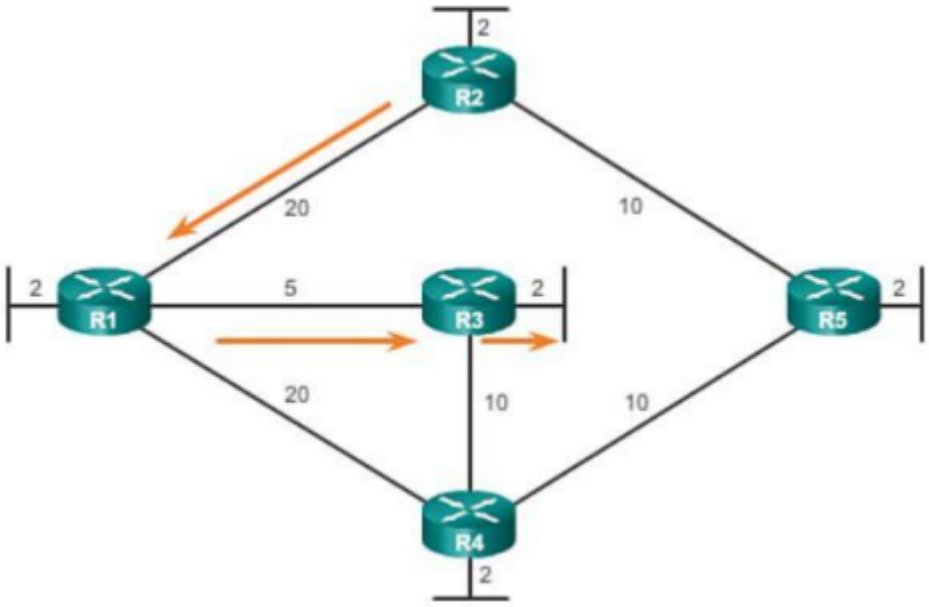
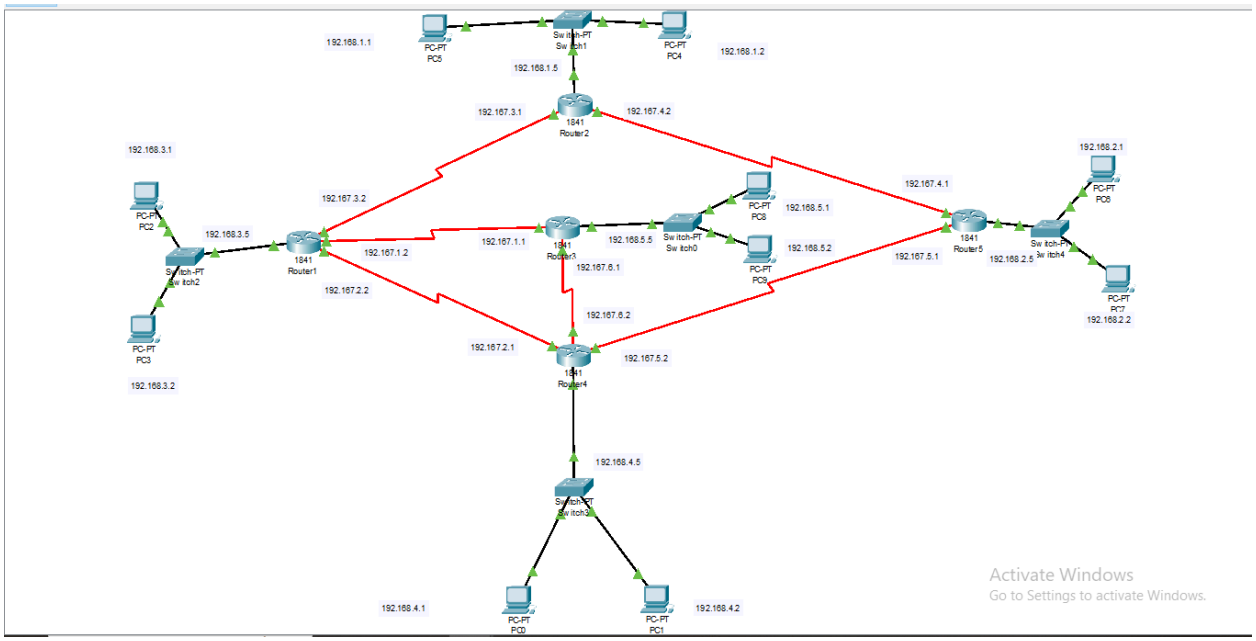
NAME->SAGAR
ROLL->211CH063

