Cisco Certified Network Associate
CCNA 200-301 v1.1

NetworkPlus Training Center CCNA Lab Workbook

Developed by

Waleed Adlan

Network Plus Training Center

Lab # 1

How to Create A LAN

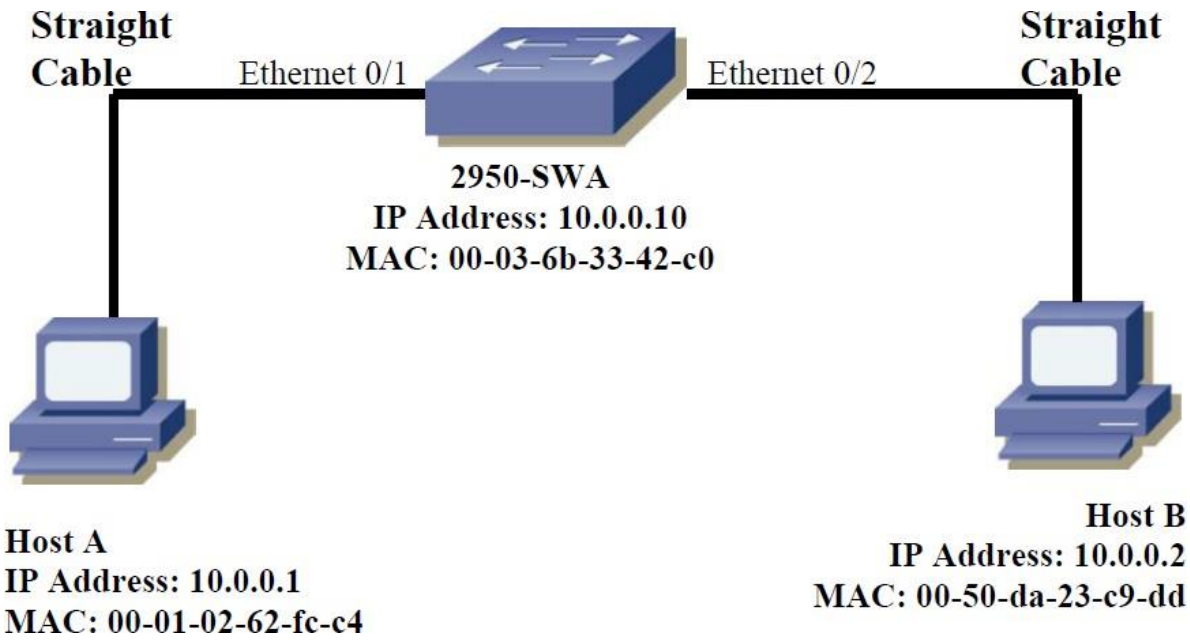
Objective

This lab demonstrates how to make a LAN Network.

The demonstration includes:

1. To connect 2 PC's with a switch using a straight cable

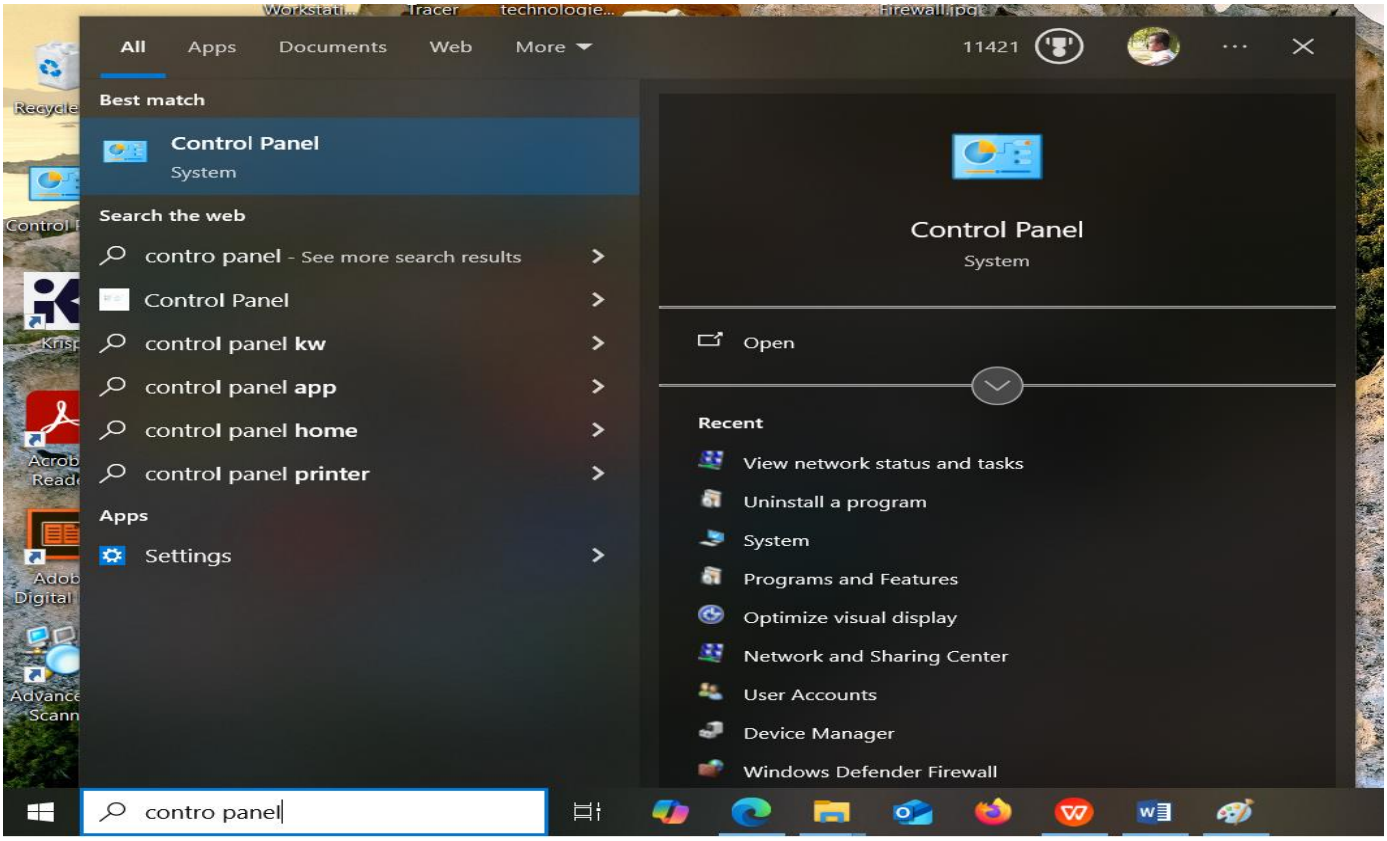
Diagram



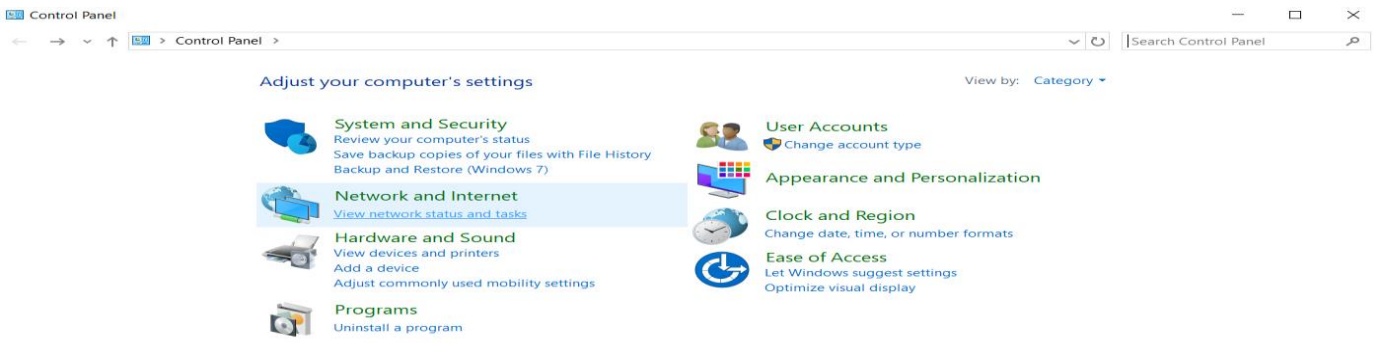
Below are the task

Assigning IP Addresses to the PCs

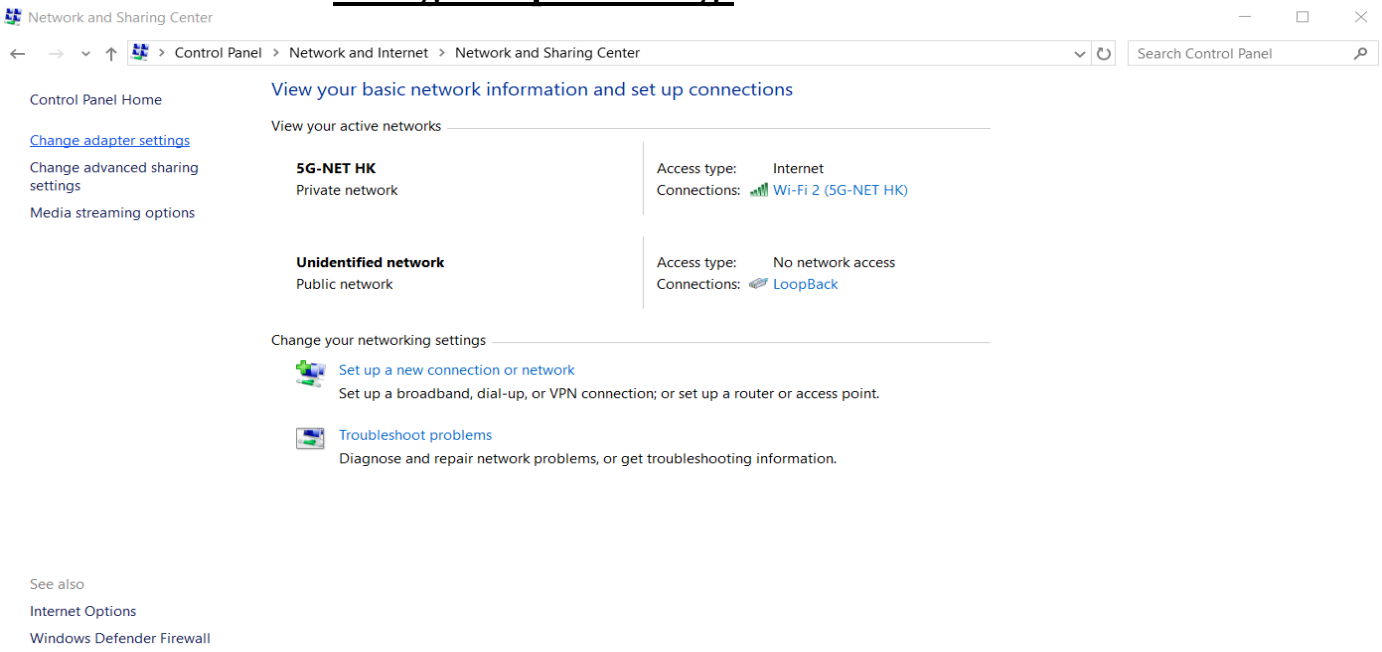
Task 1: Go to Control Panel



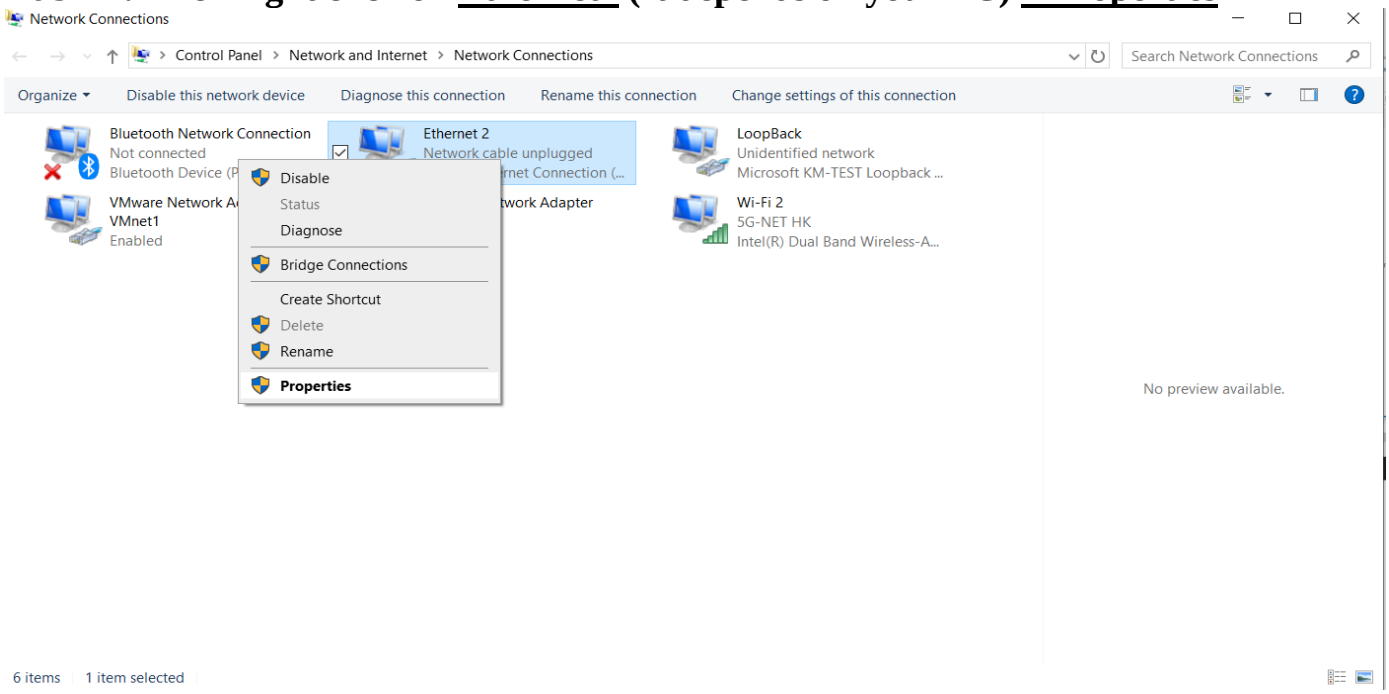
Task 2: Then Go to Network and Internet > View Network Status and Tasks



