Laboratory Problem List

Experiment No: 01
Name of the Experiment: Configure Wired Local Area Network (LAN)
Required Software: Cisco Packet Tracer
Required Component:

a) Switch (2960).
b) UTP Cable (Straight Through).
c) End Device (Desktop, Laptop, Printer etc).
d) IP Address (192.168.0.1).

Description: A Local Area Network (LAN) is a group of devices connected within a confined physical space, like a building, office, or home. It can vary in size, from a simple home setup with one or a few devices to a large enterprise network with thousands of connected devices. The defining feature of a LAN is its geographic limitation, meaning all connected devices are within a single area.

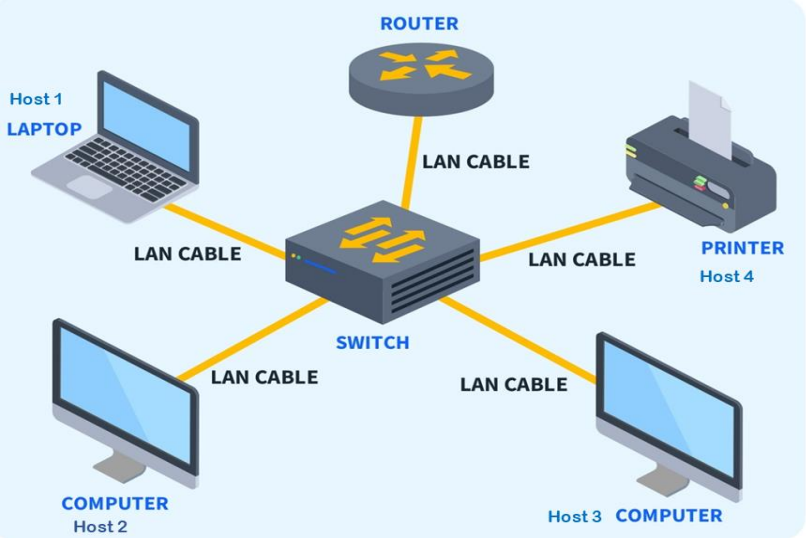

Figure 1: A Local area network with its end devices.

In contrast, networks like Wide Area Networks (WANs) and Metropolitan Area Networks (MANs) cover broader geographic regions and often interconnect multiple LANs.

Configuration Procedure:

a) Drag and Drop a switch (2960) on CISCO Packet Tracer interface.
b) Take some end devices like PC, Laptop, Printer which supports NIC Card with RJ45 connector. For printer connected at first power off the printer then plug out the module and plug in PT-HOST-NM-1CGE module.
c) Choose Copper "Straight Through" UTP Cable for connect ion.
d) Click on switch and select the specific port no for new connection.
e) Repeat procedure (4) as much your end device remain connection less.
f) Double click on an end device and you can see this interface is by default on "Physical" tab.
g) Select Desktop tab and click on "IP Configuration"
h) Put IP Address and Click on submit section Subnet Mask will take automatically and same procedure for printer also.
i) Just close the section.
j) Put IP Address on all the remaining end device.

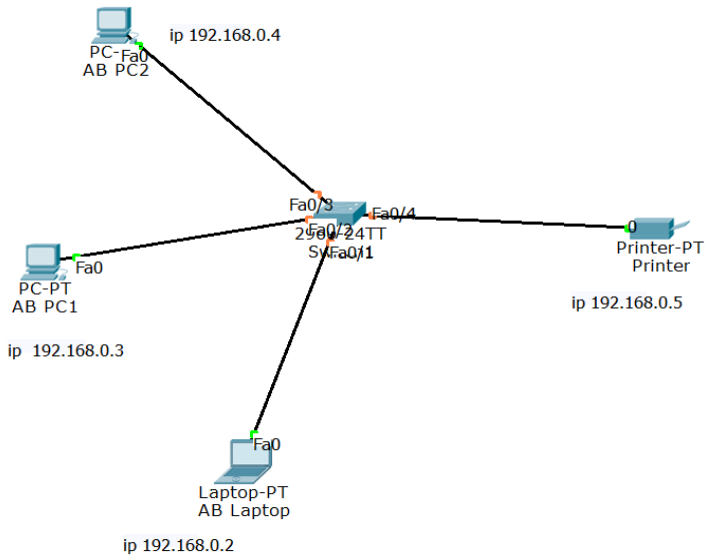

Figure 2: A Local area network with its end devices using cisco packet tracer.

Simulation Process:

First way:

a) Select a packet (Simple PDU) from right side bar. Mouse pointer will change with packet symbol.
b) Select first a PC and then select another PC with packet symbol pointer.
c) It implies that a packet will flow from first device to second device.
d) Then you can see successful notification right side bottom section.
Figure 2: A Local area network with its end devices.

Second way:

a) Double click on PC, select "Desktop" tab, Click on "Command Prompt"
For example AB PC1 IP 192.168.0.3 and it will ping with printer IP 192.168.0.5.
b) write down "ping 192.168.0.5" press enter (same process for all).

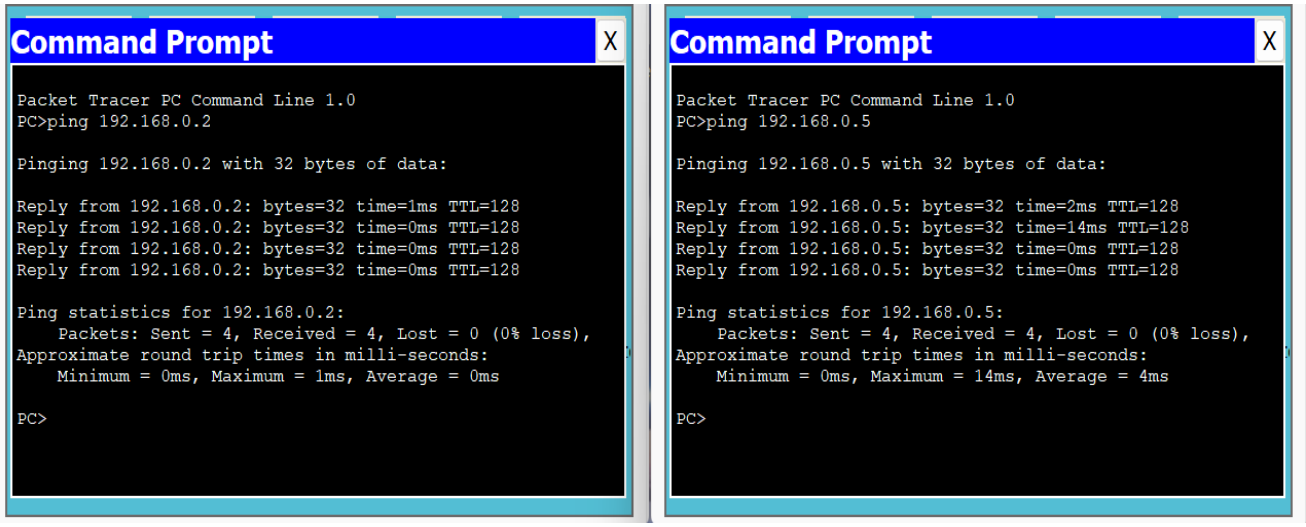

Figure 3: Packet send using command prompt.

