

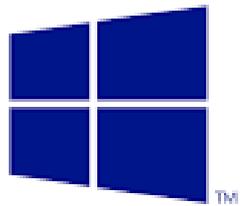


Hunan University of Arts and Science

Networking Theory & Applications

CIS 291

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Windows Server® 2012

Part 2



Chapter 4

Deploying and configuring core network services

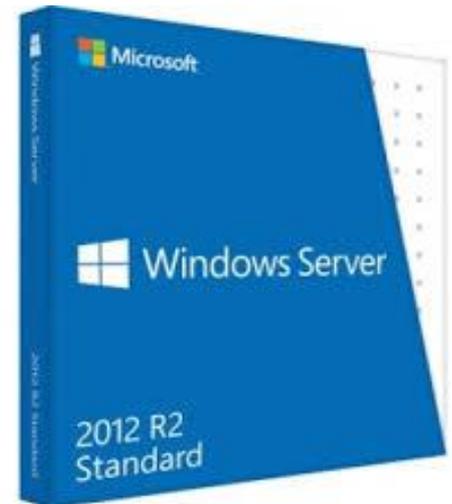
部署和配置核心网络服务

Objectives in this chapter: 本章的目标

1- Configure IPv4 and IPv6 addressing

2- Configure servers

3- Deploy and configure DNS service



Objective 4.2: Configure servers

1- Understanding DHCP

The **Dynamic Host Configuration Protocol (DHCP)** service:

- Automatically configures the IP address and other TCP/IP settings on network computers by assigning addresses from a pool (called a **scope**) and reclaiming them when they are no longer in use.
- Saves time.
- Prevents configuration errors.

DHCP consists of three components:

- **DHCP server application:** Responds to client requests for TCP/IP configuration settings.
- **DHCP client:** Issues requests to servers and applies the TCP/IP configuration settings it receives to the local computer.
- **DHCP communications protocol:** Defines the formats and sequences of the messages exchanged by DHCP clients and servers.

- All the Microsoft Windows operating systems include DHCP client capabilities, and all the server operating systems (including WS 2012 R2) include the Microsoft DHCP Server role.
- The DHCP standards define three different IP address allocation methods:
 - **Dynamic allocation:** The DHCP server assigns an IP address to a client computer from a scope, for a specified length of time. DHCP servers only lease addresses to clients with this method.
 - **Automatic allocation:** The DHCP server permanently assigns an IP address to a client computer from a scope. It is essentially dynamic allocation with an indefinite lease.
 - **Manual allocation:** The DHCP server permanently assigns a specific IP address to a specific computer on the network. It is called a reservation. You use manually allocated addresses for computers that must have the same IP address at all times.
- In addition to IP addresses, DHCP can help to configure a TCP/IP client, including a subnet mask, default gateway, and DNS server addresses. For example, the Ms- DHCP server includes more than 50 configuration parameters, which it can deliver along with the IP address.
- DHCP traffic is carried within standard UDP/IP datagrams, using port 67 at the server and port 68 at the client.

2- DHCP Options

All DHCP messages include an options field, which is a catch-all area designed to carry the various parameters (other than the IP address)

The DHCP Message Type option identifies the overall function of the DHCP message and is required in all DHCP packets.

The DHCP communication protocol defines eight message types, as follows:

- ■ **DHCPDISCOVER** Used by clients to request configuration parameters from a DHCP server
- ■ **DHCPOFFER** Used by servers to offer IP addresses to requesting clients
- ■ **DHCPREQUEST** Used by clients to accept or renew an IP address assignment
- ■ **DHCPDECLINE** Used by clients to reject an offered IP address
- ■ **DHCPACK** Used by servers to acknowledge a client's acceptance of an offered IP address
- ■ **DHCPNAK** Used by servers to reject a client's acceptance of an offered IP address
- ■ **DHCPRELEASE** Used by clients to terminate an IP address lease
- ■ **DHCPINFORM** Used by clients to obtain additional TCP/IP configuration parameters from a server

3- BOOTP Vendor Information Extensions

These options include many of the basic TCP/IP configuration parameters used by most client systems, such as the following:

- **Subnet Mask:** Specifies which bits of the IP address identify the host system and which bits identify the network where the host system resides.
- **Router:** Specifies the IP address of the router (or default gateway) on the local network segment the client should use to transmit to systems on other network segments.
- **Domain Name Server:** Specifies the IP addresses of the servers the client will use for DNS name resolution.
- **Host Name:** Specifies the DNS host name the client system will use.
- **Domain name:** Specifies the name of the DNS domain on which the system will reside.