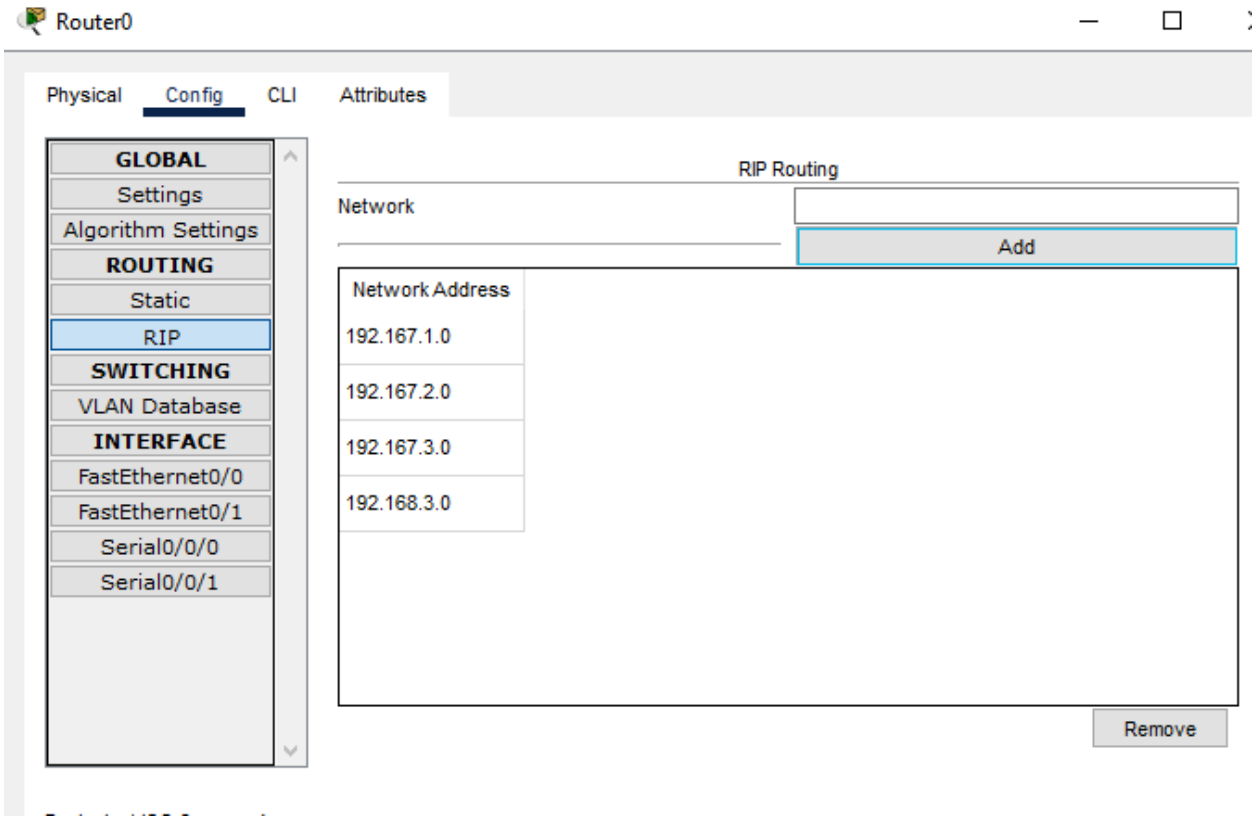
Assignment 2

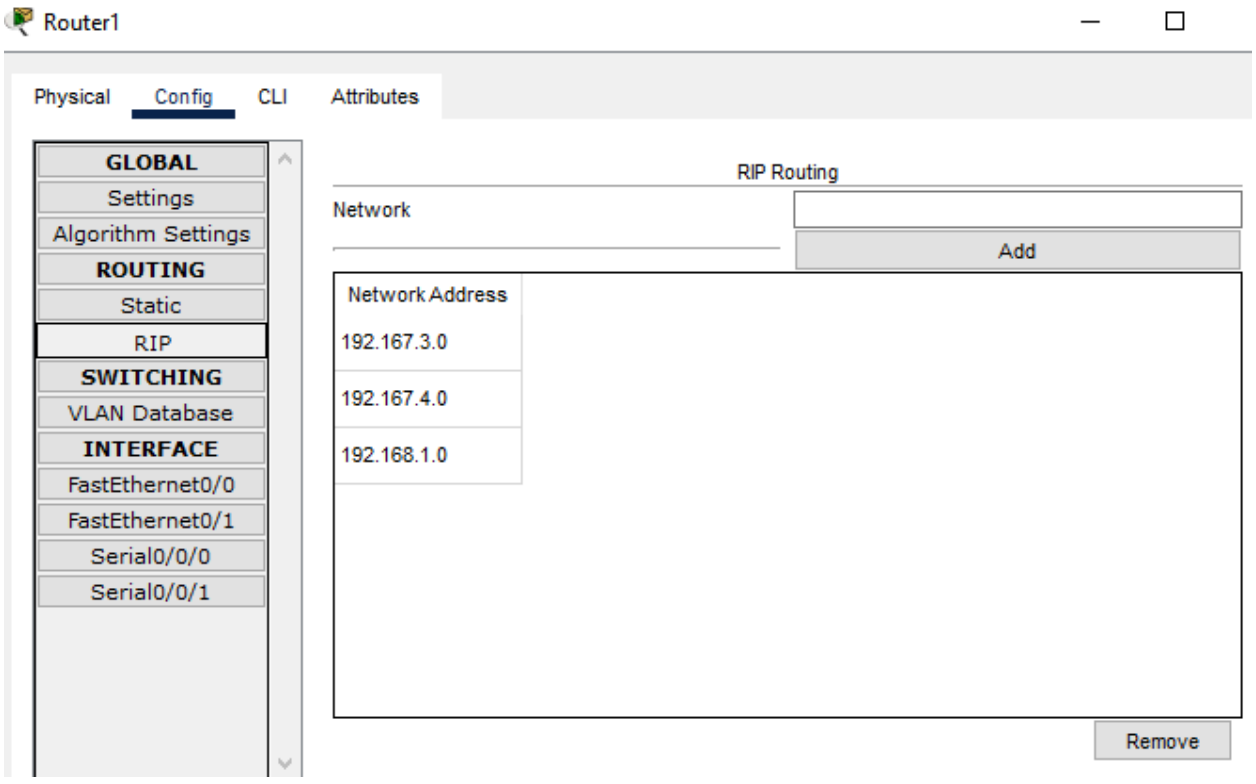


RIP Protocol



After setting up all the hosts and router with the given ip addresses and subnet mask.we did the rip configuration which will then be