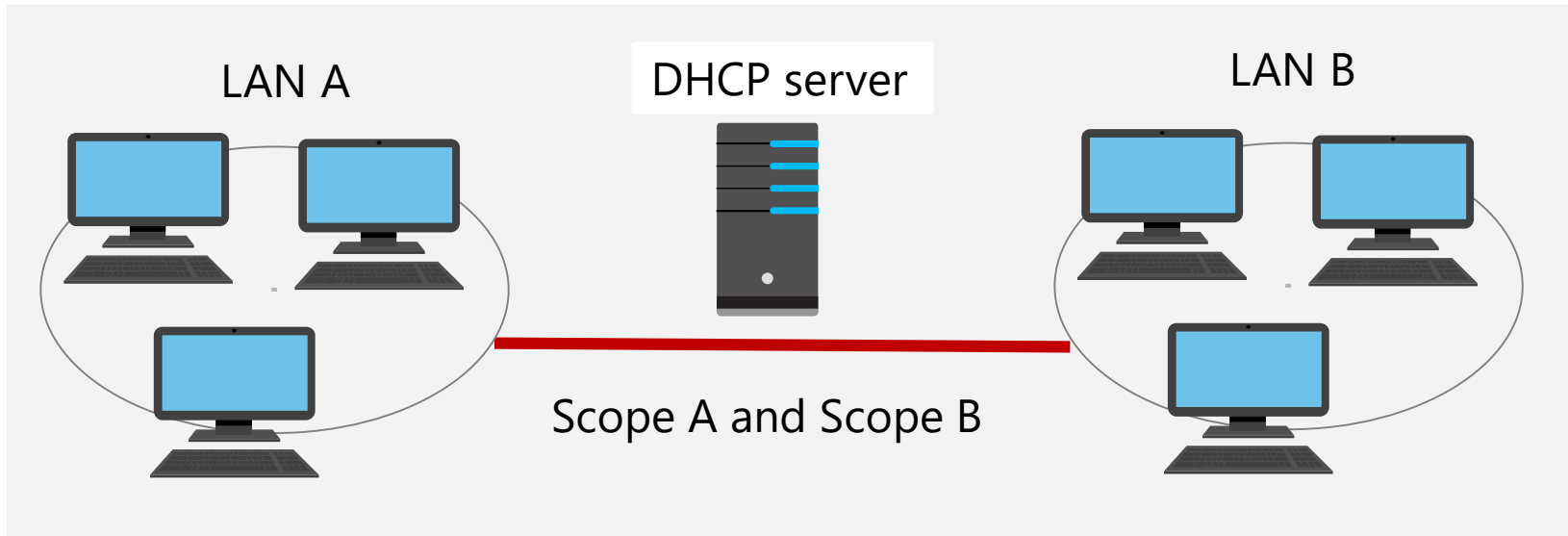
- Limit physical access to the network by:
  - Disconnecting unused LAN drops
  - Require authenticated layer 2 connections
- Enable DHCP auditing to track DHCP usage
- DHCP name protection:
  - Prevents Windows operating systems from having their DNS name registration overwritten by non-Windows operating systems using the same name
  - Uses a DHCID resource record to track the devices that originally requested the DNS name registration

# Advanced options for configuring DHCP

Policy-based assignments allow you to base IP assignment on the following criteria:

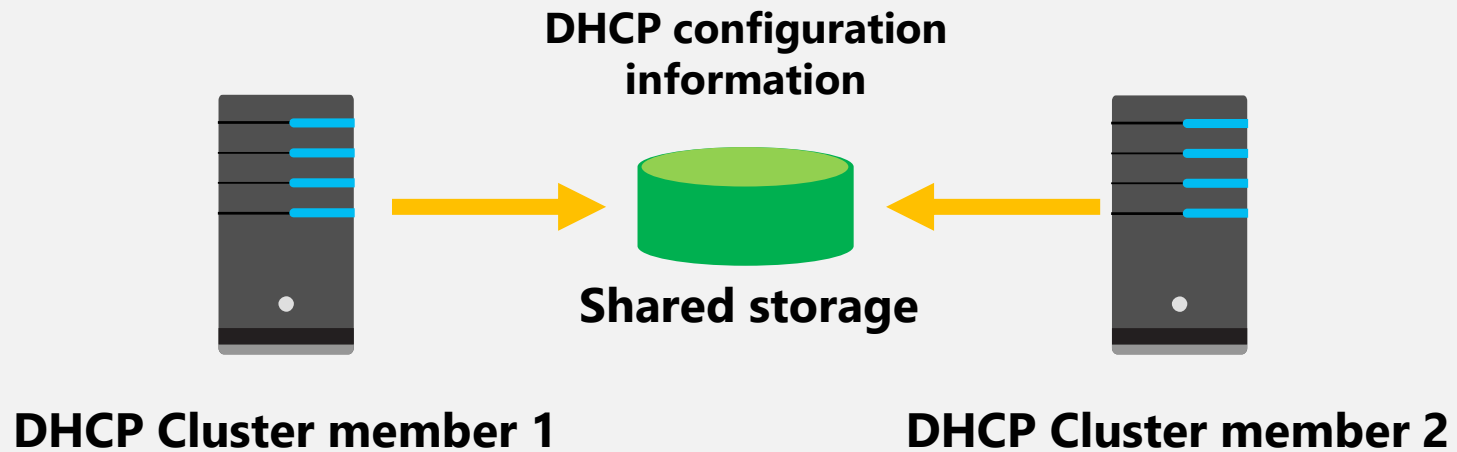
- Vendor class (defined by hardware vendors)
- User class (defined by Administrators)
- MAC address
- FQDN
- Relay agent information

# Configuring superscopes and multicast scopes

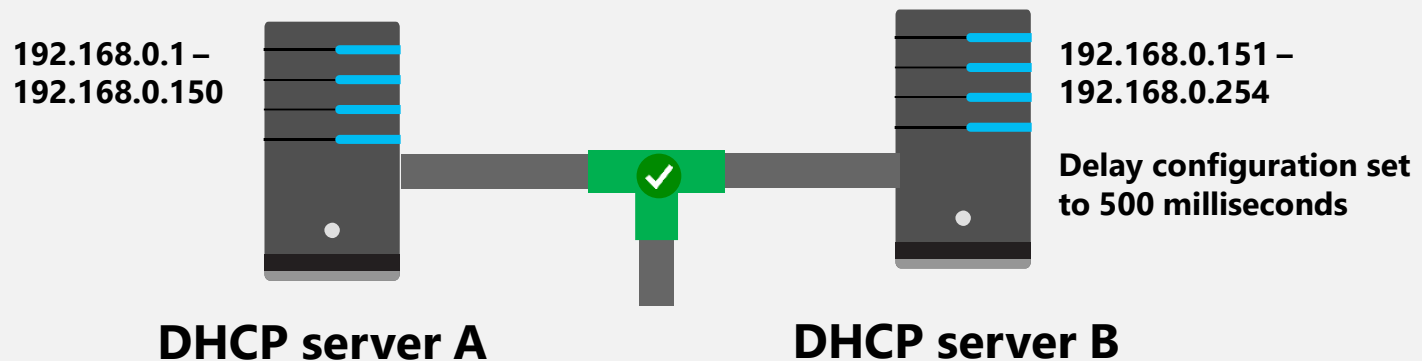


# High availability options for DHCP

## DHCP cluster



## DHCP split scope



# What is DHCP failover?

- DHCP failover:
  - Enables two DHCP servers to provide IP addresses and optional configurations to the same subnets or scopes
  - Requires failover relationships to have unique names
  - Supports the hot standby mode and the load sharing mode
- When you use DHCP failover:
  - The MCLT determines when a failover partner assumes control of the subnet or scope
  - The auto state switchover interval determines when a failover partner is considered to be down
  - Message authentication can validate the failover messages
  - Firewall rules are auto-configured during DHCP installation

