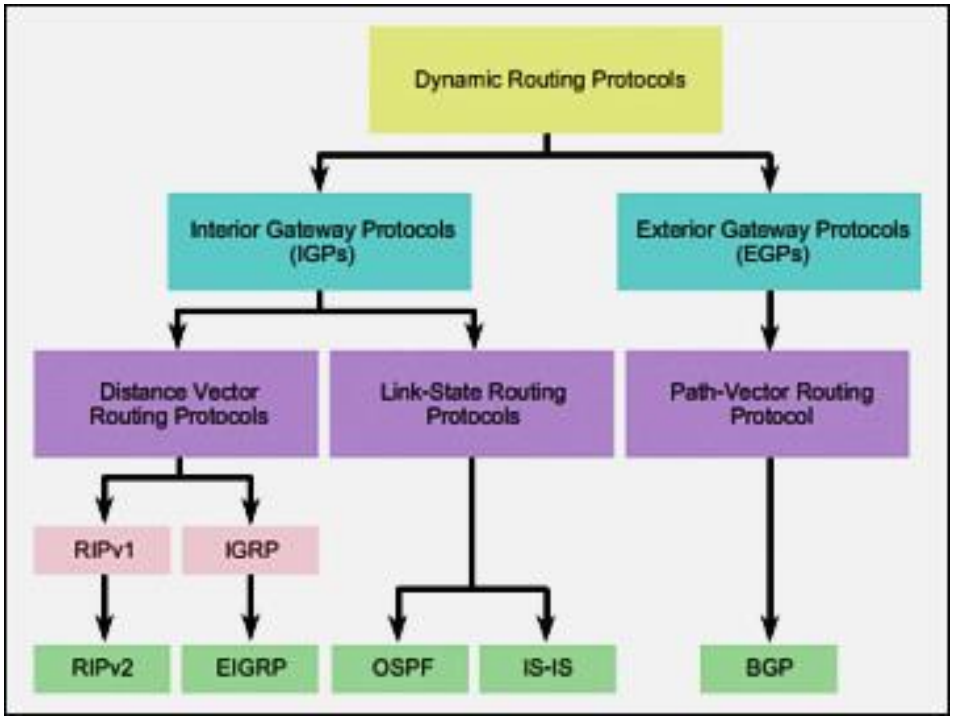
LAB 7: Implementation of RIP, EIGRP, OSPF and BGP

Objective(s):
To Understand the Basic Operation(s) of RIP, EIGRP, OSPF and BGP

Background:

Routing Protocols are the set of defined rules used by the routers to communicate between source & destination. They do not move the information to the source to a destination, but only update the routing table that contains the information.



IGP (Interior Gateway Protocols)
Interior gateways are gateways that belong to the same autonomous system.
They communicate with each other using the Routing Information Protocol (RIP), Open Shortest Path First (OSPF) protocol and Enhanced Interior Gateway Routing Protocol (EIGRP)

1. **Routing Information Protocol (RIP) :** RIP is used in both LAN and WAN Networks. It also runs on the Application layer of the OSI model. Two versions of RIP are RIPv1 and RIPv2.

