DHCP Configuration

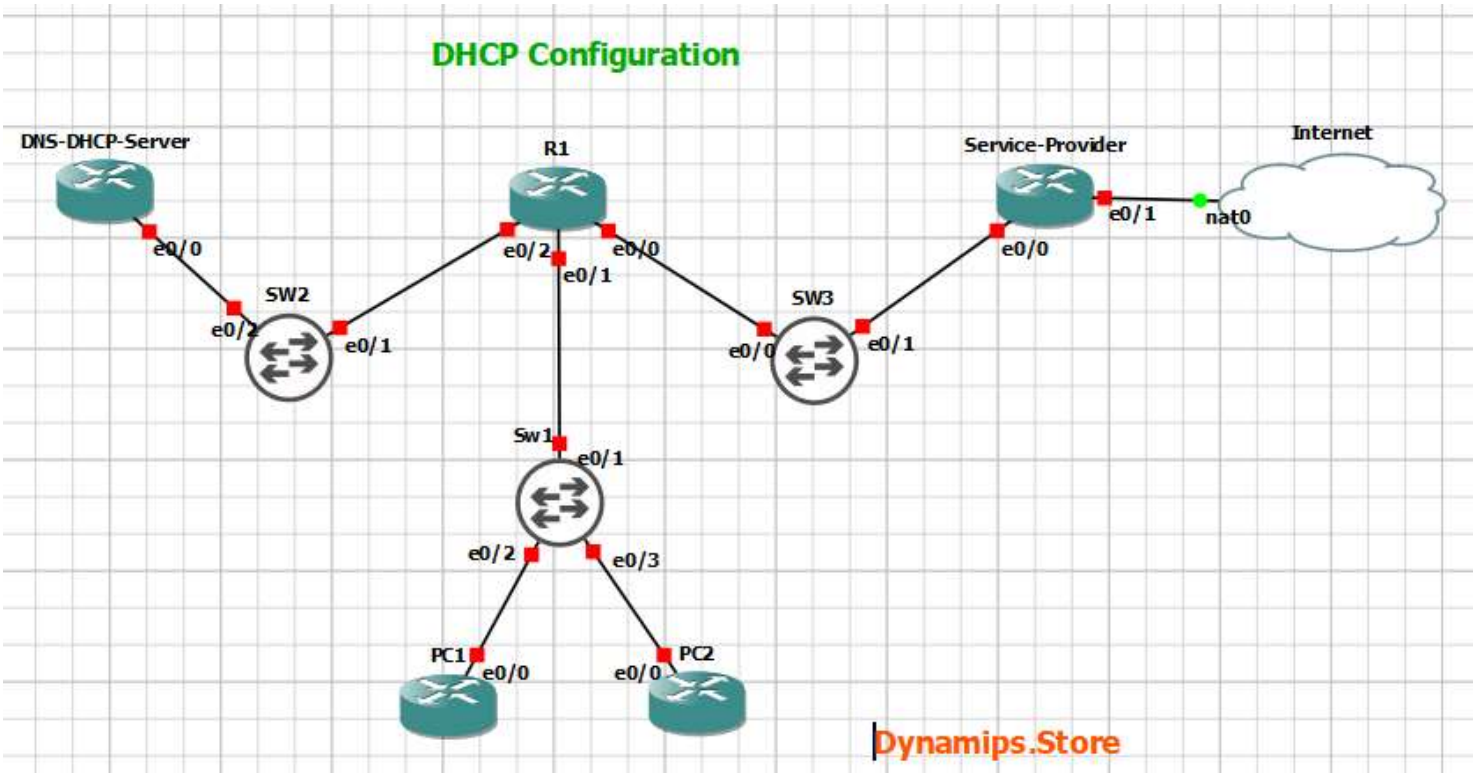
Lab Objective:

In this lab you will perform a DHCP configuration for a small campus network. You will configure a router's outside interface as a DHCP client. You will then set up DCHP services, using a Cisco router first and then an external DHCP server. The external DHCP server is inside the campus LAN but outside the router.

Note that the external DHCP server at 10.10.20.10 will not be used until the last part of the lab.

Lab Topology:

The lab network topology is illustrated below:



Task 1: Basic Configuration.

Configure hostnames and IP addresses on all routers as illustrated in the network topology

Task 2: Cisco DHCP Client.