shared to the neighbours while making connection.

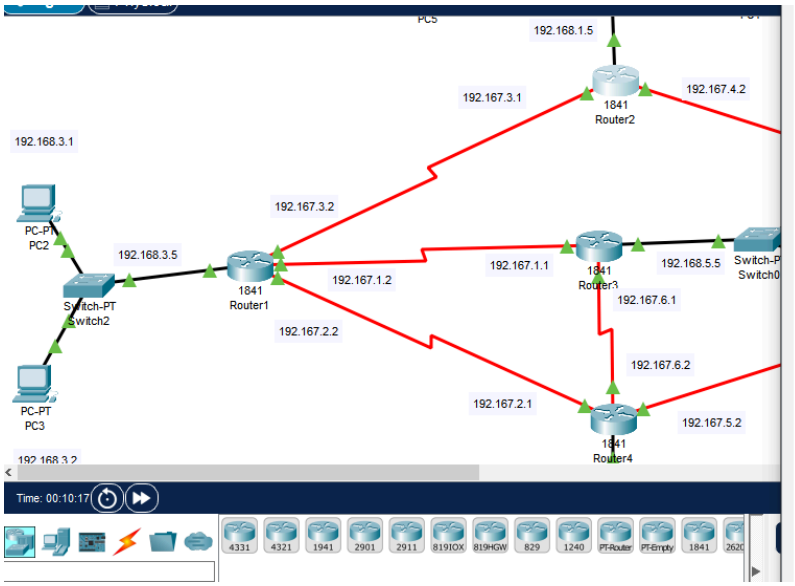

Router0
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
RIP Routing
Network
Add
Network Address
192.167.1.0
192.167.2.0
192.167.3.0
192.168.3.0
Remove

