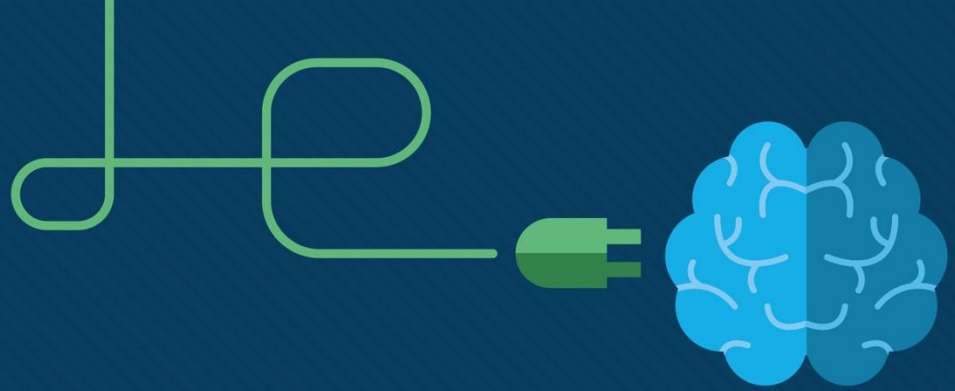


7 DHCPv4

单元目标

模块标题: **DHCPv4**

模块目标: 实施 DHCPv4, 跨多个 LAN 运行

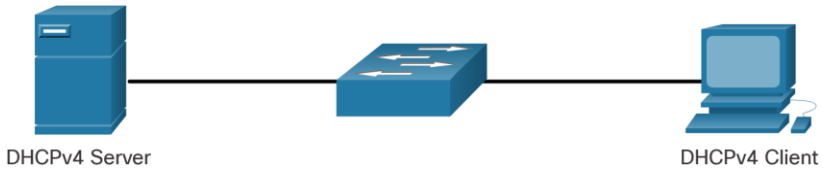
主题标题	主题目标
DHCP4 的概念	介绍 DHCPv4 在中小型企业网络中的运行方式。
配置一台思科 IOS DHCP4 服务器	将路由器配置为 DHCPv4 服务器。
配置 DHCP4 客户端	将路由器配置为 DHCPv4 客户端。

7.1 DHCPv4 的概念

DHCPv4 简介

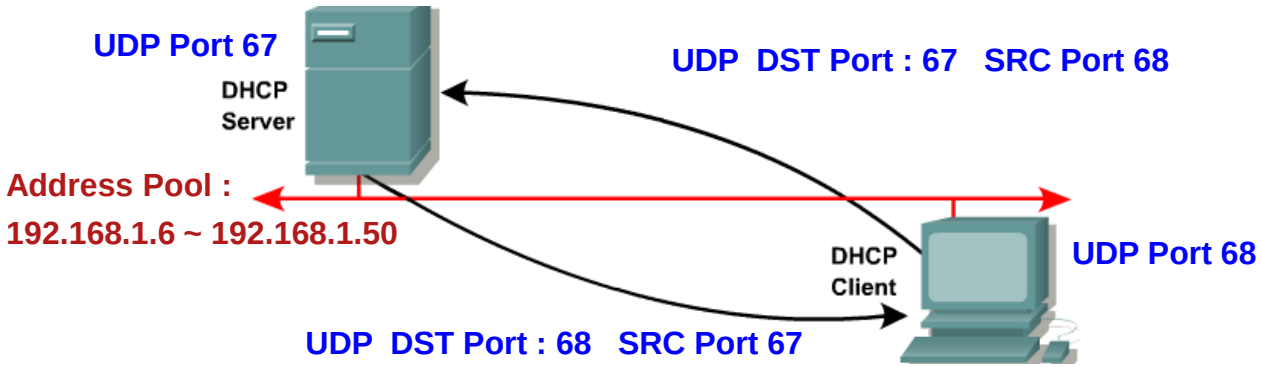
Dynamic Host Configuration Protocol v4（DHCPv4）

—— 动态主机配置协议



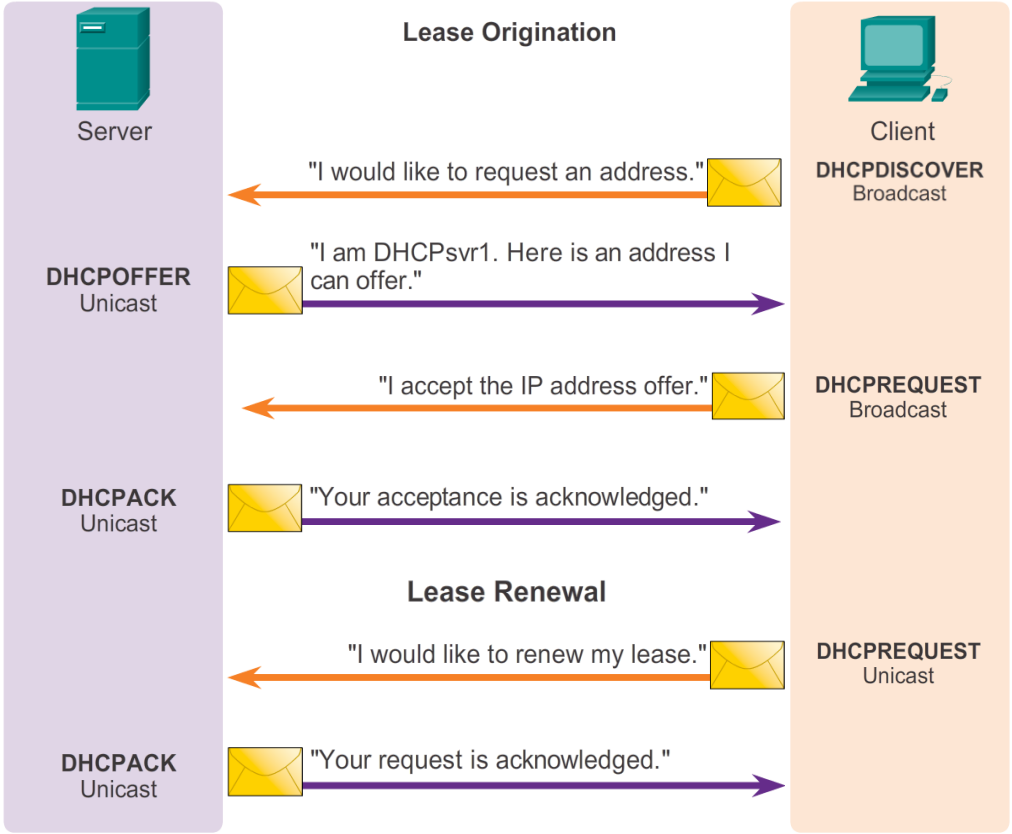
- 动态分配IPv4地址和其它网络配置信息
- 专用DHCPv4服务器 vs Cisco IOS DHCP服务器
- DHCPv4服务器从地址池中动态分配或租用IPv4地址
- 客户端在管理定义的期限内从服务器租用地址
- 租约到期后，通常会为客户端重新分配相同的地址