- You have not acquired a static public IP address from the Internet service provider. Configure the outside interface Ethernet 0/0 on R1 to receive its IP address using DHCP. The Service Provider is already configured and you have no access to it.
- Verify that R1 received its public IP address via DHCP (you may need to wait a few minutes for the address to be assigned).
- What is the IP address of R1's DHCP server?

Task 3: Cisco DHCP Server.

- Enable the DHCP service on R1 so it gives out IP addresses to the PCs in the 10.10.10.0/24 subnet. Leave IP addresses 10.10.10.1 – 10 free to be assigned to servers and printers. 10.10.20.10 is the DNS server.
- Verify the clients received their IP information via DHCP.
- Verify the clients can ping the DNS server by its hostname 'DNSserver' (it might take some time for DNS to resolve the hostname).
- On R1, verify both clients received an IP address via DHCP.
- Cleanup – remove the DHCP server configuration on R1. You will use an external DHCP server instead in the next section.
- Enter the command 'ipconfig /release' on the PCs to release their IP addresses.

Task 4: External DHCP Server.

- The server at 10.10.20.10 has been configured as a DHCP server with a scope of IP addresses for the 10.10.10.0/24 subnet, but the PCs there are not receiving IP addresses. Why is this?
- Configure the network to allow the PCs to receive their IP addresses from the DHCP server.
- Verify the clients received their IP information via DHCP.

Solution

Task 1: Basic Configuration.

Configure hostnames and IP addresses on all routers as illustrated in the network topology

PC1

```
Router>enable
Router#conf t
Router(config)#hostname PC1
```

PC2

```
Router>enable
Router#conf t
Router(config)#hostname PC2
```

DNS and DHCP Server

```
Router>enable
Router#conf t
Router(config)#hostname DNSandDHCPserver
DNSandDHCPserver(config)#int e0/0
DNSandDHCPserver(config)#ip add 10.10.20.10 255.255.255.0
DNSandDHCPserver(config)#no shut
```

R1

```
Router>enable
Router#conf t
Router(config)#hostname R1
R1(config)#int e0/2
R1(config-if)#ip address 10.10.20.1 255.255.255.0
R1(config-if)#no shut
R1(config-if)#int e0/1
R1(config-if)#ip address 10.10.10.1 255.255.255.0
R1(config-if)#no shut
```

Service Provider

```
Router>enable
Router#conf t
Router(config)#hostname SP
SP(config)#ip dhcp pool SP
SP(dhcp-config)#network 203.0.113.0 255.255.255.0
SP(dhcp-config)#def
SP(dhcp-config)#default-router 203.0.113.1
SP(dhcp-config)#dns
SP(dhcp-config)#dns-server 10.10.20.10
SP(dhcp-config)#int e0/0
SP(config-if)#ip add 203.0.113.1 255.255.255.0
SP(config-if)#no shut
```

SW1

```
Switch>enable
Switch#conf t
Switch(config)#hostname SW1
```

SW2

```
Switch>enable
Switch#conf t
Switch(config)#hostname SW2
```

Task 2: Cisco DHCP Client.

- You have not acquired a static public IP address from the Internet service provider. Configure the outside interface Ethernet 0/0 on R1 to receive its IP address using DHCP. The Service Provider is already configured and you have no access to it.

```
R1(config)#int e0/0
R1(config-if)#ip address dhcp
R1(config-if)#no shut
```

- Verify that R1 received its public IP address via DHCP (you may need to wait a few minutes for the address to be assigned).

```
R1#show ip int brief
Interface              IP-Address      OK? Method Status                Protocol
Ethernet0/0            203.0.113.2     YES DHCP   up                    up
Ethernet0/1            10.10.10.1      YES manual up                    up
Ethernet0/2            10.10.20.1      YES manual up                    up
Ethernet0/3            unassigned      YES unset  administratively down down
```

- What is the IP address of R1's DHCP server?