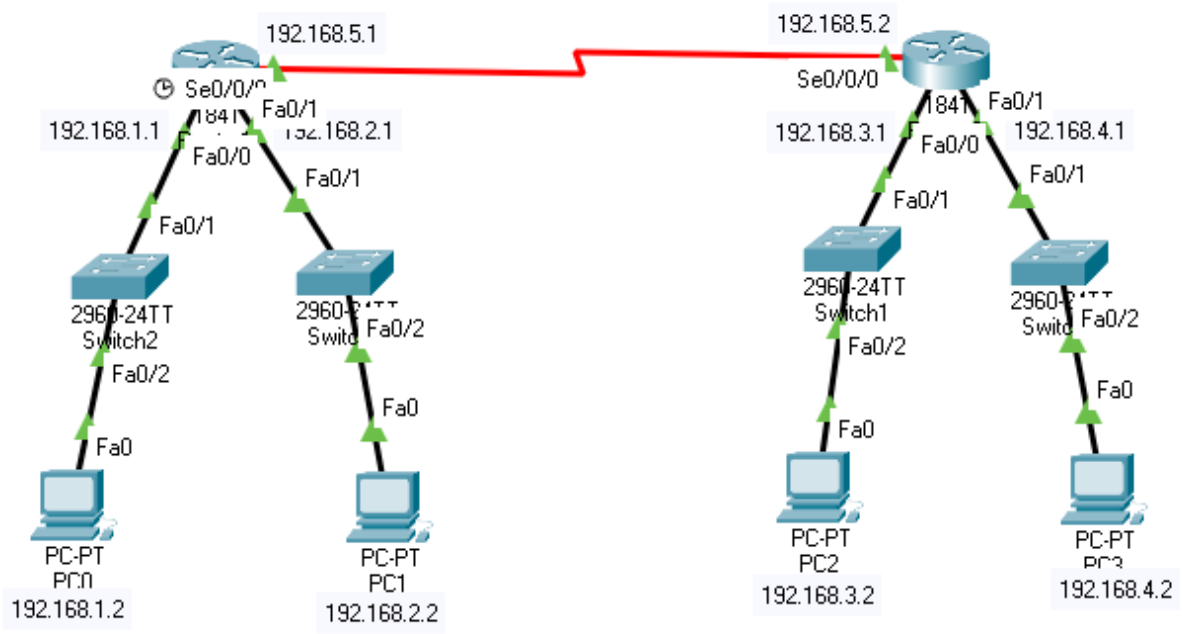
2. **Open Shortest Path First (OSPF):** Open Shortest Path First (OSPF) protocol is a link-state IGP tailor-made for IP networks using the Shortest Path First (SPF) method. OSPF routing allows us to maintain databases detailing information about the surrounding topology of the network. It also uses the Dijkstra algorithm (Shortest path algorithm) to recalculate network paths when its topology changes. It is secure, as it can authenticate protocol changes to keep data secure.

3. **Enhanced Interior Gateway Routing Protocol (EIGRP):** EIGRP is a hybrid routing protocol that provides routing protocols, distance vector, and link-state routing protocols. It can route the same protocols that IGRP routes using the same composite metrics as IGRP, which helps the network select the best path destination.

Exterior Gateway Protocol (EGP): EGP is a protocol used to exchange data between gateway hosts that are neighbors with each other within autonomous systems. This routing protocol offers a forum for routers to share information across different domains. The full form for EGP is the Exterior Gateway Protocol. EGP protocol includes known routers, network addresses, route costs, or neighboring devices.

- **Border Gateway Protocol (BGP):** BGP is the latest routing protocol of the Internet, which is classified as a DPVP (distance path vector protocol). It sends updated router table data when changes are made. Therefore, there is no auto-discovery of topology changes, which means that the user needs to configure BGP manually.

Configuration RIP, EIGRP and OSPF



Router Configuration

Serial Link Configuration

Router 1

```
Router(config)#hostname R1
R1(config)#interface s0/0/0
R1(config-if)#ip address 192.168.5.1 255.255.255.0
R1(config-if)#clock rate 64000
R1(config-if)#bandwidth 1024
R1(config-if)#no shutdown
```

Router 2

```
Router(config)#hostname R2
R2(config)# interface serial 0/0/0
R2(config-if)#ip address 192.168.5.2 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#exit
```

Other Interfaces

Router 1

```
R1(config)#interface fastethernet 0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#interface fastethernet 0/1
R1(config-if)#ip address 192.168.2.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#exit
R1#show interface brief
```