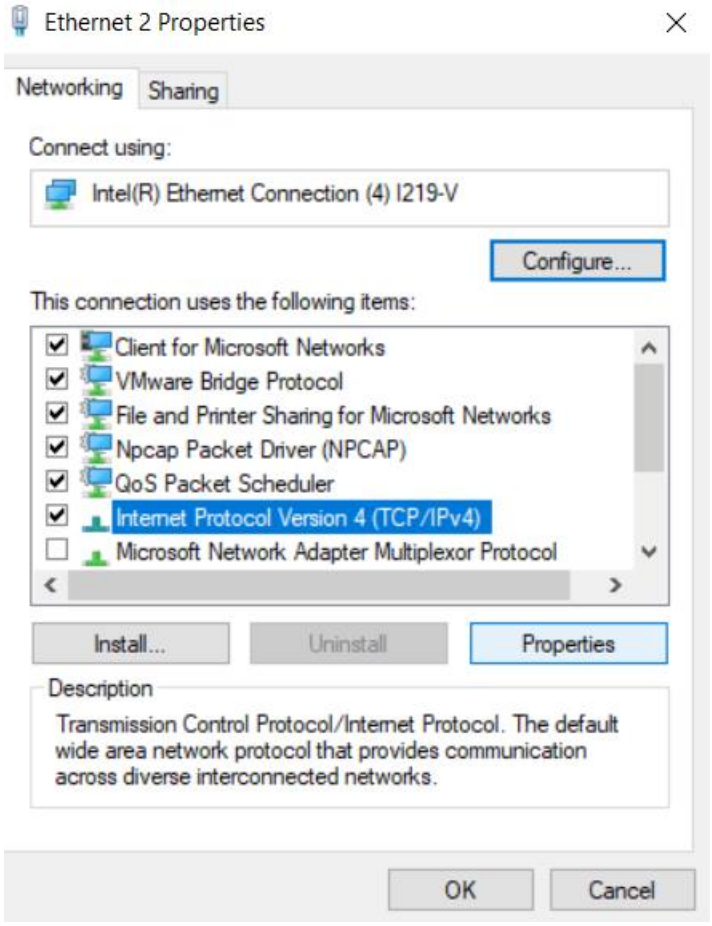
Task 3: Then Go to Change Adapter Settings



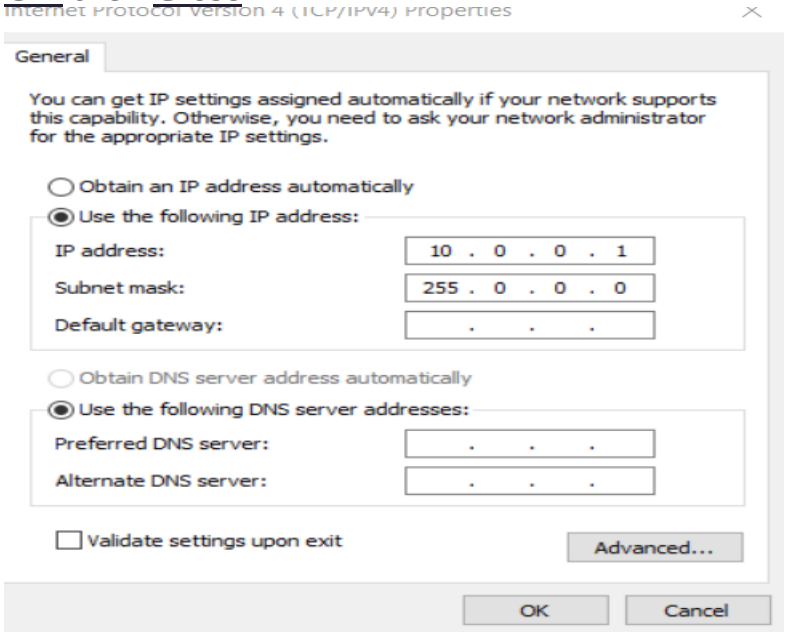
Task 4: Then right click on Ethernet2 (It depends on your PC) > Properties



Task 5: Then Select Internet Protocol Version 4 (TCP/IPv4) and choose Properties



Task 6: Then Assign IP addresses as shown below with the subnet mask and choose OK then Close

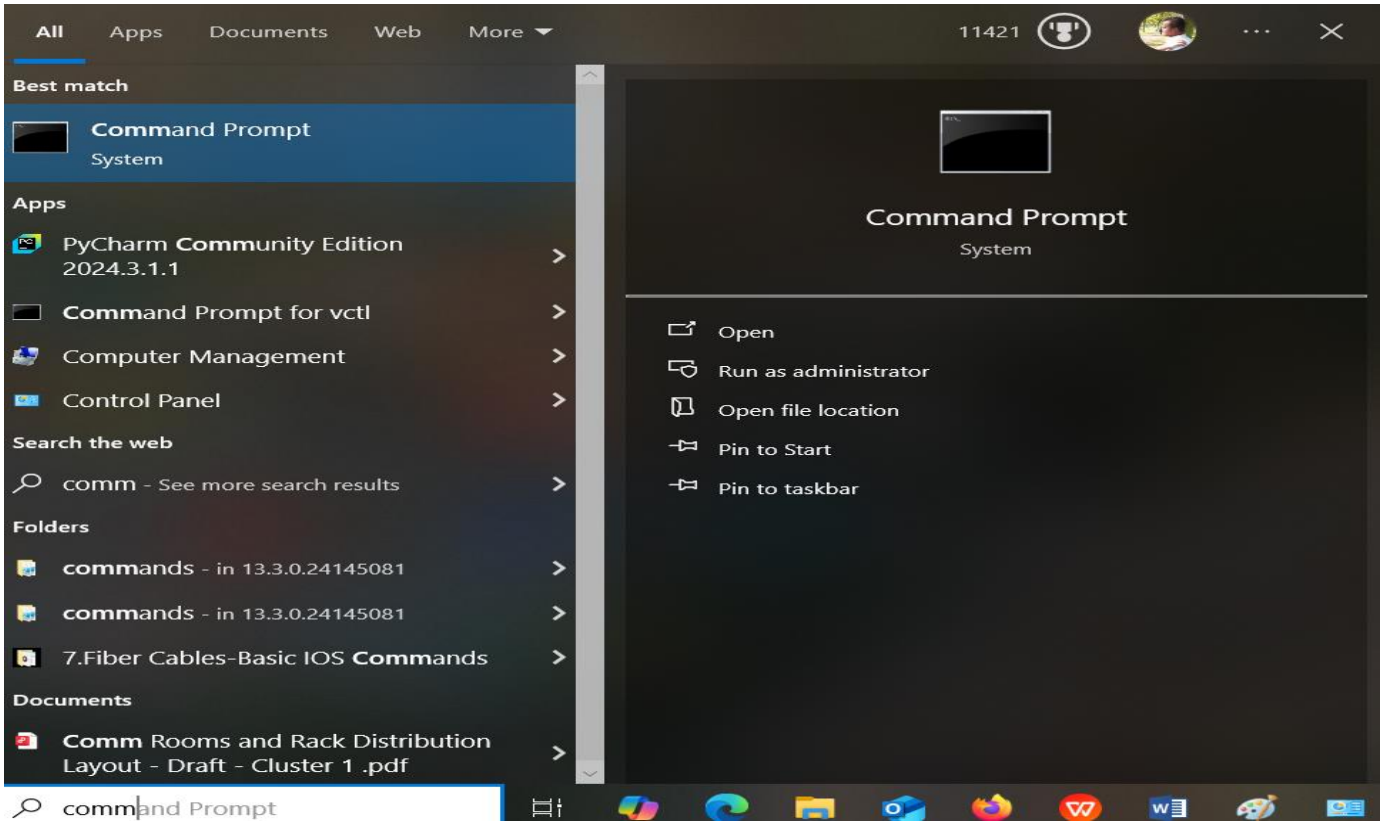


Task 7: Repeat the above process for PC_B, by assigning it IP 10.0.0.2 255.0.0.0

Task 8: Verification of IP Address Assignment:

Verify Both IPs have the correct IP addresses by issuing the **ipconfig** Command in the Windows Command Prompt

To navigate to the command prompt in Windows, move to **Start Menu**>**Command Prompt**



C:\>ipconfig
IP Address: …….10.0.0.1
Subnet Mask:……...255.0.0.0
Default Gateway:…….0.0.0.0

Task 9: Then verify the connectivity between the two PCs by issuing the following command in the Command Prompt

Ping 10.0.0.2 From PC_A and ensure connectivity between the two PCs

Reply from 10.0.0.2: bytes=32 time<l0ms TTL=l28
Reply from 10.0.0.2: bytes=32 time<l0ms TTL=l28
Reply from 10.0.0.2: bytes=32 time<l0ms TTL=l28
Reply from 10.0.0.2: bytes=32 time<l0ms TTL=l28

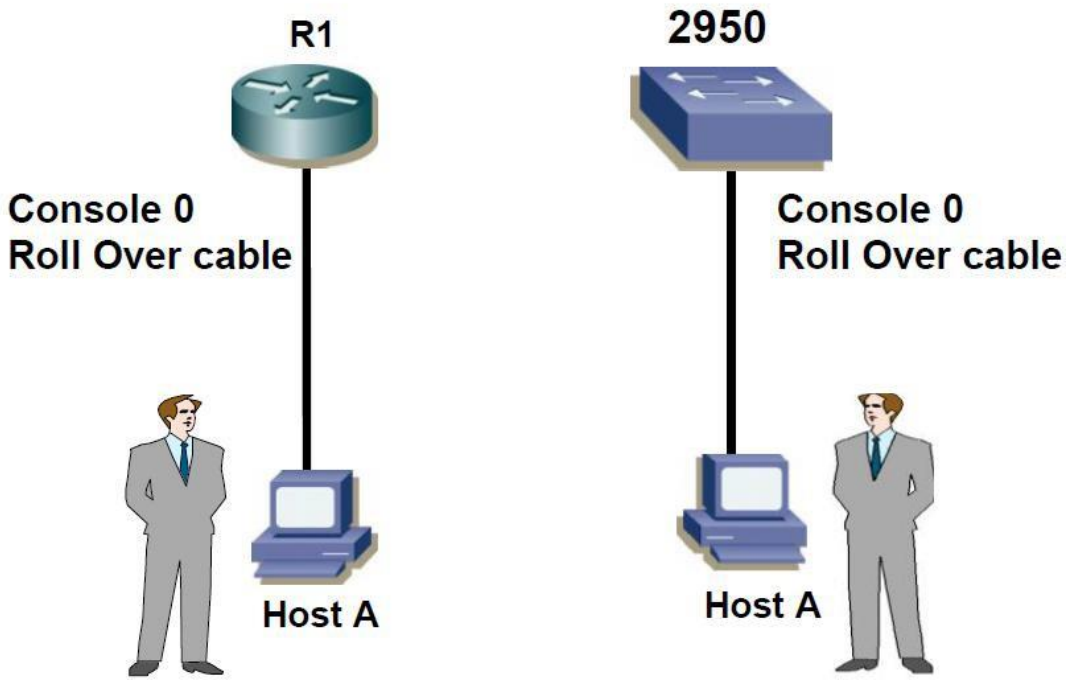
Lab # 2

Open A Hyper Terminal Session

Objective

This lab demonstrates how to open a Hyper Terminal session.

