Campus Network Simulator

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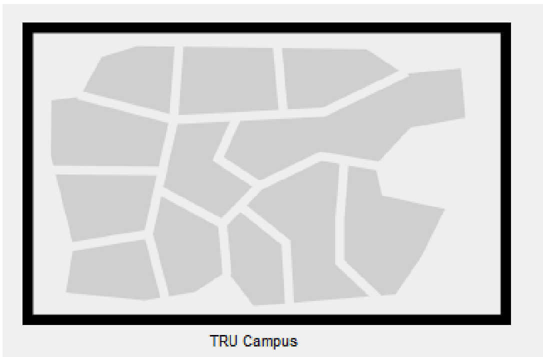
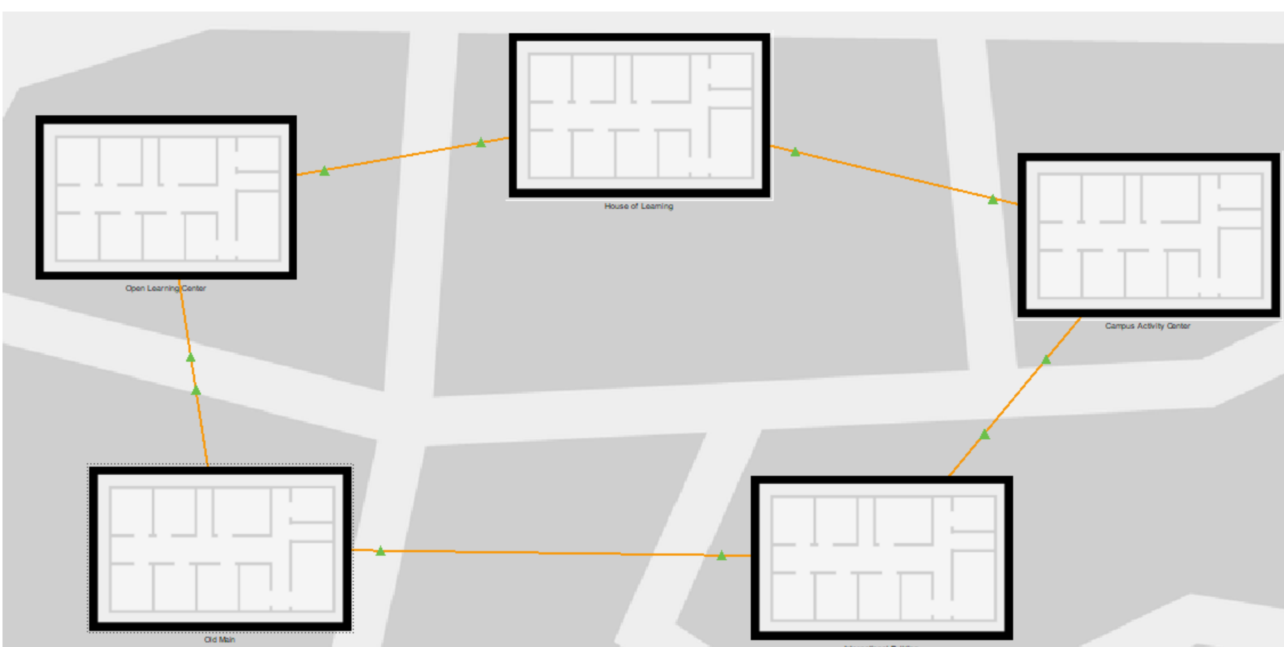
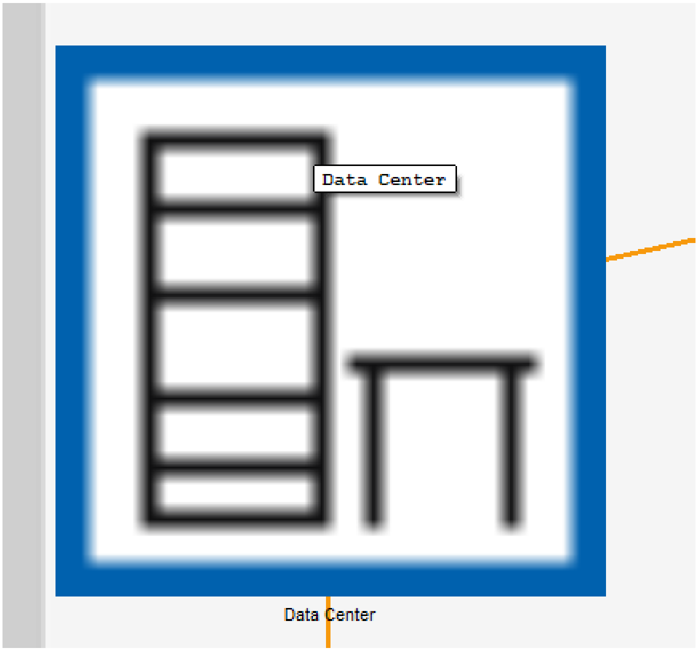
1. Introduction:

