

Chapter II

TCP/IP Infrastructure: DHCP

Configuring TCP/IP on Windows OS Computers

- All hosts on a TCP/IP network require at least
 - An IP address
 - A subnet mask
- Options for configuring IP addresses on workstations and servers
 - Configure each one manually with a static IP address (Static IP Addressing)
 - Configure computers to obtain an IP address automatically: requires a DHCP server on the network (Dynamic IP Addressing)

Configuring Static IP Addresses

- The decision on whether to use a static or dynamic IP-addressing method is often a function of the size of the network
- For each network card configured to use TCP/IP, you must configure
 - An IP address
 - A subnet mask
- TCP/IP Properties dialog box
 - Can be used to configure an IP address and a subnet mask

Manually Configuring TCP/IP Properties

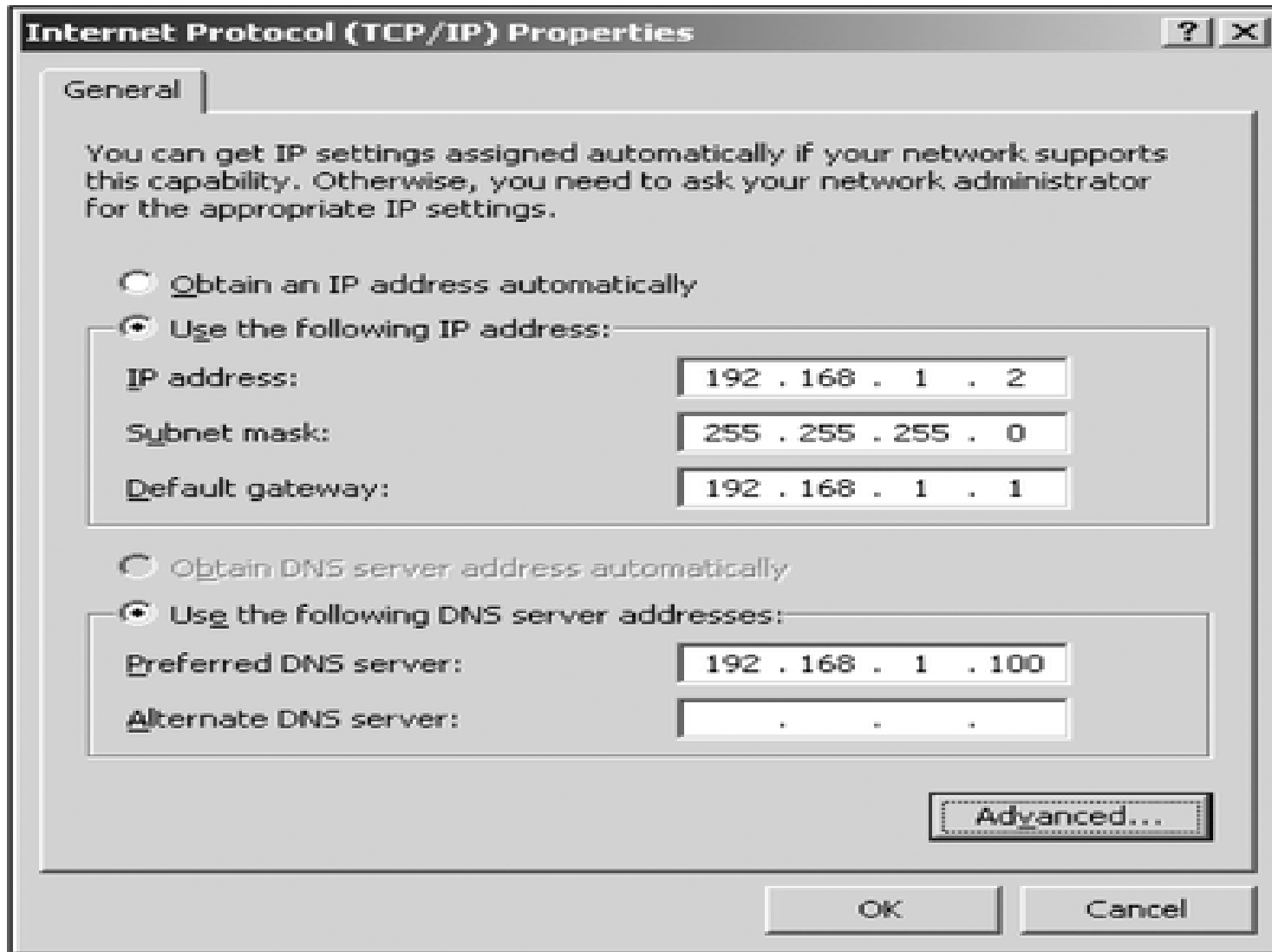


Figure 8-5 Manually configuring TCP/IP properties

TCP/IP Options

- Optional parameters for configuring IP addresses on workstations and servers
 - Default gateway: IP address of router that workstations and servers uses for access to other logical networks
 - DNS server (preferred & alternate): IP address of DNS server that workstations and servers uses for domain name resolution
 - WINS server: IP address of WINS server that workstations and servers uses for NetBIOS name resolution

Dynamic IP Addressing

- Automatic IP addressing from DHCP Server:
 - use DHCP Server to assign IP address information automatically to DHCP-enabled clients
- Automatic private IP addressing (APIPA)
 - Allows DHCP-enabled clients to assign themselves an IP address and subnet mask in the event that a DHCP server is unavailable
 - Provides a client with limited functionality on the network

Configuring IP Addresses Dynamically

- Dynamic IP addressing
 - Possible if there is a server on the network running DHCP
 - Advantages: Can eliminate some administrative problems associated with configuring static IP addresses, such as
 - The chance of human error
 - IP address duplication
- A DHCP server is configured with a range of IP addresses that will be assigned to clients on the network

Administering the Network Infrastructure