The DHCP server is at 203.0.113.1. We can get this information by viewing the DHCP lease information.

```
R1#show dhcp lease
Temp IP addr: 203.0.113.2 for peer on Interface: Ethernet0/0
Temp sub net mask: 255.255.255.0
   DHCP Lease server: 203.0.113.1, state: 5 Bound
   DHCP transaction id: 2263
   Lease: 86400 secs, Renewal: 43200 secs, Rebind: 75600 secs
Temp default-gateway addr: 203.0.113.1
   Next timer fires after: 11:55:18
   Retry count: 0   Client-ID: cisco-aabb.cc00.0400-Et0/0
   Client-ID hex dump: 636973636F2D616162622E636330302E
```

```
                        303430302D4574302F30
   Hostname: R1
```

<u>Task 3:</u> Cisco DHCP Server.

- Enable the DHCP service on R1 so it gives out IP addresses to the PCs in the 10.10.10.0/24 subnet. Leave IP addresses 10.10.10.1 – 10 free to be assigned to servers and printers. 10.10.20.10 is the DNS server.

```
R1(config)#ip dhcp excluded-address 10.10.10.1 10.10.10.10
R1(config)#ip dhcp pool Flackbox
R1(dhcp-config)#network 10.10.10.0 255.255.255.0
R1(dhcp-config)#default-router 10.10.10.1
R1(dhcp-config)#dns-server 10.10.20.10
```

- Verify the clients received their IP information via DHCP.

```
PC1(config)#int e0/0
PC1(config-if)#ip address dhcp
PC1(config-if)#no shut

PC1#show dhcp lease
Temp IP addr: 10.10.10.11 for peer on Interface: Ethernet0/0
Temp sub net mask: 255.255.255.0
   DHCP Lease server: 10.10.10.1, state: 5 Bound
   DHCP transaction id: 1ABB
   Lease: 86400 secs, Renewal: 43200 secs, Rebind: 75600 secs
Temp default-gateway addr: 10.10.10.1
   Next timer fires after: 11:59:15
   Retry count: 0   Client-ID: cisco-aabb.cc00.0600-Et0/0
   Client-ID hex dump: 636973636F2D616162622E636330302E
                       303630302D4574302F30
   Hostname: PC1

PC2(config)#int e0/0
PC2(config-if)#ip address dhcp
PC2(config-if)#no shut

PC2#show dhcp lease
Temp IP addr: 10.10.10.12 for peer on Interface: Ethernet0/0
Temp sub net mask: 255.255.255.0
   DHCP Lease server: 10.10.10.1, state: 5 Bound
```

```
   DHCP transaction id: 74F
   Lease: 86400 secs, Renewal: 43200 secs, Rebind: 75600 secs
Temp default-gateway addr: 10.10.10.1
   Next timer fires after: 11:58:57
   Retry count: 0   Client-ID: cisco-aabb.cc00.0700-Et0/0
   Client-ID hex dump: 636973636F2D616162622E636330302E
                       303730302D4574302F30
   Hostname: PC2
```

- Verify the clients can ping the DNS server by its hostname 'DNSserver' (it might take some time for DNS to resolve the hostname).

```
DNSandDHCPserver(config)#ip route 0.0.0.0 0.0.0.0 10.10.20.1

PC1(config)#ip route 0.0.0.0 0.0.0.0 10.10.10.1

PC1(config)#ip route 0.0.0.0 0.0.0.0 10.10.10.1

PC1(config)#ip  host dnsanddhcpserver 10.10.20.10
PC1(config)#do  ping dnsanddhcpserver
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.20.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 5/11/27 ms

PC2(config)#ip host dnsanddhcpserver 10.10.20.10
PC2(config)#do ping dnsanddhcpserver
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.20.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 6/11/17 ms
```

- On R1, verify both clients received an IP address via DHCP.

```
R1#show ip dhcp binding
Bindings from all pools not associated with VRF:
IP address       Client-ID/              Lease expiration      Type
                 Hardware address/
                 User name
10.10.10.11      0063.6973.636f.2d61.    Mar 13 2021 02:30 AM    Automatic
                 6162.622e.6363.3030.
                 2e30.3630.302d.4574.
```

```
                302f.30
10.10.10.12     0063.6973.636f.2d61.   Mar 13 2021 02:31 AM   Automatic
                6162.622e.6363.3030.
                2e30.3730.302d.4574.
                302f.30
```

- Cleanup – remove the DHCP server configuration on R1. You will use an external DHCP server instead in the next section.

```
R1(config)#no ip dhcp excluded-address 10.10.10.1 10.10.10.10
R1(config)#no ip dhcp pool Flackbox
```