4- DHCP Extensions (1)

These options provide parameters that govern the DHCP lease negotiation and renewal processes:

- **Requested IP Address:** Used by the client to request a particular IP address from the server.
- **IP Address Lease Time:** Specifies the duration of a dynamically allocated IP address lease.
- **Server Identifier:** Specifies the IP address of the server involved in a DHCP transaction; used by the client to address unicasts to the server.

DHCP Extensions (2)

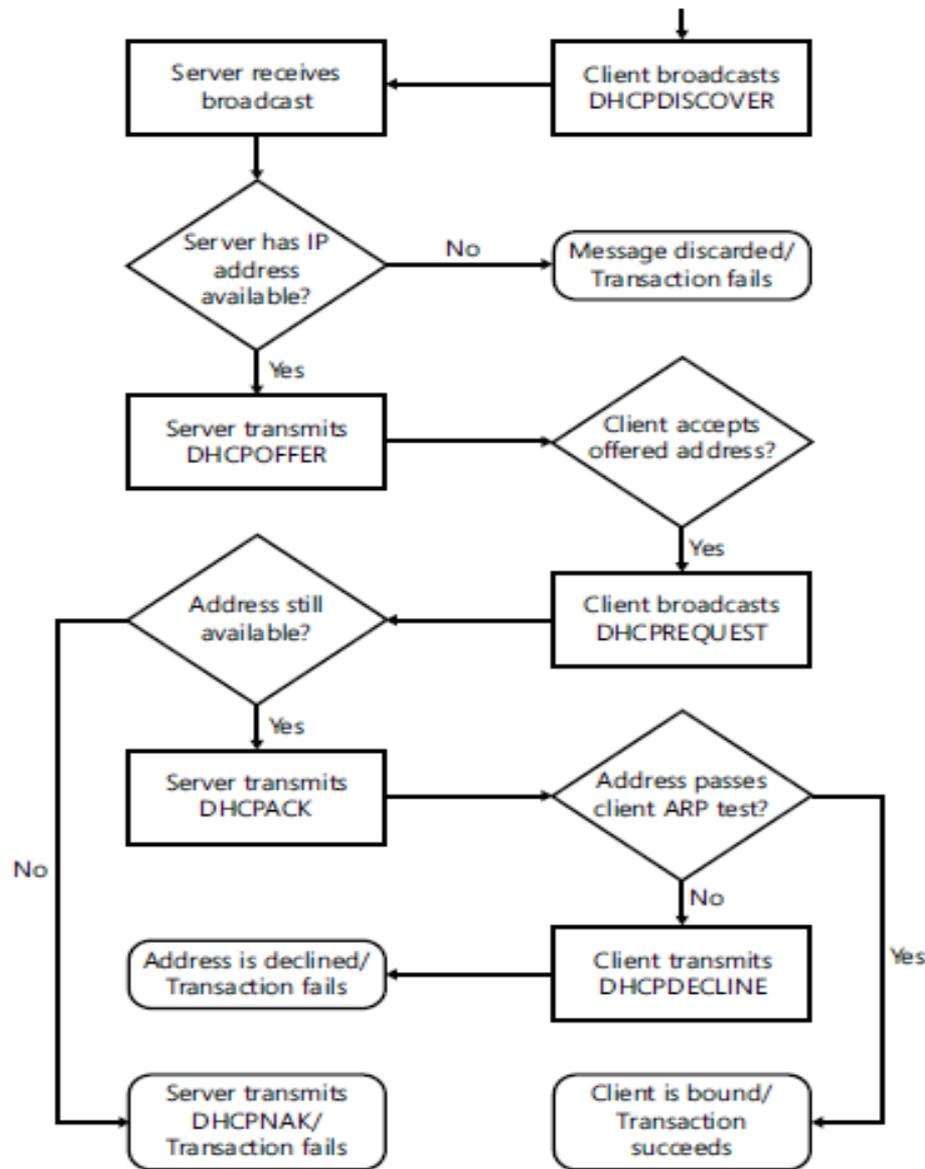
- **Parameter Request List:** Used by the client to send a list of requested configuration options (identified by their code numbers) to the server.
- **Message:** Carries an error message from the server to the client in a DHCPNAK message.
- **Renewal (T1) time value:** Specifies the time period that must elapse before an IP address lease enters the renewing state.
- **Rebinding (T2) time value:** Specifies the time period that must elapse before an IP address lease enters the rebinding state.