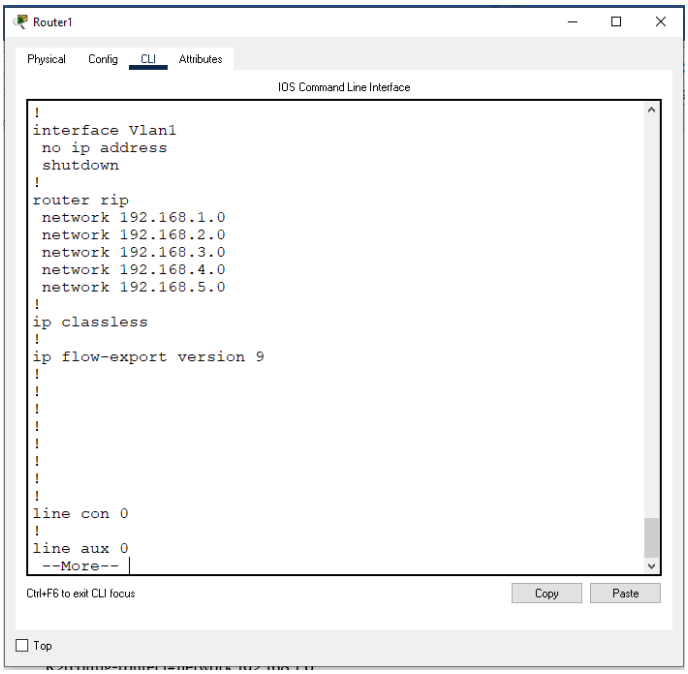
Router 2

```
R2(config)#interface fastethernet 0/0
R2(config-if)#ip address 192.168.3.1 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#interface fastethernet 0/1
R2(config-if)#ip address 192.168.4.1 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#exit
R2#show interface brief
```

RIP Implementation

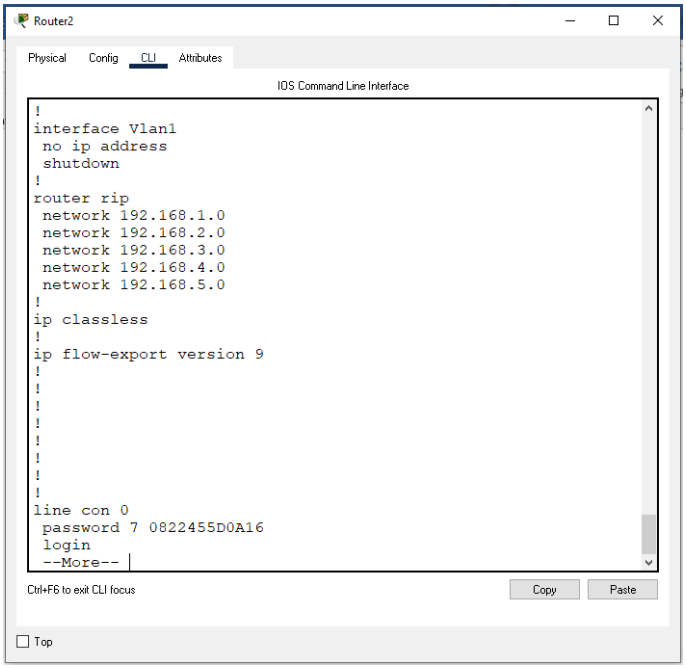
Router 1

```
R1(config)#router rip
R1(config-router)#network 192.168.1.0
R1(config-router)#network 192.168.2.0
R1(config-router)#network 192.168.3.0
R1(config-router)#network 192.168.4.0
R1(config-router)#network 192.168.5.0
R1(config-router)#exit
R1(config)#exit
R1#show run
```