Introducing DHCPv4

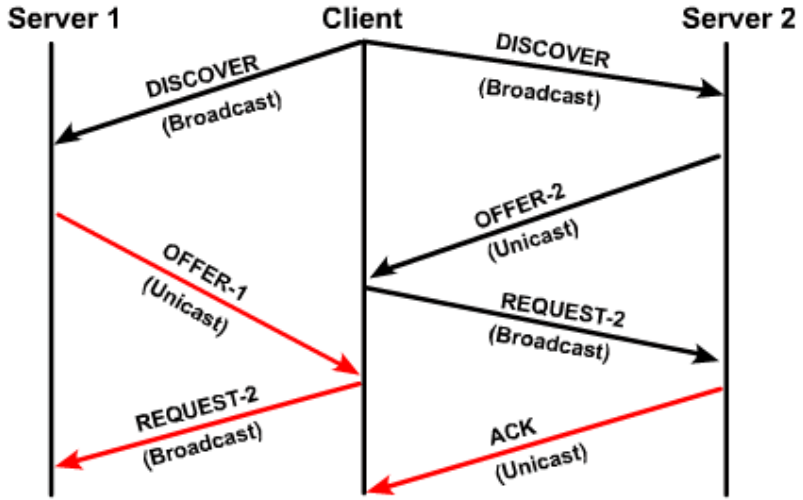


- Automatic Allocation: DHCP automatically assigns a IP address to a device. There is no lease and the address is permanently assigned to the device.
- Dynamic Allocation: DHCP automatically dynamically assigns, or leases, an IP address from a pool of addresses for a limited period of time chosen by the server
- Manual Allocation: The administrator assigns a pre-allocated IP address to the client. Then DHCP automatically assigns the static IP address to the device.

DHCPv4 工作原理

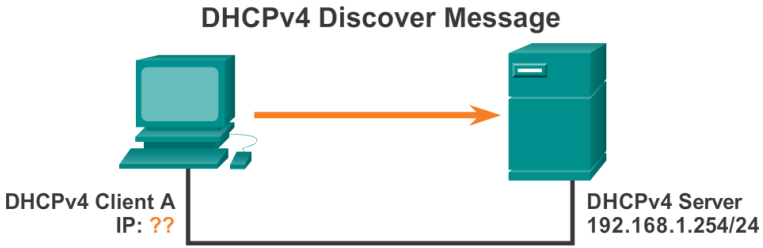


DHCPv4 Operation



- DHCP client broadcasts DHCP DISCOVER packet on local subnet
- DHCP servers send OFFER packet with lease information
- DHCP client selects lease and broadcasts DHCP REQUEST packet
- Selected DHCP server sends DHCP ACK packet

DHCPv4 发现并提供消息

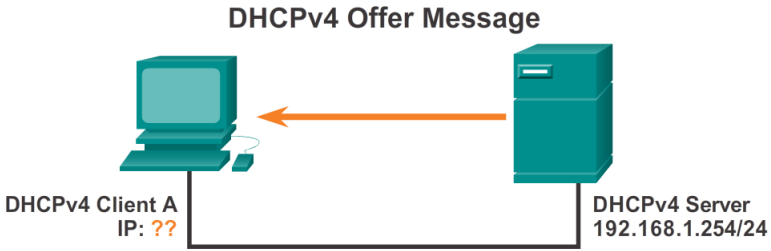


Ethernet Frame	IP	UDP	DHCPDISCOVER
SRC MAC: MAC A DST MAC: FF:FF:FF:FF:FF:FF	IP SRC: 0.0.0.0 IP DST: 255.255.255.255	UDP 67	CIADDR: 0.0.0.0 GIADDR: 0.0.0.0 Mask: 0.0.0.0 CHADDR: MAC A

MAC: Media Access Control Address
CIADDR: Client IP Address
GIADDR: Gateway IP Address
CHADDR: Client Hardware Address

The DHCP client sends a directed IP broadcast with a DHCPDISCOVER packet. In this example, the DHCP server is on the same segment and will pick up this request. The server notes the GIADDR field is blank; therefore, the client is on the same segment. The server also notes the hardware address of the client in the request packet.

DHCPv4 发现并提供消息



Ethernet Frame	IP	UDP	DHCP Reply
SRC MAC: MAC Serv DST MAC: MAC A	IP SRC: 192.168.1.254 IP DST: 192.168.1.10	UDP 68	CIADDR: 192.168.1.10 GIADDR: 0.0.0.0 Mask: 255.255.255.0 CHADDR: MAC A

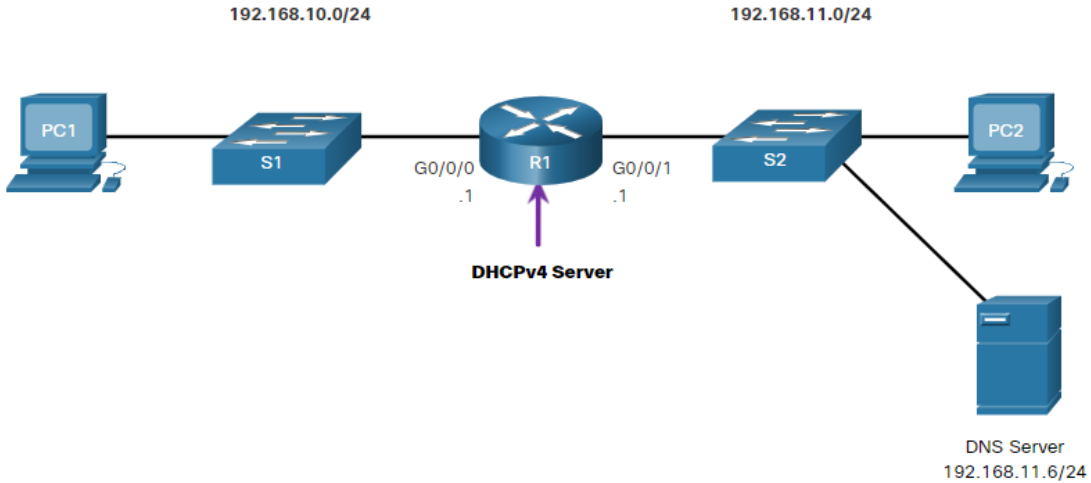
MAC: Media Access Control Address
CIADDR: Client IP Address
GIADDR: Gateway IP Address
CHADDR: Client Hardware Address

The DHCP server picks an IP address from the available pool for that segment, as well as the other segment and global parameters. The DHCP server puts them into the appropriate fields of the DHCP packet. The DHCP server then uses the hardware address of A (in CHADDR) to construct an appropriate frame to send back to the client.