5- DHCP communications

- To design a DHCP strategy for an enterprise network and deploy it properly requires an understanding of the communications that occur between DHCP clients and servers.
- In Windows computers, the DHCP client is enabled by default, although it is not mentioned by name in the interface. The Obtain An IP Address Automatically option in the Internet Protocol Version 4 (TCP/IPv4) or 6 (TCP/IPv6).

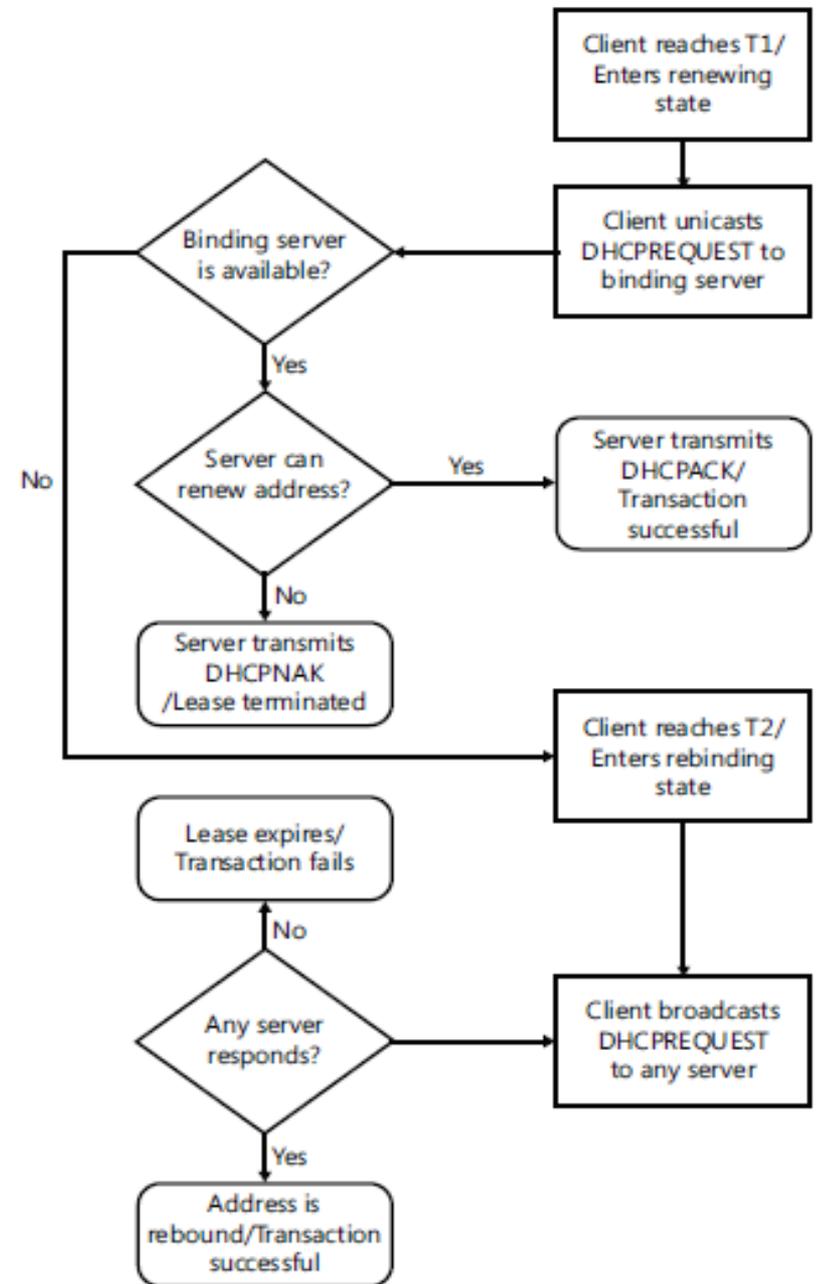
A- DHCP LEASE NEGOTIATION

- DHCP communication is always initiated by the client, as shown in Figure 4-6, and proceeds as follows:



The DHCP IP address assignment process

B- DHCP LEASE RENEWAL

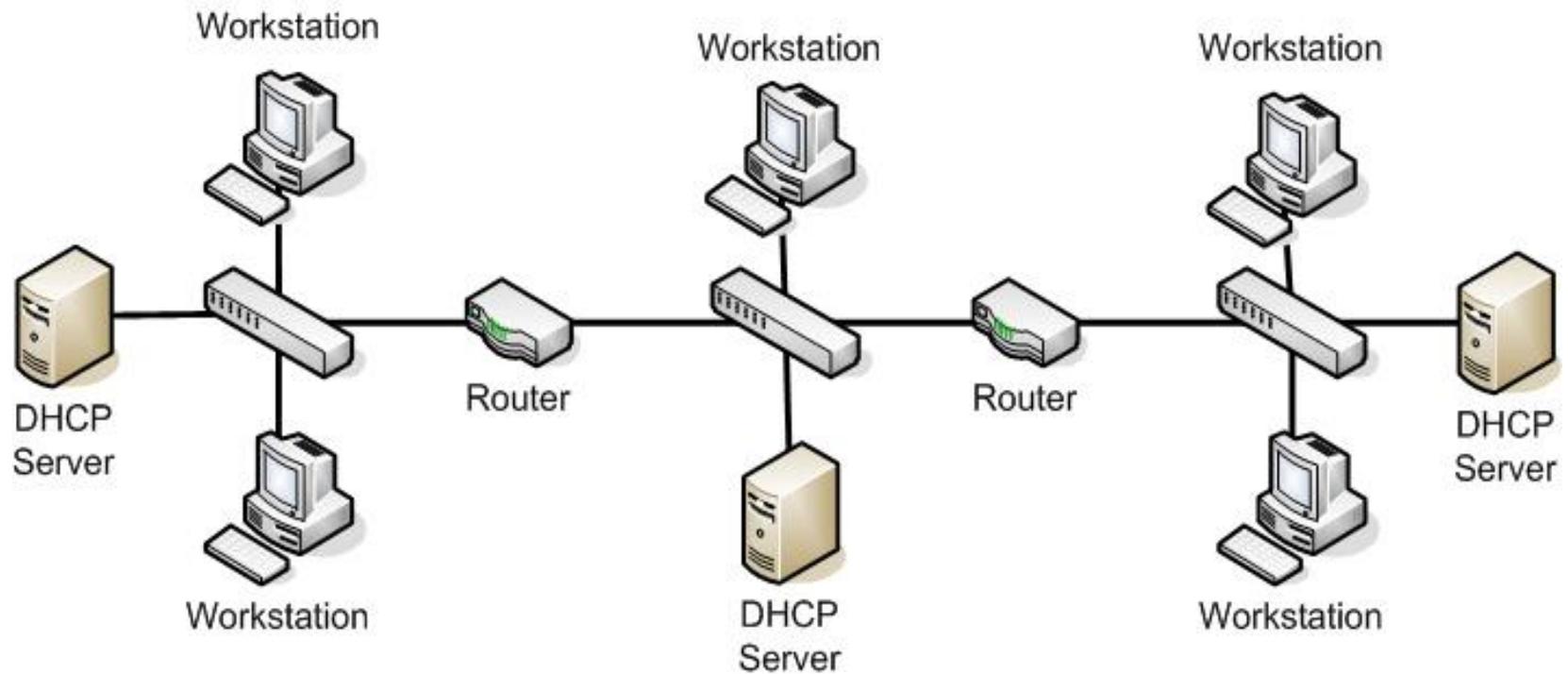


The DHCP IP address renewal process

6- Designing a DHCP Infrastructure

- The Windows Server 2012 DHCP Server service is theoretically capable of supporting many thousands of clients.
- Virtually all enterprise networks require more than one DHCP server.
- DHCP relies on broadcast messages, which have limitations.