Diagram

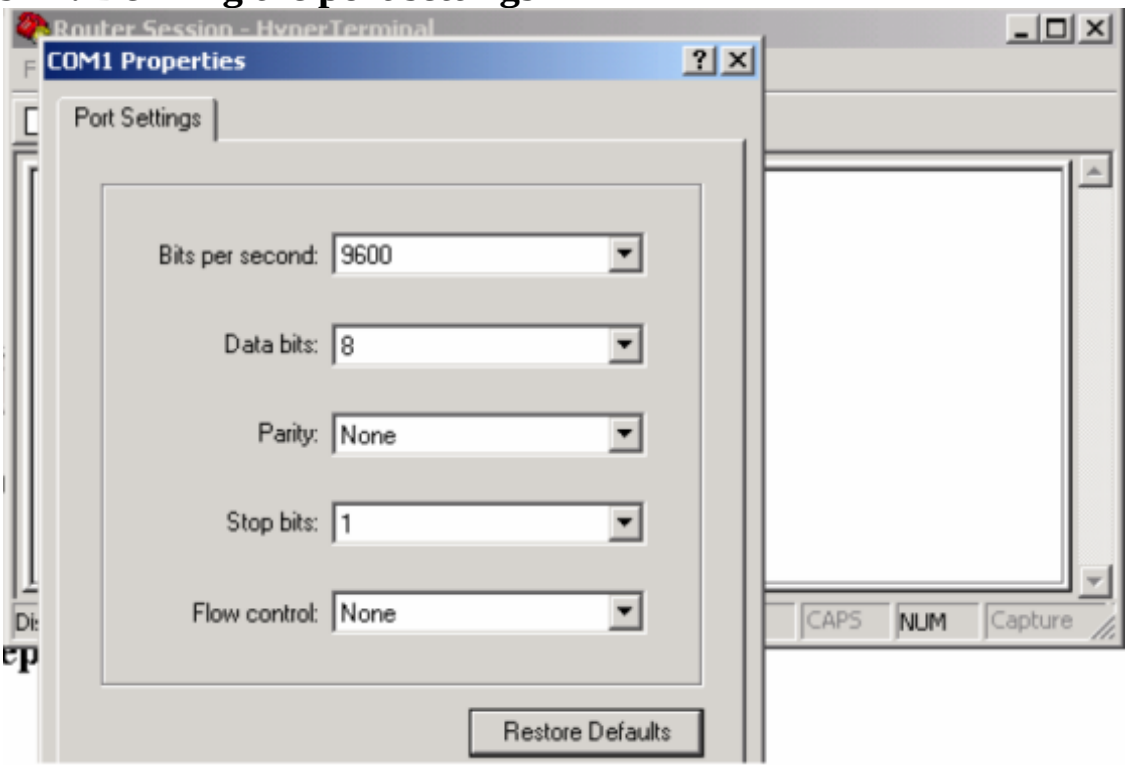


Task 1: Open HyperTerminal

Task 2: Session Name

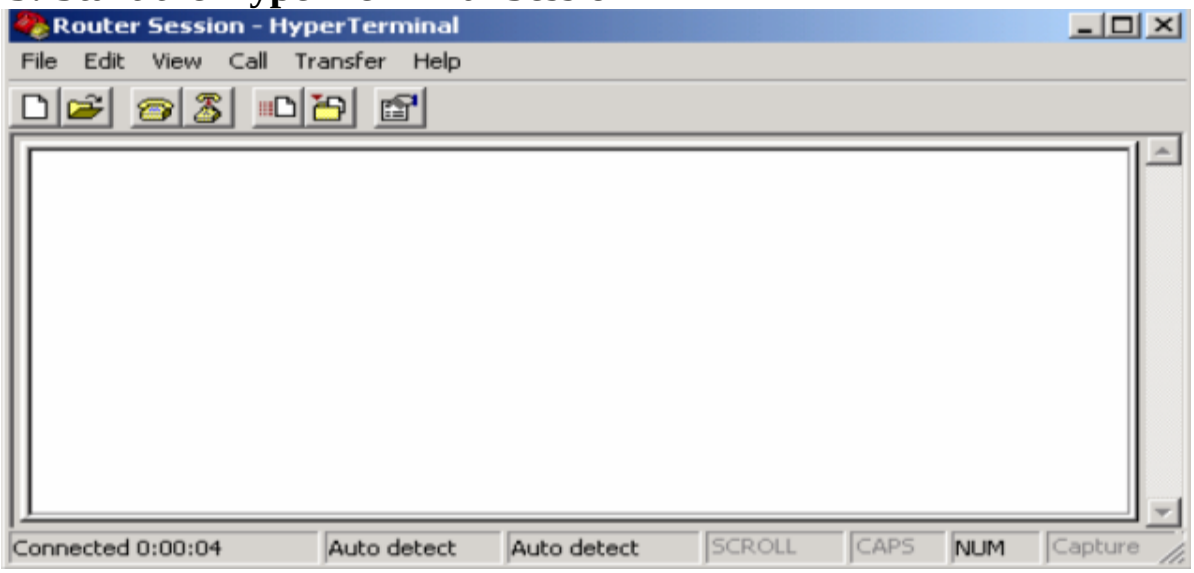
Task 3: Defining the connection type i.e COM1

Task 4: Defining the port settings



Note: Choose Restore Defaults

Task 5: Start the HyperTerminal Session



Lab # 3

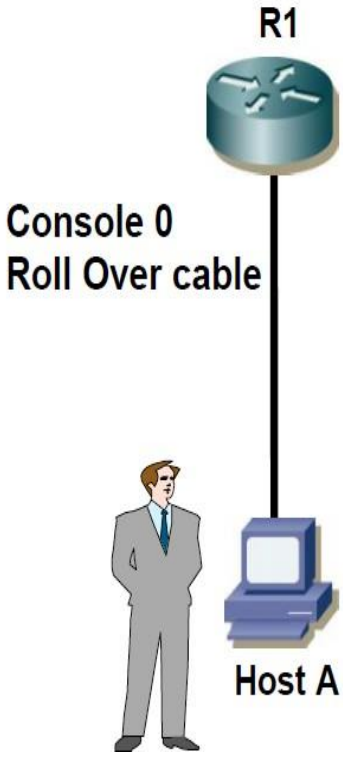
Router Basic IOS

Objective

This lab includes basic commands of Router IOS on 2500 Series.

i. Router Basic Commands.

Diagram



Task 1: After connecting your PC to the Console

Router con 0 is now available

Press RETURN to get started.

Router>

Task 2: To Enter Into Privilege mode/Executive Mode

From User Mode & Vice Versa.

Router>enable
Router#
Router#disable
Router>

Task 3: To Enter Into Global Configuration Mode.

Router#configure terminal
Router(config)#

Task 4: To change the Host Name of Router.

Router(config)#hostname Rl
Rl (config)#

Task 5(A): Set the System Clock, Date & Time on the Router

Rl#clock set?

hh:mm:ss Cunent Time

Rl#clock set 6:30:45 ?

<1-31> Day of the month
Rl#clock set 6:30:45 **1** JAN?

<]993-2035> Year

Rl#clock set 6:30:45 **1** JAN 2025

Task 5(B): Verify the System Clock, Date & Time on the Router

Rl#show clock

06:32:33.527 UTC Sat Jan 1 2025

Task 6(A): Set the Message of the Day Banner on the Route1·.

Rl(config)#banner motd # HELLO & WELCOME TO CISCO WORLD#

Task 6(B): Verify the Message of the Dav Banner on the Router.

R1 con0 is now available

Press RETURN to get stm1ed.

HELLO & WELCOME TO CISCO WORLD

R1>

Task 7: Display the Version Information of the Router.

Rl#show version

Cisco Internetwork Operating System Software
IOS (tm) 2500 Software (C2500-I-L), Version 12.H(7)Tt RELEASE SOFTWARE (fc2)
Copyright (c) 1986-1999 by cisco Systems, Inc. Compiled Mon 06-Dec-99 14:50 by phanguye
Image text-base: 0x0303C728, data-base: 0x00001000

ROM: System Bootstrap, Version 5.2(8a), RELEASE SOFTV/ ARE
BOOTFLASH: 3000 Bootstrap Software (IGS-RXBOOT), Version 10.2(8a), RELEASE SOFTWARE (fol)
Rl uptime is 1 minute
System returned to ROM by reload
System image file is "flash:c2500-i-1[1].120-7.T.bin"
cisco 2500 (68030) processor (revision F) with 16384K/2048K bytes of memory. Processor board ID 04851445, with hardware revision 00000000
Bridging software.
X.25 software, Version 3.0.0.
1 Ethernet/IEEE 802.3 interface(s)
2 Serial network interface(s)
32K bytes of non-volatile configuration memory.
8192K bytes of p1·ocessor board System flash (Read ONLY)

Configuration register is Ox2102

Task 8: Display the Flash Information.

Rl#dir

OR

Rl#show flash:

System flash directory:
File Lengthame/status
17432656 c2500-i-1[1].120-7.T.bin
[7432720 bytes used, 955888 available, 8388608 total] 8192K bytes of p1·ocessor board System flash (Read ONLY)

Task 9: Show contents of Current Configuration (RAM).

Rl#show running-config

Task 10: Show contents of Startup Configuration (NVRAM).

Rt#show startup-config

Task ll(A): Set the Line Console Password on the Router.

R1(config)#line console 0
R1(config-line)#password cisco
R1(config-line)#login

Task 1l(B): Verification Line Console Password on the switch.

R1 con0 is now available

Press RETURN to get started.

User Acces Verification

Password:
R1>

Task 12(A): Set the privileged mode password in clear text..

R1(config)#enable password cisco

Task 12(B): Verifying the privileged mode pas word in clear text. R1#disable
Rl>enable
Password:
Rl#

Task 13(A): Set the Privileged Mode password in encrypted form.

Rl(config)#enable secret cisco

The enable secret you have chosen is the same as your enable password.
This is not recommended. Re-enter the enable secret.

Rl(config)#enable secret ciscol

Task 13(B): Verifying the Privileged Mode password in encrypted form.

R1>enable

Password:

Task 14: Set the Line VTY Password on the Router.

Rl(config)#line vty 0 4
Rl(config-line)#password cisco
Rl(config-line)#login

Task 15: Set the Line Auxiliary Password on the Router.

Rl(config)#line aux 0
Rl(config-line)#password cisco
Rl(config-line)#login

Task 16: Remove the Privileged Mode Password (Level 15) in clear form.

Rl(config)#no enable password

Task 17: Remove the Privileged Mode Secret Password (Level 15) in encrypted form.
Rl(config)#no enable secret

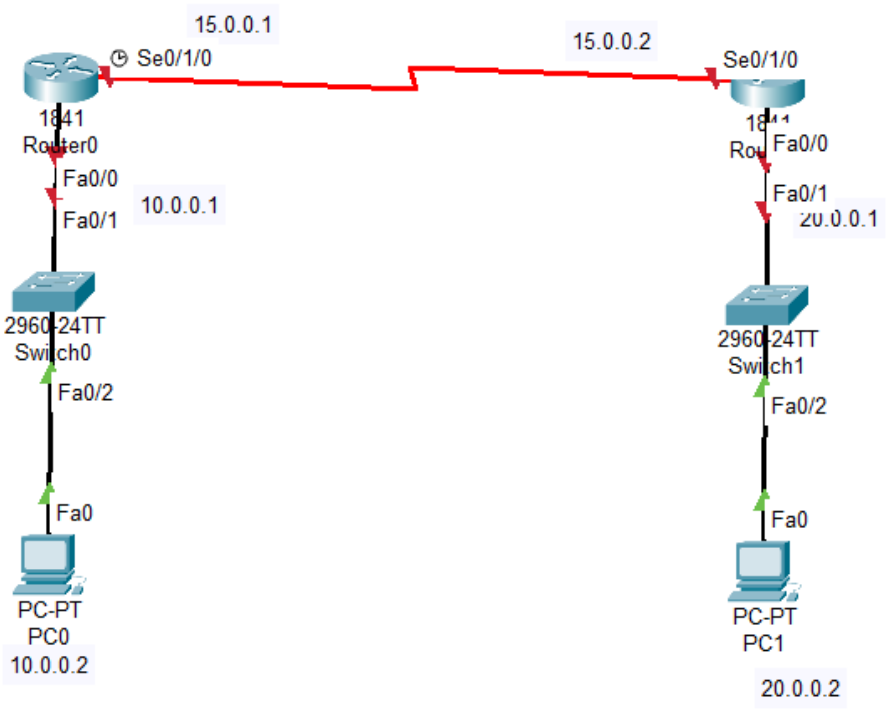
Lab # 4

Static/Default Routes

Objective

Understanding the Operation of Static/Default Routes.

Diagram



Configuration

Task l(A): Assigning the IP addresses on the Router Rl.

Rl(config)#interface serial 0/1/0

Rl(config-H)#ip address 15.0.0.1 255.0.0.0

Rl(config-if)#no shutdown

Rl(config-if)#clock rate 64000 (Clock Rate will set only DCE Interface)

Rl(config)#interface Fastethernet 0/0

Rl(config-if)#ip address 10.0.0.1 255.0.0.0

Rl(config-if)#no shutdown

Task l(B): Assigning the IP addresses on the Router R2.

R2(config)#interface serial 0/1/0

R2(config-if)#ip address 15.0.0.2 255.0.0.0

R2(config-if)#no shutdown

R2(config)#interface Fastethernet 0/0

R2(config-if)#ip address 20.0.0.1 255.0.0.0

R2(config-if)#no shutdown

Task 2(A): Check the Routing table of the Router Rl.

Rl#sh ip route

C 10.0.0.0/8 is directly connected, Fastethernet0/0

C 15.0.0.0/8 is directly connected, Serial 0/1/0

Task 2(B): Check the Routing table of the Router R2.

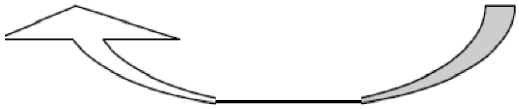
R2#sh ip route

C 20.0.0.0/8 is directly connected, FastEthernet0/0

C 15.0.0.0/8 is directly connected, Serial0/1/0

Task 3(A): Administratively define the Static Route on the Router Rl.

