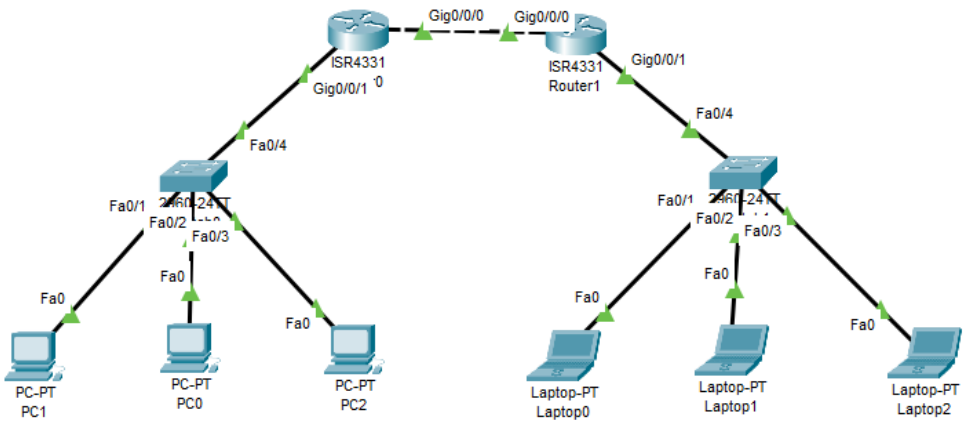
Experiment Name: Design and Configure a Network Infrastructure with Two Networks Connected by a Cisco Router Using Static Routing

Objective: To design and implement a simple network topology where two LANs are connected via a Cisco router and to configure static routing between them for proper communication.

Theory Study:

- Computer Network: A system of interconnected devices that communicate to share resources.
- Network Design: Involves connecting devices using switches and routers, assigning IP addresses, and ensuring communication between networks.
- IP Addressing: Each device gets a unique IP address. Subnet masks help define the network and host portions.
- Switch: A Layer 2 device used to connect devices in the same local network (LAN)
- Router: A Layer 3 device that connects different networks and routes data between them
- Static Routing: A manual method of routing where specific paths are set by the network admin. It's simple and used in small networks for predictable routing.

Topology:



Router Configuration :(cli code)

Configuration Router R1:

```
Router> enable
Router# configure terminal
Router(config)# hostname R1

R1(config)# interface serial 0/0/0
R1(config-if)# ip address 172.150.1.1 255.255.255.252
R1(config-if)# clock rate 64000
R1(config-if)# no shutdown
R1(config-if)# exit

R1(config)# interface fastEthernet 0/0
R1(config-if)# ip address 192.168.10.1 255.255.255.0
R1(config-if)# no shutdown
R1(config-if)# exit

R1(config)# ip route 172.150.1.4 255.255.255.252 serial 0/0/0
R1(config)# ip route 192.168.20.0 255.255.255.0 serial 0/0/0
R1(config)# ip route 192.168.30.0 255.255.255.0 serial 0/0/0

R1(config)# exit
R1# show ip route
```