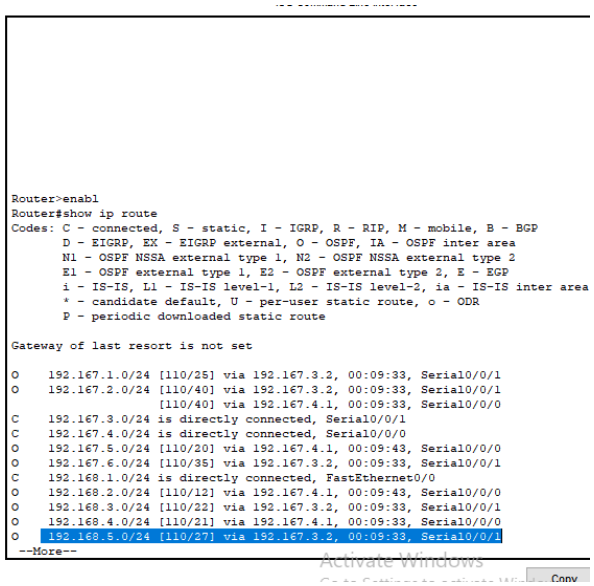

Router1
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
SWITCHING
VLAN Database
INTERFACE
FastEthernet0/0
FastEthernet0/1
Serial0/0/0
Serial0/0/1
RIP Routing
Network
Add
Network Address
192.167.3.0
192.167.4.0
192.168.1.0
Remove

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	--	PC0	PC8	ICMP		0.000	N	30	(edit)	
	Failed	PC2	PC6	ICMP		0.000	N	31	(edit)	
	Successful	PC2	PC6	ICMP		0.000	N	32	(edit)	
	Failed	PC2	PC8	ICMP		0.000	N	33	(edit)	
	Successful	PC2	PC8	ICMP		0.000	N	34	(edit)	
	Failed	PC3	PC1	ICMP		0.000	N	35	(edit)	
	Failed	PC3	PC0	ICMP		0.000	N	36	(edit)	
	Successful	PC3	PC1	ICMP		0.000	N	37	(edit)	
	Failed	PC2	PC4	ICMP		0.000	N	38	(edit)	
	Successful	PC3	PC4	ICMP		0.000	N	39	(edit)	
	Successful	PC3	PC4	ICMP		0.000	N	40	(edit)	
	Successful	PC2	PC8	ICMP		0.000	N	41	(edit)	
	Successful	PC2	PC6	ICMP		0.000	N	42	(edit)	
	Successful	PC2	PC1	ICMP		0.000	N	43	(edit)	
	Successful	PC2	PC4	ICMP		0.000	N	44	(edit)	

Here pc2 ,pc8,pc6,pc1 and pc4 all are in different networks.Initially it needs some time for setting up of connection. we are successful in sending messages after some time .
And similarly for all other routers we have added network address of the links to which it is connected.





Working of RIP protocol ->
RIP (Routing Information Protocol) is one of the oldest distance-vector routing protocols used in computer networking. It's designed to help routers dynamically exchange routing information within a local area network or across the internet.

- Distance-Vector Algorithm: RIP routers exchange information using a distance-vector algorithm. Each router maintains a routing table that contains entries for destination networks along with the distance (metric) to reach them.