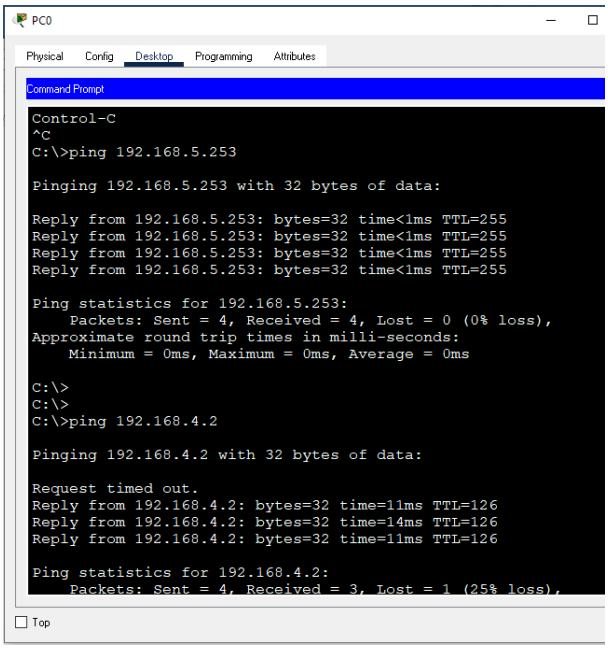


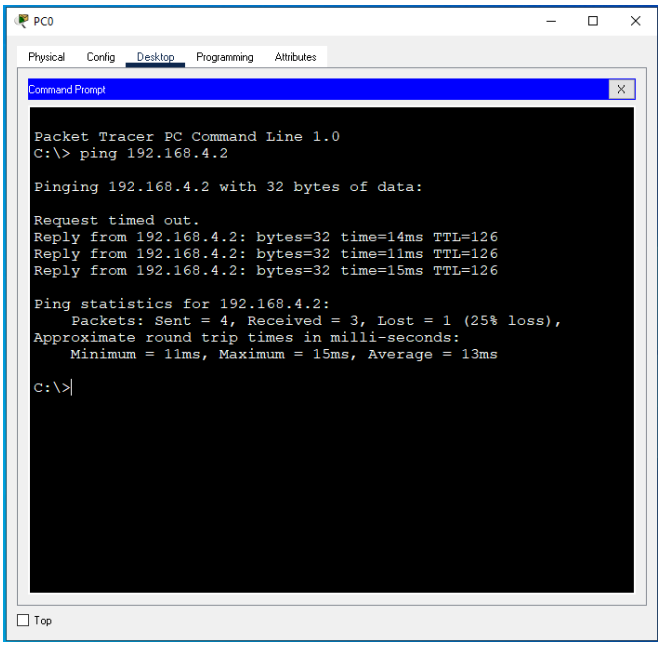
Router 2

```
R2(config)#router rip
R2(config-router)#network 192.168.1.0
R2(config-router)#network 192.168.2.0
R2(config-router)#network 192.168.3.0
R2(config-router)#network 192.168.4.0
R2(config-router)#network 192.168.5.0
R2(config-router)#exit
R2(config)#exit
R2#show run
```



Verify connections





EIGRP (Enhanced Interior Gateway Routing Protocol)

- Process ID of AS Number: It is a number which must be same for networks which are desired to connect to each other. The value can very between 100 to 400 though available options can be 1-65535
- The configuration of the interface /basic configurations remain the same.
- Remove the RIP configuration and configure EIGRP instead.
- Then Verify the Connection.

Router 1

```
R1(config)#no router rip
R1(config)#router eigrp 343
R1(config-router)#network 192.168.1.0
R1(config-router)#network 192.168.2.0
R1(config-router)#network 192.168.3.0
R1(config-router)#network 192.168.4.0
R1(config-router)#network 192.168.5.0
R1(config-router)#exit
```

Router 2

```
R2(config)#no router rip
R2(config)#router eigrp 343
R2(config-router)#network 192.168.1.0
R2(config-router)#network 192.168.2.0
R2(config-router)#network 192.168.3.0
R2(config-router)#network 192.168.4.0
R2(config-router)#network 192.168.5.0
R2(config-router)#exit
```

OSPF Implementation

- Process ID: It is any number that must be same for all networks in AS.
- Wild Card Mask (0.0.0.255): It will represent network bits in 192.168.1.0/24
- The configuration of the interface and other basic configurations remain the same.
- Remove the EIGRP configuration and configure OSPF instead.
- Then Verify the Connection.