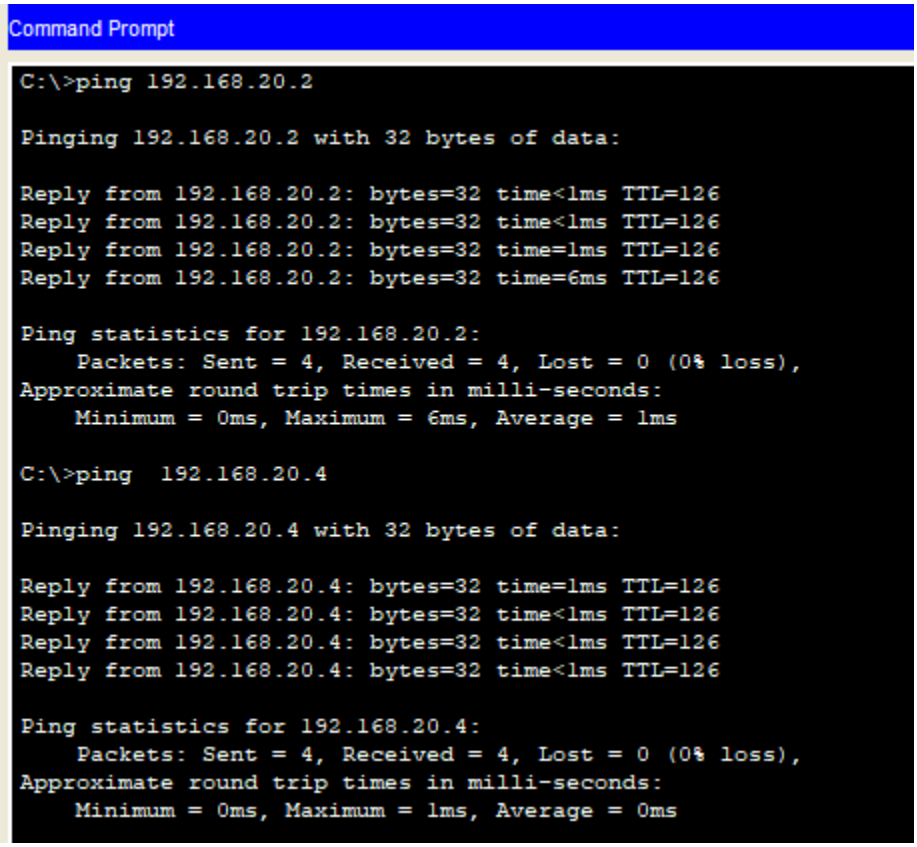
Configuration Router R2:

```
Router> enable
Router# configure terminal
Router(config)# hostname Router
```

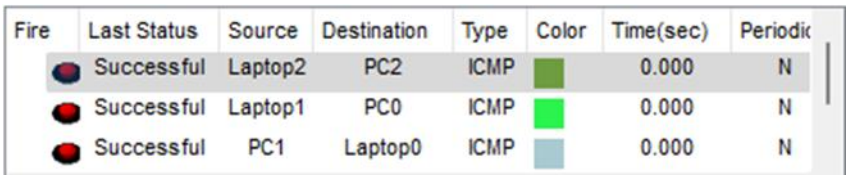
```
Router(config)# interface GigabitEthernet0/0/0
Router(config-if)# ip address 192.168.30.2 255.255.255.0
Router(config-if)# no shutdown
Router(config-if)# exit

Router(config)# interface GigabitEthernet0/0/1
Router(config-if)# ip address 192.168.20.1 255.255.255.0
Router(config-if)# no shutdown
Router(config-if)# exit

Router(config)# interface GigabitEthernet0/0/2
Router(config-if)# shutdown
Router(config-if)# exit

Router(config)# interface Vlan1
Router(config-if)# shutdown
Router(config-if)# exit

Router(config)# ip route 192.168.10.0 255.255.255.0 192.168.30.1

Router(config)# exit
Router# show running-config
```

Output:

Ping screenshot :



Packet sending screenshot :



Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic
	Successful	Laptop2	PC2	ICMP		0.000	N
	Successful	Laptop1	PC0	ICMP		0.000	N
	Successful	PC1	Laptop0	ICMP		0.000	N

Experiment Name: Design and Configure a RIP Server

Objective: To configure and verify RIP routing protocol on multiple routers so that they can share routing information and establish connectivity between all networks.

Theory Study:

RIP (Routing Information Protocol)