Experiment No: 02
Name of the Experiment: Configure Wireless Local Area Network (**WLAN**)
Required Software: Cisco Packet Tracer
Required Component:

a) Router Wireless (Linksys-WRT300N)
b) End Device (Desktop, Laptop, PDA)
c) IP Address (192.168.1.0)

Description: A Wireless Local Area Network (WLAN) is a type of LAN that connects devices within a limited area using wireless technology, typically through Wi-Fi. Unlike traditional wired LANs, WLANs enable devices to connect without physical cables, offering greater mobility and flexibility. WLANs are common in homes, offices, schools, and public spaces.

Figure 1: A Wireless Local area network (WLAN) with its some end devices.

Key features of a WLAN include:

- **Wireless Access Points (APs)**: Devices like routers or dedicated access points broadcast a Wi-Fi signal, allowing devices to connect to the network.
- **Mobility**: Users can move freely within the network's range while maintaining connectivity.
- **Scalability**: New devices can be added easily without the need for additional cabling.
- **Security Protocols**: WLANs use security measures like WPA3, WPA2, or WEP to protect against unauthorized access.

Configuration Procedure:

a) Drag and Drop a wireless router as Linksys-WMP300N and some end device like (PC,Laptop,PDA,Tablet) which support wireless communication on CISCO Packet Tracer interface.

For Desktop PC, Laptop, PDA and Tablet

b) Double click on PC-PT then by default "Physical" tab. first power off your pc then plug out the existing port insert Linksys-WMP300N Module on this pc.
c) power on your device.
For laptop same procedure will apply. Now desktop and laptop are ready to communicate.
For PDA and Tablet PC are built in Linksys-WMP300N Module. So can not insert it.

Router configuration

d) Double Click and go to "Config" tab. Then select wireless.
e) now give a name to your access point (SSID as Admin)
f) Select an authentication type. By default it will Disabled we will check out "WPA-PSK" and set password 123456789 and colse it.

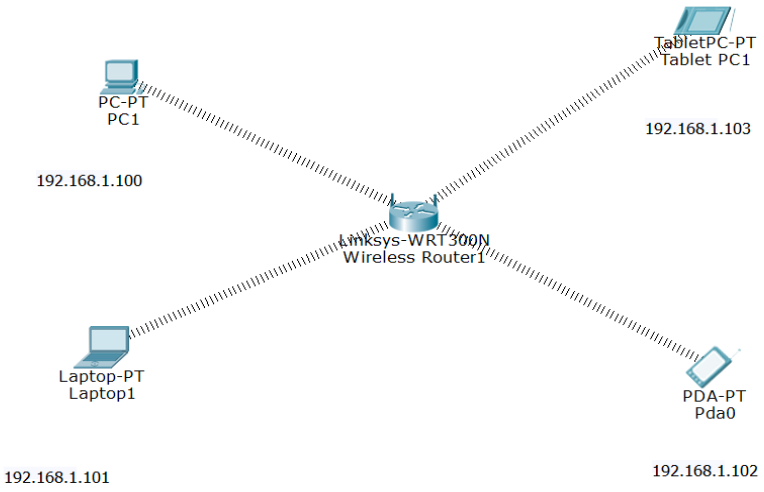

Figure 2: A Wireless Local area network (WLAN) with its some end devices using cisco packet tracer.

Connect End devices (Desktop PC, Laptop, PDA and Tablet)

g) In PC1 double click then select Desktop, configure IP Address as 192.168.1.100 subnet masking automatically 255.255.255.0 and set the default getway192.168.1.1

h) Select config from Global select wireless0 then change the SSID as Admin and from authentication set WPA-PSK" and password 123456789.
Same procedure for laptop ,PDA and Tablet.

Simulation Process:

First way:

a) Select a packet (Simple PDU) from right side bar. Mouse pointer will change with packet symbol.
b) Select first a PC and then select another PC with packet symbol pointer.
c) It implies that a packet will flow from first device to second device.
d) Then you can see successful notification right side bottom section.

Second way:

a) Double click on PC, select "Desktop" tab, Click on "Command Prompt"
For example PC1 IP 192.168.1.100 and it will ping with printer IP 192.168.1.105
b) write down "ping 192.168.1.102" press enter (same process for all).

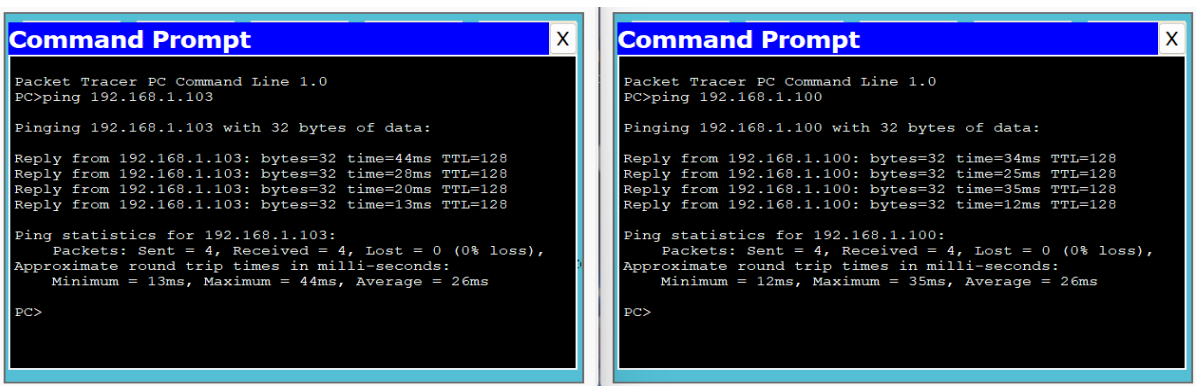

Figure 3: Packet send using command prompt..

