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Lab Manual

Lab Manual

CSE 4412 - Data Communication and Networking

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Chapter 1

LAB-01

1.1 Basic Switch Configuration

1. Click on a switch and go to **CLI**
CLI prompt will look like this: Switch>
2. Enter **privileged** mode by writing: Router> enable
Status : Router#
3. **Startup Config** : Switch# show startup-config
4. **Running Config** : Switch# show running-config
5. **Modify Running Config** : Enter global configuration mode : Switch# configure terminal
Status : Switch(config)#
6. **Give the switch a hostname** : Switch(config)# hostname IUT
Status : IUT(config)#
7. **Save the running-config in startup-config** : IUT# copy running-config startup-config
N.B : Remember to exit from global configuration mode before writing this command.

1.2 Basic Router Configuration

1. All the steps of basic switch configuration.
2. **Configure the interfaces** : Remember that a router can have multiple interfaces and you'll need to configure each one separately.

Enter Interface setup mode : IUT(config)# interface gigabitEthernet 0/0
IUT(config-if)# ip address 192.168.12.1 255.255.255.0
–Here first one is specific ip of an interface and second one is subnet mask
IUT(config-if)# no shutdown
IUT(config-if)# description LAN-SOUTH-HALL

3. Save them

1.3 Extras

1. Avoid .1 to configure devices cuz it's used as interface configuration.
2. Use Copper Straight Through wires to connect 2 different devices.
3. Use Copper Cross Over wires to connect 2 similar devices.
4. **See Legends :** Router# Show ip route.
5. IP of interfaces have to be set as default gateway of the pc's.
6. **Ping :** Desktop —> Command Prompt
7. **Detailed interface status :**
IUT# show interface
8. **Short Interface status :**
IUT# show ip interface brief
9. **Specific interface status :**
IUT# show interface <interface name>

Chapter 2

LAB-02

2.1 Subnetting

Chapter 3

LAB-03

3.1 Creating Vlan

1. To create a Vlan with Vlan ID 10:
switch(config)# vlan 10
2. To assign name to vlan:
Switch(config-vlan)# name [Vlan_name]

3.2 Configure Access Link

1. Select the interface:
Switch(config)# interface Fast-Ethernet 0/1
2. configure the interface as an access link:
Switch(config-if)# switchport mode access
3. Select the vlan to have access to the access link:
Switch(config-if)# switchport access vlan 10
4. No shutdown:
Switch(config-if)# no shutdown

3.3 Configure Trunk Link

1. Select the interface:
Switch(config)# interface Fast-Ethernet 0/4
2. configure the interface as a trunk link:
Switch(config-if)# switchport mode trunk
3. Specify the list of VLANs specified on the trunk port:
Switch(config-if)# switchport trunk allowed vlan all
4. No shutdown:
Switch(config-if)# no shutdown

3.4 Set-UP PCs

1. Setup the PCs with appropriate IP and subnet masks and **Default Gateway**

3.5 Extras

1. TO see all vlans in a switch:
Switch# show vlan

Chapter 4

LAB-04 (Inter VLAN)

4.1 Using Router

1. Keep The Router Running:
Router(config)# int g0/0
Router(config-if)# no shutdown
2. Assign virtual VLAN to the router interface:
Router(config)# int g0/0.10
Router(config-subif)# encapsulation dot1q 10
Router(config-subif)# IP address 192.168.10.1 255.255.255.0
3. **Don't Forget to implement trunk link**
4. **Don't Forget the default gateway**

4.2 Using Multi-Layer Switch (MLS)

1. Create the vlans in MLS:
Switch(config)# vlan 10
2. Enter IP routing:
Switch(config-vlan)# ip routing
3. Make the trunk link:
Switch(config)# int range fa0/1-2
Switch(config-if-range)# switchport trunk encapsulation dot1q
Switch(config-if-range)# switchport mode trunk
Switch(config-if-range)# no shutdown
4. Assign IP Addresses:
Switch(config-if-range)# int vlan 10
Switch(config-if)# ip address 192.168.10.1 255.255.255.0
Switch(config-if)# no shut
Switch(config-if)# exit

4.3 Static Routing:

1. **Configure R1 Interface:**

```
R1(config)#int g0/0
R1(config-if)#ip add 192.168.1.1 255.255.255.0
R1(config-if)#desc connection-to-PC0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#int s0/1/0
R1(config-if)#ip add 192.168.0.2 255.255.255.252
R1(config-if)#desc connection-to-R3
R1(config-if)#clock rate 64000
R1(config-if)#no shutdown
R1(config-if)#exit
```

```
R1(config)#int s0/1/1
R1(config-if)#ip add 192.168.0.6 255.255.255.252
R1(config-if)#desc connection-to-R2
R1(config-if)#clock rate 64000
R1(config-if)#no shutdown
R1(config-if)#exit
```

