Dynamic Host Configuration Protocol, DHCP provides configuration parameters to Internet hosts. DHCP consists of two components: a protocol for delivering host-specific configuration parameters from a DHCP Server to a host and a mechanism for allocating network addresses to hosts. DHCP is built on a client/server model, where designated DHCP Server hosts allocate network addresses and deliver configuration parameters to dynamically configured hosts. By default, Cisco routers running Cisco IOS software include DHCP server and relay agent software.

DHCP supports three mechanisms for IP address allocation:

- Automatic allocation—DHCP assigns a permanent IP address to a client.
- Dynamic allocation—DHCP assigns an IP address to a client for a limited period of time (or until the client explicitly relinquishes the address).
- Manual allocation—The network administrator assigns an IP address to a client and DHCP is used simply to convey the assigned address to the client.

The format of DHCP messages is based on the format of Bootstrap Protocol (BOOTP) messages, which ensures support for BOOTP relay agent functionality and interoperability between BOOTP clients and DHCP Servers. BOOTP relay agents eliminate the need for deploying a DHCP Server on each physical network segment. BOOTP is explained in RFC 951, *Bootstrap Protocol (BOOTP)*, and RFC 1542, *Clarifications and Extensions for the Bootstrap Protocol*.

To identify the hardware platform or software image information associated with a feature, use the Feature Navigator on Cisco.com to search for information about the feature or refer to the software release notes for a specific release. For more information, see the "Identifying Supported Platforms" section in the "Using Cisco IOS Software" chapter in this book.

DHCP Server Overview

The Cisco IOS DHCP Server feature is a full DHCP Server implementation that assigns and manages IP addresses from specified address pools within the router to DHCP clients. If the Cisco IOS DHCP Server cannot satisfy a DHCP request from its own database, it can forward the request to one or more secondary DHCP Servers defined by the network administrator. Figure shows the basic steps that occur when a DHCP client requests an IP address from a DHCP Server. The client, Host A, sends a DHCPDISCOVER broadcast message to locate a Cisco IOS DHCP Server. A DHCP Server offers configuration parameters (such as an IP address, a MAC address, a domain name, and a lease for the IP address) to the client in a DHCPOFFER unicast message.

Note A DHCP client may receive offers from multiple DHCP Servers and can accept any one of the offers; however, the client usually accepts the first offer it receives. Additionally, the offer from the DHCP Server is not a guarantee that the IP address will be allocated to the client; however, the server usually reserves the address until the client has had a chance to formally request the address.

The client returns a formal request for the offered IP address to the DHCP Server in a DHCPREQUEST broadcast message. The DHCP Server confirms that the IP address has been allocated to the client by returning a DHCPACK unicast message to the client.

Note The formal request for the offered IP address (the DHCPREQUEST message) that is sent by the client is broadcast so that all other DHCP Servers that received the DHCPDISCOVER broadcast message from the client can reclaim the IP addresses that they offered to the client.

If the configuration parameters sent to the client in the DHCPOFFER unicast message by the DHCP Server are invalid (a misconfiguration error exists), the client returns a DHCPDECLINE broadcast message to the DHCP Server.

The DHCP Server will send to the client a DHCPNAK denial broadcast message, which means the offered configuration parameters have not been assigned, if an error has occurred during the negotiation of the parameters or the client has been slow in responding to the DHCPOFFER message (the DHCP Server assigned the parameters to another client) of the DHCP Server.

DHCP defines a process by which the DHCP Server knows the IP subnet in which the DHCP client resides, and it can assign an IP address from a pool of valid IP addresses in that subnet.

The DHCP Server identifies which DHCP address pool to use to service a client request as follows:

- If the client is not directly connected (the giaddr field of the DHCPDISCOVER broadcast message is non-zero), the DHCP Server matches the DHCPDISCOVER with a DHCP pool that has the subnet that contains the IP address in the giaddr field.

- If the client is directly connected (the giaddr field is zero), the DHCP Server matches the DHCPDISCOVER with DHCP pool(s) that contain the subnet(s) configured on the receiving interface. If the interface has secondary IP addresses, the subnets associated with the secondary IP addresses are examined for possible allocation only after the subnet associated with the primary IP address (on the interface) is exhausted.