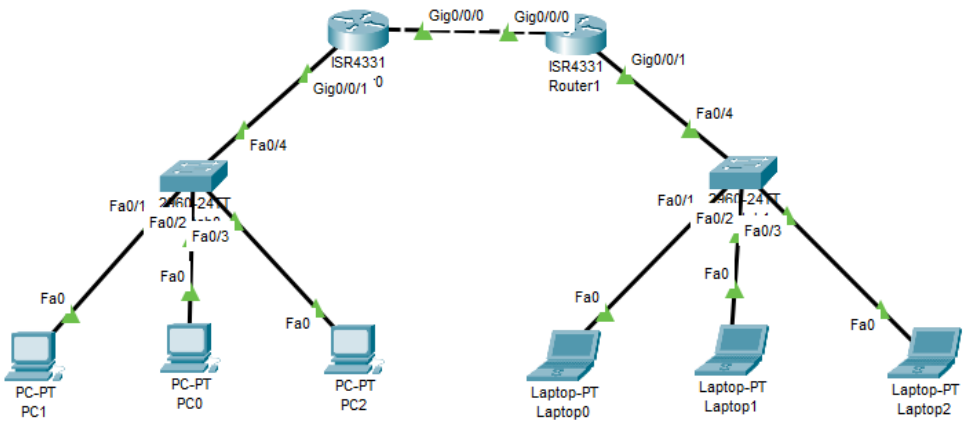
RIP is a **dynamic routing protocol** based on the **distance-vector** algorithm. It uses **hop count** as a metric to determine the best path, with a maximum hop limit of **15** (16 means unreachable). RIP sends the **entire routing table every 30 seconds** to neighbors.

There are two versions:

- **RIP v1**: Classful (no subnet info), uses broadcast.
- **RIP v2**: Classless (CIDR supported), uses multicast, and supports authentication.

RIP is simple and suitable for **small networks**, but not ideal for large networks due to slow convergence and scalability limits.

Topology:



Router Configuration : (cli code)

router-0:

```
Router> enable
Router# configure terminal
Router(config)# hostname R0

! Set IPs
R1(config)# interface g0/0/0
R1(config-if)# ip address 192.168.30.1 255.255.255.0
R1(config-if)# no shutdown

R1(config)# interface g0/0/1
R1(config-if)# ip address 192.168.10.1 255.255.255.0
R1(config-if)# no shutdown

! RIP Configuration
R1(config)# router rip
R1(config-router)# version 2
R1(config-router)# no auto-summary
R1(config-router)# network 192.168.10.0
R1(config-router)# network 192.168.30.0
```

Router-1:

Router> enable

Router# configure terminal

Router(config)# hostname R1

! Set IPs

R2(config)# interface g0/0/0

R2(config-if)# ip address 192.168.30.2 255.255.255.0

R2(config-if)# no shutdown

R2(config)# interface g0/0/1

R2(config-if)# ip address 192.168.20.1 255.255.255.0

R2(config-if)# no shutdown

! RIP Configuration

R2(config)# router rip

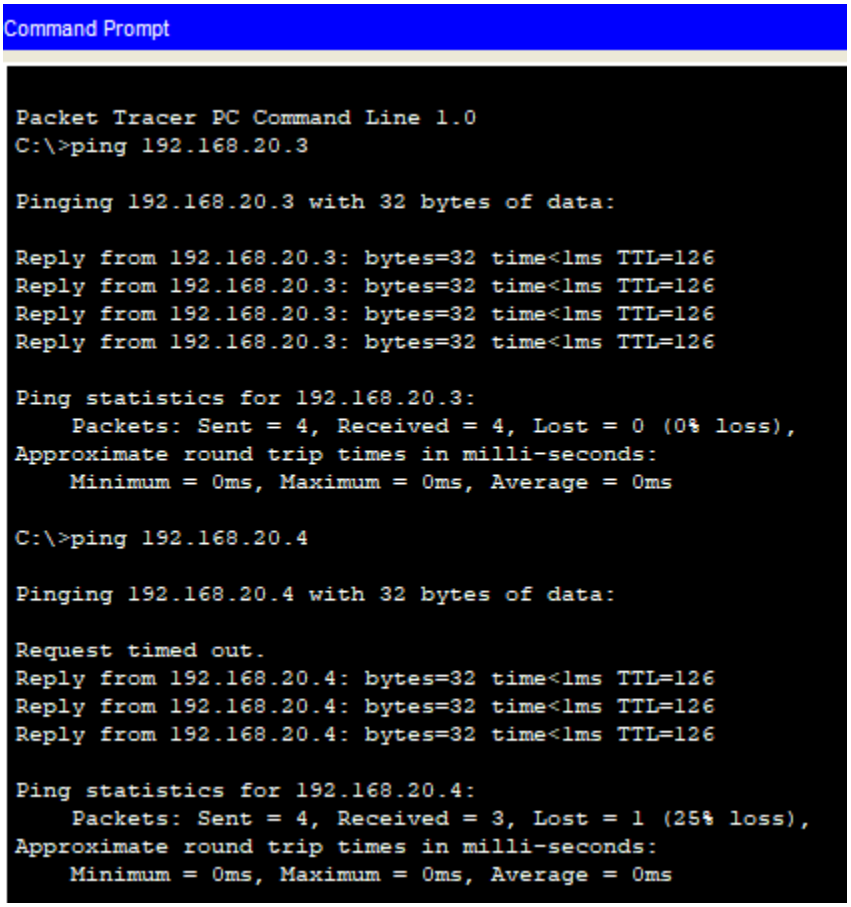
R2(config-router)# version 2

R2(config-router)# no auto-summary

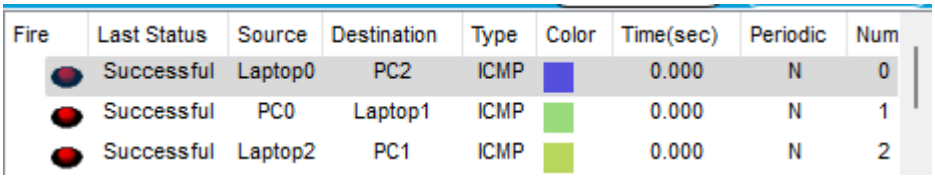
R2(config-router)# network 192.168.20.0

R2(config-router)# network 192.168.30.0

Ping screenshot:



Packet sending screenshot :



Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num
	Successful	Laptop0	PC2	ICMP		0.000	N	0
	Successful	PC0	Laptop1	ICMP		0.000	N	1
	Successful	Laptop2	PC1	ICMP		0.000	N	2

Experiment Name: Design and Configuration of Two Separate Networks (CSE & EEE) with DHCP and Router Interconnection

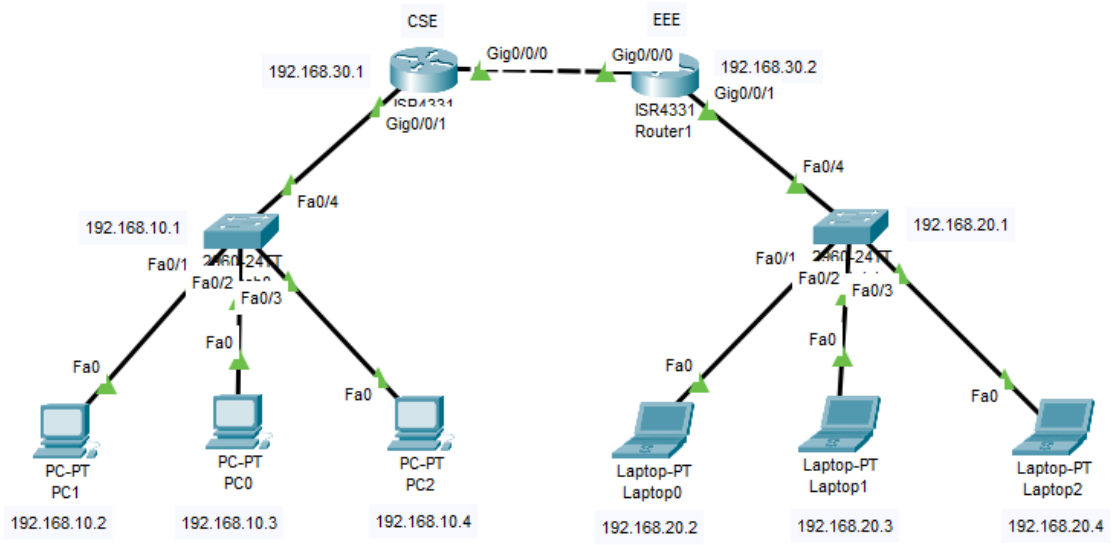
Objective:

To design and configure two separate LANs (CSE and EEE), connect them using a Cisco router, and configure DHCP to automatically assign IP addresses to hosts in both networks.