- Administering the network infrastructure requires maintaining and troubleshooting network services, protocols, and hardware
 - TCP/IP protocol: Used by Windows Server 2003 for network communications throughout the infrastructure and the Internet
 - Dynamic Host Configuration Protocol (DHCP) servers: Provide dynamic IP configuration (automatically assigning IP address, mask and optional parameters) to clients on the network

Administering the Network Infrastructure (Continued)

- Domain Name System (DNS) service: Provides domain name resolution and internet/intranet service location capabilities
- WINS servers: Provides NetBIOS name resolution and shared resources location capabilities
- Routers: Provides interconnects capabilities between two or more computer networks, which do not share a common network address

The DHCP Server

- Dynamic Host Configuration Protocol automates network-parameter assignment to network devices from one or more DHCP servers.
- The DHCP server manages a pool of IP addresses and information about client configuration parameters such as default gateway, domain name, the name servers ...
- DHCP uses a client-server architecture. The client sends a broadcast request for configuration information. The *DHCP server* receives the request and responds with configuration information from its configuration database.

The DHCP Process

- On a network, DHCP delivers IP addressing information automatically:
 - To client computers
 - Servers and other devices such as printers
- Using DHCP reduces the amount of time spent configuring individual computers on the network and can eliminate some administrative problems associated with configuring static IP addresses, such as human error factor or IP address duplication

The DHCP Process

Leasing an IP Address

- A client computer that is configured to use DHCP must obtain a lease for an IP address
- The process to lease an address is composed of four packets and DHCP client is going into four states:
 - DHCPDISCOVER: initializing state
 - DHCPOFFER: selecting state
 - DHCPREQUEST: requesting state
 - DHCPACK: binding state

Leasing an IP Address (continued)