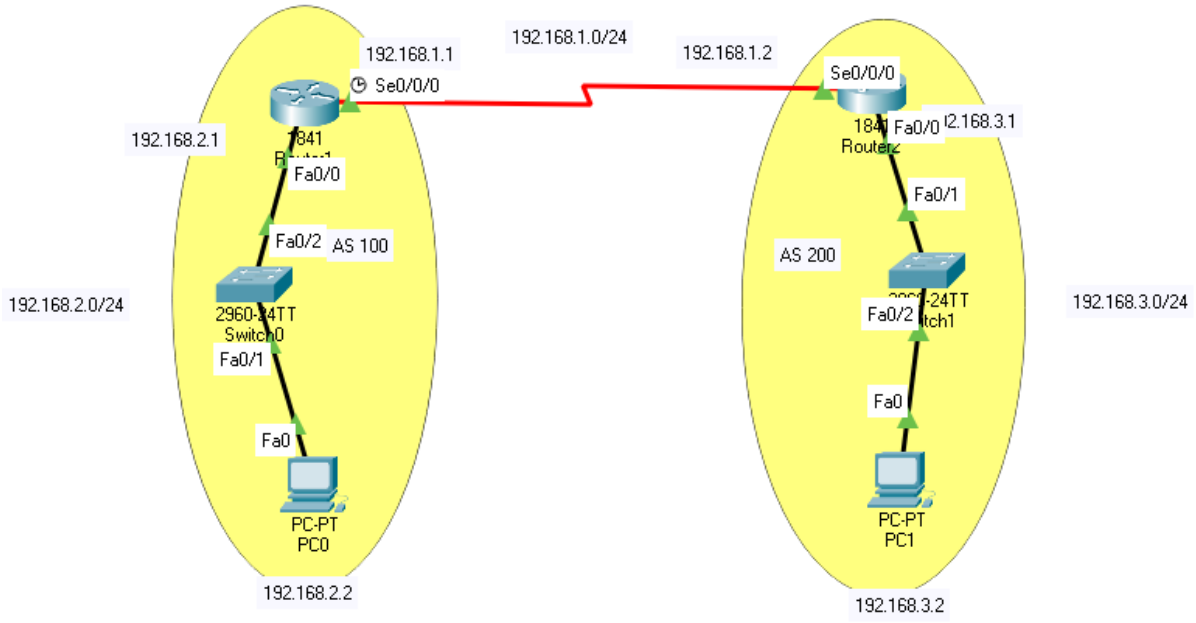
Router 1

```
R1(config)#no router eigrp 343
R1(config)#router ospf 343
R1(config-router)#network 192.168.1.0 0.0.0.255 area 0
R1(config-router)#network 192.168.2.0 0.0.0.255 area 0
R1(config-router)#network 192.168.3.0 0.0.0.255 area 0
R1(config-router)#network 192.168.4.0 0.0.0.255 area 0
R1(config-router)#network 192.168.5.0 0.0.0.255 area 0
R1(config-router)#exit
```

Router 2

```
R2(config)#no router eigrp 343
R2(config)#router ospf 343
R2(config-router)#network 192.168.1.0 0.0.0.255 area 0
R2(config-router)#network 192.168.2.0 0.0.0.255 area 0
R2(config-router)#network 192.168.3.0 0.0.0.255 area 0
R2(config-router)#network 192.168.4.0 0.0.0.255 area 0
R2(config-router)#network 192.168.5.0 0.0.0.255 area 0
R2(config-router)#exit
```

BGP Implementation



Router 1

```
Router(config)#router bgp 100
Router(config-router)#network 192.168.1.0
Router(config-router)#network 192.168.2.0
Router(config-router)#neighbor 192.168.1.2 remote-as 200
Router(config-router)#neighbor 192.168.3.2 remote-as 200
Router(config-router)#
```

Router 2

```
Router(config)#router bgp 200
Router(config-router)#network 192.168.1.0
Router(config-router)#network 192.168.3.0
Router(config-router)#neighbor 192.168.1.1 remote-as 100
Router(config-router)#
    %BGP-5-ADJCHANGE: neighbor 192.168.1.1 Up
Router(config-router)#neighbor 192.168.2.3 remote-as 100
Router(config-router)#
```

Verify Connectivity