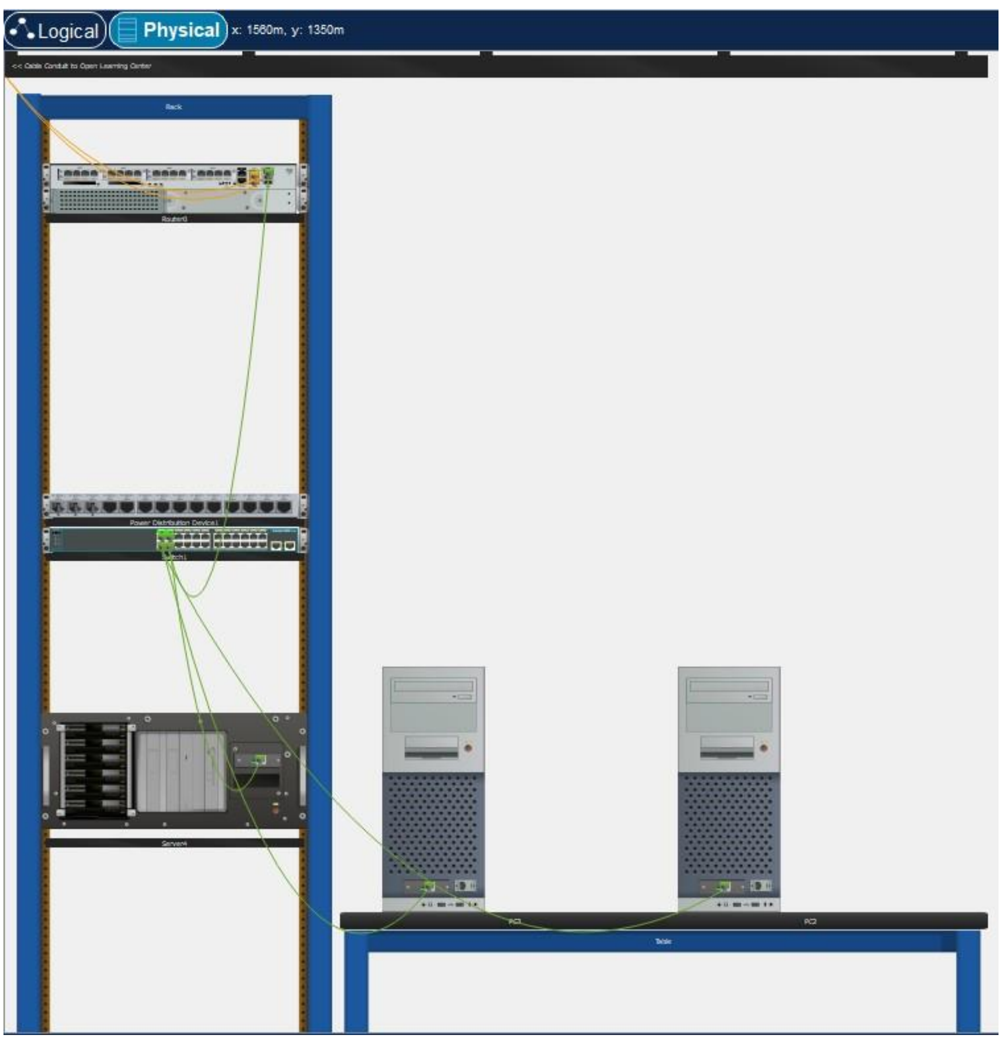
Suppose I have been ordered to architect network infrastructures of campus for Thompson Rivers University (TRU), so I rename the default city name, Home City, as “TRU Campus” in the Physical Mode of the Cisco Packet Tracer.