7.2 配置DHCPv4 服务器

思科 IOS DHCPv4 服务器

现在，您对 DHCPv4 的工作原理以及如何简化网络管理员的工作已经有了一个基本的了解。可以将运行思科 IOS 软件的思科路由器配置为 DHCPv4 服务器。思科 IOS DHCPv4 服务器从路由器内的指定地址池分配 IPv4 地址给 DHCPv4 客户端，并管理这些 IP 地址。



思科 IOS DHCPv4 服务器

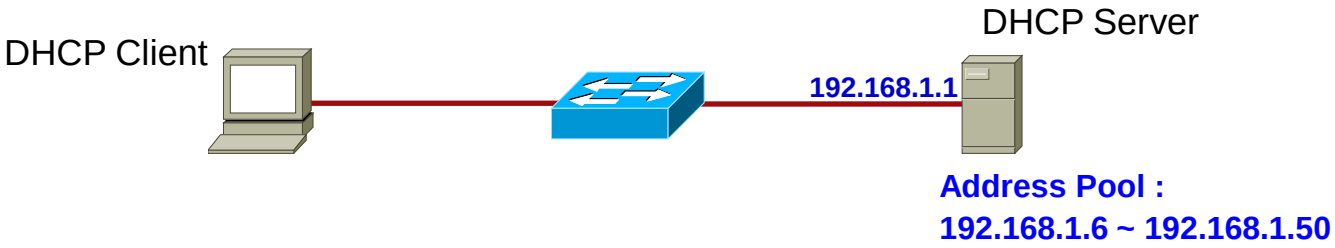
- Step 1. Define a range of addresses that DHCP is not to allocate. These are usually static addresses reserved for the router interface, switch management IP address, servers, and local network printers.

```
Router(config)# ip dhcp excluded-address start-ip-address [end-ip-address]
```

```
Router(config)# ip dhcp excluded-address 192.168.1.1  192.168.1.5
Router(config)# ip dhcp excluded-address 192.168.1.254
```

思科 IOS DHCPv4 服务器

- Step 2. Create the DHCP pool using the ip dhcp pool command.



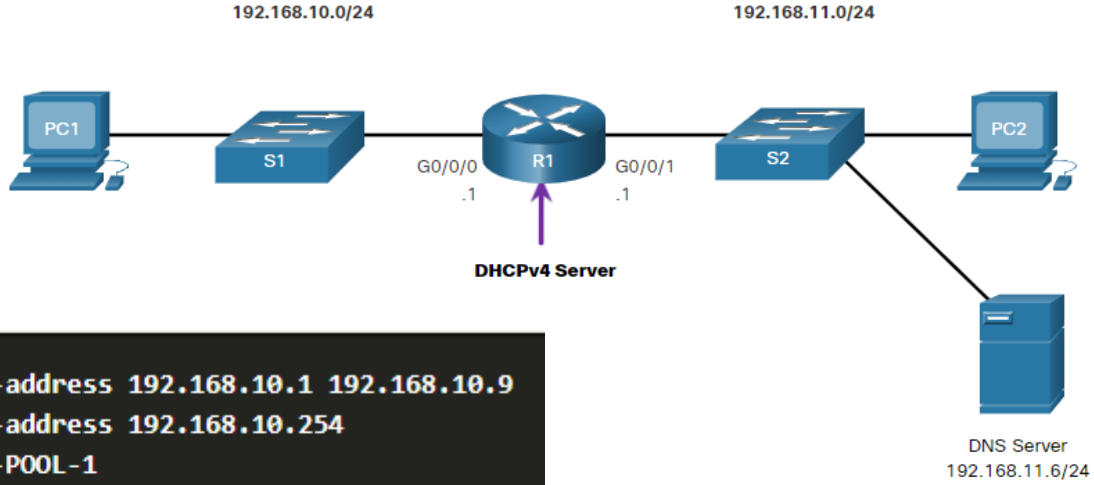

```
Router(config)# ip dhcp pool NET1
Router(dhcp-config)# network 192.168.1.0 255.255.255.0
```

思科 IOS DHCPv4 服务器

- Step 3. Configure the specifics of the pool.
  1. You should also define the default gateway or router for the clients to use with the default-router command.
  2. You can configure the IP address of the DNS server that is available to a DHCP client using the dns-server command.
  3. The default setting is one day, but you can change this by using the lease command

```
Router(config)# ip dhcp pool NET1
Router(dhcp-config)# network 192.168.1.0 255.255.255.0
Router(dhcp-config)# default-router 192.168.1.1
Router(dhcp-config)# dns-server 202.112.100.10
Router(dhcp-config)# lease 0 6
```

配置思科 IOS DHCPv4 服务器
配置示例




```
R1(config)# ip dhcp excluded-address 192.168.10.1 192.168.10.9
R1(config)# ip dhcp excluded-address 192.168.10.254
R1(config)# ip dhcp pool LAN-POOL-1
R1(dhcp-config)# network 192.168.10.0 255.255.255.0
R1(dhcp-config)# default-router 192.168.10.1
R1(dhcp-config)# dns-server 192.168.11.5
R1(dhcp-config)# domain-name example.com
R1(dhcp-config)# end
R1#
```