Theory Study:

This experiment demonstrates how to interconnect two LANs using a Cisco router. Each LAN (CSE and EEE) belongs to a different IP subnet. The router enables communication between the networks and also acts as a DHCP server, dynamically assigning IP configurations to end devices. DHCP simplifies IP management and ensures devices receive valid IPs, subnet masks, and gateway settings automatically.

Topology:



Router Configuration :(cli code)

CSE_Router:

Router>en

```
Router>enable
Router#conf
Router#configure ter
Router#configure terminal
Router(config)#inte
Router(config)#interface fas
Router(config)#interface fastEthernet 0/0
Router(config-if)#ip add
Router(config-if)#ip address 192.168.30.1 255.255.255.252
Router(config-if)#no shu
Router(config-if)#no shutdown
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)#ex
Router(config-if)#exit
Router(config)#in
Router(config)#interface fa
Router(config)#interface fastEthernet 0/1
Router(config-if)#ip add
Router(config-if)#ip address 192.168.10.1 255.255.255.0
Router(config-if)#no shu
Router(config-if)#no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
```

Router(config-if)#exit

Router(config)#exit

Router(config)#exit

Router#

%SYS-5-CONFIG_I: Configured from console by console

Router#wr

Router#write

Building

DHCP Configuration:

Router>ena

Router>enable

Router#confi

Router#configure ter

Router#configure terminal

Router(config)#ip dh

Router(config)#ip dhcp poo

Router(config)#ip dhcp pool cat

Router(dhcp-config)#net

Router(dhcp-config)#network 192.168.10.0 255.255.255.0

Router(dhcp-config)#ref

Router(dhcp-config)#def

Router(dhcp-config)#default-router 192.168.10.1

Router(dhcp-config)#exit

Router(config)#wr

Router(config)#exit

Router#

Router#wr

Router#write

Building configuration...

[OK]

EEE_Router:

Router>en

Router>enable

Router#conf

Router#configure ter

Router#configure terminal

Router(config)#inte

Router(config)#interface fas

Router(config)#interface fastEthernet 0/0

Router(config-if)#ip add

Router(config-if)#ip address 192.168.30.2 255.255.255.252

Router(config-if)#no shu

Router(config-if)#no shutdown

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)#ex

Router(config-if)#exit

Router(config)#in

Router(config)#interface fa

Router(config)#interface fastEthernet 0/1

Router(config-if)#ip add

Router(config-if)#ip address 192.168.20.1 255.255.255.0

Router(config-if)#no shu

Router(config-if)#no shutdown

Router(config-if)#

%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

Router(config-if)#exit

Router(config)#exit

Router(config)#exit

Router#

%SYS-5-CONFIG_I: Configured from console by console

Router#wr

Router#write

Building

DHCP Configuration:

Router>ena

Router>enable

Router#confi

Router#configure ter

Router#configure terminal

Router(config)#ip dh

Router(config)#ip dhcp poo

Router(config)#ip dhcp pool dog

Router(dhcp-config)#net

Router(dhcp-config)#network 192.168.20.0 255.255.255.0

Router(dhcp-config)#ref

Router(dhcp-config)#def

Router(dhcp-config)#default-router 192.168.20.1

Router(dhcp-config)#exit

Router(config)#wr

Router(config)#exit

Router#

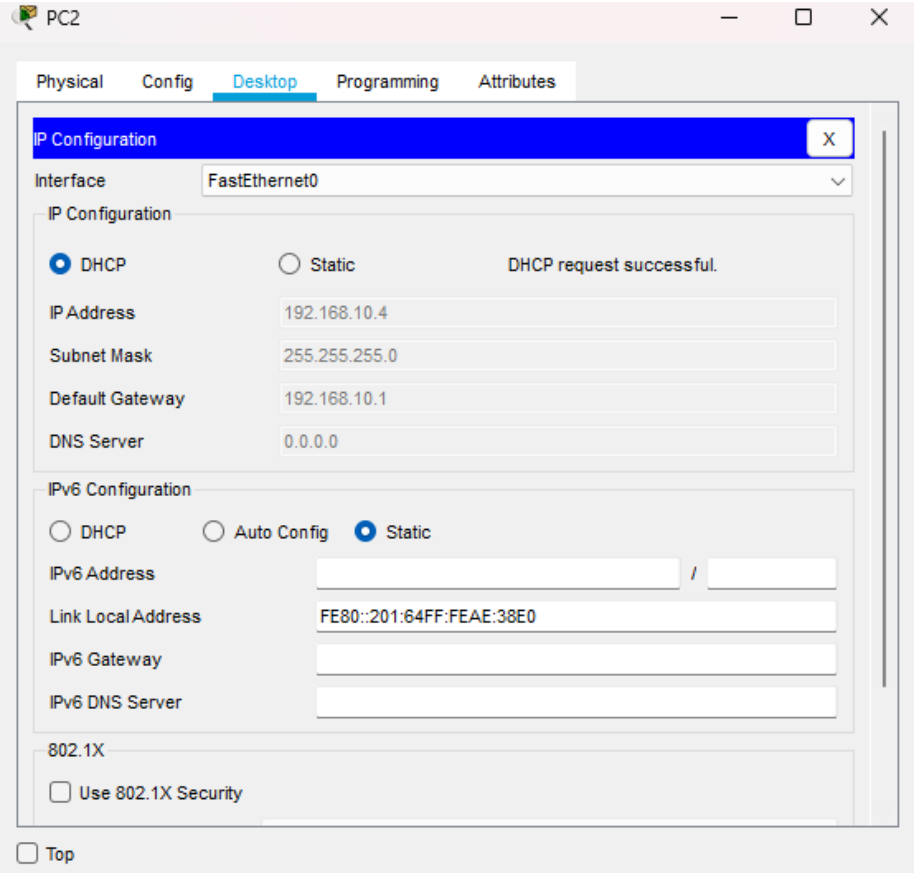
Router#wr

Router#write

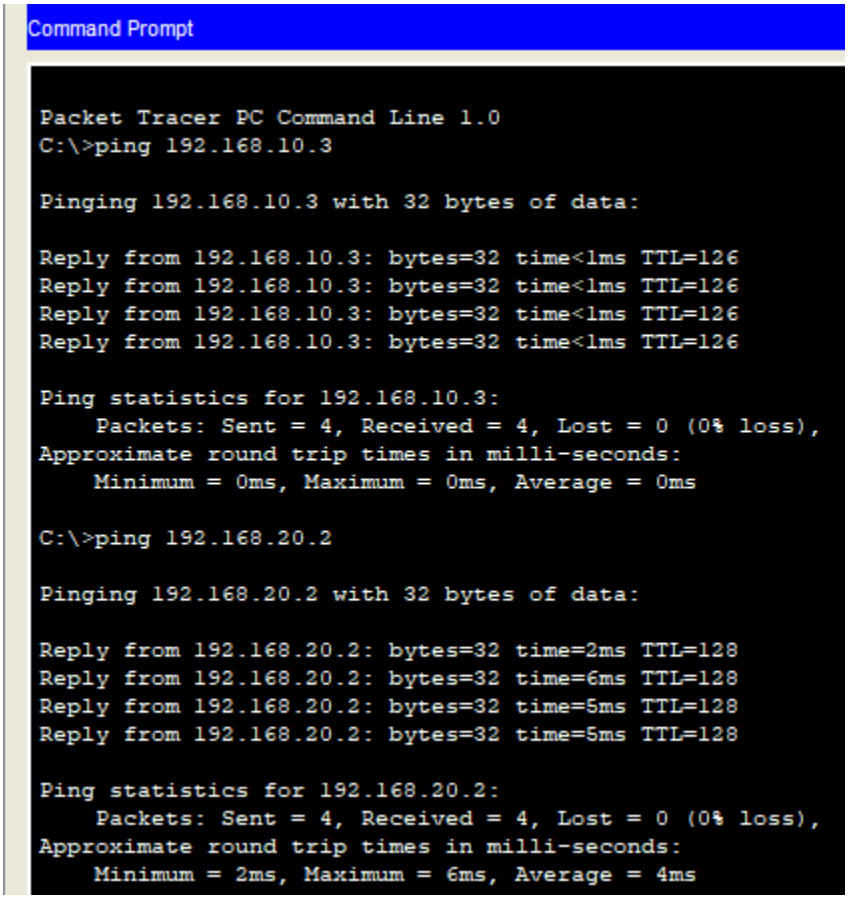
Building configuration...