Experiment No: 03
Name of the Experiment: Transfer packets through two different networks
Required Software: Cisco Packet Tracer
Required Component:

a) Switch
b) UTP Cable (Straight Through)
c) End Device (Desktop, Laptop etc)
d) IP Address (192.168.1.0, 192.168.2.0)
e) Router

Description: When transferring packets between two different networks on a single router, the router serves as an intermediary by having multiple interfaces, each connected to a distinct IP subnet. When a device from one subnet sends a packet destined for another subnet, the router examines the destination IP address, consults its routing table to determine the appropriate interface for the target network, and forwards the packet through that interface. The router utilizes protocols like ARP to resolve the destination device's MAC address within the target subnet, ensuring the packet reaches the correct device. This process enables seamless communication between separate networks by efficiently directing traffic based on network configurations and routing protocols, allowing devices on different subnets to interact as if they were part of a unified network while maintaining proper segmentation and management.

Configuration Procedure:

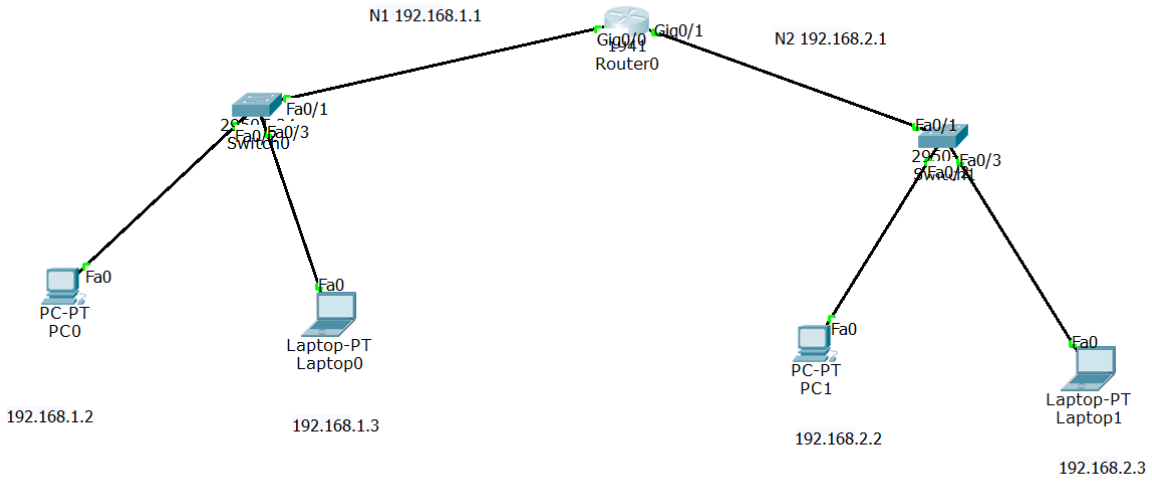

Figure 1: Packet transferring using two different network on cisco packet tracer.

a) Drag and Drop two switch one router and 4 end devices.
b) Select cable and connect two switch through router and then end device will connected with switch.
c) Double click on router, here this router by default two interface Gig 0/0 and Gig 0/1. those two interface are connected two different switch also two different network.
d) Click on CLI type no on the text edit option.
e) If you press yes then router will ask several question for his system maintains but all of those are not usable to us. so we just type no.
f) Router stay normally three stages. one is privilege mode then global config and Finlay specific configuration.

g) Now we are in privilege mode to promote global config type enable and press enter then you can see it's router symbol will change.
h) we are now global configuration mode so we need to access specific interface and configure it.
i) just write down "interface Gig 0/0" this is for interface Gig 0/0 of router. Then it need to add ip address so that just type e.g "ip address 192.168.1.1" then put subnet musk 255.255.255.0
j) By default every interface of Cisco device down state. So we need it to up. just write down "no shut" command.
k) go back to previlege mode by "exit" command.
l) finally write down "wr" to save configuration
m) we just configured only one interface. we need another one of different network with different ip address.
n) After configure the router we need to mention ip address of each end device.

CLI Command:

```
Continue with configuration dialog? [yes/no]: no
Press RETURN to get started!
Router>enable
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface gig0/0
Router(config-if)#ip add 192.168.1.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state
to up
Router(config-if)#exit
Router(config)#interface gig0/1
Router(config-if)#ip add 192.168.2.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state
to up
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#wr
Building configuration...
[OK]
Router#
```

Simulation Process:

a) Select a packet from right side bar. Mouse pointer will change with packet symbol.
b) Select first a PC and then select another PC with packet symbol pointer.
c) It implies that a packet will flow from first device to second device.
d) Then you can see successful notification right side bottom section.

Experiment No: 04
Name of the Experiment: Dynamic IP through DHCP
Required Software: Cisco Packet Tracer
Required Component:

a) Router (1841).
b) Switch (2950).
c) End Device (Desktop, Laptop).

Description: Dynamic Host Configuration Protocol (DHCP) is a network management protocol used to automatically assign IP addresses and configure other network settings (like subnet masks, default gateways, and DNS servers) to devices on a network. This allows devices to join a network and communicate with others without manual configuration, streamlining the setup process for network administrators.

Here's how DHCP works:

1. **Discovery**: A device (client) joins the network and sends a DHCP Discover message to find any available DHCP servers.
2. **Offer**: The DHCP server responds with a DHCP Offer message, proposing an IP address and other configuration information.
3. **Request**: The client replies with a DHCP Request message, indicating that it accepts the offered IP address and other settings.
4. **Acknowledgment**: The server sends a DHCP Acknowledgment message, confirming the IP address and providing any other settings the client needs.

With DHCP, the IP address is typically leased for a certain amount of time, meaning it can be reclaimed by the server once the lease expires or if the device disconnects. This system helps optimize IP address usage in networks, especially larger ones with many connected devices.

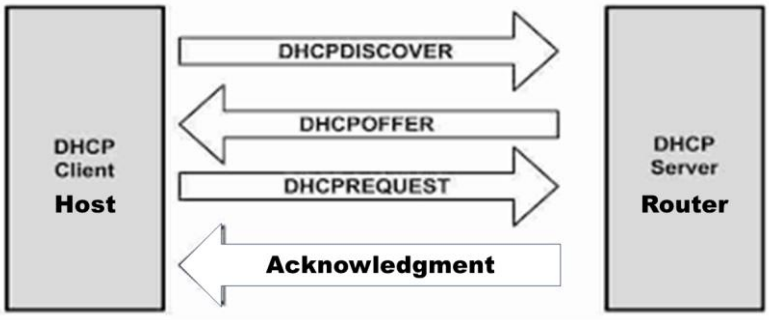

Figure 1: DHCP connection procedure.