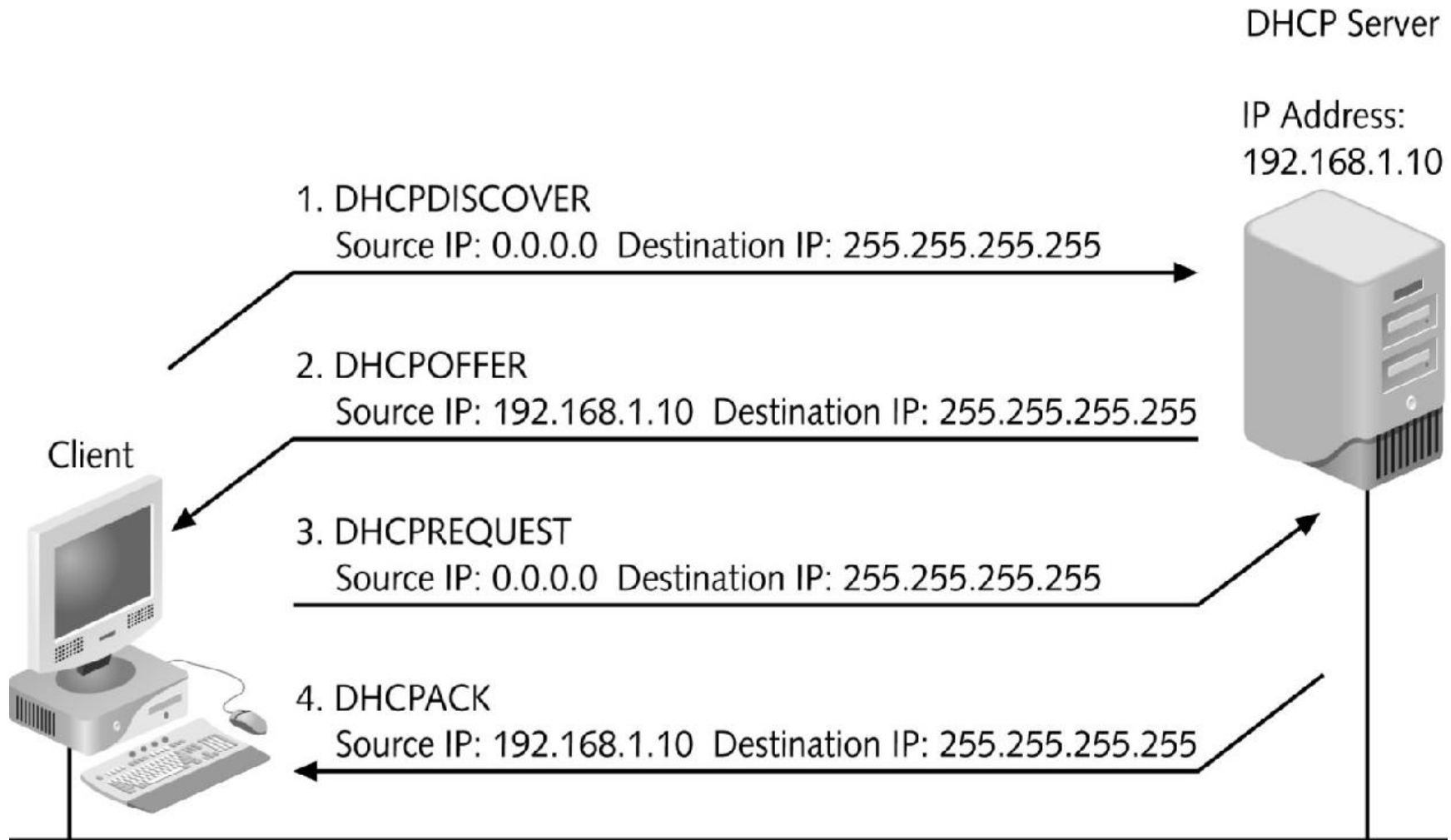


Figure 5-2 The four packets in the DHCP lease process

Configuring TCP/IP properties dynamically using DHCP

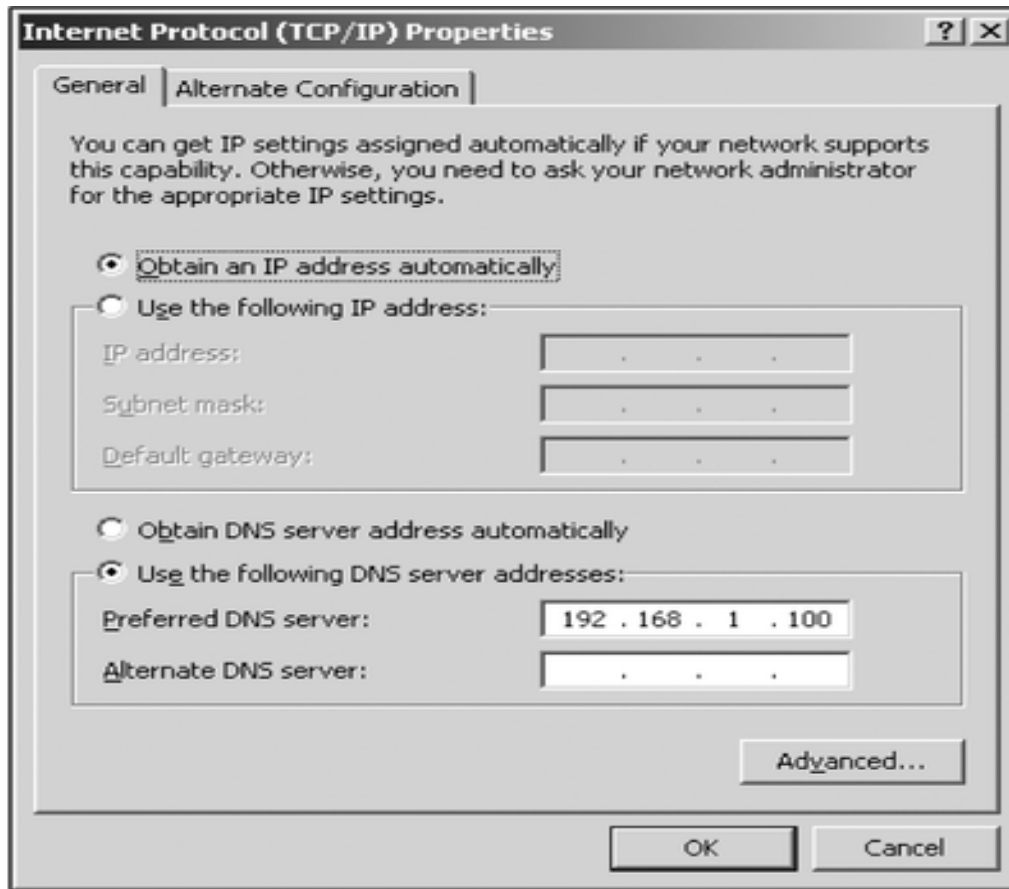


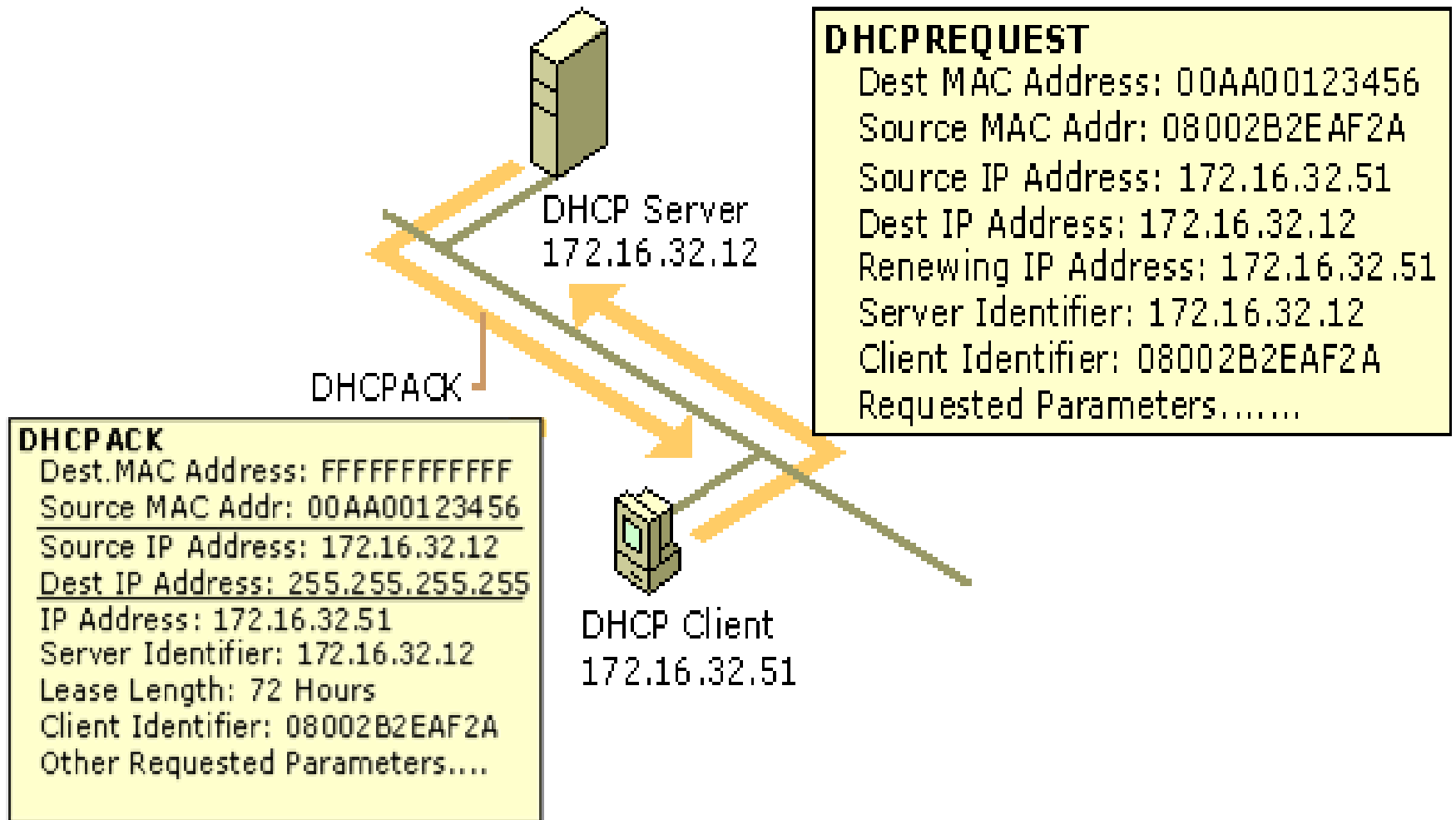
Figure 8-6 Configuring TCP/IP properties dynamically using DHCP

The DHCP Process

Renewing An IP Address

- An IP address is permanent or timed
- A permanent address is never reused for another client
- A timed lease allows clients to use an IP address for a specified period of time. DHCP clients try to renew their lease when 50 percent of the lease time has expired
- A client can initiate the release of an IP address before the lease time has expired by using the command `ipconfig/release`

Renewing An IP Address (continued)



Planning DHCP

- When planning how to implement DHCP, you must first consider whether it is a small or large network
- A small network with a single subnet or one network:
 - Uses only hubs and switches (no router)
 - Uses a single DHCP server to service all clients without any special configuration
- Large networks with more than one subnet:
 - use routers to move packets between the subnets
 - DHCP relays or multiple DHCP servers must be configured
- Having several DHCP servers makes management very complex because each server is managed separately

