**Configure DHCP Server for multiple VLANs on the Switch**

VLAN is a switch feature. It creates a group of devices that share broadcast messages in the local network. A broadcast message generated in one VLAN does not reach another VLAN. A DHCP server and clients use broadcast messages to communicate. Hence, if we configure a DHCP server in a VLAN and DHCP clients in another VLAN, DHCP clients will never get IP configurations. DHCP works when both the DHCP server and clients are available in the same VLAN. If we have multiple VLANs in a network, we have to configure a separate DHCP pool for each VLAN

Let's take a simple example to understand how VLAN controls broadcast messages.

A small network is built by using an 8 port switch. Until we configure a VLAN on it, it will forward an incoming broadcast message from all ports except the port on which the message came from.

Now, suppose we configure two VLANs on it and add the first four ports to the first VLAN and the last four ports to the second VLAN. After this configuration, when the switch receives a broadcast message on a port, it forwards the message only from the ports that belong to the same VLAN.

For example, if the switch receives a broadcast message on port 2, it will forward that message from ports 1, 3, and 4 only. Because, port 2 belongs to the first VLAN and other ports that belong to the first VLAN are 1, 3, and 4. Since ports 5, 6, 7, and 8 don't belong to the first VLAN, the switch will not forward the incoming broadcast message from these ports.

VLANs optimize networks by reducing the area of broadcast messages, but they cause problems for applications that rely on broadcast messages. For example, DHCP uses broadcast messages to enable communication between DHCP clients and the DHCP server.

If the DHCP server and clients are configured in different VLANs, clients will not receive IP configuration from the server. To solve this issue, we have two options. Either configure a DHCP server in each VLAN or configure multiple DHCP pools on the DHCP server and assign a DHCP pool to each VLAN.

### **Creating and assigning VLANs**

To create a VLAN, run the following command in global configuration mode.

Switch(config)#vlan [VLAN number or name]

To assign a VLAN to an interface, use the following command.

Switch(config-if)#switchport access vlan [VLAN number or name]

Create 3 VLANs: VLAN 10, VLAN 20, and VLAN 30 by running the following commands.

Switch>enable

Switch#configure terminal

Switch(config)#vlan 10

Switch(config-vlan)#exit

Switch(config)#vlan 20

Switch(config-vlan)#exit

Switch(config)#vlan 30

Switch(config-vlan)#exit

Switch(config)#

Assign **VLAN 10** to *Fa0/1* and *Fa0/2*, **VLAN 20** to *Fa0/3* and *Fa0/4*, and **VLAN 30** to *Fa0/5* and *Fa0/6*.

Switch(config)#interface FastEthernet 0/1

Switch(config-if)#switchport access vlan 10

Switch(config-if)#exit

Switch(config)#interface FastEthernet 0/2

Switch(config-if)#switchport access vlan 10

Switch(config-if)#exit

Switch(config)#interface FastEthernet 0/3

Switch(config-if)#switchport access vlan 20

Switch(config-if)#exit

Switch(config)#interface FastEthernet 0/4

Switch(config-if)#switchport access vlan 20

Switch(config-if)#exit

Switch(config)#interface FastEthernet 0/5

Switch(config-if)#switchport access vlan 30

Switch(config-if)#exit

Switch(config)#interface FastEthernet 0/6

Switch(config-if)#switchport access vlan 30

Switch(config-if)#exit

Switch(config)#

### **Configuring trunk port**

By default, all switch ports operate in access mode. In access mode, a switch port allows traffic of a single VLAN only. To allow traffic from multiple VLANs, we have to configure the port as the **trunk port**.

In our example, only the port that connects the switch and the router carries the traffic of multiple VLANs. To configure this port as a **trunk port**, use the **'switchport mode trunk'** command in interface configuration mode.

Switch(config)#interface GigabitEthernet 0/1

Switch(config-if)#switchport mode trunk

Switch(config-if)#exit

Switch(config)#

### **Configuring DHCP server and creating DHCP pools**

By default, DHCP service is enabled on all supporting Cisco switches. To use this service, we have to create and configure a DHCP pool on the switch.

The following table lists the steps that are required to create and configure a DHCP pool.

|  |  |
| --- | --- |
| **Configuration step** | **Description (*required command*)** |
| Define reserved IP addresses | Use the **'ip dhcp excluded-address'** command to define the range of reserved IP addresses. |
| Create the DHCP pool | To create a DHCP pool and enter DHCP pool configuration mode, use the **'ip dhcp pool [*pool name*]'** command. |
| Define IP range for lease | use the **'network [*network ID*] [*subnet mask*]'** command to define the range of IP addresses. DHCP uses this range to provide IP configuration to clients. |
| Set default gateway IP | To set the default gateway IP address, use the **'default-router [*IP address of the default gateway*]'** command. |
| Set DNS server IP | To set the DNS server IP address, use the **'dns-server [*IP address of the DNS server*]'** command. |

Create three DHCP pools by using the above configuration steps.