Rl(config)#ip route **20.0.0.0 255.0.0.0** 15.0.0.2 (Desired destination networks)



Task 3(B): Administratively define the Static Route on the Router R2.

R2(config)#ip route **10.0.0.0 255.0.0.0** 15.0.0.1 (Desired destination networks)

Task 4: Check the Routing table on Routers after configuring Static Routes.

Rl# show ip route

S 20.0.0.0/8 [1/0] via 15.0.0.2
C 10.0.0.0/8 is directly connected, Fastethernet0/0
C 15.0.0.0/8 is directly connected, Serial0/1/0

R2#show ip route

S 10.0.0.0/8 [1/0] via 15.0.0.2
C 20.0.0.0/8 is directly connected, Fastethernet0/0
C 15.0.0.0/8 is directly connected, Serial0/1/0

Task 5: Verify the connectivity between the Two PCs

PC_A> ping 20.0.0.2

Reply from 20.0.0.2: bytes=32 time<l0ms TTL=l28
Reply from 20.0.0.2: bytes=32 time<l0ms TTL=l28
Reply from 20.0.0.2: bytes=32 time<l0ms TTL=l28
Reply from 20.0.0.2: bytes=32 time<l0ms TTL=l28

Task 6: Remove the static route and configure default routes instead

R1(Config)# no ip route 20.0.0.0 255.0.0.0 15.0.0.2
R1(Config)# ip route 0.0.0.0 0.0.0.0 15.0.0.2

R2 (Config)# no ip route 10.0.0.0 255.0.0.0 15.0.0.1
R1(Config)# ip route 0.0.0.0 0.0.0.0 15.0.0.1

Task 7: Show the routing table and ensure connectivity Between PCs

Rl# show ip route

S*0.0.0.0/0 via 15.0.0.2
C 10.0.0.0/8 is directly connected, Fastethernet0/0
C 15.0.0.0/8 is directly connected, Serial0/1/0

Rl# show ip route

S*0.0.0.0/0 via 15.0.0.2
C 10.0.0.0/8 is directly connected, Fastethernet0/0
C 15.0.0.0/8 is directly connected, Serial0/1/0

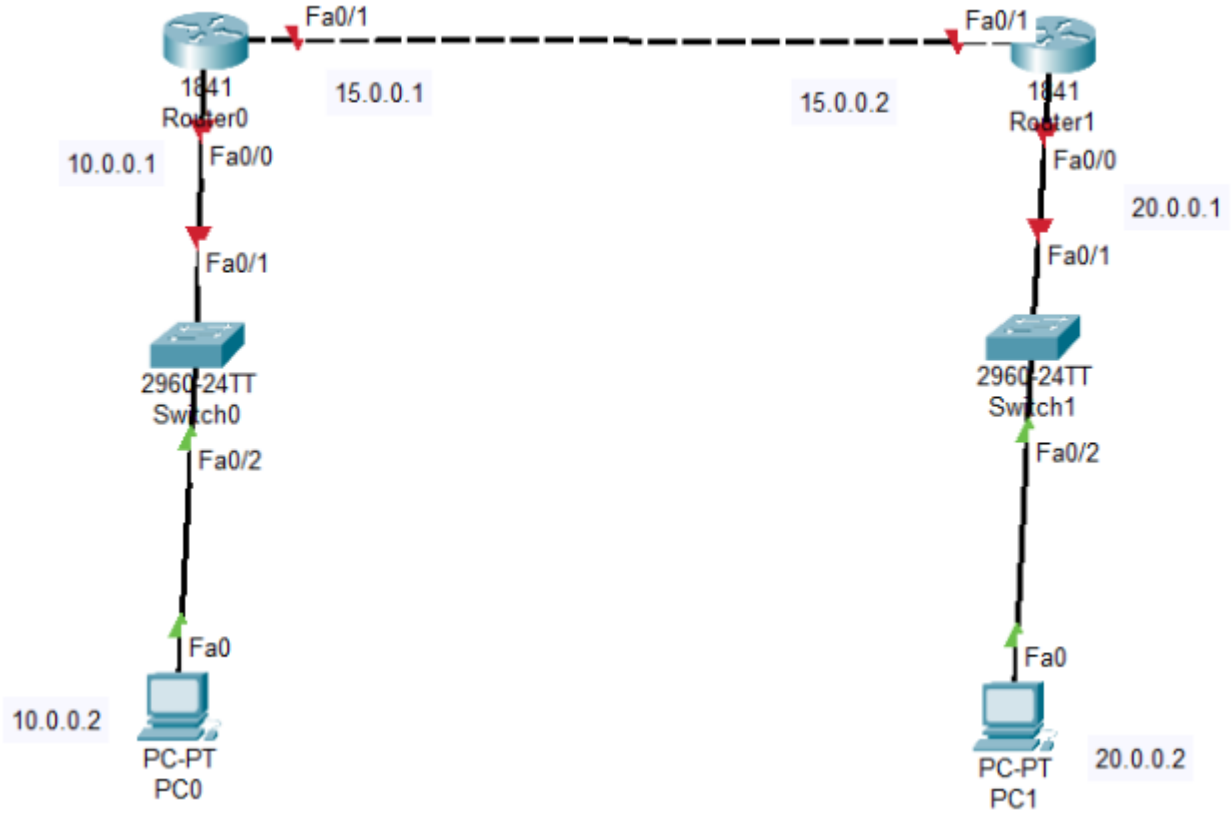
Lab # 5

RIP Routing Protocol

Objective

Understanding the Dynamic Routing table updates using the Routing Protocol (RIP)

Diagram



Configuration

Task 1: Assign IP Addresses as shown in the depicted diagram, and enable routing protocol RIP by advertising networks

```
!R1
Enable
Configure terminal
Interface fa0/0
No shutdown
Ip address 10.0.0.1 255.0.0.0
!
Interface fa0/1
No shutdown
Ip address 15.0.0.1 255.0.0.0
Exit
!
Router rip
Network 10.0.0.0
Network 15.0.0.0
```

```
!R2
Enable
Configure terminal
Interface fa0/0
No shutdown
Ip address 20.0.0.1 255.0.0.0
!
Interface fa0/1
No shutdown
Ip address 15.0.0.2 255.0.0.0
Exit
!
Router rip
Network 20.0.0.0
Network 15.0.0.0
```

Task 1: Apply show ip route on Routers to verify the routing table:

!R1
Show ip route
C 10.0.0.0/8 is directly connected, FastEthernet0/0
C 15.0.0.0/8 is directly connected, FastEthernet0/1
R 20.0.0.0/8 [120/1] via 15.0.0.2, 00:00:11, FastEthernet0/1

!R2
Show ip route
R 10.0.0.0/8 [120/1] via 15.0.0.1, 00:00:16, FastEthernet0/1
C 15.0.0.0/8 is directly connected, FastEthernet0/1
C 20.0.0.0/8 is directly connected, FastEthernet0/0

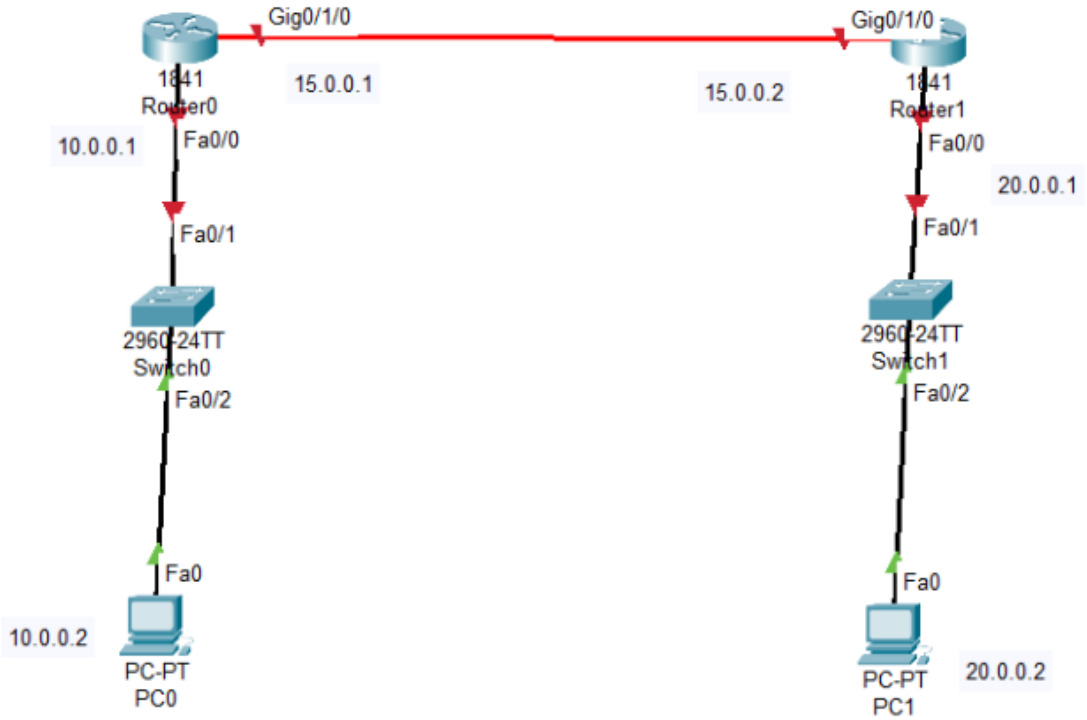
Lab # 6

Routing Protocols (OSPF)

Objective

Understanding the Routing Updates process using the Open Shortest Path First (OSPF)

Diagram



Configuration

Task 1: Configure OSPF as shown in the depicted figure, but make sure networks 10.0.0.0 and 15.0.0.0 are put in OSPF Area 0 and 20.0.0.0 in OSPF Area 1

!R1

Interface fa0/0

No shutdown

Ip address 10.0.0.1 255.0.0.0

!

Interface g0/1/0

No shutdown

Ip address 15.0.0.1 255.0.0.0

!

Router ospf 1

Network 10.0.0.0 0.255.255.255 area 0

Network 15.0.0.0 0.255.255.255 area 0

!R2

Interface fa0/0

No shutdown

Ip address 20.0.0.1 255.0.0.0

!

Interface g0/1/0

No shutdown

Ip address 15.0.0.2 255.0.0.0

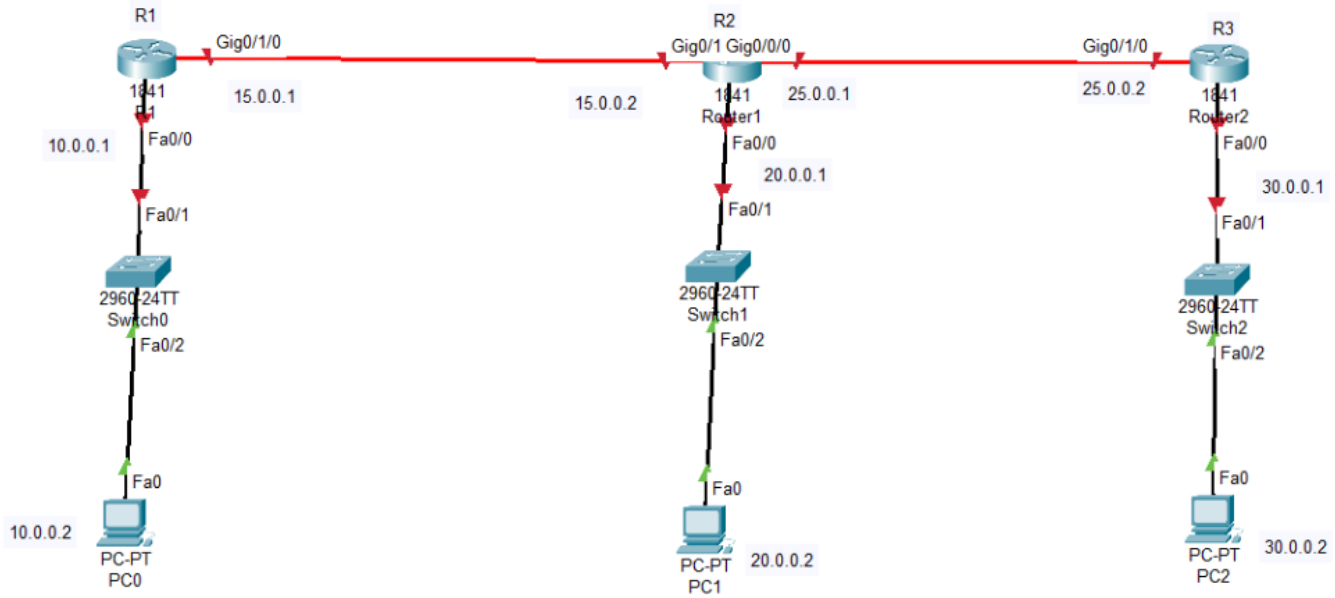
!

Router ospf 1

Network 20.0.0.0 0.255.255.255 area 1

Network 15.0.0.0 0.255.255.255 area 0

Diagram 2



Configuration

Task 2: Configure OSPF as shown in the depicted figure, but make sure all routers are put in OSPF area 0

!R1

Interface fa0/0

No shutdown

Ip address 10.0.0.1 255.0.0.0

!

