Department of Computer Science and Engineering

Islamic University of Technology (IUT)

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Laboratory Report

CSE 4412 : Data Communication and Networking Lab

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Section	**: 1**
Semester	**: 4th**
Academic Year	**: 2021-2022**
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Lab No	**: 9**

Title: Inter VLAN routing and configuring DHCP service.

Objective:

1. Inter VLAN routing
2. Configuration of DHCP

Devices Used in the Cisco Packet Tracers: 9 PCs, 3 Switches, and 1 Router

Theory:

Inter VLAN Routing:

Explain the procedure of routing a packet within three different user groups i.e. three different VLAN situated in three different levels of an office building.

The switch first examines the packet's VLAN ID and, if it matches the switch port VLAN, passes it to the destination device. In the event that the VLAN IDs are different, the packet is forwarded to the router, which examines the destination IP address and establishes the subsequent hop. If the packet's VLAN ID matches, it is then sent to the appropriate VLAN on the following switch and routed to the intended device.

So, for example, if a student were to send a packet to another student, their VLAN ID would match, and therefore, the switch would automatically send the packet to the destination. But if the VLAN IDs did not match, ie if a student wanted to send a packet to a faculty, then the packet would be forwarded to the router eventually, where the router would determine its next hop. After another request message from the de

DHCP Service:

DHCP is the Dynamic Host Configuration Protocol. It is a network protocol that is used to automatically assign IP addresses to devices that are connected to the network. When a device joins a network, it broadcasts a DHCP discover message, in response to which the DHCP server returns a DHCP offer message containing an IP Address. After another round of sending a request and returning an ACK message, the assignment of the IP Address is made official. In this stage, the device may also request specific IP addresses if it is available.

Advantages of DHCP Service:

- DHCP automates the process of IP assignment, which greatly reduces any chance of IP address conflicts.
- DHCP makes a guarantee that every device connected to a network has the same network configuration, which promotes consistency and lowers the possibility of configuration mistakes.

- DHCP can assign IP addresses to devices only when they are required and reclaim them when they are no longer in use. This results in more effective use.

- DHCP enables the central management of IP address distributions and other network setup settings. As a result, it is easier to add and remove network devices and change network parameters.

- DHCP facilitates devices to maintain their original IP addresses by requesting for them if they are available.

Disadvantage of DHCP Service:

- Though rare, devices joining the network may be assigned the same IP address. In that case, manual intervention may be required.

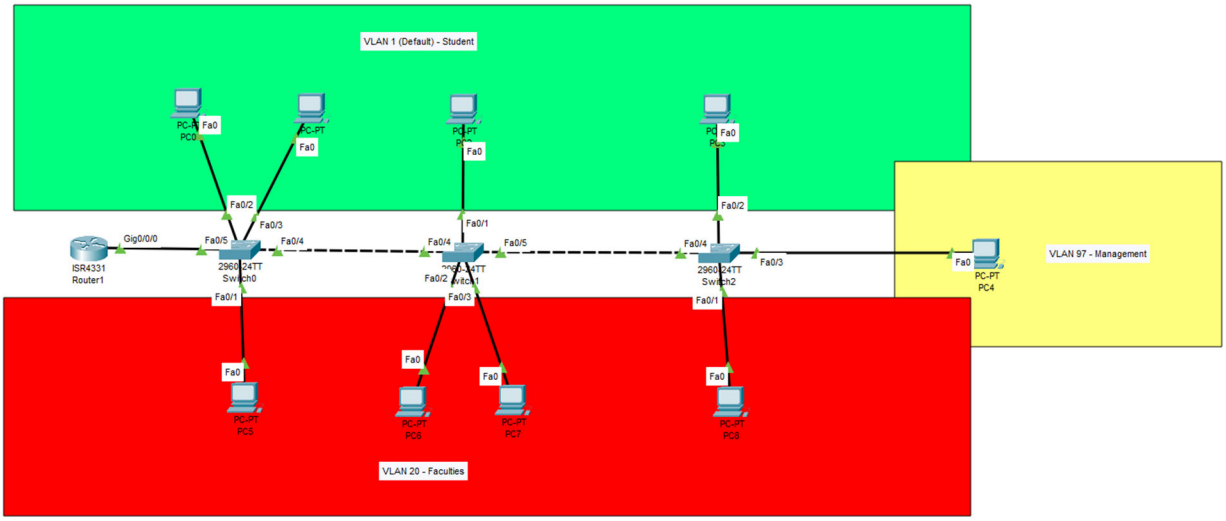
- DHCP is heavily reliant on the DHCP server to function. In case of failure, the devices on the network may be unable to connect to the network and communicate with other devices.