Switch(config)#ip dhcp excluded-address 10.0.0.1 10.0.0.10

Switch(config)#ip dhcp excluded-address 20.0.0.1 20.0.0.10

Switch(config)#ip dhcp excluded-address 30.0.0.1 30.0.0.10

Switch(config)#ip dhcp pool vPool10

Switch(dhcp-config)#network 10.0.0.0 255.0.0.0

Switch(dhcp-config)#default-router 10.0.0.1

Switch(dhcp-config)#dns-server 4.4.4.4

Switch(dhcp-config)#exit

Switch(config)#ip dhcp pool vPool20

Switch(dhcp-config)#network 20.0.0.0 255.0.0.0

Switch(dhcp-config)# default-router 20.0.0.1

Switch(dhcp-config)# dns-server 8.8.8.8

Switch(dhcp-config)#exit

Switch(config)#ip dhcp pool vPool30

Switch(dhcp-config)#network 30.0.0.0 255.0.0.0

Switch(dhcp-config)#default-router 30.0.0.1

Switch(dhcp-config)#dns-server 30.0.0.2

Switch(dhcp-config)#exit

Switch(config)#

### **Assigning IP addresses to VLANs**

DHCP uses the IP address of a VLAN to determine the pool from which it should provide an IP configuration. To assign an IP address to the VLAN, use the following commands.

Switch(config)#interface vlan [vlan name or number]

Switch(config-if)#ip address [ip address] [subnet mask]

Assign an IP address to each VLAN from the reserved IP address of the corresponding DHCP pool.

Switch(config)#interface vlan 10

Switch(config-if)#ip address 10.0.0.5 255.0.0.0

Switch(config-if)#exit

Switch(config)#interface vlan 20

Switch(config-if)#ip address 20.0.0.5 255.0.0.0

Switch(config-if)#exit

Switch(config)#interface vlan 30

Switch(config-if)#ip address 30.0.0.5 255.0.0.0

Switch(config-if)#exit

Switch(config)#

### **Configuring the router's interface**

By default, different VLANs cannot communicate with each other. To allow communication between different VLANs, we have to connect them through a router. We don't need a dedicated router interface for each VLAN. Routers support interface virtualization. We can use a single router interface to allow communication between multiple VLANs.

To virtualize the Fa0/0 interface and to configure it to allow communication between different VLANs, use the following configuration on the router.

Router>enable

Router#configure terminal

Enter configuration commands, one per line. End with CTRL/Z.

Router(config)#interface FastEthernet 0/0

Router(config-if)#no ip address

Router(config-if)#no shutdown

Router(config-if)#exit

Router(config)#interface FastEthernet 0/0.10

Router(config-subif)#encapsulation dot1Q 10

Router(config-subif)#ip address 10.0.0.1 255.0.0.0

Router(config-subif)#exit

Router(config)#interface FastEthernet 0/0.20

Router(config-subif)#encapsulation dot1Q 20

Router(config-subif)#ip address 20.0.0.1 255.0.0.0

Router(config-subif)#exit

Router(config)#interface FastEthernet 0/0.30

Router(config-subif)#encapsulation dot1Q 30

Router(config-subif)#ip address 30.0.0.1 255.0.0.0

Router(config-subif)#exit

Router(config)#

#### **Configuring and verifying DHCP clients**

To configure a host as the DHCP client, click the host and click the **Desktop** menu option and click the **IP configuration** option and choose the **DHCP** option. If the DHCP server is properly configured, the DHCP client will receive the IP configuration in a few seconds.

# How to configure DHCP server in Packet Tracer.

On the router, configure interface fa0/0 to act as the default gateway for our LAN.

Router>enable

Router#config terminal

Router(config)#int fa0/0

Router(config-if)#ip add 192.168.1.1 255.255.255.0

Router(config-if)#no shutdown

Router(config-if)#exit

Configure DHCP server on the Router. In the server we will define a **DHCP pool** of IP addresses to be assigned to hosts, a **Default gateway**  for the LAN and a **DNS Server**.

Router(config)#

Router(config)#ip dhcp pool MY\_LAN

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 192.168.1.10

We can add ip dhcp excluded-address command to our configuration so as to configure the router to exclude addresses 192.168.1.1 through 192.168.1.10 when assigning addresses to clients. The **ip dhcp excluded-address** command may be used to reserve addresses that are statically assigned to key hosts.

So add the above command under the **global configuration mode.**

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

4. Now go to every PC and on their **IP configuration** tabs, enable **DHCP**. Every PC should be able to obtain an IP address, default gateway and DNS server, as defined in step 2.For example, to enable DHCP on PC1:Click **PC1->Desktop->IP configuration.**Then enable DHCP: Do this for the other PCs.You can test the configuration by pinging PC2 from PC1. Ping should succeed.