Interface g0/1/0

No shutdown

Ip address 15.0.0.1 255.0.0.0

!

Router ospf 1

Network 10.0.0.0 0.255.255.255 area 0

Network 15.0.0.0 0.255.255.255 area 0

!R2

Interface fa0/0

No shutdown

Ip address 20.0.0.1 255.0.0.0

!

Interface g0/1/0

No shutdown

Ip address 15.0.0.2 255.0.0.0

!

Interface g0/0/0

No shutdown

Ip address 25.0.0.1 255.0.0.0

!

Router ospf 1

Network 20.0.0.0 0.255.255.255 area 0

Network 15.0.0.0 0.255.255.255 area 0

Network 25.0.0.0 0.255.255.255 area 0

!

!R3

Interface fa0/0

No shutdown

Ip address 30.0.0.1 255.0.0.0

!

Interface g0/1/0

No shutdown

Ip address 25.0.0.2 255.0.0.0

!

Router ospf 1

Network 25.0.0.0 0.255.255.255 area 0

Network 30.0.0.0 0.255.255.255 area 0

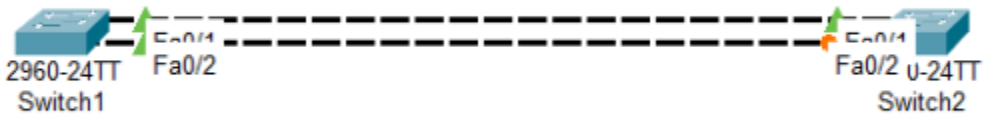
Lab# 7

Spanning-Tree

Objective:

The goal of this lab is to enable students to build a switched network and verify basic spanning-tree configuration.

Diagram:



Task 1: Verify the current status of the spanning-tree identifying the root switch, root ports, designated ports, blocked ports, etc

!SW1

Show spanning-tree vlan 1

VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 32769
Address 0001.9687.BC8E
This bridge is the root
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 0001.9687.BC8E
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 20

Interface Role Sts Cost Prio.Nbr Type
---------- ---- --- --------- -------- --------------------------------
Fa0/2 Desg FWD 19 128.2 P2p

Fa0/1 Desg FWD 19 128.1 P2p

!SW2

Show spanning-tree vlan 1

VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 32769
Address 0001.9687.BC8E
Cost 19
Port 1(FastEthernet0/1)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 00E0.F7E3.576D
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 20

Interface Role Sts Cost Prio.Nbr Type
---------- ---- --- --------- -------- --------------------------------
Fa0/2 Altn BLK 19 128.2 P2p

Fa0/1 Root FWD 19 128.1 P2p

Task2: Make the non-root switch to be the root switch

!SW2

Spanning-tree vlan 1 priority 0

End

!

Show spanning-tree vlan 1
VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 1

Address 00E0.F7E3.576D
This bridge is the root
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 1 (priority 0 sys-id-ext 1)
Address 00E0.F7E3.576D
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 20

Interface Role Sts Cost Prio.Nbr Type
---------- ---- --- --------- -------- --------------------------------
Fa0/2 Desg FWD 19 128.2 P2p

Fa0/1 Desg FWD 19 128.1 P2p

Task3: Make the Port 2 in SW1 to be the root port by making changes in SW2

!SW2

Interface fa0/2

Spanning-tree vlan 1 port-priority 0

!SW1

Show spanning-tree vlan 1

VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 1
Address 00E0.F7E3.576D
Cost 19
Port 2(FastEthernet0/2)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 0001.9687.BC8E
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 20

Interface Role Sts Cost Prio.Nbr Type
---------- ---- --- --------- -------- --------------------------------

Fa0/2 Root FWD 19 128.2 P2p

Fa0/1 Altn BLK 19 128.1 P2p

Task4: Make Port 1 in SW1 again to be the root port by making changes only in SW1

!SW1

Interface fa0/1

Spanning-tree vlan 1 cost 18

!

Show spanning-tree vlan 1

VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 1
Address 00E0.F7E3.576D
Cost 18
Port 1(FastEthernet0/1)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 0001.9687.BC8E
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 20

Interface Role Sts Cost Prio.Nbr Type
---------- ---- --- --------- -------- --------------------------------
Fa0/2 Altn BLK 19 128.2 P2p

Fa0/1 Root FWD 18 128.1 P2p

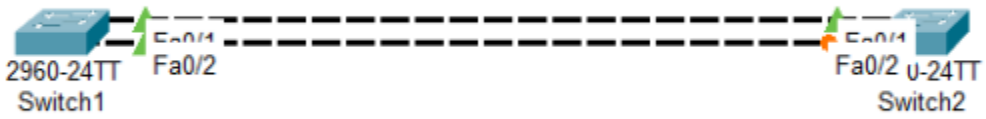
Lab# 8

Rapid Spanning-Tree

Objective:

The goal of this lab is to configure and verify rapid spanning-tree configuration and relevant enhanced features.

Diagram:



Task 1: On Switch2, shutdown Port1 (the forwarding port), and check the status of the second port while moving to listening, learning and forwarding. But you have to issue the show spanning-tree vlan 1 very fast

!SW2

Interface fa0/1

Shutdown

End

!

Show spanning-tree vlan 1
VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 32769
Address 0001.9687.BC8E

Cost 19
Port 2(FastEthernet0/2)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 00E0.F7E3.576D
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 20

Interface Role Sts Cost Prio.Nbr Type
---------- ---- --- --------- -------- --------------------------------
Fa0/2 Root LSN 19 128.2 P2p

Show spanning-tree vlan 1

VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 32769
Address 0001.9687.BC8E
Cost 19
Port 2(FastEthernet0/2)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 00E0.F7E3.576D
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 20

Interface Role Sts Cost Prio.Nbr Type
---------- ---- --- --------- -------- --------------------------------
Fa0/2 Root LRN 19 128.2 P2p

Show spanning-tree vlan 1

VLAN0001
Spanning tree enabled protocol ieee
Root ID Priority 32769
Address 0001.9687.BC8E
Cost 19
Port 2(FastEthernet0/2)
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec

Bridge ID Priority 32769 (priority 32768 sys-id-ext 1)
Address 00E0.F7E3.576D
Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
Aging Time 20

```
Interface Role Sts Cost Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Fa0/2 Root FWD 19 128.2 P2p
```

Task2: Configure the two switches as rapid-pvst, and issue no shutdown to port2, and check how fast the convergence in the rapid-pvst

!SW1/SW2

Spanning-tree mode rapid-pvst

!
!SW2

Interface fa0/1

No shutdown

Task 3: Configure Port 3 on Switch2 as Portfast and check how port3 moved to forwarding state when you connect a PC on that port

!SW2

Interface fa0/3

Spanning-tree portfast

Task 4: Configure Port3 to have bpduguard enabled, and then connect a switch to see how the port will be blocked by moving into err-disabled state

!SW2

Interface fa0/3

Spanning-tree bpduguard enable

Task 5: Configure Port3 to have guard root port enabled, and configure the connected switch with priority 0 and check how port3 will be blocked and placed in root-inconsistent state

!SW2

Interface fa0/3

Spanning-tree guard root

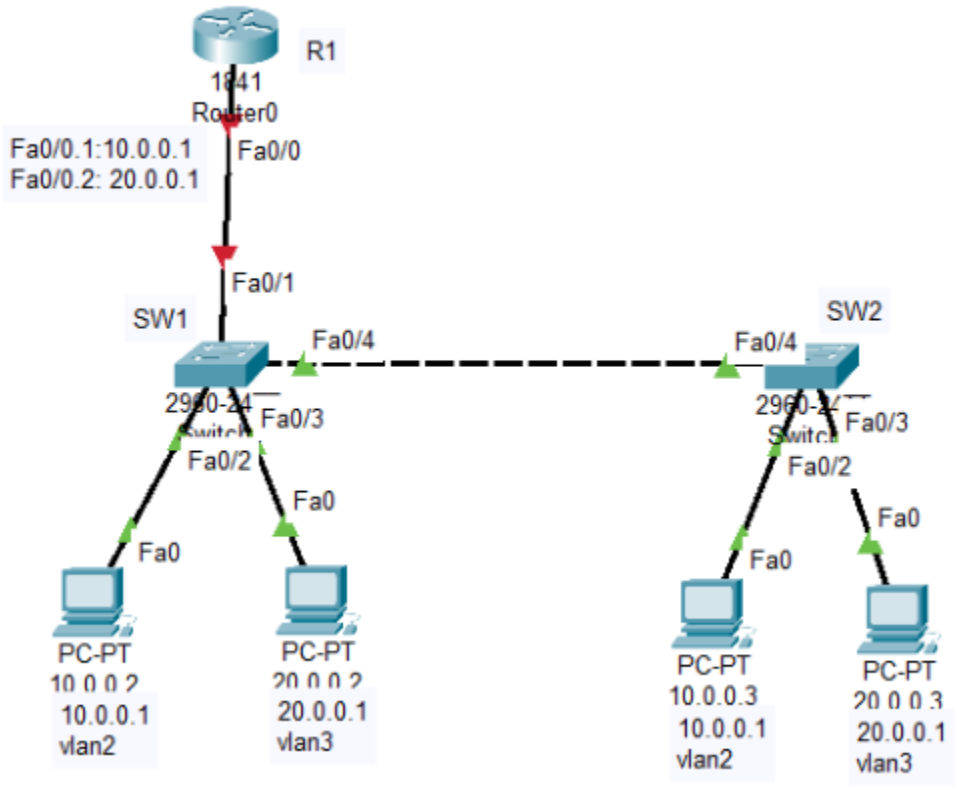
Lab# 9

VLANs

Objective:

The goal of this lab is to configure and verify VLANs configuration on switches, and configure intervlan routing on the router to allow different vlans to communicate to each other.

Diagram:



Task 1: Connect the above network, create vlans on the switches and assign the relevant ports, configure the trunk link between the switches and between SW1 and the router. Then configure the router as router on stick as depicted in the diagram. Use the following show commands for troubleshooting

!Show commands on switches

Show vlan

Show interface trunk

!Show commands on Router

Show ip int brief

Show ip route

!SW1/SW2

Vlan 2

Name Eng

!

Vlan 3

Name Hr

!

Int fa0/2

Switchport access vlan 2

!

Int fa0/3

Switchport access vlan 3

!

Int fa0/4

Switchport mode trunk

!

!SW1

```
Int fa0/1
Switchport mode trunk


!R1
Int fa0/0
No shutdown
!
Int fa0/0.1
Encaps dot1q 2
Ip address 10.0.0.1 255.0.0.0
!
Int fa0/0.2
Encaps dot1q 3
Ip address 20.0.0.1 255.0.0.0
Exit
!
```

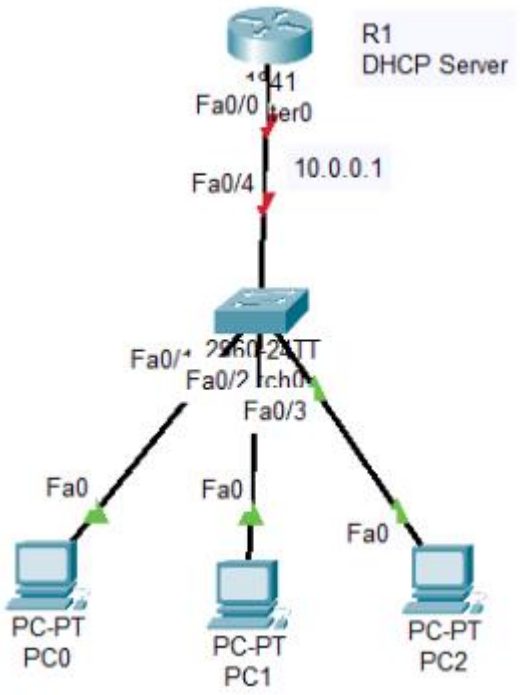
Lab# 10

DHCP

Objective:

The goal of this lab is to configure and verify DHCP on Cisco Routers, and to configure DHCP Relay

Diagram1:



Task 1: Configure R1 as DHCP Server, and ensure that all PCs connected to the switch are getting IP address dynamically

!R1

Interface fa0/0

No shutdown

!

Ip address 10.0.0.1 255.0.0.0

Exit

!

Ip dhcp excluded-address 10.0.0.1

!