配置思科 IOS DHCPv4 服务器
验证 DHCPv4

使用表中的命令验证思科 IOS DHCPv4 服务器是否正常运行。

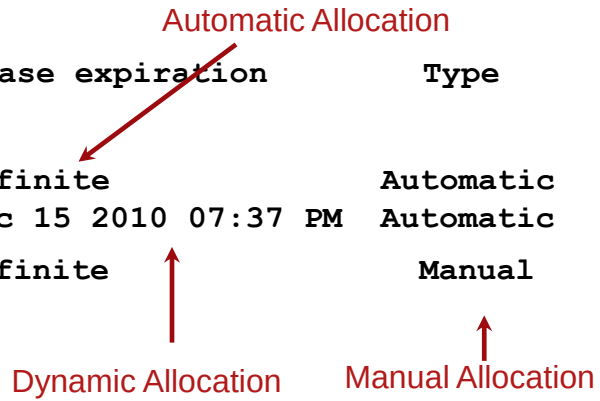
命令	说明
show running-config | section dhcp	显示路由器上配置的 DHCPv4 命令。
show ip dhcp binding	显示所有由 DHCPv4 服务提供的 IPv4 地址和 MAC 地址。
show ip dhcp server statistics	这条命令会显示出已发送和接收的 DHCPv4 消息数量的计数信息。

Verifying a DHCPv4 Server

- Verifying DHCP

To verify the operation of DHCP, use the **show ip dhcp binding** command. This command displays a list of all IP address to MAC address bindings that have been provided by the DHCP service.

```
R1#show ip dhcp binding

IP address       Client-ID/              Lease expiration        Type
                 Hardware address/
                 User name
192.168.1.7      0100.0d87.db9f.6e       Infinite                Automatic
192.168.1.8      0100.0c89.df99.64       Dec 15 2010 07:37 PM    Automatic
192.168.1.9      0100.0347.b59c.ae       Infinite                Manual
```



验证 DHCPv4 的工作状态(续)

验证 **DHCPv4 的统计信息:** 命令 **show ip dhcp server statistics** 的输出信息可以验证路由器发送和接收的消息。此命令显示关于已发送和接收的 DHCPv4 消息数量的计数信息。

```
R1# show ip dhcp server statistics
Memory usage         19465
Address pools        1
Database agents      0
Automatic bindings   2
Manual bindings      0
Expired bindings     0
Malformed messages   0
Secure arp entries   0
Renew messages       0
Workspace timeouts   0
Static routes        0
Relay bindings       0
Relay bindings active        0
Relay bindings terminated    0
Relay bindings selecting     0
Message              Received
BOOTREQUEST          0
DHCPDISCOVER         4
DHCPREQUEST          2
DHCPDECLINE          0
DHCPRELEASE          0
DHCPINFORM           0
```

验证 DHCPv4 的工作状态(续)

验证 DHCPv4 客户端接收到的 IPv4 编址：在 PC1 上输入命令ipconfig /all 可以让设备显示出 TCP/IP 参数，如示例中所示。由于 PC1 连接到网段 192.168.10.0/24，因此，它会自动从该池接收 DNS 后缀、IPv4 地址、子网掩码、默认网关和 DNS 服务器地址。不需要 DHCP 特定的路由器接口配置。如果 PC 连接到包含可用 DHCPv4 池的网段，该 PC 就能从相应的池中自动获取 IPv4 地址。

```
C:\Users\Student> ipconfig /all
Windows IP Configuration
   Host Name . . . . . . . . . . . . : ciscolab
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No
Ethernet adapter Ethernet0:
   Connection-specific DNS Suffix  . : example.com
   Description . . . . . . . . . . . : Realtek PCIe GBE Family Controller
   Physical Address. . . . . . . . . : 00-05-9A-3C-7A-00
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   IPv4 Address. . . . . . . . . . . : 192.168.10.10
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained  . . . . . . . . . : Saturday, September 14, 2019 8:42:22AM
   Lease Expires   . . . . . . . . . : Sunday, September 15, 2019 8:42:22AM
   Default Gateway . . . . . . . . . : 192.168.10.1
   DHCP Server . . . . . . . . . . . : 192.168.10.1
   DNS Servers . . . . . . . . . . . : 192.168.11.5
```

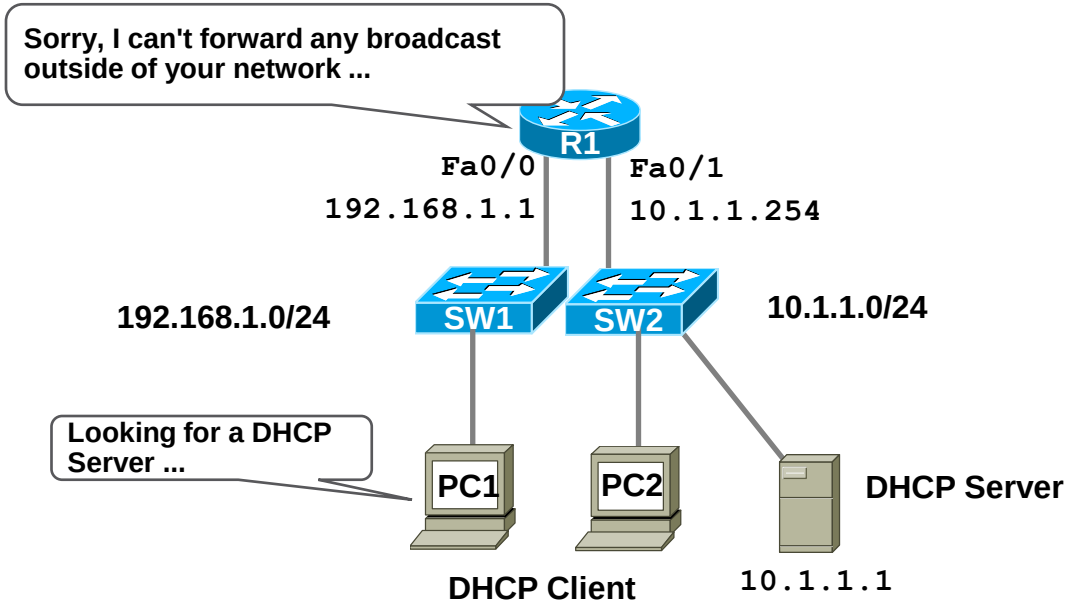
禁用思科 IOS DHCPv4 服务器

DHCPv4服务默认就是启用的。要禁用这项服务，应该使用全局配置模式命令 **no service dhcp** 。使用 **service dhcp** 全局配置模式命令可以重新启用 DHCPv4 服务器进程，如示例中所示。如果没有配置参数，启用服务将不会有效果。