2. **Configure R2 Interfaces**

3. **Configure R3 Interfaces**

4. **Configure The PC's**

5. **Configure static routing to Remote LAN in R1:**

```
R1(config)#ip route 192.168.2.0 255.255.255.0 s0/1/1
It's a directly connected static default route.
R1(config)#ip route 192.168.2.0 255.255.255.0 192.168.0.1 5
It's a next-hop floating static default route.
```

6. **Configure static routing to Local LAN in R2**

7. **Configure static routing to Local LAN in R3**

4.4 Extras

1. Serial (Router to router is serial port): add HWIC2T

Chapter 5

LAB-05 (Dynamic Routing)

5.1 RIP

Routing Information Protocol (RIP) following distance-vector algorithm.

1. Enable RIP by using the router rip global configuration command.
R1(config) # router rip
2. Tell router to use the RIPv2 by the version 2 command.
R1(config-router) # version 2
3. Tell RIP which networks to advertise by using one or more network commands.
R1(config-router) # network 10.0.0.0

5.2 OSPF

Open Shortest Path First (OSPF) protocol following link state routing algorithm.

1. **R1(config) # router ospf 1**
2. **R1(config-router)# network 10.0.1.0 0.0.0.255 area 0**

Go through the slide very carefully.

5.3 Redistribution

Redistribution is a necessary concept when you are trying to integrate multiple routing protocols to work coherently in a topological system. Please practice this and check if you can make it work. In the Core Router, redistribute all the routing protocols. (The core router runs three (3) different routing protocols for the connected subnetworks. Route redistribution is necessary for this network design to communicate among the subnetworks. Route redistribution allows routes from one routing protocol to be advertised in another.)

A. Redistribute RIP and Static into OSPF

```
Router(config)#router ospf 1
```

```
Router(config-router)#redistribute rip metric 1 subnets
```

```
Router(config-router)#redistribute static metric 1 subnets
```

B. Redistribute OSPF and Static into RIP

```
Router(config)#router rip
```

```
Router(config-router)#redistribute ospf 1 metric 1
```

```
Router(config-router)#redistribute static metric 1
```

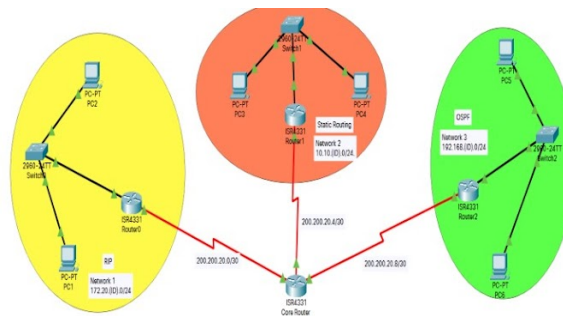


Figure 5.1: Redistribution

N.B. For better understanding: [Follow This Link](#)

Chapter 6

LAB-06 (Switch Port Security)

6.1 Switch Port Security Options

1. **First Go To Specific interface and enable switchport security features:**
S1(config)# interface range f0/1 – 2
S1(config-if-range)# switchport port-security
2. **To set the maximum number of MAC addresses allowed on a port, use the following command:**
Switch(config-if)# switchport port-security maximum (value)
3. **The switch can be configured to learn about MAC addresses on a secure port in one of three ways:**
 - (a) **Manually Configured**
Switch(config-if)# switchport port-security mac-address (mac-address)
 - (b) **Dynamically Learned**
Default learning method
 - (c) **Dynamically Learned – Sticky**
Switch(config-if)# switchport port-security mac-address sticky
4. **Set Violation Mode**
S1(config-if-range)# switchport port-security violation protect/restrict/shutdown.

6.2 Switch Port Analyzer (SPAN)

```
S1(config)# monitor session 1 source interface f0/5
S1(config)# monitor session 1 destination interface f0/6
Verify Using: S1# show monitor
```

Chapter 7

LAB-07 (ACL & DHCP)

7.1 Access Control List (ACL)

1. Configure Router Interfaces
2. Configure PC's
3. **Define ACL**
Router(config)# access-list 1 deny 192.168.10.0 0.0.0.255
Router(config)# access-list 1 permit any
4. **Verify ACL**
Router# show access-lists
5. **Apply ACL**
Router(config)# interface gigabitEthernet 0/2
Router(config-if)# ip access-group 1 out

7.2 Editing ACL

Router(config)# ip access-list standard 1(ACL number)

7.2.1 Appending

Just add another ACL:// Router(config)# access-list 1 deny any

7.2.2 Inserting

```

HP Switch(config)# ip access-list standard My-List
HP Switch(config-std-nacl)# 15 deny 10.10.10.1/24
HP Switch(config-std-nacl)# show run
.
.
.
ip access-list standard "My-List"
10 permit 10.10.10.25 0.0.0.0
15 deny 10.10.10.1 0.0.0.255
20 permit 10.20.10.117 0.0.0.0
30 deny 10.20.10.1 0.0.0.255
40 permit 0.0.0.0 255.255.255.255
exit

```

Enters the "Named-ACL context for "My-List".