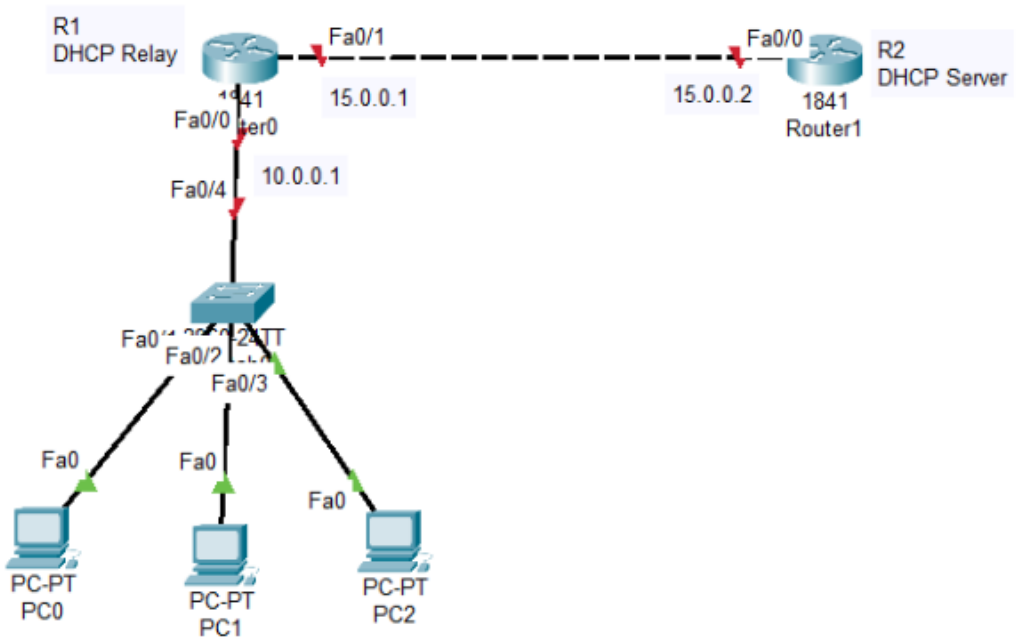
Ip dhcp pool cisco

Network 10.0.0.0 255.0.0.0

Default-router 10.0.0.1

Dns-server 8.8.8.8

Diagram2:



Task 2: Connect another router to the first router, and make the second router as DHCP server for PCs, while the first router to act as DHCP relay and remove the previous DHCP Server configuration. Don't forget to make 10.0.0.0 network reachable to the DHCP Server (Second Router)

!R1

No ip dhcp excluded-address 10.0.0.1

No ip dhcp pool cisco

!

Interface fa0/0

Ip helper-address 15.0.0.2

!

Interface fa0/1

No shutdown

Ip address 15.0.0.1 255.0.0.0

!R2

Interface fa0/0

No shutdown

Ip address 15.0.0.2 255.0.0.0

Exit

!

Ip route 10.0.0.0 255.0.0.0 15.0.0.1

!

Ip dhcp excluded-address 10.0.0.1

Ip dhcp pool cisco

Network 10.0.0.0 255.0.0.0

Default-router 10.0.0.1

Dns-server 8.8.8.8

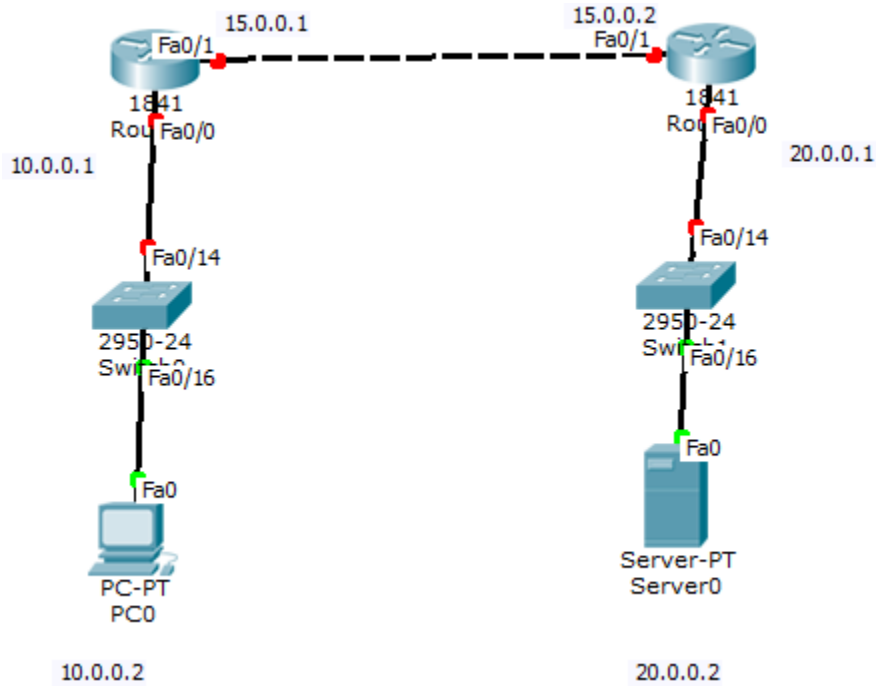
Lab# 11

Access-list

Objective:

The goal of this lab is to enable students to configure access-lists, and to master the different types of its implementation.

Diagram:



Preliminary Configuration:

- Connect the network as shown in the above figure
- Configure IP addresses in all interfaces
- Enable RIP as a routing protocol
- Ensure the ping is working between the PC and the server.

Task 1: Configure Standard Access-list in R1 that denies all traffic leaving from the network 10.0.0.0

!R1

access-list 1 deny 10.0.0.0 0.255.255.255

access-list 1 permit any

!

interface fa0/0

ip access-group 1 in

!

Verification:

Ping from the PC to the Server is not working.

PC>ping 20.0.0.2

Pinging 20.0.0.2 with 32 bytes of data:

Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.

!R1

Router#show access-lists
Standard IP access list 1
10 deny 10.0.0.0 0.255.255.255 (4 match(es))
20 permit any

Task2: Remove previous access-list from the global configuration mode and from the interface.

!R1

no access-list 1 interface

fa0/0

no ip access-group 1 in

Exercise1:

Configure Extended Access-list on R1 that permits the http trafic to the server and denies the icmp (ping) traffic.

Exercise2:

Configure Extended Access-list on R1 that denies the http trafic to the server and permits the icmp (ping) traffic.

Exercise Help:

access-list 100 deny tcp host 10.0.0.2 host 20.0.0.2 eq 80

!this statement denies the http traffic from 10.0.0.2 to 20.0.0.2

access-list 100 permit ip any any

```
!this statement permits all traffic
access-list 100 deny icmp any any
!this statement denies all ping traffic
```

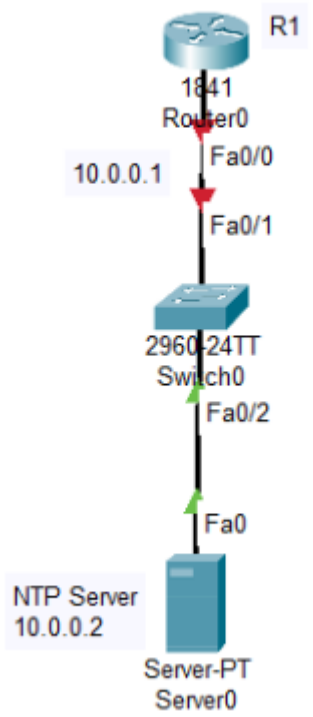
Lab# 12

NTP

Objective:

The goal of this lab is to enable students to configure NTP and to verify Its Configuration,

Diagram1:



Task 1: Connect the network as shown in the above topology, assign IP addresses. Configure the Server as NTP Server, and the router as NTP Client, and verify the ntp configuration

!R1

Interface fa0/0

No shutdown

Ip address 10.0.0.1 255.0.0.0

Exit

!

Ntp server 10.0.0.2

!Server

Go to

Services>NTP>On

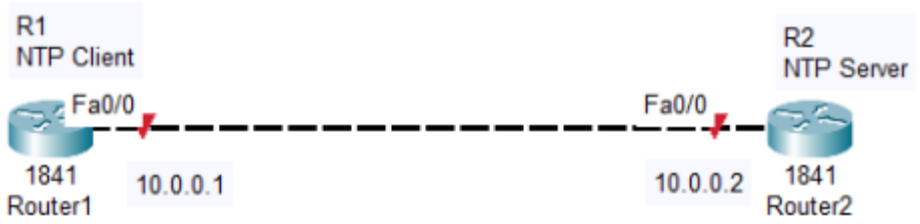
!Verification

Show clock

Show ntp status

Show ntp association

Diagram2:



Task 2: Connect the above network and make R1 as NTP Client and R2 as NTP server and verify the ntp configuration using the same above verification commands

!R1

Interface fa0/0

No shutdown

Ip address 10.0.0.1 255.0.0.0

Exit

!

Ntp server 10.0.0.2

!

!R2

Clock set 18:38:00 2 Feb 2025

Conf t

Ntp master 1

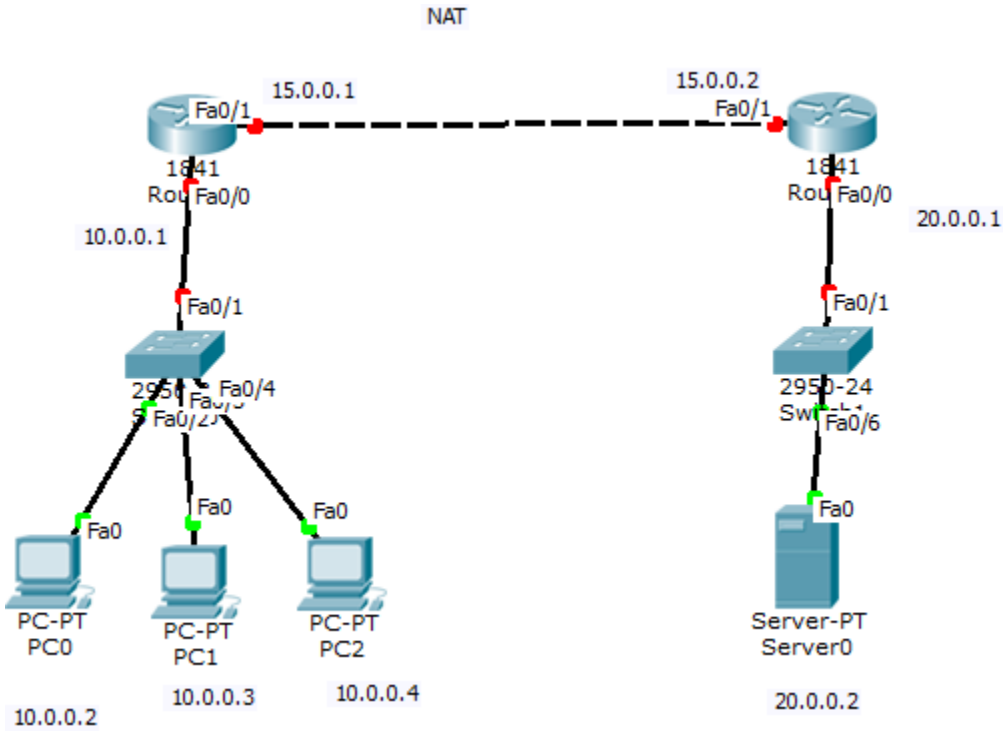
Lab# 13

Network Address Translation

Objective:

The goal of this lab is to enable students to configure different types of NAT, which includes static nat, dynamic nat, pat.

Diagram:



Preliminary Configuration:

- Connect the network as shown in the above figure
- Configure IP addresses in all interfaces
- Configure default-route on R1 to point to R2
- Ensure the ping is working between the PCs and the server.

Task 1: Configure static Nat on R1 , that translates 10.0.0.2 to 15.0.0.3, 10.0.0.3 to 15.0.0.4 and 10.0.0.4 to 15.0.0.5.

```
!R1
int fa0/0
ip nat inside
!
int fa0/1
ip nat outside
!
ip nat inside source static 10.0.0.2 15.0.0.3
ip nat inside source static 10.0.0.3 15.0.0.4
ip nat inside source static 10.0.0.4 15.0.0.5
!
```

Verification:

Ping from the PCs to the Server should be working.

```
PC>ping 20.0.0.2

Pinging 20.0.0.2 with 32 bytes of data:

Reply from 20.0.0.2: bytes=32 time=8ms TTL=128
Reply from 20.0.0.2: bytes=32 time=29ms TTL=128
Reply from 20.0.0.2: bytes=32 time=0ms TTL=128
Reply from 20.0.0.2: bytes=32 time=4ms TTL=128.
```

Task 2: Continue Nat configuration, by removing static nat commands , and configuring dynamic nat instead.

Configure Access-list that allows private addresses 10.0.0.0/8

Configure a pool of public addresses that allows two public IP addresses 15.0.0.3 & 15.0.0.4

Link between the ACL and the Pool

!R1

no ip nat inside source static 10.0.0.2 15.0.0.3

no ip nat inside source static 10.0.0.3 15.0.0.4

no ip nat inside source static 10.0.0.4 15.0.0.5

!

access-list 1 permit 10.0.0.0 0.255.255.255

ip nat pool cisco 15.0.0.3 15.0.0.4 netmask 255.0.0.0

ip nat inside source list 1 pool cisco

Verification:

The ping should be still working from two PCs at a time

Task3: Continue Nat configuration by configuring PAT

!R1

ip nat inside source list 1 interface fa0/1 overload.