When You Have a Large Network

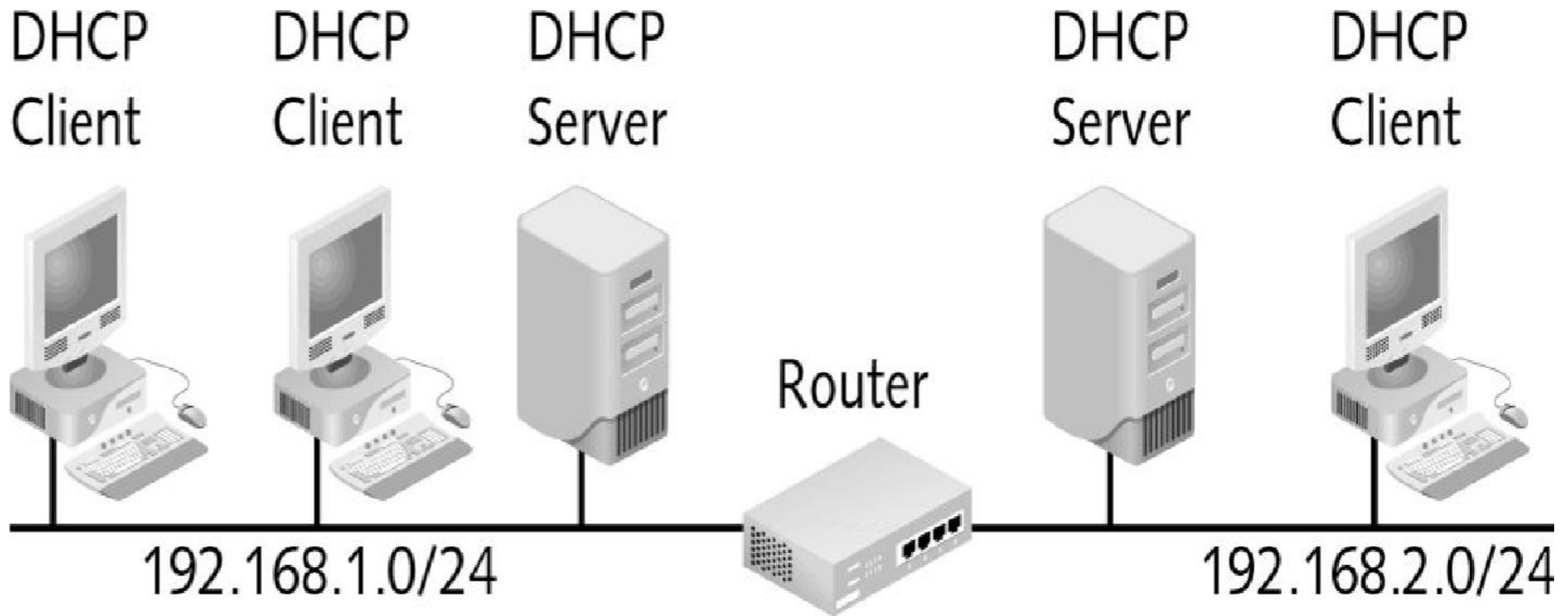


Figure 5-4 Two subnets with multiple DHCP servers

DHCP Relay

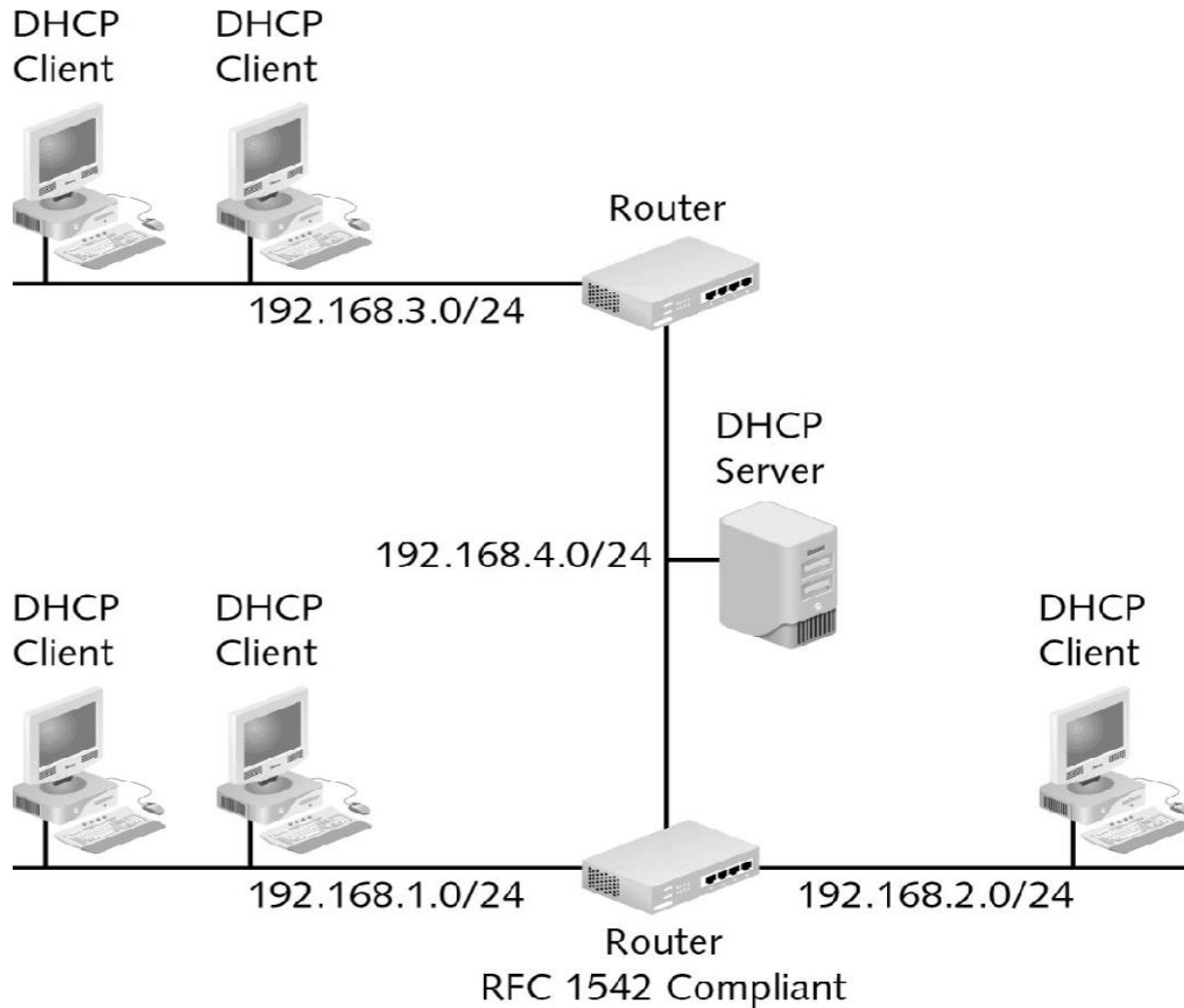


Figure 5-5 A network using DHCP relays

DHCP Relay

- A DHCP relay allows DHCP communication across routers
- Using DHCP relays can drastically simplify the implementation of DHCP because it reduces or eliminates the need for multiple DHCP servers
- DHCP relay receives broadcast DHCP packets from clients and forwards them as unicast packets to a DHCP server
- DHCP relay must be configured with the IP address of the DHCP server to deliver the unicast packets

Fault Tolerance

- A fault-tolerant DHCP system can be designed using multiple DHCP servers, if no two servers hand out the same range of addresses at the same time
- When creating a fault-tolerant DHCP infrastructure, you can implement:
 - A hot spare DHCP server
 - Multiple DHCP servers
 - Clustering

Installing DHCP

- DHCP is a standard service that is included with Windows Server 2003
- Not installed as part of the installation
- Must be added later using Add or Remove Programs
- Steps for configuring DHCP server:
 - Creating leased IP address scope
 - Excluding IP address from scope
 - Reserving fixed IP address for dedicated clients
 - Configuring additional optional parameters
 - Creating superscopes

DHCP Server Authorization

- Control over DHCP is important: an unauthorized DHCP server can hand out incorrect IP addressing information to hundreds of client computers quickly
- To exercise control over DHCP, Windows Server 2003 must be authorized to start the DHCP Service
- Authorization of a DHCP server takes place in Active Directory with the DHCP Management snap-in

Scopes

- Use a scope to define a range of IP addresses for the DHCP server to hand out to client computers
- Each scope is configured with:
 - Name
 - Starting IP address
 - Ending IP address
 - Subnet mask
 - Lease duration
 - Description
- Can also configure exclusions for the scope

Reservations

- Use a reservation to hand out a specific IP address to a particular client computer or device on the network
- Reservations are beneficial with firewalls
- Reservations are created based on the MAC address of the network card on the client workstation

Additional Options

- DHCP can hand out a variety of other IP configuration options such as:
 - Default gateway
 - DNS server
 - WINS server and many more
- These options can be configured for the entire server, a scope, or a single reservation

Superscopes

- A superscope combines multiple scopes into a single logical scope
- Can do this when a single physical part of the network has two subnets on it