- Periodic Updates: RIP routers periodically broadcast their entire routing table to neighboring routers. By default, RIP sends updates every 30 seconds. These updates contain information about all known networks along with their associated metrics.
- Hop Count Metric: RIP uses hop count as its metric. Hop count refers to the number of routers a packet must traverse to reach a destination network. Each hop from one router to another increases the hop count by one. The maximum hop count in RIP is 15, beyond which a destination is considered unreachable.
- Split Horizon and Poison Reverse: To prevent routing loops, RIP employs techniques like split horizon and poison reverse. Split horizon prevents a router from advertising routes back to the interface from which they were learned. Poison reverse involves advertising routes back to the source with an infinite metric, indicating that the route is no longer reachable.
- Route Selection: When a router receives updates from neighboring routers, it compares the information with its existing routing table. If a better (lower hop count) route to a destination is found, the router updates its routing table accordingly. However, if a worse route is received, the router may ignore it or update its table if the route has timed out.
- Route Poisoning and Route Flushing: If a router detects that a route is no longer reachable (for example, if no updates have been received for a certain period), it marks the route as unreachable and informs its neighbors. This process is called route poisoning. Eventually, if a route remains unreachable for a certain amount of time, it's removed from the routing table, a process known as route flushing.
- Timers and Metrics: RIP routers use timers to manage routing updates, route timeouts, and route invalidation. These timers ensure timely updates and prevent stale information from persisting in the network.
- Convergence: RIP networks can take time to converge, especially in larger networks or in the presence of network topology changes. Convergence refers to the process by which all routers in the network have consistent routing information. RIP's convergence time can be relatively slow compared to newer protocols like OSPF (Open Shortest Path First).

Overall, while RIP is simple to configure and deploy, it may not be suitable for larger or more complex networks due to its limitations in scalability, slow convergence, and reliance on hop count as the sole metric.

OSPF Protocol

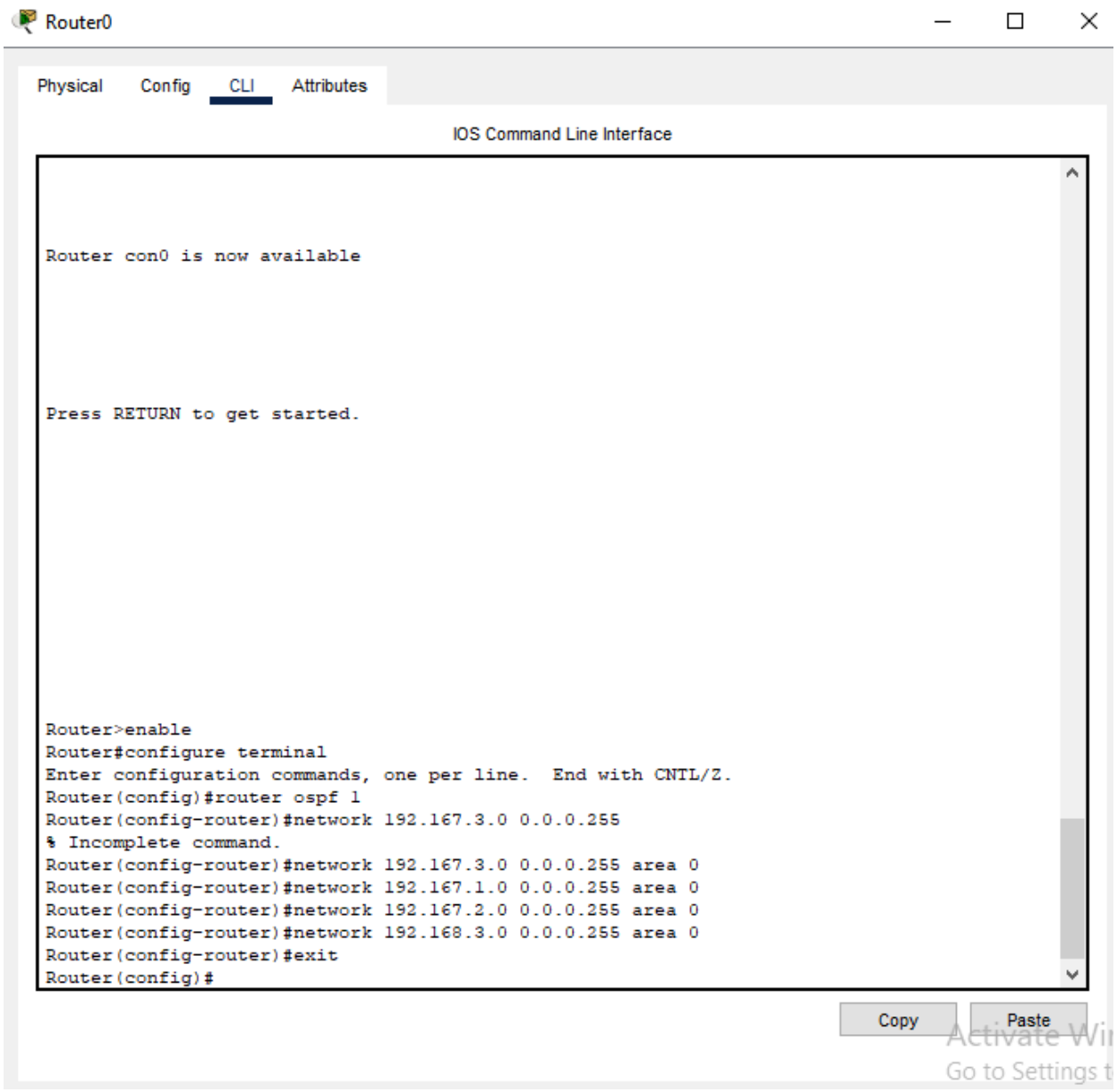
Router 1 cli for giving ospf cost-> Router 2 cli->

```
Router>
Router>enable
Router#configure terminal
Enter configuration commands, one per li
Router(config)#int fa0/0
Router(config-if)#int ospf cost 2
                   ^
% Invalid input detected at '^' marker.

Router(config-if)#ip ospf cost 2
Router(config-if)#int se0/0/0
Router(config-if)#ip ospf cost 20
Router(config-if)#int se0/1/0
Router(config-if)#ip ospf cost 5
Router(config-if)#int se0/0/1
Router(config-if)#ip ospf cost 20
Router(config-if)#
```