Verification:

The ping should be working from all PCs,

you can issue the command show ip nat translation for further check

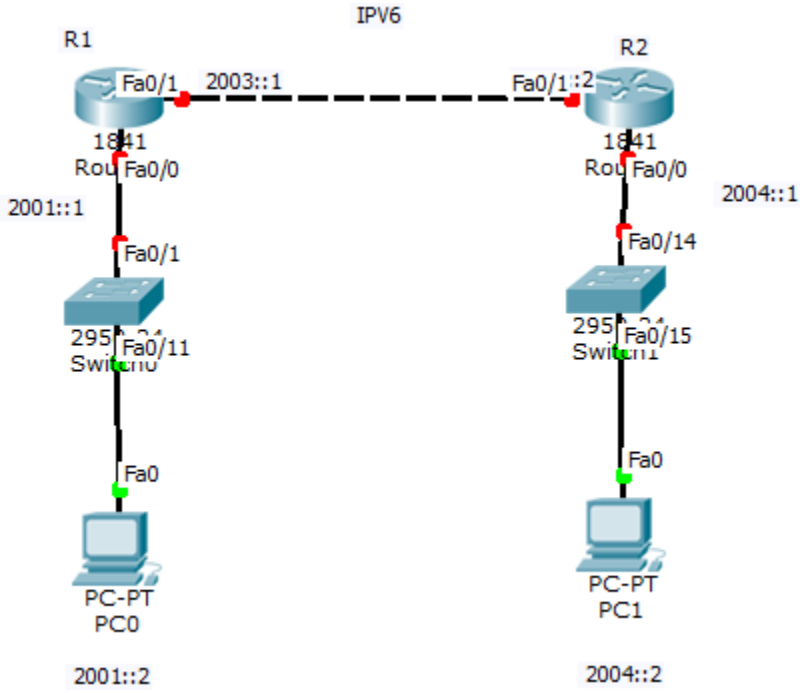
Lab# 14

IPv6

Objective:

The goal of this lab is to configure IPv6 addresses, and enable static and default routing

Diagram:



Preliminary Configuration:

- Connect the network as shown in the above figure

Task 1: Enable IPv6 routing, and assign IPv6 addresses to all interfaces on the routers, and configure static routing between the two routers

!R1

ipv6 unicast-routing

!

interface fa0/0

no shutdown

ipv6 address 2001::1/64

interface fa0/1

no shutdown

ipv6 address 2003::1/64

!
Ipv6 route 2004::/64 2003::2

!R2

ipv6 unicast-routing

!

interface fa0/0

no shutdown

ipv6 address 2004::1/64

interface fa0/1

no shutdown

```
ipv6 address 2003::2/64

!
Ipv6 route 2001::/64 2003::1
```

Verification:

ping between the PCs should be working fine.

Task 2:

Remove the static route and configure default route on both routers

```
!R1
No ipv6 route 2004::/64 2003::2
Ipv6 route ::/0 2003::2

!R2
No ipv6 route 2001::/64 2003::1
Ipv6 route ::/0 2003::1
```

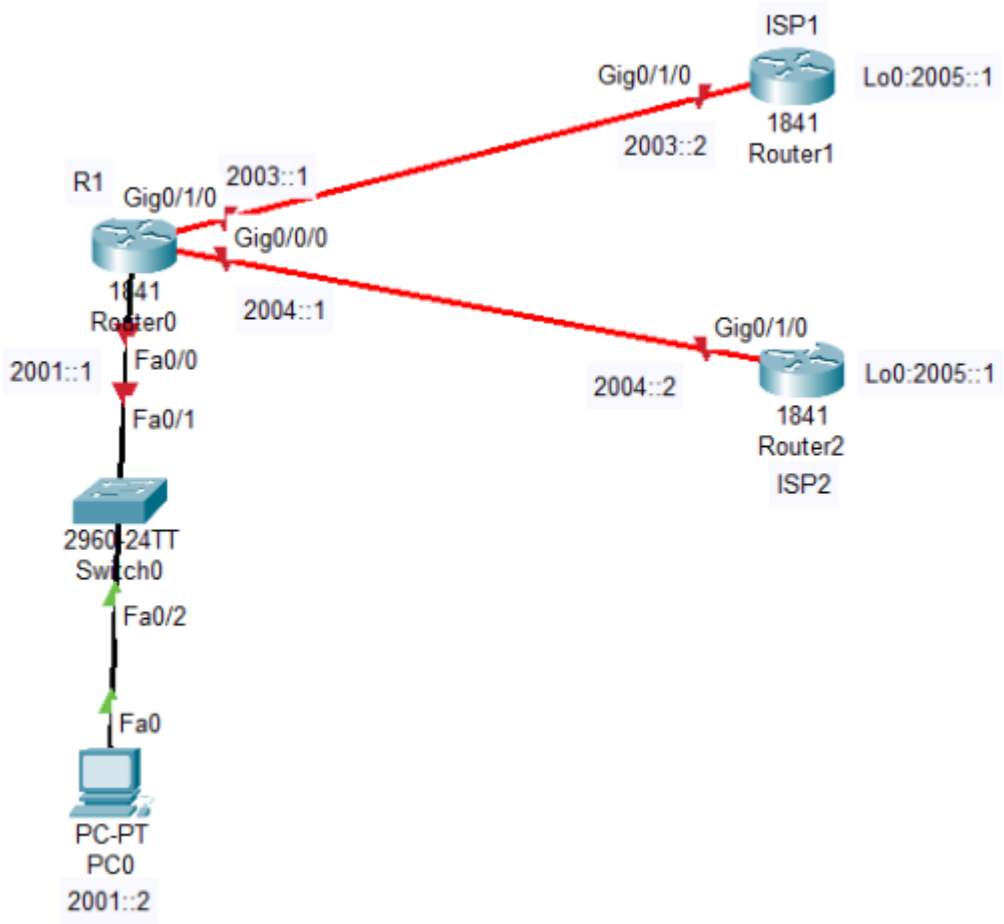
Lab# 15

IPv6 Floating Static Route

Objective:

The goal of this lab is to configure IPv6 floating static routes, and to verify it

Diagram:



Task 1: Connect the above network and assign IP addresses as depicted. Configure ISP1 & ISP2 for reverse static routes pointing to 2001::/64 network. Then configure R1 with floating default routes by making ISP1 is the preferred route.

```
!R1
Ipv6 unicast-routing
!
Interface fa0/0
No shutdown
Ipv6 address 2001::1/64
!
Interface g0/1/0
No shutdown
Ipv6 address 2003::1/64
Exit
!
Interface g0/0/0
No shutdown
Ipv6 address 2004::1/64
Exit
!
Ipv6 route ::/0 2003::2 5
Ipv6 route ::/0 2004::2 10


!!SP1
Ipv6 unicast-routing
Interface g0/1/0
No shutdown
Ipv6 address 2003::2/64
Exit
!
Interface lo0
Ipv6 address 2005::1/64
Exit
Ipv6 route 2001::/64 2003::1

!ISP2
Ipv6 unicast-routing
Interface g0/1/0
No shutdown
Ipv6 address 2004::2/64
```

```
Exit
!
Interface lo0
Ipv6 address 2005::1/64
Exit
Ipv6 route 2001::/64 2004::1
```

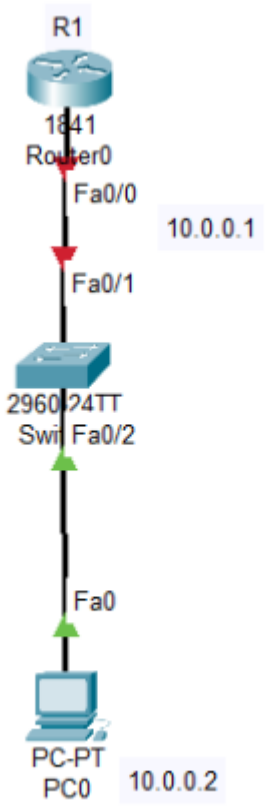
Lab# 16

SSH Configuration

Objective:

The goal of this lab is to configure SSH on Cisco router and to verify it.

Diagram:



Task 1: Connect the above network, and configure R1 to be ssh enabled with local username and password as authentication method.

```
!R1
Interface fa0/0
No shutdown
Ip address 10.0.0.1 255.0.0.0
Exit
!
Hostname R1
Ip domain-name cisco.com
Crypto key generate rsa modulus 1024
Username ccna privilege 15 password cisco
Line vty 0 4
Login local
Transport input ssh
```

!Verification

From the PC command line

```
Ssh –l ccna 10.0.0.1
Password:
```

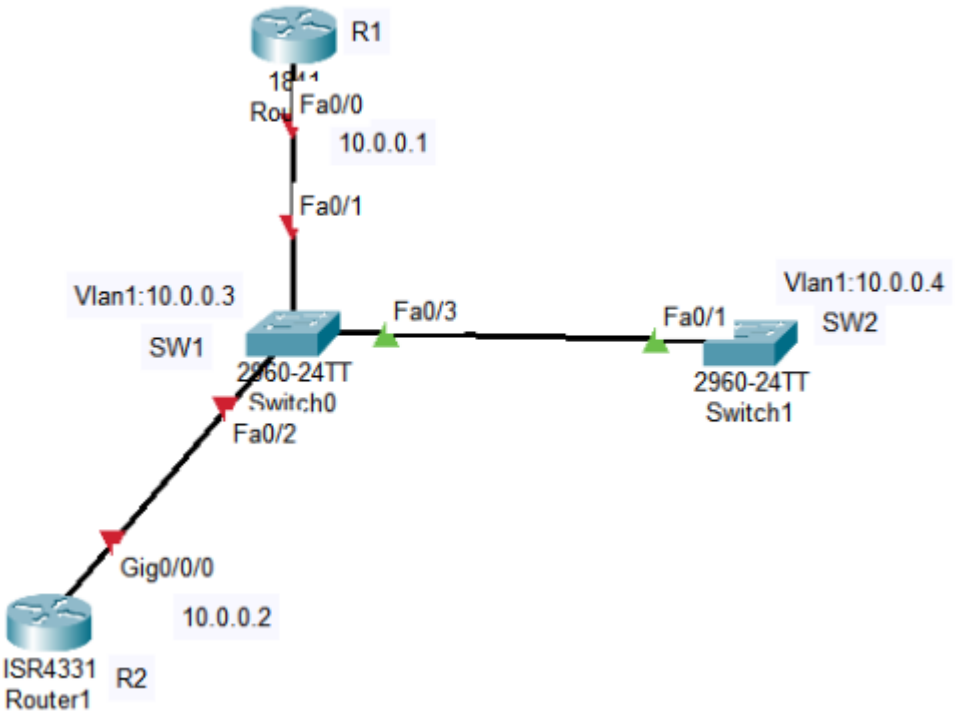
Lab# 17

CDP & LLDP Configuration

Objective:

The goal of this lab is to configure and verify CDP and LLDP configuration on Cisco Routers and Switches.

Diagram:



Task 1: Connect the above network, and assign IP addresses as shown in the figure, and verify the cdp neighbor status

!R1
Hostname R1
!
Interface fa0/0
No shutdown
Ip address 10.0.0.1 255.0.0.0

!

!R2
Hostname R2
!
Interface g0/0/0
No shutdown
Ip address 10.0.0.2 255.0.0.0
Exit

!SW1
Hostname SW1
!
Interface vlan 1
No shutdown
Ip address 10.0.0.3 255.0.0.0

!SW2
Hostname SW2
!
Interface vlan 1
No shutdown
Ip address 10.0.0.4 255.0.0.0

!Verification
!SW1
Show cdp neighbor

Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone

Device ID	Local Intrfce	Holdtme	Capability	Platform	Port ID
Switch	Fas 0/3	118	S	2960	Fas 0/1
Router	Fas 0/1	110	R	C1841	Fas 0/0
Router	Fas 0/2	133	R	ISR4300	Gig 0/0/0
R1	Fas 0/1	170	R	C1841	Fas 0/0
SW2	Fas 0/3	178	S	2960	Fas 0/1

Show cdp neighbor detail

Device ID: R1
Entry address(es):
IP address : 10.0.0.1
Platform: cisco C1841, Capabilities: Router
Interface: FastEthernet0/1, Port ID (outgoing port): FastEthernet0/0
Holdtime: 128

Version :
Cisco IOS Software, 1841 Software (C1841-ADVIPSERVICESK9-M), Version 12.4(15)T1, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2007 by Cisco Systems, Inc.
Compiled Wed 18-Jul-07 04:52 by pt_team

advertisement version: 2
Duplex: full

Device ID: SW2
Entry address(es):
IP address : 10.0.0.4
Platform: cisco 2960, Capabilities: Switch
Interface: FastEthernet0/3, Port ID (outgoing port): FastEthernet0/1
Holdtime: 135

Version :
Cisco IOS Software, C2960 Software (C2960-LANBASEK9-M), Version 15.0(2)SE4, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2013 by Cisco Systems, Inc.
Compiled Wed 26-Jun-13 02:49 by mnguyen

advertisement version: 2
Duplex: full

Device ID: R2
Entry address(es):
IP address : 10.0.0.2
Platform: cisco ISR4300, Capabilities: Router
Interface: FastEthernet0/2, Port ID (outgoing port): GigabitEthernet0/0/0
Holdtime: 151

Version :
Cisco IOS Software [Everest], ISR Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Version 16.6.4,RELEASE SOFTWARE (fc3)

Technical Support: http://www.cisco.com/techsupport

Compiled Sun 08-Jul-18 04:33 by mcpre

advertisement version: 2
Duplex: full

Task 2: Enable LLDP on all devices, and then verify the LLDP neighbor status

!R1/R2/SW1/SW2
Lldp run

!SW1
Show lldp neighbor

Capability codes:
(R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device
(W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other

Device ID	Local Intf	Hold-time	Capability	Port ID
R2	Fa0/2	120	R	Gig0/0/0
SW2	Fa0/3	120	B	Fa0/1
R1	Fa0/1	120	R	Fa0/0