[OK]

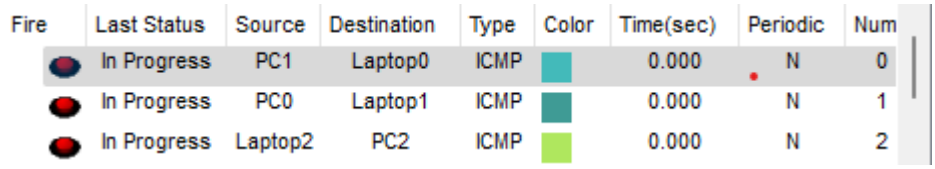
Output:



Ping :



Packet sending :



Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num
	In Progress	PC1	Laptop0	ICMP		0.000	N	0
	In Progress	PC0	Laptop1	ICMP		0.000	N	1
	In Progress	Laptop2	PC2	ICMP		0.000	N	2

Experiment Name: VLAN Configuration using Cisco Router

Objective:

To design and configure Virtual Local Area Networks (VLANs) using a Cisco router and switch to segment network traffic and improve security and management.

Theory Study:

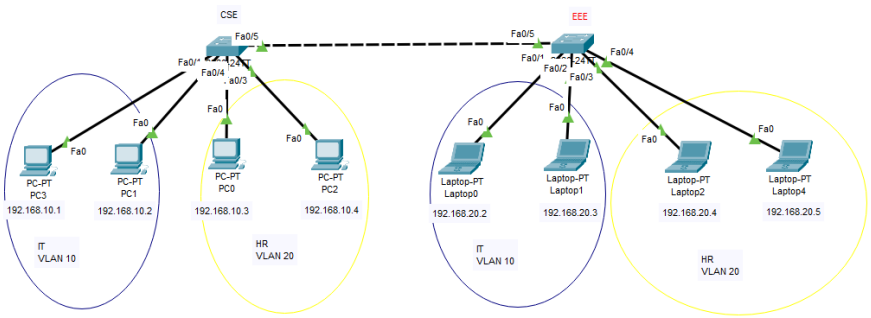
A **VLAN (Virtual Local Area Network)** is a logical grouping of devices within the same physical network, allowing segmentation based on function, department, or project team—regardless of physical location.

- VLANs help in:
  - **Reducing broadcast domains**
  - **Improving network security**
  - **Better traffic management**

Since VLANs on a switch cannot communicate directly with each other, a **Layer 3 device (router or Layer 3 switch)** is required for **Inter-VLAN routing**. The **Router-on-a-Stick** method is commonly used, where:

- One physical router interface is divided into **multiple sub-interfaces** (one for each VLAN).
- **802.1Q trunking protocol** is used to carry VLAN-tagged traffic between switch and router.