Inserts the new ACE.

Figure 7.1: Inserting an ACE in an existing ACL

7.2.3 Deleting

```

HP Switch(config)# show run
.
.
.
ACL Before Deleting an ACE
ip access-list standard "My-List"
10 permit 10.10.10.25 0.0.0.0
15 deny 10.10.10.1 0.0.0.255
20 permit 10.20.10.117 0.0.0.0
30 deny 10.20.10.1 0.0.0.255
40 permit 0.0.0.0 255.255.255.255
exit
HP Switch(config)# ip access-list standard My-List
HP Switch(config-std-nacl)# no 20
HP Switch(config-std-nacl)# show run
.
.
.
ACL After Deleting the ACE at Line 20
ip access-list standard "My-List"
10 permit 10.10.10.25 0.0.0.0
15 deny 10.10.10.1 0.0.0.255
30 deny 10.20.10.1 0.0.0.255
40 permit 0.0.0.0 255.255.255.255
exit

```

This command enters the "Named-ACL" (nacl) context for "My-List".

This command deletes the ACE at line 20.

The ACE at line 20 has been removed.

Figure 7.2: Deleting an ACE from any ACL

7.3 Dynamic Host Configuration Protocol (DHCP)

7.3.1 Configure DHCP (using server):

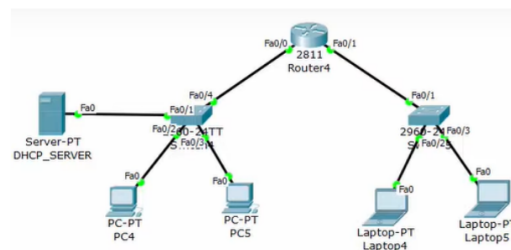


Figure 7.3: DHCP Using Server

1. Configure DHCP Server

Go to Desktop and then IP config

IP Address: 192.168.1.2

Default: 192.168.1.1

2. Make DHCP Pools

Go to Services and then DHCP

Pool Name: dotONEnetwork

Default: 192.168.1.1

Start IP: 192.168.1.3

Max Number: 20

Pool Name: dotTWOnetwork

Default: 192.168.2.1

Start IP: 192.168.2.2

Max Number: 20

N.B. Do not forget to turn on the DHCP server

3. Configure R1 Interfaces

```
R1(config)#int fa0/0
```

```
R1(config-if)# ip address 192.168.1.1 255.255.255.0
```

```
R1(config-if)# ip helper-address 192.168.1.2
```

```
R1(config-if)#no shutdown
```

```
R1(config-if)#exit
```

```
R1(config)#int fa0/1
```

```
R1(config-if)# ip address 192.168.2.1 255.255.255.0
```

```
R1(config-if)# ip helper-address 192.168.1.2
```

```
R1(config-if)#no shutdown
```

```
R1(config-if)#exit
```

N.B. In Case of vlans have to add the helper address in every sub-interface. I.E.: interface g0/0.10...

4. Configure all the PCs

Just click DHCP and the server will do the rest.

5. Verify

Ping PC1 from PC0.

7.4 Configure DHCP (inside router):

```
R1(config)# ip dhcp pool dotONEnetwork
```

```
R1(dhcp-config)# default-router 192.168.1.1
```

```
R1(dhcp-config)# network 192.168.1.0 255.255.255.0
```

```
R1(dhcp-config)# exit
```

```
R1(config)# ip dhcp pool dotTWOnetwork
```

```
R1(dhcp-config)# default-router 192.168.2.1
```

```
R1(dhcp-config)# network 192.168.2.0 255.255.255.0
```

```
R1(dhcp-config)# exit
```

Use “show ip dhcp binding” inside the router to see the status of the configured DHCP

Chapter 8

LAB-08 (NAT)

8.1 Configure NAT

Network Address Translation

1. Configure Router Interfaces
2. Configure PC's
3. Configure Server
4. Enable Static NAT inside Router1

```
Router(config)# ip nat inside source static 10.0.0.5 50.0.0.5
Router(config)# int fa0/1
Router(config-if)# ip nat inside
Router(config)# int fa0/0
Router(config-if)# ip nat outside
Router# copy running-config startup-config
```
5. Verify NAT Router# show ip nat translations
Router# show ip nat statistics