- Bad Eggs can use the features of DHCP to gain unauthorized access to the network. An Attacker may also act as a DHCP server and steal the data from any device that joins its network.

Exclusion of Addresses in DHCP Services:

Some Ip addresses are excluded from the DHCP IP address distribution pool. Some examples are the router IP address, for example, 192.168.0.1 of the network 192.168.0.0. The broadcast address is also excluded. Any server IP address must also be static and must never change. In case of failure, the server joining the DHCP network must regain its original IP address, otherwise, there may arise communication error. That IP address has to be reserved for the server and should be excluded from the DHCP IP address distribution pool. This is why some Addresses should be excluded from the Addresses in DHCP Services.

Diagram of the experiment:



Configuration of Routers:

The configuration for most of the network has already been done in the previous lab. A simpler version where the three VLANs are present without any of the remote access features is made. After that, the Switch 0 is reconfigured to have trunk access to VVLAN 1-97 at the port Fa0/5, where the router has joined.

Commands for configuring VLAN:

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int Gig0/0/0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0, changed state to up

Router(config-if)#exit
Router(config)#int gig0/0/0.1
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0.1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0.1, changed state to up

Router(config-subif)#encapsulation dot1Q 1
Router(config-subif)#ip address 200.100.1.1 255.255.255.0
Router(config-subif)#exit
Router(config)#int gig0/0/0.20
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0.20, changed state to up

Router(config-subif)#encapsulation dot1Q 20
Router(config-subif)#ip address 200.100.20.1 255.255.255.0
Router(config-subif)#exit
Router(config)#int gig0/0/0.97
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0.97, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/0.97, changed state to up

Router(config-subif)#encapsulation dot1Q 97
Router(config-subif)#ip address 200.100.97.1 255.255.255.0
Router(config-subif)#exit
```

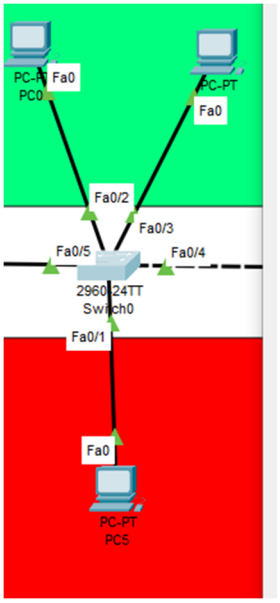
Commands for configuring DHCP:

```
Router(config)#ip dhcp excluded-address 200.100.1.1
Router(config)#ip dhcp excluded-address 200.100.1.102 200.100.1.255
Router(config)#ip dhcp excluded-address 200.100.20.1
Router(config)#ip dhcp excluded-address 200.100.20.22 200.100.20.255
Router(config)#ip dhcp excluded-address 200.100.97.1
Router(config)#ip dhcp excluded-address 200.100.97.12 200.100.97.255
Router(config)#ip dhcp pool poolv1
Router(dhcp-config)#network 200.100.1.0 255.255.255.0
Router(dhcp-config)#default-router 200.100.1.1
Router(dhcp-config)#dns 8.8.8.8
Router(dhcp-config)#exit
Router(config)#ip dhcp pool poolv20
Router(dhcp-config)#network 200.100.20.0 255.255.255.0
Router(dhcp-config)#default-router 200.100.20.1
Router(dhcp-config)#dns 8.8.8.8
Router(dhcp-config)#exit
Router(config)#ip dhcp pool poolv97
Router(dhcp-config)#network 200.100.97.0 255.255.255.0
Router(dhcp-config)#default-router 200.100.97.1
Router(dhcp-config)#dns 8.8.8.8
Router(dhcp-config)#exit
Router(config)#
```

The IP address exclusions are made to ensure the constraints of only 100 students, 20 faculties, and 10 management.

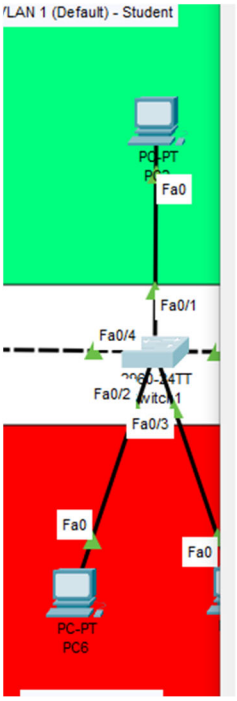
Observation:

Switch 0




```
Switch>en
Switch#show vlan

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/2, Fa0/3, Fa0/6, Fa0/7
                                                Fa0/8, Fa0/9, Fa0/10, Fa0/11
                                                Fa0/12, Fa0/13, Fa0/14, Fa0/15
                                                Fa0/16, Fa0/17, Fa0/18, Fa0/19
                                                Fa0/20, Fa0/21, Fa0/22, Fa0/23
                                                Fa0/24, Gig0/1, Gig0/2
20   Faculties                        active    Fa0/1
97   Management                       active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active

VLAN Type  SAID       MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------
1    enet  100001     1500  -      -      -        -    -        0      0
20   enet  100020     1500  -      -      -        -    -        0      0
97   enet  100097     1500  -      -      -        -    -        0      0
1002 fddi  101002     1500  -      -      -        -    -        0      0
1003 tr    101003     1500  -      -      -        -    -        0      0
1004 fdnet 101004     1500  -      -      -        ieee -        0      0
1005 trnet 101005     1500  -      -      -        ibm  -        0      0

VLAN Type  SAID       MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------

Remote SPAN VLANs
```

Switch 1



IOS Command Line Interface

```
Switch>en
Switch#show vlan

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/1, Fa0/6, Fa0/7, Fa0/8
                                                Fa0/9, Fa0/10, Fa0/11, Fa0/12
                                                Fa0/13, Fa0/14, Fa0/15, Fa0/16
                                                Fa0/17, Fa0/18, Fa0/19, Fa0/20
                                                Fa0/21, Fa0/22, Fa0/23, Fa0/24
                                                Gig0/1, Gig0/2
20   Faculties                        active    Fa0/2, Fa0/3
97   Management                       active
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active

VLAN Type  SAID       MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------
1    enet  100001     1500  -      -      -        -    -        0      0
20   enet  100020     1500  -      -      -        -    -        0      0
97   enet  100097     1500  -      -      -        -    -        0      0
1002 fddi  101002     1500  -      -      -        -    -        0      0
1003 tr    101003     1500  -      -      -        -    -        0      0
1004 fdnet 101004     1500  -      -      -        ieee -        0      0
1005 trnet 101005     1500  -      -      -        ibm  -        0      0

VLAN Type  SAID       MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------

Remote SPAN VLANs
------------------------------------------------------------------------------

Primary Secondary Type              Ports
```

Challenges:

Overall, no challenges have faced this lab, simply had to follow my lab notes and the pictures I took during the lecture. After completing the lab, however, I noticed the network for VLAN 1 had been switched to VLAN 10 in lab 9 from lab 8. The methods would still be the same just the devices assigned to VLAN 1 would have to be shifted to VLAN 10.