A distributed DHCP infrastructure



Using a Distributed DHCP Infrastructure



Break

7- Deploying a DHCP Server

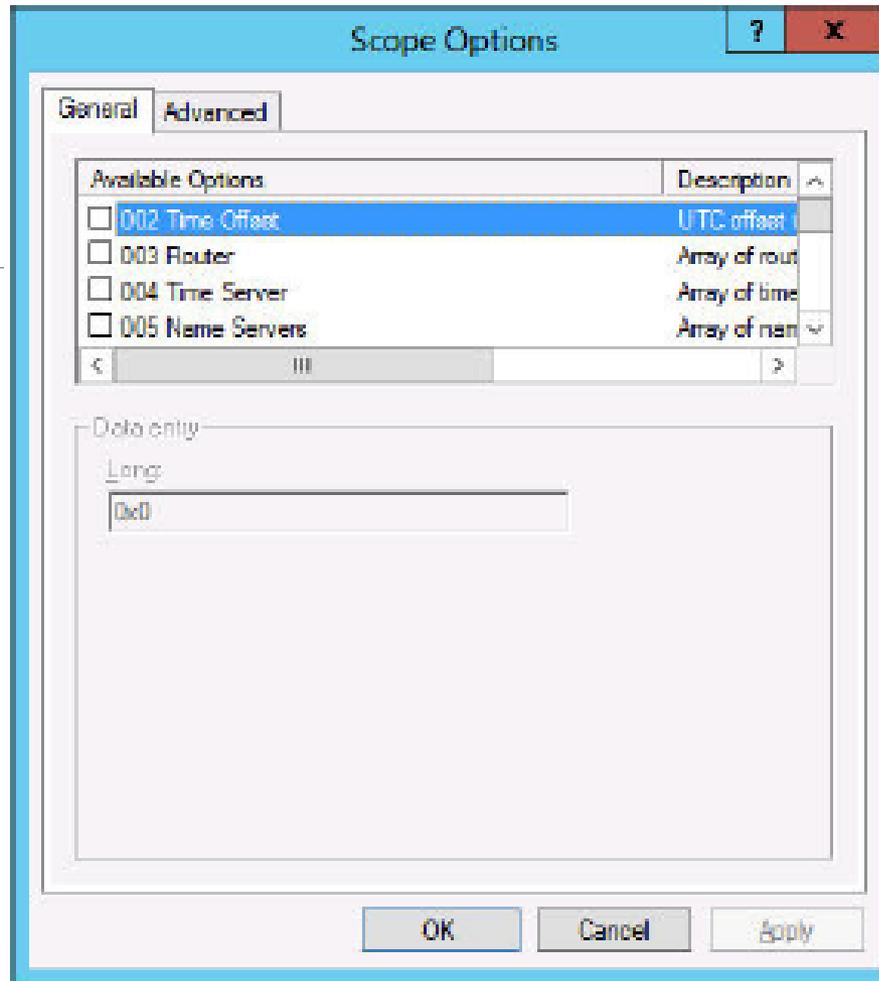
- The DHCP Server service is packaged as a role in Windows Server 2012.
- Install the role, through the Add Roles and Features Wizard in Server Manager.
- DHCP servers operate independently, so you must install the service and configure scopes on every computer that will function as a DHCP server.
- When you install the DHCP Server role on a computer that is a member of an Active Directory Domain Services domain, the DHCP Server is automatically authorized to allocate IP addresses to clients that are members of the same domain.
- If the server is not a domain member when you install the role, and you join it to a domain later, you must manually authorize the DHCP server in the domain by right-clicking the server node in the DHCP console and, from the shortcut menu, selecting Authorize.
- After installing the DHCP Server role, you must configure the service by creating a scope before it can serve clients.

8- Creating a Scope

- A scope is a range of IP addresses on a particular subnet that are selected for allocation by a DHCP server.
- Create a scope using the DHCP snap-in for Microsoft Management Console (MMC).
- In Windows Server versions prior to WS 2012, you can create a scope as you install the DHCP Server role. However, in WS 2012 and WS 2012 R2, the procedures are separate. To create a scope by using the DHCP snap-in for Microsoft Management Console (MMC)
- Procedures as follow in the page 222 – Lab practice

9- Configuring DHCP Options

- The Windows DHCP server supports two kinds of options:
 - **Scope options:** Supplied only to DHCP clients receiving addresses from a particular scope.
 - **Server options:** Supplied to all DHCP clients receiving addresses from the server.
- All the options supported by the Windows DHCP server can be either scope or server options, and the process of configuring them is basically the same.
- To configure a scope option, right-click the Scope Options node and, from the shortcut menu, select Configure Options. This opens the Scope Options dialog box, which provides appropriate controls for each of the available options



The Scope Options dialog box

10- Creating a Reservation

- A **reservation** is a manually allocated address instead of dynamic allocation..
- Used for computers whose IP addresses must remain the same (static), like domain controllers, DNS servers, and Internet web servers.
- Allows you to manage all of your IP addresses through DHCP.
- You create a reservation by expanding the scope node, right-clicking the Reservations node, and, from the shortcut menu, selecting New Reservation. The New Reservation dialog box opens, as shown

The screenshot shows the 'New Reservation' dialog box. It has a title bar with 'New Reservation', a help icon, and a close icon. The main area contains the following fields:

- Reservation name: [Empty text box]
- IP address: [IP address field with '10.0.0.1' entered]
- MAC address: [Empty text box]
- Description: [Empty text box]

Below these fields is a section titled 'Supported types' with three radio button options:

- Both
- DHCP
- BOOTP

At the bottom right are 'Add' and 'Close' buttons.