注意：清除 DHCP 绑定关系或者终止并重新启动 DHCP 服务，这些操作可能会导致网络上临时出现分配重复的 IP 地址。

```
R1(config)# no service dhcp
R1(config)# service dhcp
R1(config)#
```

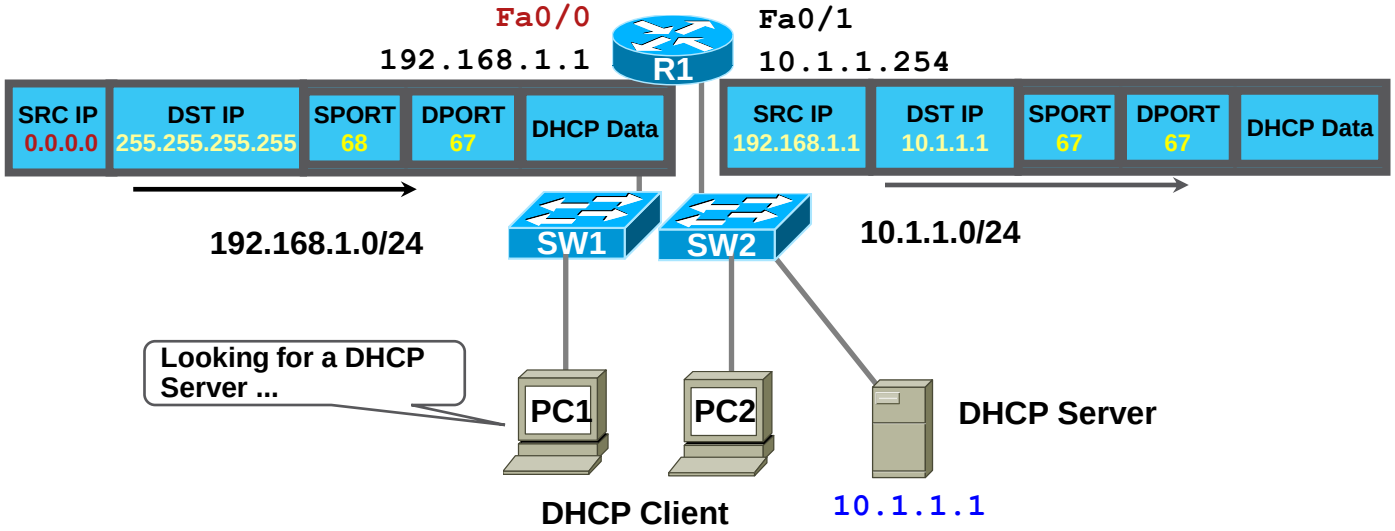
DHCPv4 中继



- PC1 is attempting to acquire an IP address from the DHCP server located at 10.1.1.1 . In this scenario router R1 is not configured as a DHCP server.

DHCPv4 Relay

```
R1(config)# interface fa0/0
R1(config-if)# ip helper-ddress 10.1.1.1
```

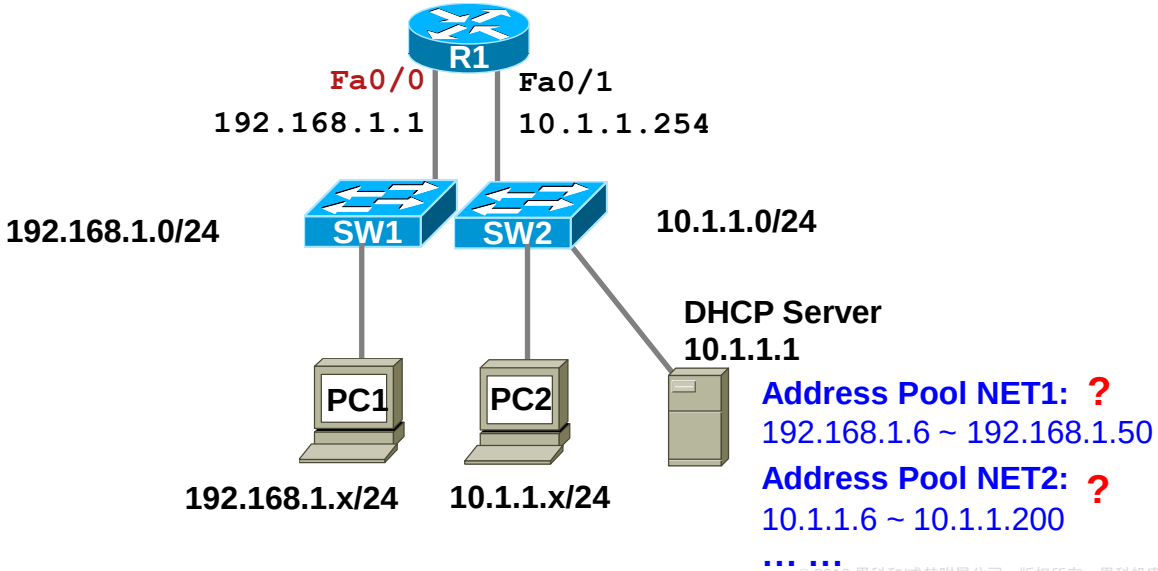


- Configure the IP helper address on the interface receiving the broadcast.
- This command relays broadcast requests for key services to a configured address.

DHCPv4 Relay

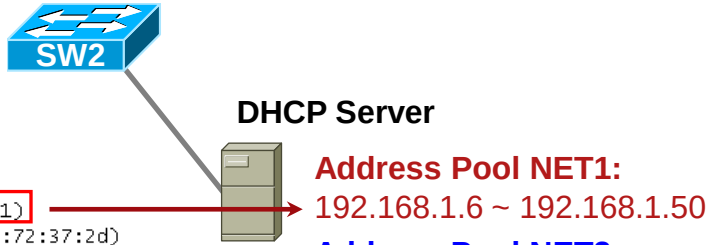
- How to determine which address is assigned ?

```
R1(config)# interface fa0/0
R1(config-if)# ip helper-ddress 10.1.1.1
```