There are main five buildings on the TRU campus such as Open Learning Center which has a centralized data center, House of Learning, Campus Activity Center, International Building, and Old Main. The routers are interconnected, forming like a pentagon to facilitate communication or transmission between different buildings such as below:




Data Center
Data Center


Logical
Physical
x: 1560m, y: 1350m

2. IP Addressing Choices:

Each building is allocated a unique network address, subnet, and default gateway to ensure efficient IP management as below.

2.1. Building 1 (Open Learning Center):

- Network Address: 192.168.10.0
- IP Subnet: 192.168.10.0 /24
- Default Gateway: 192.168.10.1

2.2. Building 2 (House of Learning):

- Network Address: 192.168.20.0
- IP Subnet: 192.168.20.0 /24
- Default Gateway: 192.168.20.1

2.3. Building 3 (Campus Activity Center):

- Network Address: 192.168.30.0
- IP Subnet: 192.168.30.0 /24
- Default Gateway: 192.168.30.1

2.4. Building 4 (International Building):

- Network Address: 192.168.40.0
- IP Subnet: 192.168.40.0 /24
- Default Gateway: 192.168.40.1

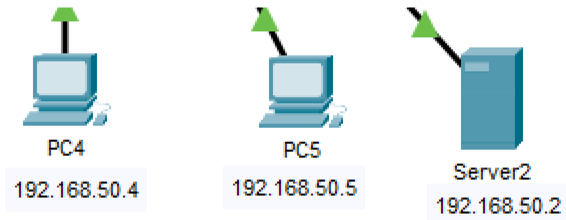
2.5. Building 5 (Old Main):

- Network Address: 192.168.50.0
- IP Subnet: 192.168.50.0 /24
- Default Gateway: 192.168.50.1

3. Devices Selection:

Devices are strategically chosen such that routers play a crucial role in interconnecting networks, switches facilitate local connectivity as central devices in each building, and PCs and servers as end devices respond to the individual needs of each building. Each end device is also allocated an IPv4 address. This device selection ensures a comprehensive and scalable network infrastructure.

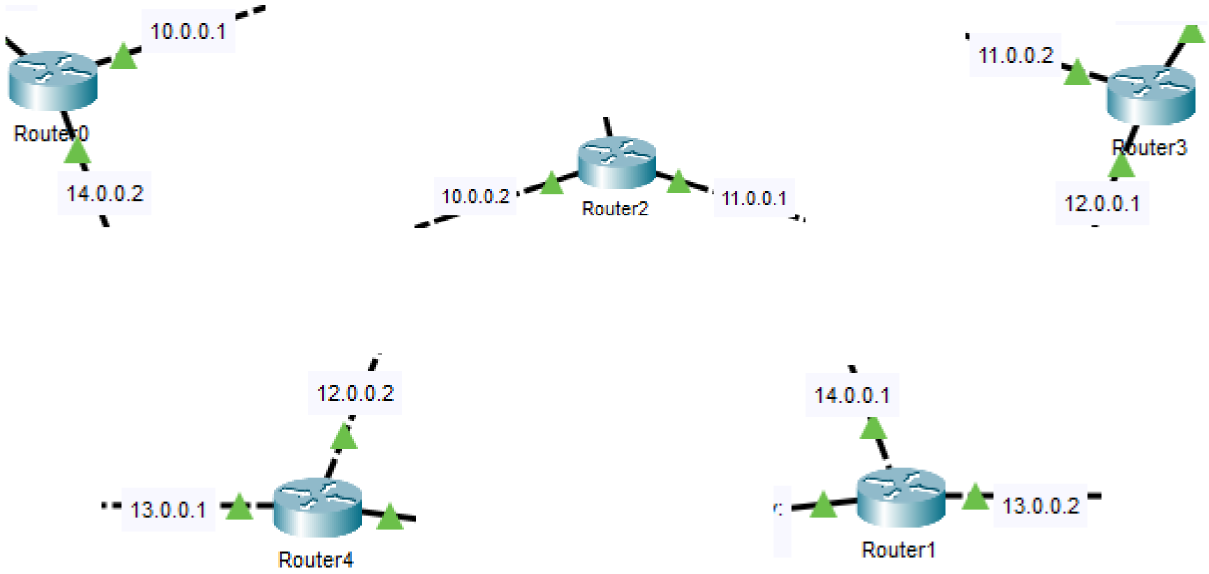
e.g.)