Configuration Procedure:

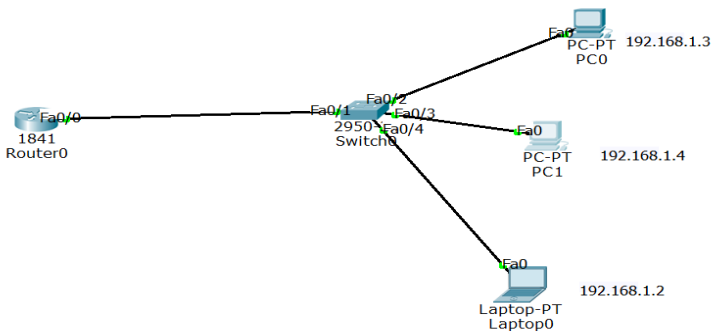

Figure 2: DHCP using cisco packet tracer.

a) Drag and Drop one switch one router and 3 or more end device.
b) Connect them UTP Straight Through Cable.
c) Double click on router and then click on CLI Mode.
d) enter privilege then global configuration mode.
e) Access an interface such as fa 0/0.
f) Assign ip and subnet musk then “no shut” to up this state.
g) exit from here to global configuration mode
h) write down the command “ipdhcp pool alamin”
i) Mention the network and then router default ip
j) exit and save change.
k) double click on select “Desktop” and click on “IP configuration”
l) click on DHCP to send a request for ip

CLI Command:

```
Continue with configuration dialog? [yes/no]: no
Press RETURN to get started!
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface fa0/0
Router(config-if)#ip address 192.168.1.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up
Router(config-if)#exit
Router(config)#ip dhcp pool alamin
Router(dhcp-config)#network 192.168.1.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.1.1
Router(dhcp-config)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#wr
Building configuration...
[OK]
Router#
```

Simulation Process:

First way:

a) Select a packet (Simple PDU) from right side bar. Mouse pointer will change with packet symbol.
b) Select first a PC and then select another PC with packet symbol pointer.
c) It implies that a packet will flow from first device to second device.
d) Then you can see successful notification right side bottom section.

Second way:

a) Double click on PC, select “Desktop” tab, Click on “Command Prompt”
For example PC1 IP 192.168.1.2 and it will ping with printer IP 192.168.1.3

b) write down “ping 192.168.1.3” press enter (same process for all)
Same process for all

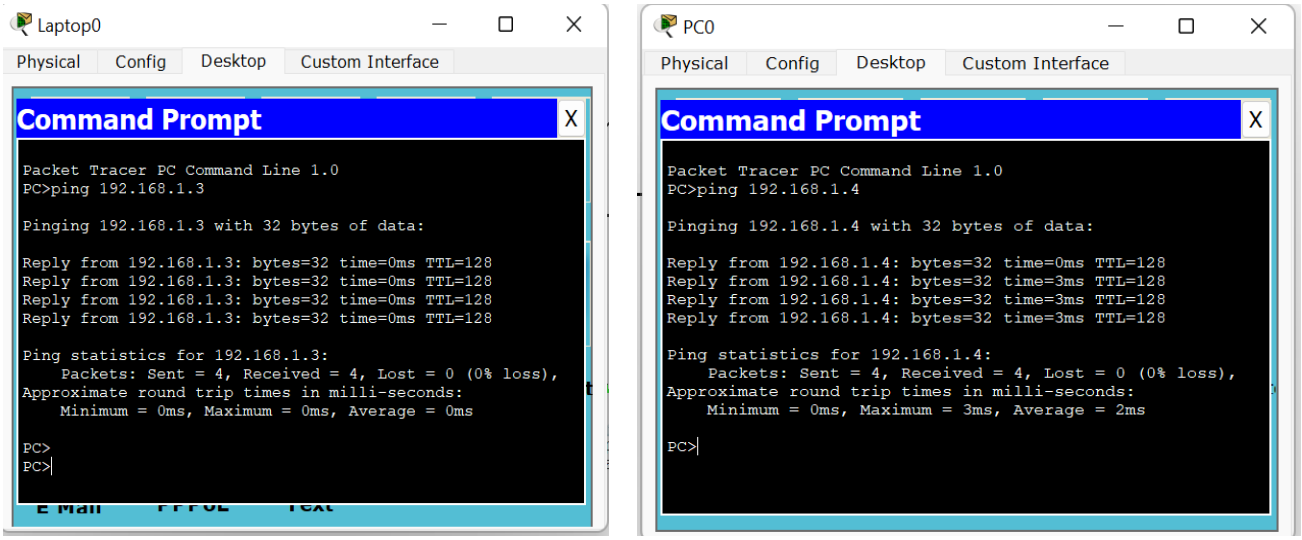

Figure 3: The simulation process using command prompt.

Experiment No: 05
Name of the Experiment: Configure Routing Information Protocol (RIP)

Required Software: Cisco Packet Tracer
Required Component:

a) Router
b) Switch
c) UTP Cable (Straight Through)
d) Ethernet crossover cable
e) End Device (Desktop, Laptop etc)

Description: The Routing Information Protocol (RIP) is a distance-vector routing protocol primarily designed for smaller networks, where simplicity and low resource requirements are advantageous. RIP determines the best route by using hop count as its metric, where each hop is a router along the path, and the maximum hop count allowed is 15. This limitation helps prevent routing loops but restricts RIP to smaller networks. RIP operates by sending periodic updates of the entire routing table to neighbouring routers every 30 seconds, which ensures that routers maintain up-to-date routing information but also generates considerable network traffic. The protocol has two versions: RIPv1, which is classful and does not support subnetting, and RIPv2, which is classless, supporting subnetting, multicasting, and authentication for added security. Techniques like split horizon and route poisoning are implemented in RIP to prevent routing loops. However, RIP's simplicity also leads to limitations, such as slow convergence and poor scalability, making it less suited for larger or highly dynamic networks. As a result, while RIP is easy to configure and maintain, it has largely been replaced by more robust protocols like OSPF and EIGRP in modern networks.