Topology:



Router Configuration :(cli code)

CSE__SWITCH:

```
Switch>en
Switch#configure terminal
Switch(config)#vlan 10
Switch(config-vlan)#na
Switch(config-vlan)#name IT
Switch(config-vlan)#exit
Switch(config)#vl
Switch(config)#vlan 20
Switch(config-vlan)#nam
Switch(config-vlan)#name HR
Switch(config-vlan)#exit
Switch(config)#exit
Switch(config)#interface fastEthernet 0/1
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/4
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/3
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/2
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
```

Switch(config)#exit

Switch(config)#interface fastEthernet 0/5

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)#inter

Switch(config)#interface ran

Switch(config)#interface range fas

Switch(config)#interface range fastEthernet 0/1 -4

Switch(config-if-range)#sw

Switch(config-if-range)#switchport mo

Switch(config-if-range)#switchport mode acc

Switch(config-if-range)#switchport mode access

Switch(config-if-range)#exit

Switch(config)#

EEE__SWITCH:

Switch>en

Switch#configure terminal

Switch(config)#vlan 10

Switch(config-vlan)#na

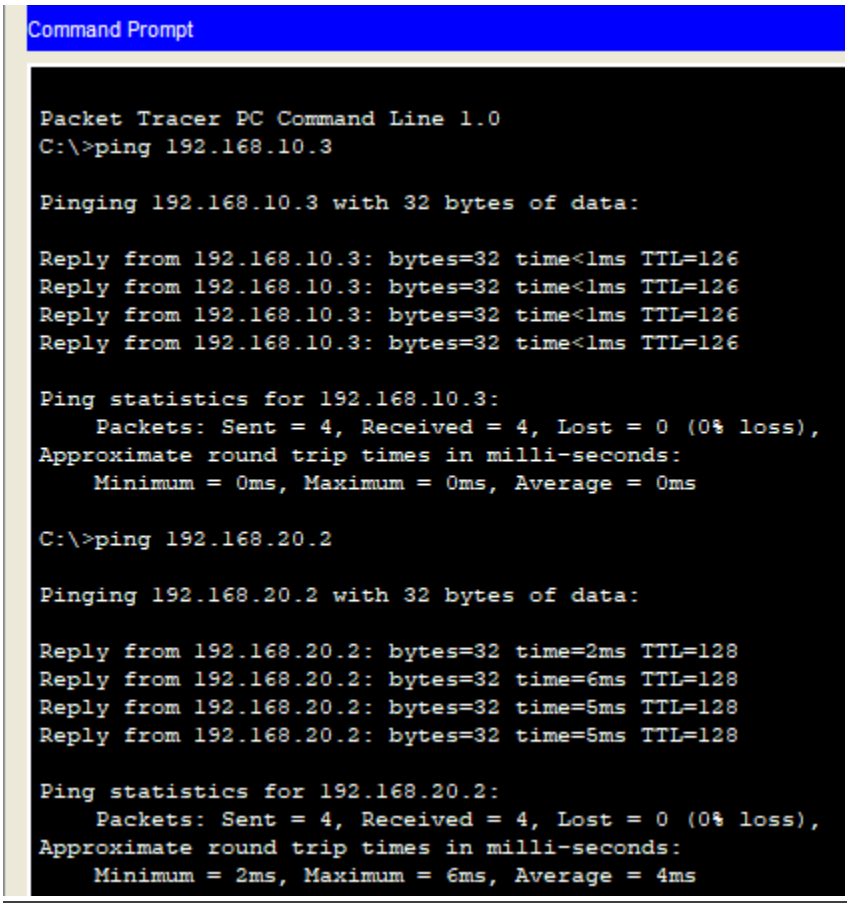
Switch(config-vlan)#name IT

Switch(config-vlan)#exit

Switch(config)#vl

```
Switch(config)#vlan 20
Switch(config-vlan)#nam
Switch(config-vlan)#name HR
Switch(config-vlan)#exit
Switch(config)#exit
Switch(config)#interface fastEthernet 0/1
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/2
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/3
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#interface fastEthernet 0/4
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#interface range fastEthernet 0/1 -4
Switch(config-if-range)#sw
Switch(config-if-range)#switchport mo
Switch(config-if-range)#switchport mode acc
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#exit
Switch(config)#
```

Ping:



Packet sending :

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num
	Successful	PC3	PC1	ICMP		0.000	N	0
	Successful	PC0	PC2	ICMP		0.000	N	1
	Successful	Laptop0	Laptop1	ICMP		0.000	N	2