DHCPv4 Relay

```
    14 40.172000   192.168.1.1   10.1.1.1      DHCP   DHCP Discover - Transaction ID 0x1735f2a0
    15 40.266000   10.1.1.1      192.168.1.6   ICMP   Echo (ping) request
    16 41.688000   10.1.1.1      192.168.1.6   ICMP   Echo (ping) request
    17 42.219000   10.1.1.1      192.168.1.1   DHCP   DHCP Offer    - Transaction ID 0x1735f2a0
    18 42.453000   192.168.1.1   10.1.1.1      DHCP   DHCP Request  - Transaction ID 0x1735f2a0
    19 42.516000   10.1.1.1      192.168.1.1   DHCP   DHCP ACK      - Transaction ID 0x1735f2a0

⊞ Frame 14 (342 bytes on wire, 342 bytes captured)
⊞ Ethernet II, Src: c2:01:0a:9c:00:01 (c2:01:0a:9c:00:01), Dst: c2:00:0a:9c:00:00 (c2:00:0a:9c:00:00)
⊞ Internet Protocol, Src: 192.168.1.1 (192.168.1.1), Dst: 10.1.1.1 (10.1.1.1)
⊞ User Datagram Protocol, Src Port: bootps (67), Dst Port: bootps (67)
⊟ Bootstrap Protocol
    Message type: Boot Request (1)
    Hardware type: Ethernet
    Hardware address length: 6
    Hops: 1
    Transaction ID: 0x1735f2a0
    Seconds elapsed: 3 (little endian bug?)
  ⊟ Bootp flags: 0x0000 (Unicast)
      0... .... .... .... = Broadcast flag: Unicast
      .000 0000 0000 0000 = Reserved flags: 0x0000
    Client IP address: 0.0.0.0 (0.0.0.0)
    Your (client) IP address: 0.0.0.0 (0.0.0.0)
    Next server IP address: 0.0.0.0 (0.0.0.0)
    Relay agent IP address: 192.168.1.1 (192.168.1.1)
    Client MAC address: HonHaiPr_72:37:2d (00:1c:25:72:37:2d)
    Server host name not given
    Boot file name not given
  ⊞ Option: (t=53,l=1) DHCP Message Type = DHCP Discover
```

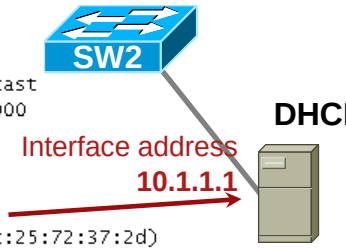


DHCPv4 Relay

```
    14 40.172000   192.168.1.1     10.1.1.1        DHCP     DHCP Discover - Transaction ID 0x1735f2a0
    15 40.266000   10.1.1.1        192.168.1.6     ICMP     Echo (ping) request
    16 41.688000   10.1.1.1        192.168.1.6     ICMP     Echo (ping) request
    17 42.219000   10.1.1.1        192.168.1.1     DHCP     DHCP Offer    - Transaction ID 0x1735f2a0
    18 42.453000   192.168.1.1     10.1.1.1        DHCP     DHCP Request  - Transaction ID 0x1735f2a0
    19 42.516000   10.1.1.1        192.168.1.1     DHCP     DHCP ACK      - Transaction ID 0x1735f2a0

⊞ Frame 17 (342 bytes on wire, 342 bytes captured)
⊞ Ethernet II, Src: c2:00:0a:9c:00:00 (c2:00:0a:9c:00:00), Dst: c2:01:0a:9c:00:01 (c2:01:0a:9c:00:01)
⊞ Internet Protocol, Src: 10.1.1.1 (10.1.1.1), Dst: 192.168.1.1 (192.168.1.1)
⊞ User Datagram Protocol, Src Port: bootps (67), Dst Port: bootps (67)
⊟ Bootstrap Protocol
    Message type: Boot Reply (2)
    Hardware type: Ethernet
    Hardware address length: 6
    Hops: 0
    Transaction ID: 0x1735f2a0
    Seconds elapsed: 0
  ⊟ Bootp flags: 0x0000 (Unicast)
      0... .... .... .... = Broadcast flag: Unicast
      .000 0000 0000 0000 = Reserved flags: 0x0000
    Client IP address: 0.0.0.0 (0.0.0.0)
    Your (client) IP address: 192.168.1.6 (192.168.1.6)
    Next server IP address: 0.0.0.0 (0.0.0.0)
    Relay agent IP address: 192.168.1.1 (192.168.1.1)
    Client MAC address: HonHaiPr_72:37:2d (00:1c:25:72:37:2d)
    Server host name not given
    Boot file name not given
  ⊞ Option: (t=53,l=1) DHCP Message Type = DHCP Offer
```

DHCPv4 Relay

```
     6 32.688000   0.0.0.0           255.255.255.255   DHCP   DHCP Discover - Transaction ID 0x1f0de88f
     7 32.906000   c2:00:04:60:00:00  Broadcast         ARP    Who has 10.1.1.6?  Tell 10.1.1.1
     8 34.719000   10.1.1.1          10.1.1.6          DHCP   DHCP Offer    - Transaction ID 0x1f0de88f
     9 34.719000   0.0.0.0           255.255.255.255   DHCP   DHCP Request  - Transaction ID 0x1f0de88f
    10 34.750000   10.1.1.1          10.1.1.6          DHCP   DHCP ACK      - Transaction ID 0x1f0de88f
    11 34.750000   HonHaiPr_72:37:2d  Broadcast         ARP    Gratuitous ARP for 10.1.1.6 (Request)

⊞ Ethernet II, Src: HonHaiPr_72:37:2d (00:1c:25:72:37:2d), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
⊞ Internet Protocol, Src: 0.0.0.0 (0.0.0.0), Dst: 255.255.255.255 (255.255.255.255)
⊞ User Datagram Protocol, Src Port: bootpc (68), Dst Port: bootps (67)
⊟ Bootstrap Protocol
    Message type: Boot Request (1)
    Hardware type: Ethernet
    Hardware address length: 6
    Hops: 0
    Transaction ID: 0x1f0de88f
    Seconds elapsed: 0
  ⊟ Bootp flags: 0x0000 (Unicast)
      0... .... .... .... = Broadcast flag: Unicast
      .000 0000 0000 0000 = Reserved flags: 0x0000
    Client IP address: 0.0.0.0 (0.0.0.0)
    Your (client) IP address: 0.0.0.0 (0.0.0.0)
    Next server IP address: 0.0.0.0 (0.0.0.0)
    Relay agent IP address: 0.0.0.0 (0.0.0.0)
    Client MAC address: HonHaiPr_72:37:2d (00:1c:25:72:37:2d)
    Server host name not given
    Boot file name not given
  ⊞ Option: (t=53,l=1) DHCP Message Type = DHCP Discover
```