Configuration Procedure:

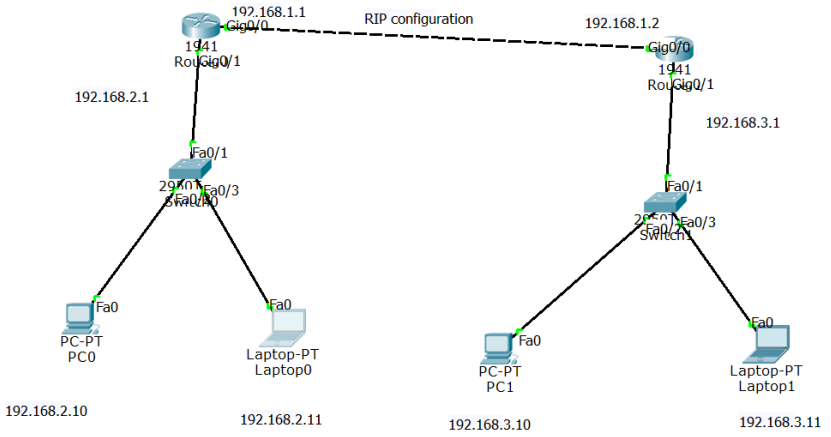

Figure 1: RIP Configuration using cisco packet tracer.

a) Drag and Drop Routers, Switches and PCs.
b) Select cable and make sure a proper connection.
c) Double click on router.
d) Click on CLI Tab.
e) First assign IP Address of on interface.
f) Assign RIP command.
g) Mention RIP version
h) Finally save this configuration

CLI Command:

Router0

```
Continue with configuration dialog? [yes/no]: no
Press RETURN to get started!
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int gig0/1
Router(config-if)#ip add 192.168.2.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
Router(config-if)#exit
Router(config)#int gig 0/0
Router(config-if)#ip add 192.168.1.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
Router(config-if)#exit
```

Router1

```
Continue with configuration dialog? [yes/no]: no
Press RETURN to get started!
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int gig0/1
Router(config-if)#ip add 192.168.3.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
Router(config-if)#exit
Router(config)#int gig0/0
Router(config-if)#ip add 192.168.1.2
% Incomplete command.
Router(config-if)#ip add 192.168.1.2 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
Router(config-if)#exit
```

Rip Configuration of Router0

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#net 192.168.1.0
Router(config-router)#net 192.168.2.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

```
Router#wr
Building configuration...
[OK]
```

Rip Configuration of Router1

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#net 192.168.1.0
Router(config-router)#net 192.168.3.0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#wr
Building configuration...
[OK]
Router#
```

Simulation Process:

IP Route:

```
Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, GigabitEthernet0/0
L       192.168.1.1/32 is directly connected, GigabitEthernet0/0
     192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, GigabitEthernet0/1
L       192.168.2.1/32 is directly connected, GigabitEthernet0/1
R    192.168.3.0/24 [120/1] via 192.168.1.2, 00:00:02, GigabitEthernet0/0
Router#
```

First way:

e) Select a packet (Simple PDU) from right side bar. Mouse pointer will change with packet symbol.
f) Select first a PC0 and then select another PC1 with packet symbol pointer.
g) It implies that a packet will flow from first device to second device.
h) Then you can see successful notification right side bottom section.

Second way:

c) Double click on PC, select “Desktop” tab, Click on “Command Prompt”
For example PC0 IP 192.168.2.10 and it will ping with printer IP 192.168.3.10
d) write down “ping 192.168.3.10” press enter (same process for all)
Same process for Laptop also.

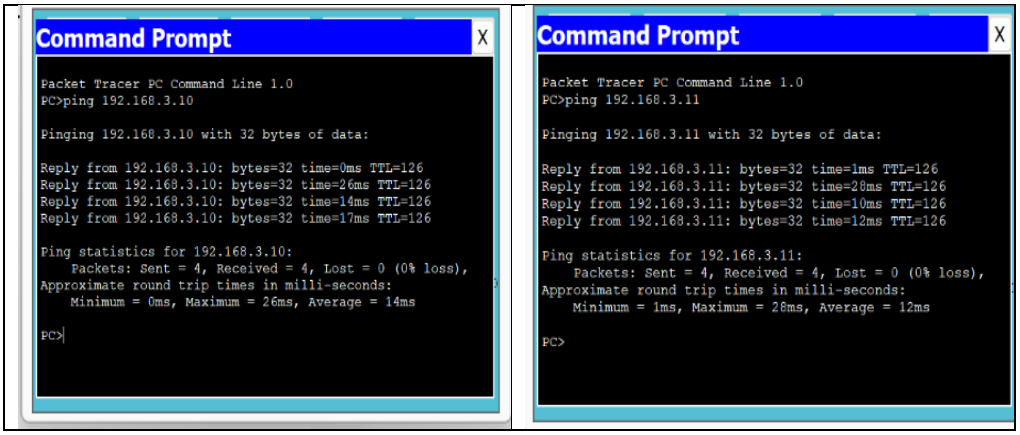

Figure 2: The simulation process using command prompt.

Experiment No: 06
Name of the Experiment: Configure Open Shortest Path First (OSPF) Routing Protocol
Required Software: Cisco Packet Tracer
Required Component:

a) Switch
b) UTP Cable (Straight Through)
c) Ethernet crossover cable
d) End Device (Desktop, Laptop etc)
e) Router

Description: Open Shortest Path First (OSPF) is a widely used link-state routing protocol designed for large and complex IP networks, known for its fast convergence and efficient route calculation. Unlike distance-vector protocols, OSPF maintains a complete map of the network topology, which enables routers to compute the shortest path to each destination using Dijkstra's algorithm. Each router within an OSPF area exchanges link-state advertisements (LSAs) with others, allowing the routers to construct a complete topology map and determine optimal routes based on various metrics, primarily link cost. OSPF supports hierarchical network design by dividing networks into areas, which helps reduce routing overhead and allows for scalability in larger networks. It also provides advanced features like load balancing, route authentication, and support for Variable Length Subnet Masking (VLSM). Due to its efficiency and adaptability, OSPF is widely deployed in enterprise and service provider networks where reliability and speed are essential.
OSPF is a link-state protocol optimized for large networks with fast convergence, RIP is a basic distance-vector protocol suited for small networks with a 15-hop limit, and EIGRP is an advanced distance-vector protocol (Cisco proprietary) with rapid convergence and scalability for larger networks.

Configuration Procedure:

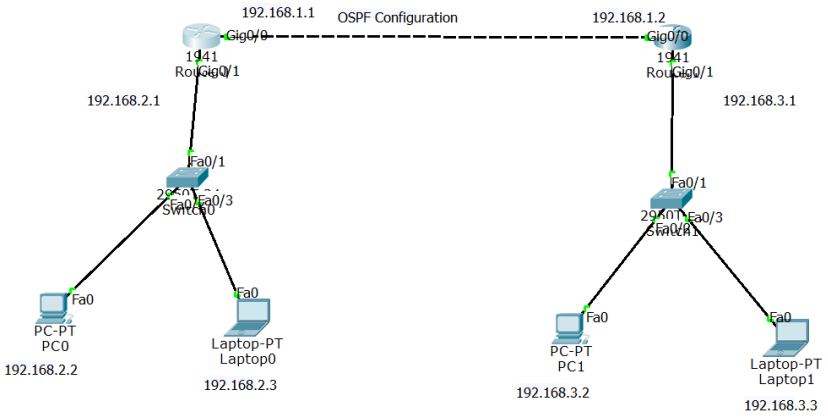

Figure 1: OSPF Configuration using cisco packet tracer.

a) **Drag and Drop Devices**: Place routers, switches, and PCs onto the workspace.
b) **Select and Connect Cables**: Choose the correct cables to connect the devices, ensuring proper connections.
c) **Access Router CLI**: Double-click the router, go to the **CLI** tab and write the cli code.
d) **Configure OSPF**:
Enter router ospf [process ID] (e.g., router ospf 1).

Set network with network [network address] [wildcard mask] area [area ID], e.g., network 192.168.1.0 0.0.0.255 area 0.

e) **Save Configuration**:
Return to exec mode by typing end.
Save with write memory or copy running-config startup-config.

CLI Command:

Router0