4. Cables Selection:

In each building, Cooper Straight-Through Cables (Unshielded Twisted Pair) with Auto MDI-X mode are used for device connections. Between routers for inter-building connections, Fiber Optic Cables with multimode is employed because it is used between different buildings but not too long distance (within a few hundred meters). Specific IP addresses are assigned to each interface of the router, facing its neighboring two routes, for precise identification and seamless communication between routers.

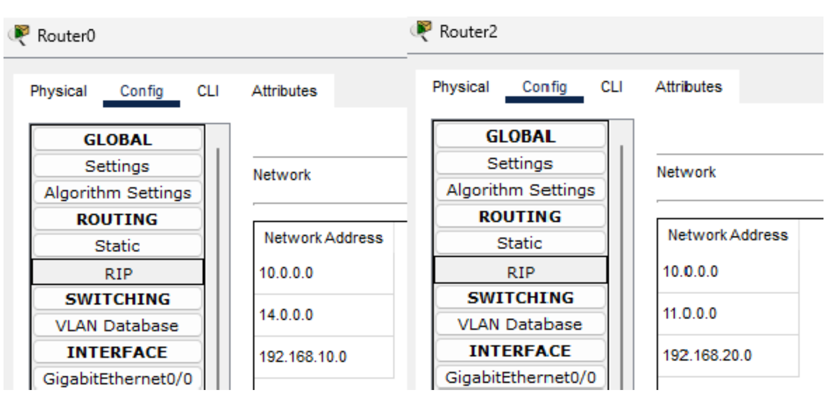
e.g.)