- Enter the command 'ipconfig /release' on the PCs to release their IP addresses.

```
PC1(config)#int e0/0
PC1(config-if)#no ip address dhcp
PC1(config-if)#ip address dhcp
PC1(config-if)#do show dhcp lease
Temp IP addr: 0.0.0.0 for peer on Interface: Ethernet0/0
Temp sub net mask: 0.0.0.0
   DHCP Lease server: 0.0.0.0, state: 11 Purging
   DHCP transaction id: 1B27
   Lease: 0 secs, Renewal: 0 secs, Rebind: 0 secs
   Next timer fires after: 00:00:31
   Retry count: 0   Client-ID: cisco-aabb.cc00.0600-Et0/0
   Client-ID hex dump: 636973636F2D616162622E636330302E
                       303630302D4574302F30
   Hostname: PC1

PC2(config)#int e0/0
PC2(config-if)#no ip address dhcp
PC2(config-if)#ip address dhcp
PC2(config-if)#do show dhcp lease
Temp IP addr: 0.0.0.0 for peer on Interface: Ethernet0/0
Temp sub net mask: 0.0.0.0
   DHCP Lease server: 0.0.0.0, state: 3 Selecting
   DHCP transaction id: 1BAA
   Lease: 0 secs, Renewal: 0 secs, Rebind: 0 secs
   Next timer fires after: 00:00:04
   Retry count: 3   Client-ID: cisco-aabb.cc00.0700-Et0/0
   Client-ID hex dump: 636973636F2D616162622E636330302E
                       303730302D4574302F30
```

```
   Hostname: PC2
```

<u>Task 4:</u> External DHCP Server.

- The server at 10.10.20.10 has been configured as a DHCP server with a scope of IP addresses for the 10.10.10.0/24 subnet, but the PCs there are not receiving IP addresses. Why is this?

DHCP requests use broadcast traffic. R1 is not forwarding the requests on to the DHCP server as routers do not forward broadcast traffic by default.

```
DNSandDHCPserver(config)#ip dhcp excluded-address 10.10.10.1 10.10.10.10
DNSandDHCPserver(config)#ip dhcp pool Flackbox
DNSandDHCPserver(dhcp-config)#network 10.10.10.0 255.255.255.0
DNSandDHCPserver(dhcp-config)#def
DNSandDHCPserver(dhcp-config)#default-router 10.10.10.1
DNSandDHCPserver(dhcp-config)#dns-s
DNSandDHCPserver(dhcp-config)#dns-server 10.10.20.10
```

- Configure the network to allow the PCs to receive their IP addresses from the DHCP server.

On the interface where they are received, configure the router to forward DHCP requests to the server.

```
R1(config)#int e0/1
R1(config-if)#ip helper-address 10.10.20.10
```

- Verify the clients received their IP information via DHCP.

```
PC1(config)#int e0/0
PC1(config-if)#ip address dhcp
PC1(config-if)#do show dhcp lease
Temp IP addr: 10.10.10.11 for peer on Interface: Ethernet0/0
Temp sub net mask: 255.255.255.0
   DHCP Lease server: 10.10.20.10, state: 5 Bound
   DHCP transaction id: 1CAC
   Lease: 86400 secs, Renewal: 43200 secs, Rebind: 75600 secs
Temp default-gateway addr: 10.10.10.1
   Next timer fires after: 11:59:55
   Retry count: 0   Client-ID: cisco-aabb.cc00.0600-Et0/0
   Client-ID hex dump: 636973636F2D616162622E636330302E
                       303630302D4574302F30
   Hostname: PC1
```

```
PC2(config)#int e0/0
PC2(config-if)#ip address dhcp
PC2(config-if)#do show dhcp lease
Temp IP addr: 10.10.10.13 for peer on Interface: Ethernet0/0
Temp sub net mask: 255.255.255.0
   DHCP Lease server: 10.10.20.10, state: 4 Requesting
   DHCP transaction id: 1B72
   Lease: 86400 secs, Renewal: 0 secs, Rebind: 0 secs
Temp default-gateway addr: 10.10.10.1
   Next timer fires after: 00:00:03
   Retry count: 1   Client-ID: cisco-aabb.cc00.0700-Et0/0
   Client-ID hex dump: 636973636F2D616162622E636330302E
                       303730302D4574302F30
   Hostname: PC2
```