

## - Dynamic Host Control Protocol -

### DHCP (Dynamic Host Control Protocol)

In networks with a large number of hosts, statically assigning IP addresses and other IP information quickly becomes impractical.

**Dynamic Host Control Protocol (DHCP)** provides administrators with a mechanism to *dynamically* allocate IP addresses, rather than manually setting the address on each device.

DHCP servers **lease** out IP addresses to DHCP clients, for a specific period of time. There are four steps to this DHCP process:

- When a DHCP client first boots up, it broadcasts a **DHCPDiscover** message, searching for a DHCP server.
- If a DHCP server exists on the local segment, it will respond with a **DHCPOffer**, containing the “offered” IP address, subnet mask, etc.
- Once the client receives the offer, it will respond with a **DHCPRequest**, indicating that it will accept the offered protocol information.
- Finally, the server responds with a **DHCPACK**, acknowledging the clients acceptance of offered protocol information.

By default, DHCP leases an address for **8 days**. Once 50% of the lease expires, the client will try to renew the lease with the *same* DHCP server. If successful, the client receives a *new* 8 day lease.

If the renewal is *not* successful, the client will continue “attempting” to renew, until 87.5% of the lease has expired. Once this threshold has been reached, the client will attempt to find another DHCP server to bind to.

In addition to IP address and subnet mask information, DHCP can provide the following protocol parameters:

- Default Gateway
- Domain Name and DNS servers
- Time Servers
- WINS servers

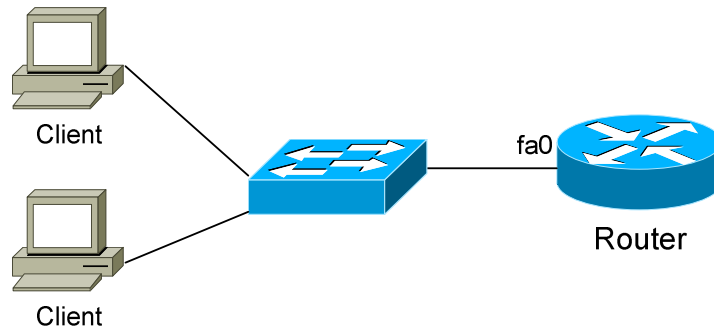
These are just a few examples of the many DHCP “options” that exist.

\* \* \*

All original material copyright © 2007 by Aaron Balchunas ([aaron@routeralley.com](mailto:aaron@routeralley.com)), unless otherwise noted. All other material copyright © of their respective owners.

This material may be copied and used freely, but may not be altered or sold without the expressed written consent of the owner of the above copyright. Updated material may be found at <http://www.routeralley.com>.

## Configuring a Cisco Router as a DHCP Server



Cisco routers can be configured to function as DHCP servers. The first step is to create a DHCP **pool**:

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

The first command creates a *dhcp pool* named *MYPOOL*. The second command creates our DHCP **scope**, indicating the range of addresses to be leased. The above command indicates any address between 192.168.1.1 – 192.168.1.255 can be leased.

Specific addresses can be excluded from being leased:

```
Router(config)# ip dhcp excluded-address 192.168.1.1
Router(config)# ip dhcp excluded-address 192.168.1.5 192.168.1.10
```

The first command excludes only address *192.168.1.1*. The second command excludes address *192.168.1.5* through *192.168.1.10*.

To specify DHCP options to be leased with the address:

```
Router(config)# ip dhcp pool MYPOOL
Router(dhcp-config)# default-router 192.168.1.1
Router(dhcp-config)# dns-server 192.168.1.5
Router(dhcp-config)# domain-name MYDOMAIN
```

To specify the duration of the DHCP lease:

```
Router(config)# ip dhcp pool MYPOOL
Router(dhcp-config)# lease 1 12
```

The above changes the default *lease* from 8 days to *1* day, *12* hours. To view current DHCP leases:

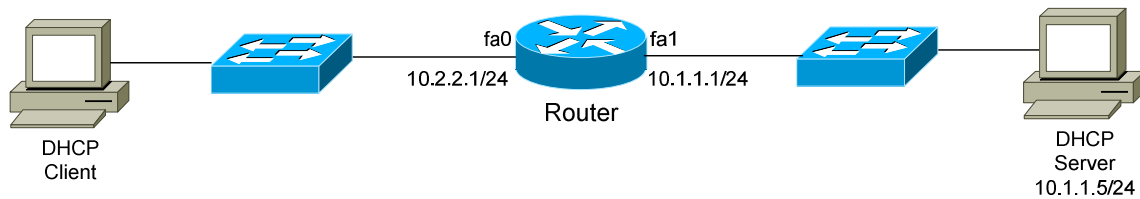
```
Router# show ip dhcp binding
```

\*\*\*

All original material copyright © 2007 by Aaron Balchunas ([aaron@routeralley.com](mailto:aaron@routeralley.com)), unless otherwise noted. All other material copyright © of their respective owners.

This material may be copied and used freely, but may not be altered or sold without the expressed written consent of the owner of the above copyright. Updated material may be found at <http://www.routeralley.com>.

## IP Helper Address



Recall that DHCP clients *broadcast* their **DHCPDiscover** packets, when searching for a DHCP server.

What would happen if the DHCP server is on a different network, separated from the clients by a router? Routers, by default, will never forward a broadcast.

Thus, in the above example, the client would never be able to reach the DHCP server to acquire its IP address. That is, unless the *ip helper-address* command is used:

```
Router(config)# interface fa0
Router(config-if)# ip helper-address 10.1.1.5
```

Notice that the *ip helper-address* command is configured on the interface connecting to the DHCP client, pointing to the IP address of the DHCP server. When the client broadcasts its DHCPDiscover packet, the router will direct that broadcast to the DHCP server. And there was much rejoicing.

By default, the *ip helper-address* command will forward the following UDP traffic:

- TFTP (port 69)
- DNS (port 53)
- Time (port 37)
- NetBIOS (ports 137-138)
- ND (Network Disks – used by Sun workstations)
- TACACS (port 49)
- BOOTP/DHCP (ports 67-68)

Customized UDP traffic can be specified using the following command:

```
Router(config)# ip forward-protocol udp 107
Router(config)# no ip forward-protocol udp 69
```

(Reference: [http://www.cisco.com/en/US/products/sw/iosswrel/ps5207/products\\_command\\_reference\\_chapter09186a0080238b72.html#wp1182972](http://www.cisco.com/en/US/products/sw/iosswrel/ps5207/products_command_reference_chapter09186a0080238b72.html#wp1182972))

\* \* \*

All original material copyright © 2007 by Aaron Balchunas ([aaron@routeralley.com](mailto:aaron@routeralley.com)), unless otherwise noted. All other material copyright © of their respective owners.

This material may be copied and used freely, but may not be altered or sold without the expressed written consent of the owner of the above copyright. Updated material may be found at <http://www.routeralley.com>.