FIGURE 4-11 Creating a reservation

11- Using PXE

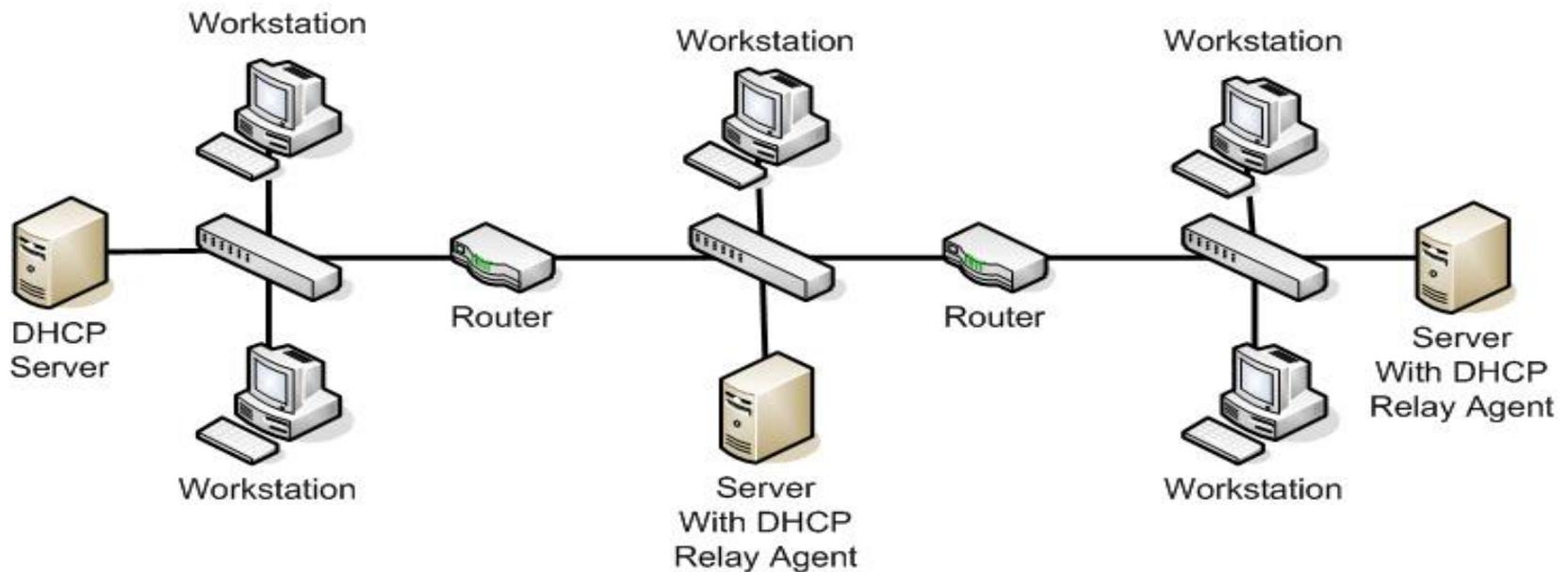
- The **Pre-boot Execution Environment (PXE)** is a feature built into many network interface adapters that enables them to connect to a DHCP server over the network and obtain TCP/IP client settings, even when the computer has no operating system.
- DHCP can also supply the workstation with an option specifying the location of a boot file that the system can download and use to start the computer and initiate a Windows operating system installation.

Using PXE with WDS

- Windows Server 2012 R2 includes a role called Windows Deployment Services (WDS), which enables administrators to manage image files that remote computers can use to start up and install Windows.
- For a PXE adapter to access WDS images, the DHCP server on the network must have a custom PXEClient option (option 60) configured with the location of the WDS server on the network.
- The PXE client on the workstation typically needs no configuration, with the possible exception of an alteration of the boot device order so that the computer attempts a network boot before using the local devices.

12- Deploying a DHCP Relay Agent

- If you create a centralized or hybrid DHCP infrastructure, you will need a DHCP relay agent on every subnet that does not have a DHCP server on it.
- Many routers are capable of functioning as DHCP relay agents, but when they cannot, you can configure a Windows Server 2012 computer to function as a relay agent. **by using the following procedure. P 228 Lab Practice**



A centralized DHCP infrastructure