# Demonstration: Configure DHCP failover

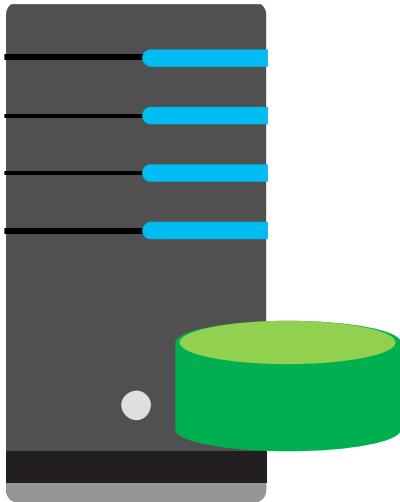
In this demonstration, you will learn how to configure a DHCP failover relationship

# Maintaining the DHCP database

- The DHCP database (Dhcp.mdb) contains information relating to scopes, leases, reservations, and all other configuration information
- The default location of DHCP database files is **%systemroot%\system32\DHCP**
- The DHCP database is automatically backed up every 60 minutes, or can be backed up manually
- You can reconcile the DHCP database to repair inconsistencies
- You can move the DHCP database to a new DHCP server when the DHCP Server service is moved

# Migrating the DHCP server

- You can migrate the DHCP server by exporting the DHCP data from the old server and importing it to the new server
- You can use Windows PowerShell or NetShell commands



Export data from  
current server to a file



Import data to new  
server from the file





# Discussion: Troubleshooting DHCP

How do you address the following issues that can occur when you do not configure DHCP properly?

- Address conflicts
- Failure to obtain a DHCP address
- Address obtained from an incorrect scope
- DHCP database suffered data corruption or loss
- DHCP server has exhausted its IP address pool



10 minutes



# Lab: Implementing DHCP

- Exercise 1: Planning the DHCP server implementation
- Exercise 2: Implementing the DHCP configuration
- Exercise 3: Validating the DHCP implementation

Logon Information

Virtual machines: **20741A-LON-DC1**

**20741A-EU-RTR**

**20741A-LON-SVR1**

**20741A-TOR-SVR1**

**20741A-LON-CL1**

User name: **Adatum\Administrator**

Password: **Pa\$\$w0rd**

Virtual machine: **20741A-NA-RTR**

User name: **Administrator**

Password: **Pa\$\$w0rd**

Estimated Time: 70 minutes

# Lab Scenario

A. Datum Corporation is planning to open three branch offices in different cities in North America. The branch offices will be located in Houston Texas: Mexico City, Mexico; and Portland, Oregon.

The following table describes the planned computer distribution in the branch offices.

Location	Computer and device requirements
Houston	<ul style="list-style-type: none"><li>• 300 desktop computers</li><li>• 100 laptop computers connecting to both the wireless and wired networks</li><li>• 50 tablet computers connecting only to the wireless network</li></ul>
Mexico City	<ul style="list-style-type: none"><li>• 100 desktop computers</li><li>• 50 laptop computers connecting to both the wireless and wired networks</li><li>• 20 tablet computers connecting only to the wireless network</li></ul>
Portland	<ul style="list-style-type: none"><li>• 100 desktop computers</li><li>• 75 laptop computers connecting to both the wireless and wired networks</li><li>• 150 tablet computers connecting only to the wireless network</li></ul>

# Lab Scenario (Continued)

A. Datum is using Microsoft Office 365 for all email and file access for the North American branch offices, with some shared folders located in the Toronto regional office on servers that are running the Windows Server 2016. Because all offices have fast and highly available network connections to the Toronto office, A. Datum is not planning to deploy any servers in the branch offices at this point.

The A. Datum network team has assigned the subnets 172.16.18.0/18 to the Toronto main office. The Toronto office is currently using the network assignments shown in the following table.

IP subnet	Purpose
172.16.18.0/24	Network devices and network printers
172.16.19.0/24	Servers
172.16.20.0/24 to 172.16.52.0/24	Desktop computers
172.16.53.0/24 to 172.16.60.0/24	Wireless devices

Using this information, you must now plan and implement DHCP to support your design.

# Lab Review

- Why do the scopes created in the lab start at 172.16.x.2 and not 172.16.x.1?
- What is the default location of the DHCP database?

# Module Review and Takeaways

- Best Practices
- Common Issues and Troubleshooting Tips