The Cisco IOS DHCP Server feature offers the following benefits:

- Reduced Internet access costs

  Using automatic IP address assignment at each remote site substantially reduces Internet access costs. Static IP addresses are considerably more expensive to purchase than are automatically allocated IP addresses.

- Reduced client configuration tasks and costs

  Because DHCP is easy to configure, it minimizes operational overhead and costs associated with device configuration tasks and eases deployment by nontechnical users.

- Centralized management

  Because the DHCP Server maintains configurations for several subnets, an administrator only needs to update a single, central server when configuration parameters change.

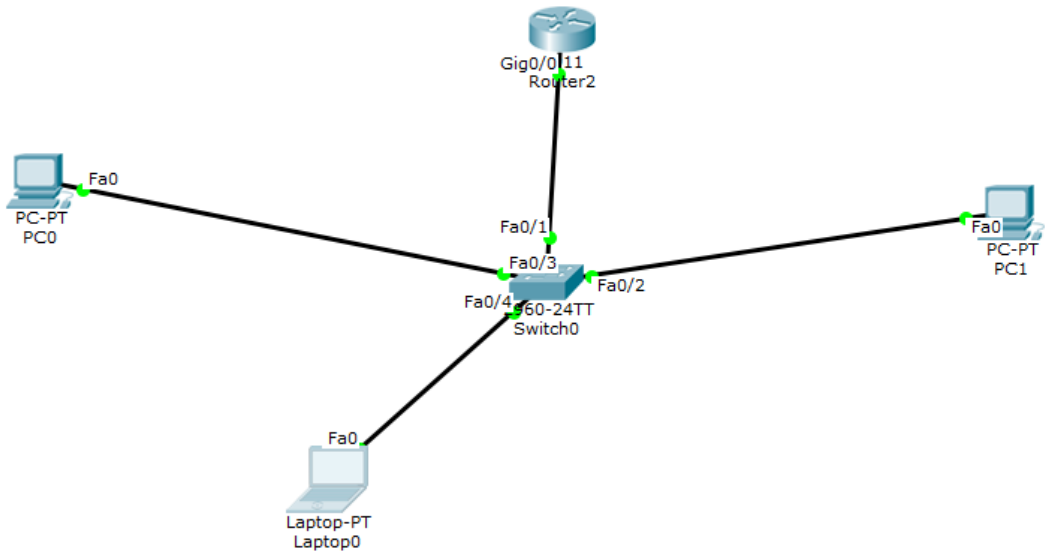
Before you configure the Cisco IOS DHCP Server feature, complete the following tasks:

- Identify an external File Transport Protocol (FTP), Trivial File Transfer Protocol (TFTP), or remote copy protocol (rcp) server that you will use to store the DHCP bindings database.
- Identify the IP addresses that you will enable the DHCP Server to assign, and the IP addresses that you will exclude.
- Identify DHCP options for devices where necessary, including the following:
  - Default boot image name
  - Default routers
  - Domain Name System (DNS) servers
  - NetBIOS name server
- Decide on a NetBIOS node type (b, p, m, or h).
- Decide on a DNS domain name.

DHCP Client Overview

The Cisco IOS DHCP client now enables you to obtain an IP address from a DHCP Server dynamically using the DHCP protocol as specified in RFC 2131. In Cisco IOS Release 12.2, only Ethernet interfaces are supported; work is in progress to support all interface types. The Cisco IOS DHCP client offers the following benefits:

- Reduces time to configure and deploy
- Reduces the number of configuration errors
- Enables customers to centrally control the IP address assigned to a Cisco IOS router



Router 2

Continue with configuration dialog? [yes/no]: n

Press RETURN to get started!

```
Router>ena
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int gig 0/0
```

```
Router(config-if)#ip add 192.168.101.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#ip dhcp pool IPD
Router(dhcp-config)#network 192.168.101.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.101.1
Router(dhcp-config)#exit
Router(config)#ip dhcp excluded-address 192.168.101.1
192.168.101.10
Router(config)#exit
```

Pc0:
Click on PC0->Desktop-> IP configuration->Select DHCP

Result: DHCP Request Successful