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  En
Router(config)#int se0/0/1
Router(config-if)#ip ospf cost 20
Router(config-if)#ip ospf cost 10
Router(config-if)#exit
Router(config)#int se0/0/1
Router(config-if)#ip ospf cost 20
Router(config-if)#int se0/0/0
Router(config-if)#ip ospf cost 10
Router(config-if)#exit
Router(config)#
```

Similar commands is given to each of the router and changes done as per the cost of path given in problem.



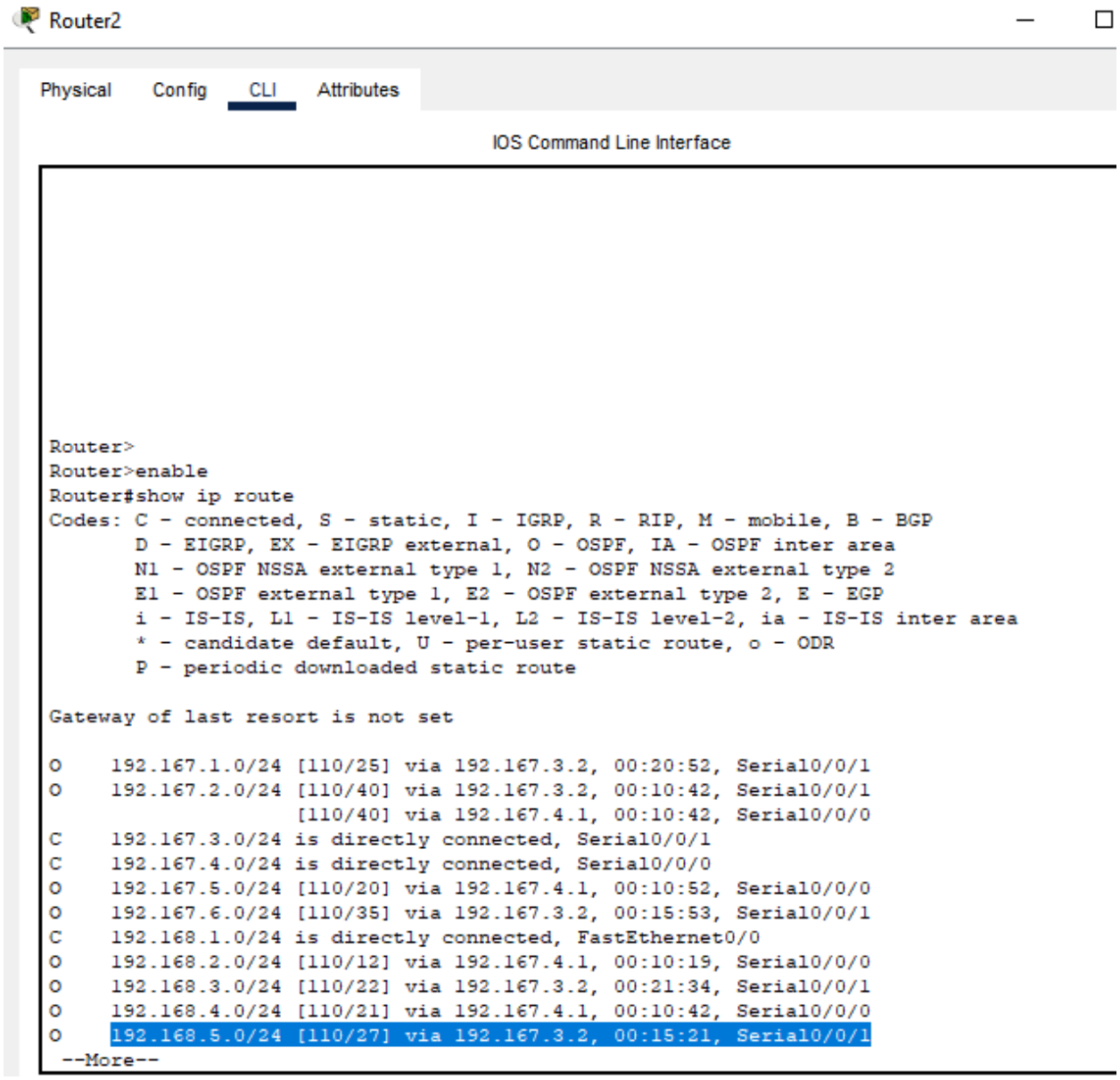
PDU list window after simulation->

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC3	PC2	ICMP		0.000	N	12	(edit)	(delete)
	Successful	PC6	192.168.2.5	ICMP		0.000	N	13	(edit)	(delete)
	Successful	PC7	192.168.2.5	ICMP		0.000	N	14	(edit)	(delete)
	Successful	PC5	Router2	ICMP		0.000	N	15	(edit)	(delete)
	Successful	PC5	PC4	ICMP		0.000	N	16	(edit)	(delete)
	Successful	PC2	192.167.1.1	ICMP		0.000	N	17	(edit)	(delete)
	Successful	PC2	PC6	ICMP		0.000	N	18	(edit)	(delete)
	Successful	PC2	PC4	ICMP		0.000	N	19	(edit)	(delete)
	Successful	PC2	PC5	ICMP		0.000	N	20	(edit)	(delete)
	Successful	PC2	PC4	ICMP		0.000	N	21	(edit)	(delete)
	Successful	PC0	PC8	ICMP		0.000	N	22	(edit)	(delete)
	Successful	PC0	PC8	ICMP		0.000	N	23	(edit)	(delete)
	Successful	Router2	192.167.3.2	ICMP		0.000	N	24	(edit)	(delete)
	Successful	Router2	192.167.3.2	ICMP		0.000	N	25	(edit)	(delete)
	Successful	PC5	PC2	ICMP		0.000	N	26	(edit)	(delete)
	Successful	PC5	PC2	ICMP		0.000	N	27	(edit)	(delete)
	Successful	PC4	PC8	ICMP		0.000	N	28	(edit)	(delete)
	Successful	PC5	PC6	ICMP		0.000	N	29	(edit)	(delete)
	Successful	PC5	PC0	ICMP		0.000	N	30	(edit)	(delete)
	Successful	PC5	PC2	ICMP		0.000	N	31	(edit)	(delete)
	Successful	PC5	PC6	ICMP		0.000	N	32	(edit)	(delete)
	Successful	PC5	PC8	ICMP		0.000	N	33	(edit)	(delete)
	Successful	PC5	PC0	ICMP		0.000	N	34	(edit)	(delete)
	Successful	Router1	Router3	ICMP		0.000	N	35	(edit)	(delete)
	Successful	Router4	Router3	ICMP		0.000	N	36	(edit)	(delete)
	Successful	PC2	Router1	ICMP		0.000	N	37	(edit)	(delete)
	Successful	Router5	Router4	ICMP		0.000	N	38	(edit)	(delete)
	Successful	Router1	Router3	ICMP		0.000	N	39	(edit)	(delete)
	Successful	PC2	PC8	ICMP		0.000	N	40	(edit)	(delete)

Similarly we are including all the network in same area via cli of each router. After that we can easily send data between pc of different networks.

results->



working->

OSPF (Open Shortest Path First) is a link-state routing protocol used in computer networks, particularly in large-scale enterprise networks and the internet.