DHCP Server

Address Pool NET1:
192.168.1.6 ~ 192.168.1.50

Address Pool NET2:
10.1.1.6 ~ 10.1.1.200

… …

DHCPv4 Relay

```
     6 32.688000   0.0.0.0          255.255.255.255   DHCP   DHCP Discover - Transaction ID 0x1f0de88f
     7 32.906000   c2:00:04:60:00:00 Broadcast         ARP    Who has 10.1.1.6?  Tell 10.1.1.1
     8 34.719000   10.1.1.1         10.1.1.6          DHCP   DHCP Offer    - Transaction ID 0x1f0de88f
     9 34.719000   0.0.0.0          255.255.255.255   DHCP   DHCP Request  - Transaction ID 0x1f0de88f
    10 34.750000   10.1.1.1         10.1.1.6          DHCP   DHCP ACK      - Transaction ID 0x1f0de88f
    11 34.750000   HonHaiPr_72:37:2d Broadcast         ARP    Gratuitous ARP for 10.1.1.6 (Request)

⊞ Ethernet II, Src: c2:00:04:60:00:00 (c2:00:04:60:00:00), Dst: HonHaiPr_72:37:2d (00:1c:25:72:37:2d)
⊞ Internet Protocol, Src: 10.1.1.1 (10.1.1.1), Dst: 10.1.1.6 (10.1.1.6)
⊞ User Datagram Protocol, Src Port: bootps (67), Dst Port: bootpc (68)
⊟ Bootstrap Protocol
    Message type: Boot Reply (2)
    Hardware type: Ethernet
    Hardware address length: 6
    Hops: 0
    Transaction ID: 0x1f0de88f
    Seconds elapsed: 0
  ⊟ Bootp flags: 0x0000 (Unicast)
      0... .... .... .... = Broadcast flag: Unicast
      .000 0000 0000 0000 = Reserved flags: 0x0000
    Client IP address: 0.0.0.0 (0.0.0.0)
    Your (client) IP address: 10.1.1.6 (10.1.1.6)
    Next server IP address: 0.0.0.0 (0.0.0.0)
    Relay agent IP address: 0.0.0.0 (0.0.0.0)
    Client MAC address: HonHaiPr_72:37:2d (00:1c:25:72:37:2d)
    Server host name not given
    Boot file name not given
  ⊞ Option: (t=53,l=1) DHCP Message Type = DHCP Offer
```

Interface address
10.1.1.1

DHCP Server

Address Pool NET1:
192.168.1.6 ~ 192.168.1.50

Address Pool NET2:
10.1.1.6 ~ 10.1.1.200

… …

Troubleshooting Tasks

Troubleshooting Task 1:	Resolve conflicts.
Troubleshooting Task 2:	Verify physical connectivity.
Troubleshooting Task 3:	Test with a static IPv4 address.
Troubleshooting Task 4:	Verify switch port configuration.
Troubleshooting Task 5:	Test from the same subnet or VLAN.

Verifying the Router DHCPv4 Configuration

Verifying DHCPv4 Relay and DHCPv4 Services

```
R1# show running-config | section interface GigabitEthernet0/0
interface GigabitEthernet0/0
 ip address 192.168.10.1 255.255.255.0
 ip helper-address 192.168.11.6
 duplex auto
 speed auto
R1#

R1# show running-config | include no service dhcp
R1#
```

Debugging DHCPv4

Verifying DHCPv4 Using Router debug Commands

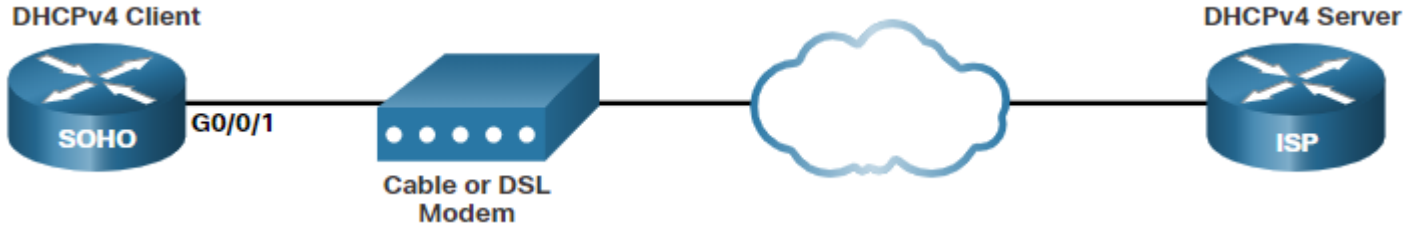
```
R1(config)# access-list 100 permit udp any any eq 67
R1(config)# access-list 100 permit udp any any eq 68
R1(config)# end
R1# debug ip packet 100
IP packet debugging is on for access list 100
*IP: s=0.0.0.0 (GigabitEthernet0/1), d=255.255.255.255, len 333,
rcvd 2
*IP: s=0.0.0.0 (GigabitEthernet0/1), d=255.255.255.255, len 333,
stop process pak for forus packet
*IP: s=192.168.11.1 (local), d=255.255.255.255
(GigabitEthernet0/1), len 328, sending broad/multicast

<Output omitted>

Router1# debug ip dhcp server events
DHCPD: returned 192.168.10.11 to address pool LAN-POOL-1
DHCPD: assigned IP address 192.168.10.12 to client
0100.0103.85e9.87.
DHCPD: checking for expired leases.
DHCPD: the lease for address 192.168.10.10 has expired.
DHCPD: returned 192.168.10.10 to address pool LAN-POOL-1
```

7.3 配置 DHCPv4 客户端

由思科路由器充当 DHCPv4 客户端

在有些场景下，您可能可以通过 ISP 访问 DHCP 服务器。在这类场景中，您可以把思科 IOS 路由器配置为 DHCPv4 客户端。

- 有时，小型办公室/家庭办公室 (SOHO) 和分支机构站点中的思科路由器需要配置为DHCPv4客户端，让它们扮演和客户端计算机类似的角色。所用方法取决于 ISP。但是，最简单的配置是使用以太网接口来连接电缆或 DSL 调制解调器。
- 要把一个以太网接口配置为 DHCP 客户端，需要使用接口配置模式命令 **ip address dhcp** 进行配置。
- 在图中，ISP已经经过配置，在使用 **ip address dhcp** 命令配置了G0/0/1接口之后，ISP就可以为选定客户提供209.165.201.0/27网络范围内的IP地址了。