Total entries displayed: 3

Show lldp neighbor detail

Chassis id: 0005.5E1D.D801
Port id: Gig0/0/0
Port Description: GigabitEthernet0/0/0
System Name: R2
System Description:
Cisco IOS Software [Everest], ISR Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Version 16.6.4,RELEASE SOFTWARE (fc3)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2018 by Cisco Systems, Inc.
Compiled Sun 08-Jul-18 04:33 by mcpre
Time remaining: 90 seconds
System Capabilities: R
Enabled Capabilities: R
Management Addresses - not advertised
Auto Negotiation - supported, enabled
Physical media capabilities:

100baseT(FD)
1000baseT(FD)
Media Attachment Unit type: 10
Vlan ID: 1

Chassis id: 0009.7C98.B401
Port id: Fa0/1
Port Description: FastEthernet0/1
System Name: SW2
System Description:
Cisco IOS Software, C2960 Software (C2960-LANBASEK9-M), Version 15.0(2)SE4, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2013 by Cisco Systems, Inc.
Compiled Wed 26-Jun-13 02:49 by mnguyen
Time remaining: 90 seconds
System Capabilities: B
Enabled Capabilities: B
Management Addresses - not advertised
Auto Negotiation - supported, enabled
Physical media capabilities:
100baseT(FD)
100baseT(HD)
1000baseT(HD)
Media Attachment Unit type: 10
Vlan ID: 1

Chassis id: 000D.BD01.AD01
Port id: Fa0/0
Port Description: FastEthernet0/0
System Name: R1
System Description:
Cisco IOS Software, 1841 Software (C1841-ADVIPSERVICESK9-M), Version 12.4(15)T1, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2007 by Cisco Systems, Inc.
Compiled Wed 18-Jul-07 04:52 by pt_team
Time remaining: 90 seconds
System Capabilities: R
Enabled Capabilities: R
Management Addresses - not advertised
Auto Negotiation - supported, enabled
Physical media capabilities:
100baseT(FD)
100baseT(HD)
Media Attachment Unit type: 10
Vlan ID: 1

Total entries displayed: 3

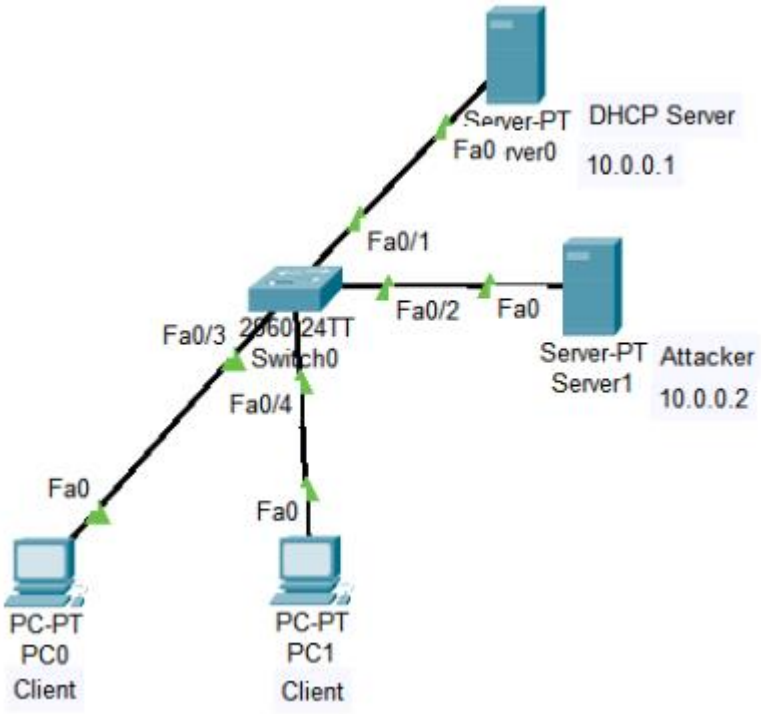
Lab# 18

DHCP Snooping

Objective:

The goal of this lab to configure and verify dhcp snooping in lan network.

Diagram:



Task 1: Connect the above network, assign IP addresses to the DHCP server and the attacker as depicted in the figure. Then enable dhcp snooping in the switch, and make sure that port1 is dhcp snooping trusted port.

!SW
Ip dhcp snooping
Ip dhcp snooping vlan 1
!
Int fa0/1
Ip dhcp snooping trust

Task 2: Enable the DHCP Service on the DHCP Server to dynamically assign IP addresses starting from 10.0.0.10 and for 10 clients only. Then make the Attacker to be configured for DHCP as well for the range starting from 10.0.0.20 and for 10 ip addresses as well.

!Verification

We can notice the clients are getting ip address from the trusted dhcp server

If we shutdown the port of the switch that is connected to the trusted dhcp server, we can notice that the clients are not getting ip addres from the attacker because of the dhcp snooping feature enabled on the switch

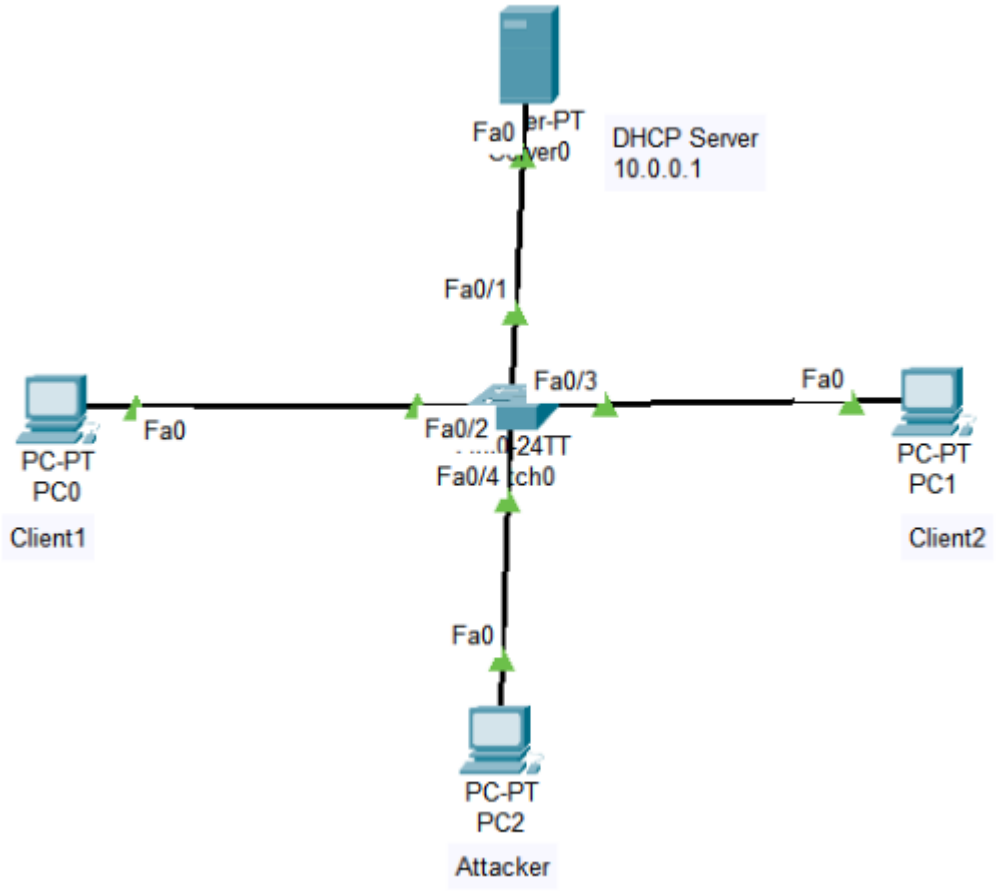
Lab# 19

Dynamic ARP Inspection

Objective:

The goal of this lab is to configure and verify Dynamic ARP Inspection

Diagram:



Task 1: Connect the network as shown in the diagram, enable the DHCP server to dynamically assign ip addresses to the client starting 10.0.0.10.
Before connecting the attacker to the network, assign it ip address similar to client1 then connect the attacker to the network.
Make a ping from the attacker to Client2, and you can notice the ping is working

successfully (IP Spoofing happened)

Task 2: Repeat the process again, but start first by enabling dhcp snooping and dynamic arp inspection on the switches, then configure the port that connected to the dhcp server as trust port. Then allow client1, and client2 to get ip address dynamically from the dhcp server. Then try to make the same previous process of the attacker trying to sppof client1 ip address. This time, the process will not work because of the dynamic arp inspection feature.

!SW
Ip dhcp snooping
Ip dhcp snooping vlan 1
Ip arp inspection vlan 1
!
Interface fa0/1
Ip dhcp snooping trust

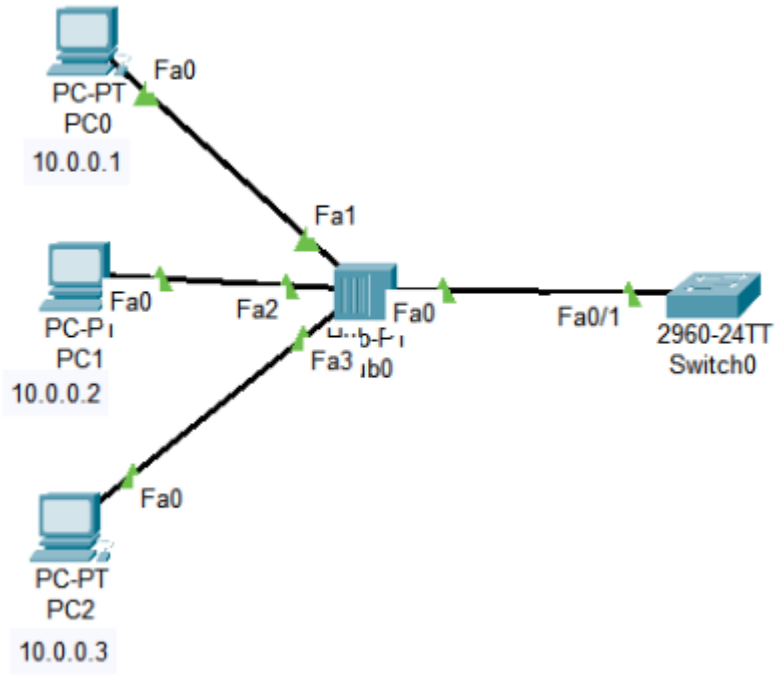
Lab# 20

Port Security

Objective:

The goal of this lab is to configure and verify Switch Port Security Configuration

Diagram:



Task 1: Connect the network as shown in the diagram, and assign IP addresses to the PCs as depicted. Then Configure Port 1 in the switch with port security enabled, and try to make a ping from two different PCs and check the port is moved to down state due the security violation.

!SW
Interface fa0/1
Switchport mode access
Switchport port-security

Task 2: Modify the configuration, so that port 1 is configured to be mac-address sticky, with maximum number of users allowed to be set to 1 and the violation to be shutdown

```
!SW
Interface fa0/1
Switchport mode access
Switchport port-security
Switchport port-security maximum 1
Switchport port-security violation shutdown
```

Task 3: Modify the configuration with static mac-address, and maximum mac-addresses to be 1 with shutdown violation

```
!SW
Interface fa0/1
No switchport port-security mac-address sticky
Switchport port-security mac-address aaaa.aaaa.aaaa

!Where aaaa.aaaa.aaaa is pc1 mac-address
```

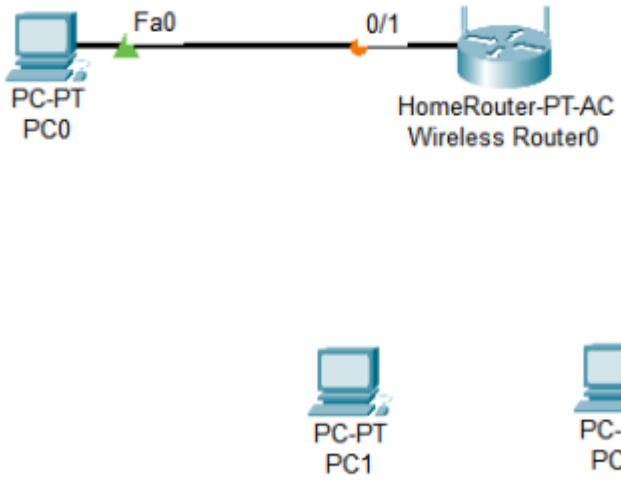
Lab# 21

Wireless LAN Configuration

Objective:

The goal of this lab is to wireless access point with ssid, and enable wpa2 personal security

Diagram:



Task 1: Connect the network as shown in the diagram. Make PC1 to get IP address dynamically from the wireless router. Then use the following parameters to login gui from PC0 to to the router.

Wireless Router IP address: 192.168.0.1
Username: admin
Password: admin

Task 2: Set the wireless SSID to be Network Plus, and the security to be WPA2 Personal with preshared key Cisco@123

Wireless SSID

Wireless>Basic Wireless Settings>Network Name (SSID)>Network Plus

Security

Wireless>Wireless Security> 2.4Ghz Security Mode>WPA2 Personal >
Passphrase:Cisco@123

!Don't forget to save the configuration after each step

!Verification

Test the PCs to connect to the wireless router using PC wireless client utility