Topology Discovery: OSPF routers discover the network topology by exchanging link-state advertisements (LSAs) with neighboring routers. Each router collects information about its directly connected links, including the state of those links and the routers to which they connect.

- Building the Link-State Database: Based on the received LSAs, each router constructs a complete map of the network topology known as the link-state database (LSDB). The LSDB contains information about all routers and links within the OSPF domain.
- Shortest Path Calculation: Using the LSDB, each router runs the Dijkstra algorithm to calculate the shortest path to every destination network within the OSPF domain. The shortest path is determined based on the total cost associated with traversing each link, where the cost is typically based on the bandwidth of the link.
- Routing Table Calculation: Once the shortest paths are calculated, each router constructs its routing table, which contains entries for destination networks along with the next-hop router to reach them. These entries represent the shortest paths to each destination network within the OSPF domain.
- Link-State Advertisement (LSA) Flooding: OSPF routers use flooding to distribute LSAs throughout the network. When a router receives an LSA from a neighbor, it verifies the LSA's sequence number to ensure it's the most recent update. If it is, the router forwards the LSA to all other neighbors except the one it received it from.
- Neighbor Adjacencies: Before routers can exchange routing information, they establish neighbor adjacencies. OSPF routers use Hello packets to discover neighboring routers and establish adjacencies. Once adjacencies are established, routers exchange LSAs and synchronize their LSDBs.
- OSPF Areas: OSPF networks are divided into areas to improve scalability and reduce routing overhead. Each area has its own LSDB and routing table. Routers within an area exchange LSAs only with routers within the same area, reducing the amount of routing information that needs to be exchanged across the entire OSPF domain.
- Scalability and Convergence: OSPF is highly scalable and converges quickly, making it suitable for large and complex networks. Because OSPF routers only exchange changes in the network topology (LSAs), rather than their entire routing tables, OSPF reduces the amount of routing traffic and overhead compared to distance-vector protocols like RIP.