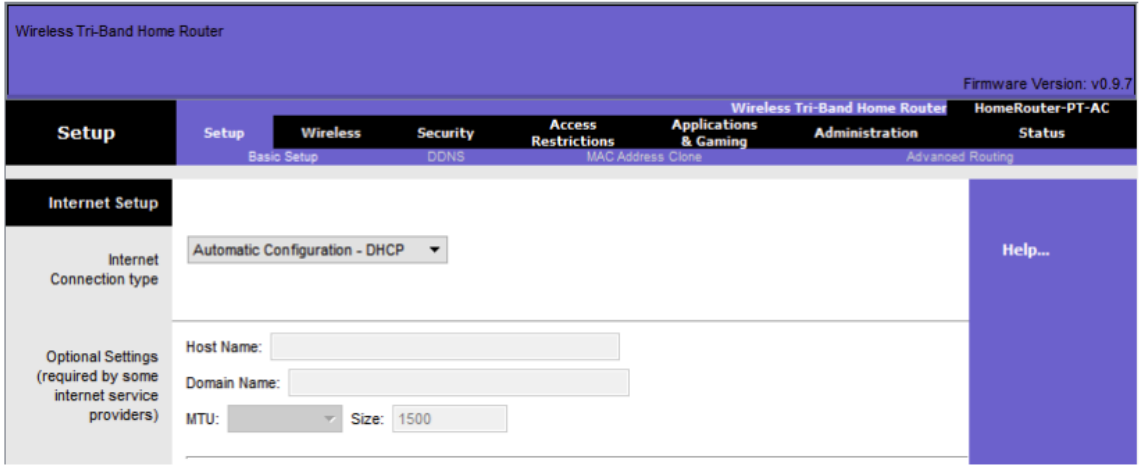
将路由器配置为 DHCPv4 客户端


```
SOHO(config)# interface g0/1
SOHO(config-if)# ip address dhcp
SOHO(config-if)# no shutdown
SOHO(config-if)#
*Jan 31 17:31:11.507: %DHCP-6-ADDRESS_ASSIGN: Interface
GigabitEthernet0/1 assigned DHCP address 209.165.201.12, mask
255.255.255.224, hostname SOHO
SOHO(config-if)# end
SOHO# show ip interface g0/1
GigabitEthernet0/1 is up, line protocol is up
  Internet address is 209.165.201.12/27
  Broadcast address is 255.255.255.255
  Address determined by DHCP
<output omitted>
```

由家用路由器充当 DHCPv4 客户端

家用路由器一般都会设置为自动从 ISP 接收 IPv4 编址信息。这是为了让客户可以轻松地设置路由器并连接到互联网。

- 例如，图中显示了 Packet Tracer 无线路由器的 WAN 设置页面。请注意，互联网连接类型设置为 **Automatic Configuration - DHCP**（自动配置 - DHCP）。当路由器连接到 DSL 或电缆调制解调器并且充当 DHCPv4 客户端，从 ISP 请求 IPv4 地址时，将使用此选项。
- 各个厂商推出的家用路由器上都有类似的设置。



7.4 单元练习与测验

Packet Tracer — 实施 DHCPv4

在这个 Packet Tracer 中，您会完成以下目标：

- 第 1 部分：将一台路由器配置为 DHCP 服务器
- 第 2 部分：配置 DHCP 中继
- 第 3 部分：将一台路由器配置为 DHCP 客户端

实验 — 实施 DHCPv4

在本实验中，您将完成以下目标：

- 第 1 部分：建立网络并配置设备的基本设置
- 第 2 部分：在 R1 上配置和验证两个 DHCPv4 服务器
- 第 3 部分：在 R2 上配置和验证 DHCP 中继

在这个模块中我学到了什么？

- DHCPv4 服务器会动态地从地址池中分配或出租 IPv4 地址，使用期限为服务器选择的一段有限时间，或者直到客户端不再需要这个地址为止。
- DHCPv4 租约过程从客户端发送请求 DHCP 服务器服务的消息开始。如果有DHCPv4服务器接收到这条消息，这台服务器就会使用IPv4地址和其他可能的网络配置信息作出响应。
- 客户端必须定期联系 DHCP 服务器以续展租期。这种租用机制确保移动或关闭的客户端不保留它们不再需要的地址。
- 当客户端启动（或者要加入网络）时，它就会开始执行这个四步的过程来租赁地址：先是DHCPDISCOVER、然后是DHCPOFFER、然后是DHCPREQUEST，最后是DHCPACK。在租约到期之前，客户端会执行两个步骤，来向DHCPv4服务器续订租约：先是DHCPREQUEST，然后是DHCPACK。
- 可以将运行思科 IOS 软件的思科路由器配置为 DHCPv4 服务器。
- 使用以下步骤配置思科 IOS DHCPv4 服务器：排除 IPv4 地址、定义 DHCPv4 地址池名称，然后配置 DHCPv4 地址池。
- 使用命令 **show running-config | section dhcp**、**show ip dhcp binding**和**show ipdhcp server statistics** 来验证您的配置。
- 默认情况下，DHCPv4 服务已启用。要禁用此服务，请使用 **no service dhcp** 全局配置模式命令。

在这个模块中我学到了什么？（续）

- 网络客户端通常并不会和为网络提供 DHCP、DNS、TFTP 和 FTP 服务的企业服务器处在同一个子网当中。为了定位服务器并接收服务，客户端通常使用广播消息。必须配置 R1 来把 DHCPv4 消息中继给 DHCPv4 服务器。
- 网络管理员可以使用接口配置命令**ip helper-address *address*** 和命令 **show ip interface**来验证配置。
- ip helper-address 命令默认转发下列八种 UDP 服务：
  - 端口 37：时间
  - 端口 49：TACACS
  - 端口 53：DNS
  - 端口 67：DHCP/BOOTP 服务器
  - 端口 68：DHCP/BOOTP 客户端
  - 端口 69：TFTP
  - 端口 137：NetBIOS 名称服务
  - 端口 138：NetBIOS 数据报服务
- 要把一个以太网接口配置为 DHCP 客户端，需要使用接口配置模式命令 **ip address dhcp** 进行配置。
- 家用路由器一般都会设置为自动从 ISP 接收 IPv4 编址信息。互联网连接类型设置为 Automatic Configuration - DHCP（自动配置 - DHCP）。当路由器连接到 DSL 或电缆调制解调器并且充当 DHCPv4 客户端，从 ISP 请求 IPv4 地址时，将使用此选项。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