```
Continue with configuration dialog? [yes/no]: no
Press RETURN to get started!
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int gig0/1
Router(config-if)#ip add 192.168.2.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
Router(config-if)#exit
Router(config)#int gig0/0
Router(config-if)#ip add 192.168.1.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#
```

Router1

```
Continue with configuration dialog? [yes/no]: no
Press RETURN to get started!
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int gig0/1
Router(config-if)#ip add 192.168.3.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
Router(config-if)#exit
Router(config)#int gig0/0
Router(config-if)#ip add 192.168.1.2 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

Ospf Configuration of Router0

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router ospf 1
```

```
Router(config-router)#network 192.168.1.0 0.0.0.255 area 0
Router(config-router)#network 192.168.2.0 0.0.0.255 area 0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#wr
Building configuration...
[OK]
Router#
```

Ospf Configuration of Router1

```
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#net 192.168.1.0 0.0.0.255 area 0
Router(config-router)#net 192.168.3.0 0.0.0.255 area 0
Router(config-router)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#wr
Building configuration...
[OK]
Router#
```

Simulation Process:

IP Route:

```
Router#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/24 is directly connected, GigabitEthernet0/0
L       192.168.1.1/32 is directly connected, GigabitEthernet0/0
     192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, GigabitEthernet0/1
L       192.168.2.1/32 is directly connected, GigabitEthernet0/1
O    192.168.3.0/24 [110/2] via 192.168.1.2, 00:05:34, GigabitEthernet0/0
Router#
```

First way:

i) Select a packet (Simple PDU) from right side bar. Mouse pointer will change with packet symbol.
j) Select first a PC0 and then select another PC1 with packet symbol pointer.
k) It implies that a packet will flow from first device to second device.
l) Then you can see successful notification right side bottom section.

Second way:

e) Double click on PC, select “Desktop” tab, Click on “Command Prompt”

For example PC0 IP 192.168.2.2 and it will ping with printer IP 192.168.3.2

f) write down “ping 192.168.3.2” press enter (same process for all)

Same process for Laptop also.

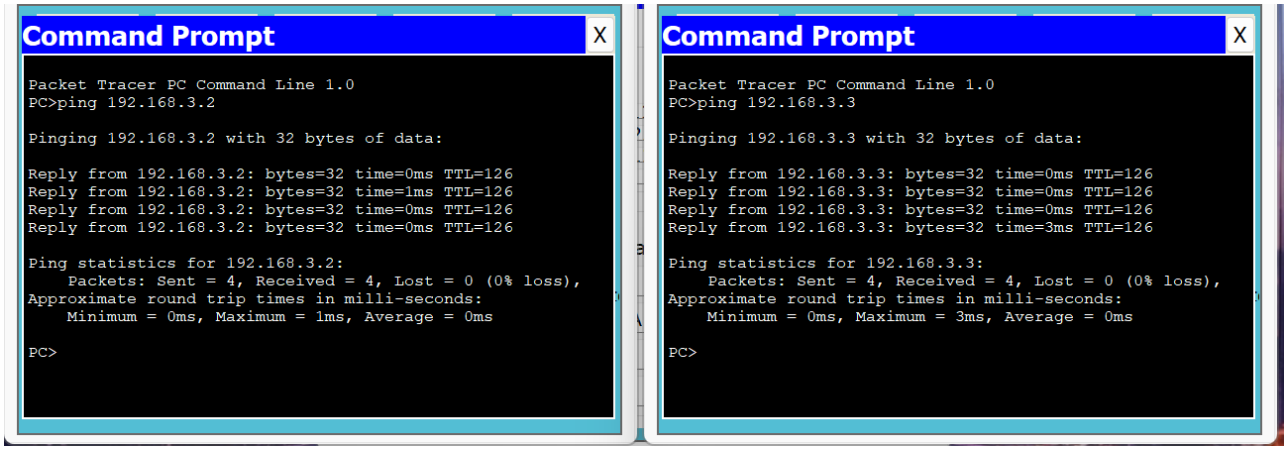

Figure 2: The simulation process using command prompt..

Experiment No: 07
Name of the Experiment: Configure Enhanced Interior Gateway Routing Protocol (EIGRP)
Required Software: Cisco Packet Tracer
Required Component:

a) Switch
b) UTP Cable (Straight Through)
c) Serial DCE cable
d) End Device (Desktop, Laptop etc.)
e) Router

Description: Enhanced Interior Gateway Routing Protocol (EIGRP) is an advanced hybrid routing protocol developed by Cisco, combining features of both distance-vector and link-state protocols. Designed for use within a single autonomous system, it offers efficient and rapid convergence due to its Diffusing Update Algorithm (DUAL), which ensures loop-free paths and pre-computes backup routes for quick recovery. EIGRP supports variable-length subnet masks (VLSM) and classless routing, enabling flexible and scalable network designs. Unlike traditional protocols, EIGRP only sends updates when topology changes occur, and only to affected routers, reducing bandwidth usage. It calculates routes based on a combination of metrics like bandwidth, delay, and optionally reliability and load, supporting both equal-cost and unequal-cost load balancing for improved performance. Although primarily used for IPv4, it also supports IPv6 and includes authentication features to secure routing information. EIGRP is especially popular in Cisco-based enterprise networks, where its efficiency and scalability make it a preferred choice over protocols like OSPF for internal routing.

Configuration Procedure:

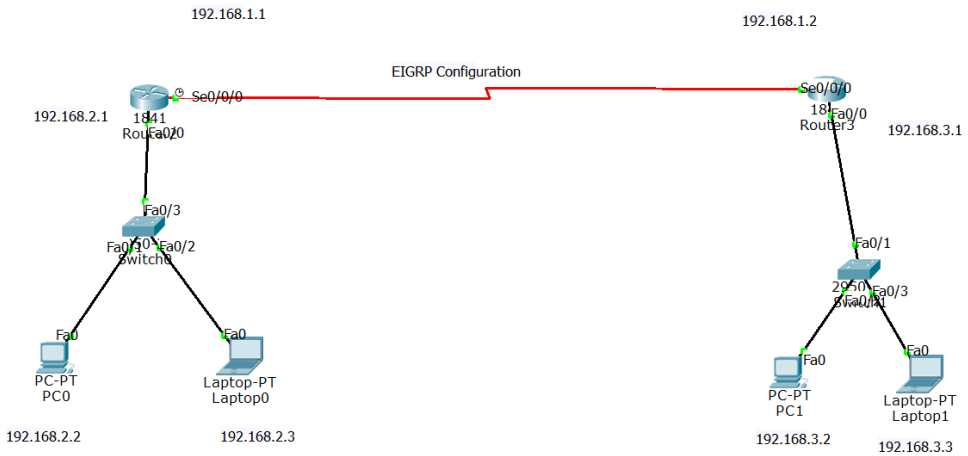

Figure 1: EIGRP Configuration using cisco packet tracer.

a) Drag and Drop Routers (2811), Switches and PCs.
b) Double click on router then by default “Physical” tab. first power off your router. We need to
add WIC-!T Module on this router. Then power on your router.
c) Select cable and make sure a proper connection.
d) Double click on router.
e) Click on CLI Tab.
f) First assign IP Address of on interface.
g) Assign EIGRP command. (eigrp then numerical value such as 1,2,3)
h) Mention network then subnet mask.
i) Finally save this configuration

CLI Command:

Router0