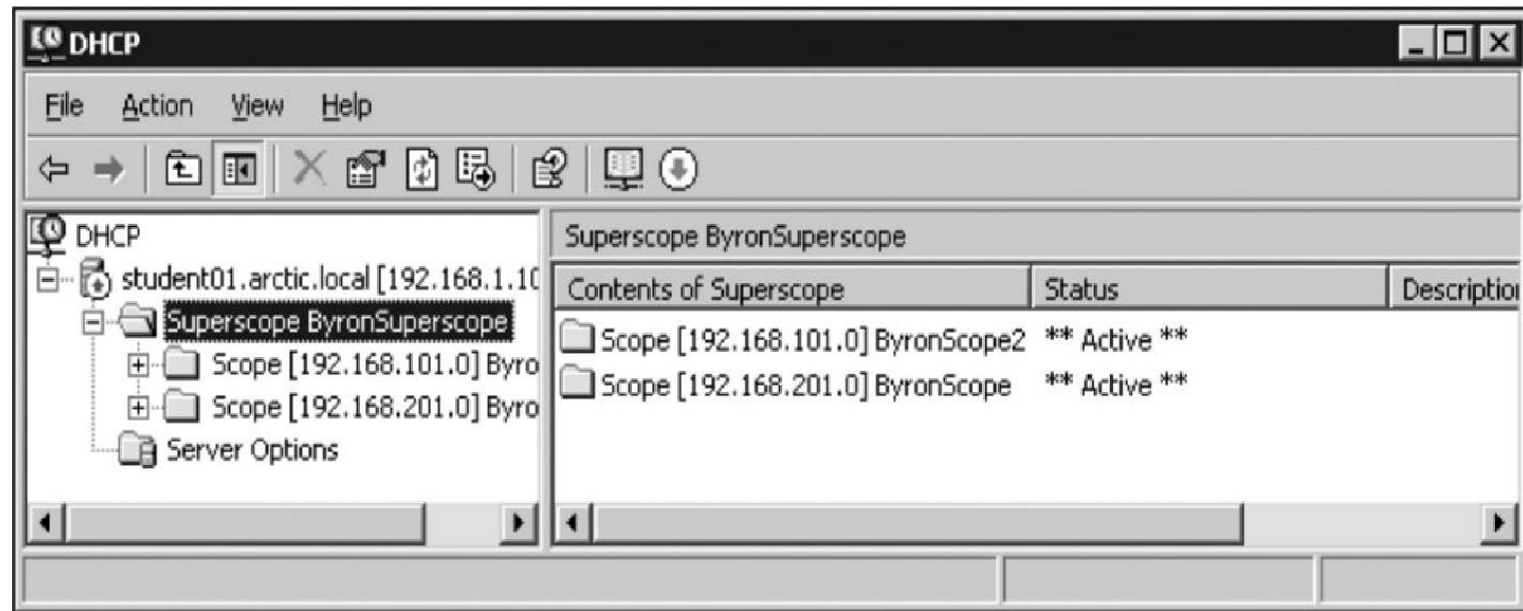


Figure 5-11 A superscope containing two scopes

Managing and Monitoring DHCP

- To manage and monitor your DHCP server you can perform the following tasks:
 - Backing up and restoring DHCP databases
 - Reconciling scopes
 - Viewing statistics
 - Enabling DHCP audit logging
 - Enabling conflict detection
 - Modifying file paths Changing bindings
 - Viewing DHCP events in Event Viewer
 - Viewing DHCP statistics in the Performance snap-in

Backing Up and Restoring DHCP Databases

- The DHCP Service has the following files:
 - The database holding the addressing information that has been assigned to client computers
 - Temporary database files only present during maintenance operations
 - Transaction logs of changes to the DHCP database
 - Checkpoint file that keeps track of which entries in the log files have been applied to the database

Viewing DHCP Statistics & DHCP Events

- The Windows Server 2003 DHCP Service automatically tracks statistics that you can view
- To view these statistics, right-click the server or scope, and click Display Statistics
- In addition to audit logging, some summary information generated by the DHCP Service is placed in the system event log
- Can view these events using Event Viewer