Overall, OSPF is a robust and efficient routing protocol that provides fast convergence, scalability, and support for complex network topologies, making it widely used in enterprise networks and the internet.

IS-IS Protocol->

IS-IS (Intermediate System to Intermediate System) is a routing protocol used in computer networking to facilitate the exchange of routing information between routers within a computer network. IS-IS is commonly used in large enterprise and service provider networks.

- Link-State Protocol: ISIS is a link-state routing protocol, which means it operates by routers exchanging information about the state of their links with neighboring routers.

This information includes the network addresses reachable through those links and the cost (metric) associated with reaching each destination.

- Hierarchical Structure: ISIS organizes routers into a hierarchical structure based on their positions in the network. Routers are divided into levels, with Level 1 routers being within a single area or local domain, and Level 2 routers being responsible for interconnecting different areas or domains. This hierarchical structure helps in scalability and efficient routing.
- SPF Algorithm: Like OSPF (Open Shortest Path First), ISIS uses the SPF (Shortest Path First) algorithm to calculate the shortest paths to all destinations within the network. Each router runs the SPF algorithm based on the received link-state information to determine the best paths to reach destinations.
- Hello Protocol: ISIS routers use a Hello protocol to establish and maintain adjacencies with neighboring routers. This protocol helps routers discover and form neighbor relationships, which are essential for exchanging routing information.
- Dijkstra's Algorithm: The SPF algorithm used by ISIS routers is typically based on Dijkstra's algorithm, which computes the shortest path tree from each router to all destinations within the network. This enables routers to make informed decisions about forwarding packets based on the most efficient paths.
- Convergence: ISIS routers continuously exchange link-state information and recalculate routes as the network topology changes. This ensures that the network can quickly converge to a stable state after topology changes, such as link failures or router additions/removals.

Overall, ISIS is a robust and scalable routing protocol designed for large, complex networks where fast convergence and efficient routing are essential requirements. It is widely used by Internet Service Providers (ISPs) and large enterprises to manage their network infrastructures.