```
Continue with configuration dialog? [yes/no]: n
Press RETURN to get started!
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip add 192.168.2.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#int se0/0/0
Router(config-if)#ip add 192.168.1.1 255.255.255.0
Router(config-if)#clock rate 128000
Router(config-if)#no shut
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
```

Router1

```
Continue with configuration dialog? [yes/no]: no
Press RETURN to get started!
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int se0/0/0
Router(config-if)#ip add 192.168.1.2 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
Router(config-if)#int fa0/0
Router(config-if)#ip add 192.168.3.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

EIGRP Configuration Router0:

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router eigrp 10
Router(config-router)#net 192.168.1.0 255.255.255.0
Router(config-router)#net 192.168.2.0 255.255.255.0
Router(config-router)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
Router#
```

EIGRP Configuration Router1:

```
Router#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router eigrp 10
Router(config-router)#net 192.168.1.0 255.255.255.0
Router(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 10: Neighbor 192.168.1.1 (Serial0/0/0) is up: new adjacency
Router(config-router)#net 192.168.3.0 255.255.255.0
Router(config-router)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
```

Simulation Process:

IP Route:

```
Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is not set

C    192.168.1.0/24 is directly connected, Serial0/0/0
C    192.168.2.0/24 is directly connected, FastEthernet0/0
D    192.168.3.0/24 [90/20514560] via 192.168.1.2, 00:09:10, Serial0/0/0
Router#
```

First way:

a) Select a packet (Simple PDU) from right side bar. Mouse pointer will change with packet symbol.
b) Select first a PC0 and then select another PC1 with packet symbol pointer.
c) It implies that a packet will flow from first device to second device.
d) Then you can see successful notification right side bottom section.

Second way:

g) Double click on PC, select “Desktop” tab, Click on “Command Prompt”
For example PC0 IP 192.168.2.2 and it will ping with printer IP 192.168.3.2

h) write down “ping 192.168.3.2” press enter (same process for all)
Same process for Laptop also.

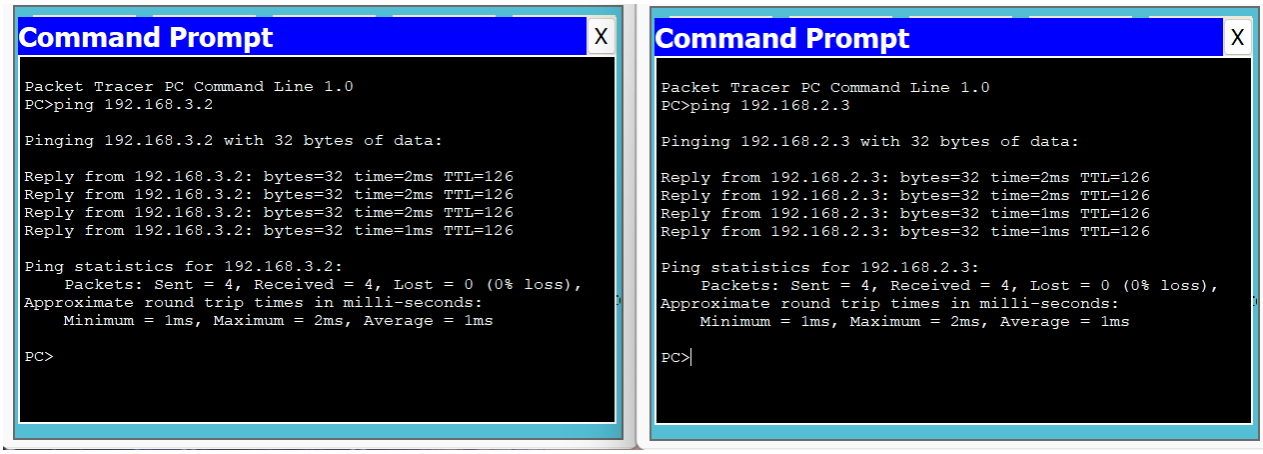

Figure 2: The simulation process using command prompt.

Experiment No: 08
Name of the Experiment: Configure Virtual Local Area Network (VLAN). **Required Software:** Cisco Packet Tracer
Required Component:

a) Switch
b) UTP Cable (Straight Through)
c) Serial DCE cable
d) End Device (Desktop, Laptop etc.)

Description: A **Virtual Local Area Network (VLAN)** is a networking technique used to logically divide a physical network into multiple isolated virtual networks. By creating VLANs, administrators can group devices based on function, department, or security requirements, regardless of their physical location. This segmentation enhances security by isolating traffic between different groups, improves network efficiency by reducing broadcast traffic, and simplifies management by allowing logical groupings without altering physical cabling. For example, VLANs can separate sensitive areas within a corporate network, like HR and finance, from other departments, or create a dedicated guest network in a business, ensuring that guest users can access the internet without gaining access to internal resources. VLANs offer flexibility, enabling easy scaling and reorganization as network requirements evolve, and are widely used in corporate, educational, and public networks for efficient, secure traffic management.

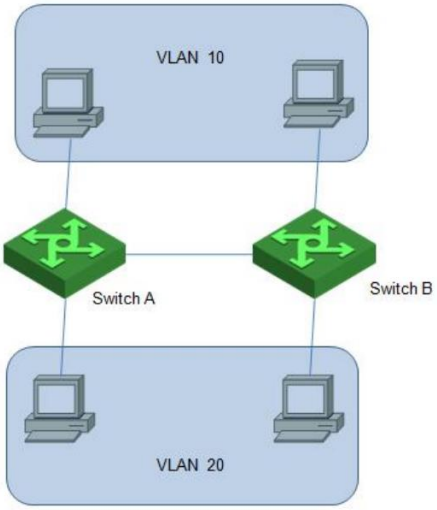

Figure 1: A Virtual Local Area Network (VLAN) with its end devices.

Configuration Procedure:

a) Open Cisco Packet Tracer.

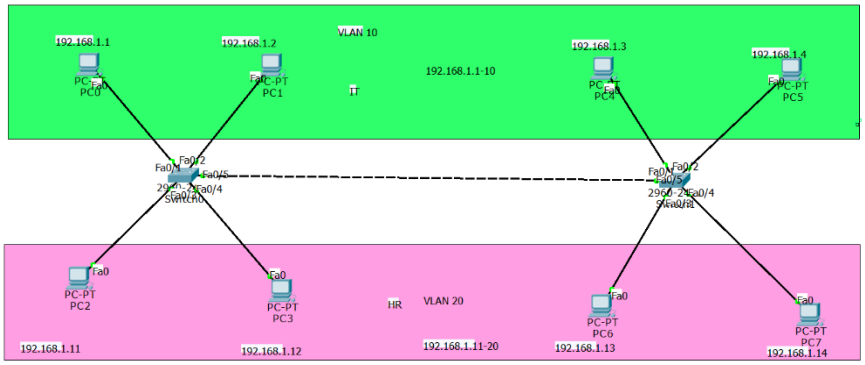

Figure 2: A Virtual Local Area Network (VLAN) with its end devices using Cisco Packet Tracer.

b) Pick up two switches from the network devices.
c) Pick up four PCs for each switch from end devices.
d) Connect the switches with each other using Copper Cross-Over.
e) Connect the remaining components using Copper Straight-Through.
f) Consider the VLAN names as follows:
   - IT department VLAN as "vlan 10".
   - HR department VLAN as "vlan 20".
g) For VLAN configuration, enter the following CLI commands in each switch:

CLI Command:

Switch0:

```
Switch>en
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name IT
Switch(config-vlan)#exit
Switch(config)#vlan 20
Switch(config-vlan)#name HR
Switch(config-vlan)#exit
Switch(config)#int fa0/1
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#int fa0/2
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#int fa0/3
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#int fa0/4
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console
```

Switch1:

```
Switch>en
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#vlan 20
Switch(config-vlan)#int fa0/3
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#int fa0/4
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#int fa0/1
Switch(config-if)#switchport access vlan 10
% Access VLAN does not exist. Creating vlan 10
Switch(config-if)#exit
Switch(config)#int fa0/2
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
```

```
Switch(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/5, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/5, changed state to up
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console
```

Switch0 for connecting Switch1:

```
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int fa0/5
Switch(config-if)#switchport mode trunk
Switch(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/5, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/5, changed state to up
Switch(config-if)#exit
Switch(config)#int range fa0/1-4
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console
Switch#wr
Building configuration...
[OK]
Switch#show vlan brief

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    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, Gig1/1
                                                 Gig1/2
10   IT                                active    Fa0/1, Fa0/2
20   HR                                active    Fa0/3, Fa0/4
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
```

Switch1 for connecting switch0:

```
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int fa0/5
Switch(config-if)#switchport mode trunk
Switch(config-if)#exit
Switch(config)#int range fa0/1-4
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console
Switch#wr
```

```
Building configuration...
[OK]
Switch#show vlan brief

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    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, Gig1/1
                                                 Gig1/2
10   VLAN0010                          active    Fa0/1, Fa0/2
20   VLAN0020                          active    Fa0/3, Fa0/4
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
Switch#
```

Simulation Process:

First way:

a) Select a packet (Simple PDU) from right side bar. Mouse pointer will change with packet symbol.
b) Select first a PC0 and then select another PC1 with packet symbol pointer.
c) It implies that a packet will flow from first device to second device.
d) Then you can see successful notification right side bottom section.

Second way:

i) Double click on PC, select "Desktop" tab, Click on "Command Prompt"
For example PC0 IP 192.168.1.1 and it will ping with printer IP 192.168.1.4
j) write down "ping 192.168.1.4" press enter (same process for all)
Same process for vlan20 also.

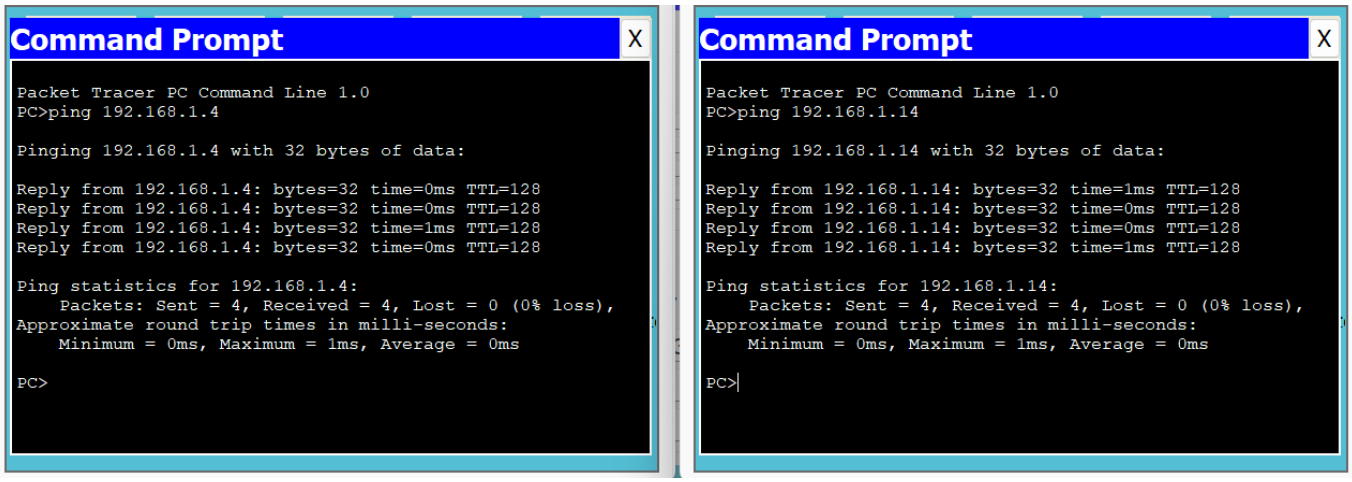

Figure 3: The simulation process using command prompt.