



**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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**Title:** Inter VLAN routing and configuring DHCP service.

**Objective:**

1. Inter VLAN routing
2. Configuration of DHCP

**Devices Used in the Cisco Packet Tracers:**

1. Switch-PT
2. Router-PT
3. PC-PT
4. Copper-cross-over cables
5. Copper-straight-through-cables

**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.

Routing a packet within three different user groups (VLANs) situated in three different levels of an office building requires Inter VLAN routing. We first have to create 3 separate VLANs, one for each user group. Upon creating the VLANs, we need to assign respective switch ports and configure the VLAN accordingly. Then we need to configure the inter VLAN routing by setting router subinterfaces for each VLAN with IP addresses in each VLAN's subnet. After this, we enable the Inter VLAN routing, allowing the traffic to be routed between the VLANs and configure the default gateways for the VLANs. And then we test the VLANs for connectivity.

**DHCP Service:**

DHCP (Dynamic Host Configuration Protocol) is a service that assigns IP addresses, subnet masks, default gateways, and other network configuration information to devices automatically.

**Advantage of DHCP Service:**

IP addresses are automatically assigned which makes the networks more scalable as more devices can be added or removed without worry. It also allows for a form of centralized management of IP addresses and

network configuration settings which allows easier management of connected devices. It minimizes configuration errors since it automatically assigns IP addresses and other network settings.

### Disadvantage of DHCP Service:

If the DHCP server fails devices won't be able to obtain IP addresses and hence won't be able to communicate. DHCP can also be vulnerable to security issues such as DHCP spoofing and DHCP starvation attacks.

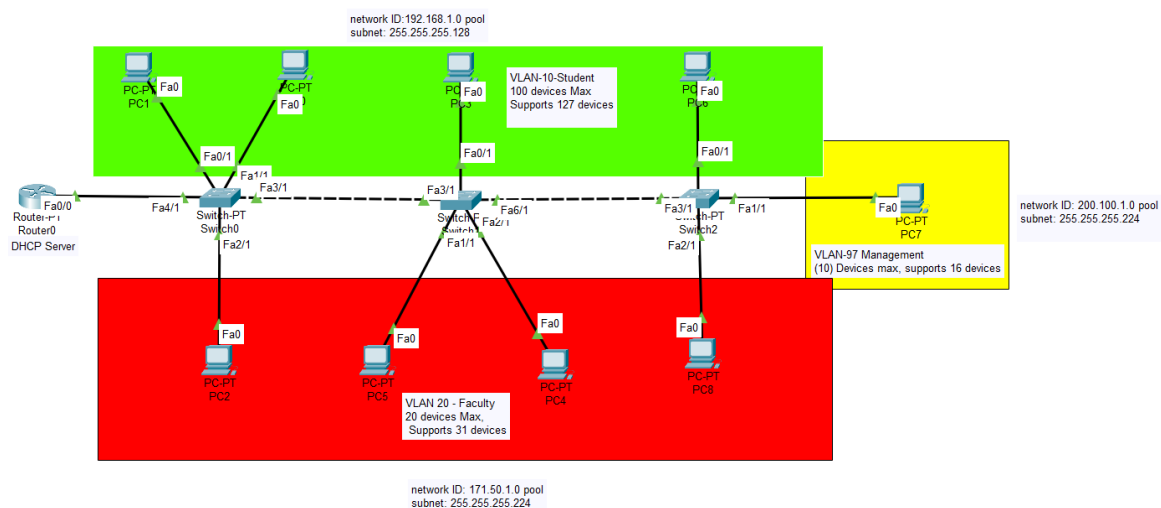
### Exclusion of Addresses in DHCP Services:

Sometimes, we need to exclude certain IP addresses from DHCP assignment. For example, if we have devices with static IP addresses, we don't want DHCP to assign those IP addresses to other devices. To exclude IP addresses from DHCP assignment, we can use the "ip dhcp excluded-address" command on the DHCP server. For example, to exclude the IP addresses 192.168.1.1 to 192.168.1.10 from DHCP assignment, we can use the following command:

**ip dhcp excluded-address 192.168.1.1 192.168.1.10**

This will ensure that DHCP won't assign these IP addresses to any devices on the network.

### Diagram of the experiment:



For simple PDU from PC1 to PC5

Simulation Panel										
Event List										
Vis.	Time(sec)	Last Device	At Device	Type						
	0.000	--	PC1	ICMP						
	0.001	PC1	Switch0	ICMP						
	0.002	Switch0	Router0	ICMP						
	0.003	Router0	Switch0	ICMP						
	0.004	Switch0	Switch1	ICMP						
	0.005	Switch1	PC5	ICMP						
	0.006	PC5	Switch1	ICMP						
	0.007	Switch1	Switch0	ICMP						
	0.008	Switch0	Router0	ICMP						
	0.009	Router0	Switch0	ICMP						
	0.010	Switch0	PC1	ICMP						
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC1	PC5	ICMP		0.000	N	0	(edit)	(delete)

## Configuration of Routers:

Commands for configuring VLAN:

Commands for creating and naming a VLAN(Faculty) is shown below:

**enable**

**configure terminal**

**vlan 20**

**name Faculty**

**exit**

Commands for configuring VLAN for one switch is shown below(Switch-PT Switch 0)

**enable**

**configure terminal**

**int fa0/1**

**switchport mode access**

**switchport access vlan 1**

**exit**

**int fa1/1**

**switchport mode access**

**switchport access vlan 1**

**exit**

**int fa2/1**

**switchport mode access**

**switchport access vlan 20**

```
exit
int fa3/1
switchport mode trunk
switchport trunk allowed vlan 1-20
exit
```

Commands for configuring DHCP:

To configure DHCP in the router we do the following commands, configuring DHCP for one VLAN(Student):

```
enable
configure terminal
int fa0/0.10
encapsulation dot1Q 10
ip address 192.168.1.129 255.255.255.128
exit
ip dhcp excluded address 192.168.1.129 192.168.1.139
ip dhcp pool poolV10
network 192.168.1.0 255.255.255.128
default-router 192.168.1.129
dns 8.8.8.8
exit
```

The addresses excluded by the DHCP are excluded as it may be statically assigned for various systems such as the router with a fixed IP address. Thus I reserved these addresses to prevent the DHCP service from assigning them to any of the PCs in the subnetwork.

similar commands are used to configure the faculty and management respectively. Also the networks are configured to support the required number of devices although I took the upper bound. For the faculty I assigned the connection to support 31 devices. For management, also 31 devices although 15 was a more legitimate number of devices, but I wanted to keep space for other network devices that may exist. For students, I ensured that 127 devices can be connected by configuring the network ID and subnet masks accordingly.

## Observation:

The screenshots of **show vlan** command in two switches are shown below:

**Switch0**

```
Switch>en
Switch#show vlan
```

VLAN	Name	Status	Ports
1	default	active	
10	Student	active	Fa0/1, Fa1/1
20	Faculty	active	Fa2/1
97	Management	active	
1002	fdi-default	active	
1003	token-ring-default	active	
1004	fdinet-default	active	
1005	trnet-default	active	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Transl
1	enet	100001	1500	-	-	-	-	-	0 0
10	enet	100010	1500	-	-	-	-	-	0 0
20	enet	100020	1500	-	-	-	-	-	0 0
97	enet	100097	1500	-	-	-	-	-	0 0
1002	fdi	101002	1500	-	-	-	-	-	0 0
1003	tr	101003	1500	-	-	-	-	-	0 0
1004	fdnet	101004	1500	-	-	-	ieee	-	0 0
1005	trnet	101005	1500	-	-	-	ibm	-	0 0

**Switch0 Configuration:**

```
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
 switchport access vlan 10
 switchport mode access
!
interface FastEthernet1/1
 switchport access vlan 10
 switchport mode access
!
interface FastEthernet2/1
 switchport access vlan 20
 switchport mode access
!
interface FastEthernet3/1
 switchport trunk allowed vlan 10-98
 switchport mode trunk
!
interface FastEthernet4/1
 switchport access vlan 97
 switchport trunk allowed vlan 10-98
 switchport mode trunk
!
interface Vlan1
 no ip address
--More--
```

**Switch1**

```
Switch>en
Switch#show vlan
```

VLAN	Name	Status	Ports
1	default	active	Fa4/1, Fa5/1
10	Student	active	Fa0/1
20	Faculty	active	Fa1/1, Fa2/1
1002	fdi-default	active	
1003	token-ring-default	active	
1004	fdinet-default	active	
1005	trnet-default	active	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Transl
1	enet	100001	1500	-	-	-	-	-	0 0
10	enet	100010	1500	-	-	-	-	-	0 0
20	enet	100020	1500	-	-	-	-	-	0 0
1002	fdi	101002	1500	-	-	-	-	-	0 0
1003	tr	101003	1500	-	-	-	-	-	0 0
1004	fdnet	101004	1500	-	-	-	ieee	-	0 0
1005	trnet	101005	1500	-	-	-	ibm	-	0 0

**Switch1 Configuration:**

```
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
 switchport access vlan 10
 switchport mode access
!
interface FastEthernet1/1
 switchport access vlan 20
 switchport mode access
!
interface FastEthernet2/1
 switchport access vlan 20
 switchport mode access
!
interface FastEthernet3/1
 switchport trunk allowed vlan 10-98
 switchport mode trunk
!
interface FastEthernet4/1
!
interface FastEthernet5/1
!
interface FastEthernet6/1
 switchport trunk allowed vlan 10-98
 switchport mode trunk
!
interface Vlan1
--More--
```

## **Challenges:**

The main challenge I faced was figuring out how the VLAN was to be configured to the router, I initially tried to configure the encapsulate mode of all the VLANs on a single interface which wasn't how it worked. Another challenge I faced was understanding the cabling required, the diagram given showed that a cross-over cable was being used, but when I used the cross-over cable it showed that the connection was not starting despite me turning on the link. Upon changing the cable to straight-through it started working again.

Another challenging part was determining how the trunk port worked which I found challenging since the last lab onwards.