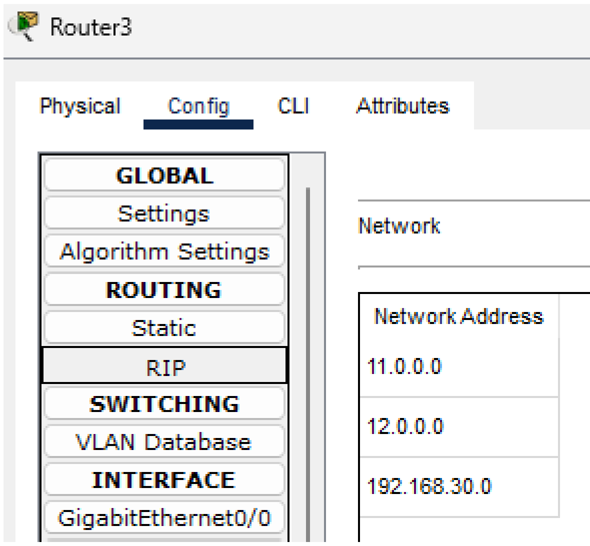


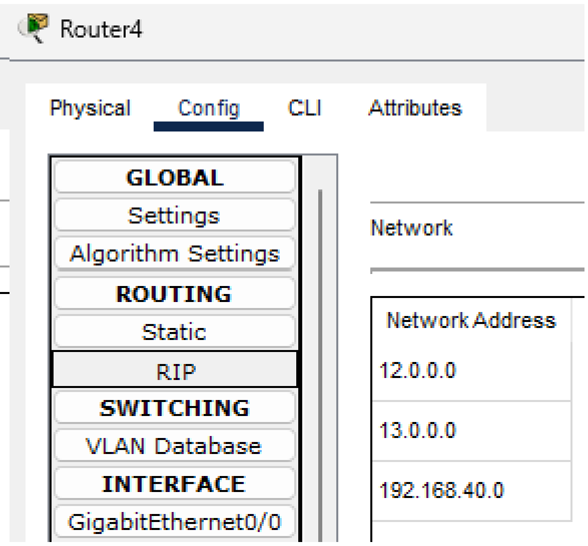
5. **Dynamic Routing Protocol:**

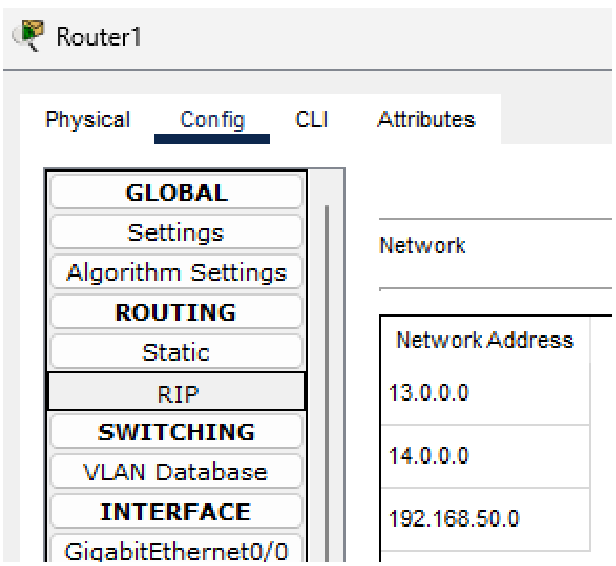
RIP (Routing Information Protocol) has been implemented on all routers as RIP uses a distance vector algorithm to find the optimal path (lowest cost, shortest path, etc.) to reach the destination. Each router is configured with the appropriate network addresses, ensuring dynamic routing capabilities and adaptabilities. The RIP was chosen as the dynamic routing protocol for its simplicity and effectiveness in smaller networks.

e.g.)









6. RIP's Advantages:

The advantage of RIP in the given scenario is using the distance vector algorithm to determine the best path to the destination. In this scenario, the distance vector offers several benefits, where the network scale is moderate, and simplicity is prioritized. The periodic updates and hop count metric enable routers to make informed routing decisions, which prompts network stability.

7. Simulation and Testing:

All possible paths were simulated, and transmissions succeeded. The following is an example of a simulated scenario:

7.1. Initial State:

- PC2 (192.168.10.2) in Open Learning Center (building1) wants to start communication with Server5 (192.168.30.5) in Campus Activity Center (building3).
- The routing tables on Router0 (Open Learning Center) and Router3 (Campus Activity Center) have information about their directly connected networks but may not have information about the destination network (192.168.30.0).

7.2. Start Transmission:

- PC2 generates a packet addressed to Server5 (192.168.30.5).
- PC2 forwards the packet to its default gateway which is Router0 (192.168.10.1).

7.3. Router0 Decision:

- Router0 checks its routing table and if it has a specific entry for 192.168.30.0.
- It uses RIP to broadcast its routing information to neighboring routers, including Router3.

7.4. RIP Update:

- Router0 broadcasts an update indication of the networks that it knows about.
- Router3 receives this update and updates its routing table accordingly.

7.5. Router3 Decision:

- Router3 has an entry for 192.168.10.0 and can forward packets to the Open Learning Center.
- It attempts to find the shortest path to reach the destination as the routers use RIP which uses a distance vector algorithm.

7.6. Packet Forwarding:

- Router3 forwards the packet to the Open Learning Center, and subsequent routers in the path update their routing tables as needed.

7.7. Arrival at Destination:

- The packet reaches Router3 in Campus Activity Center, and the Router3 forwards the packet to Server5 (192.168.30.5).

7.8. Acknowledgement from Server5 to PC2:

- Once Server5 receives the incoming packet from Router3, it processes the request to reply with an acknowledgment to the source IP, which is PC2 (192.68.10.2).

7.9. Router3 Decision Again and RIP Update:

- Router3 recognizes that the shortest path to reach PC2 is via Router0 as its routing table already has this information.
- If there are any changes in the network, it might send RIP updates to neighboring routers to inform them about its current routing table.

7.10. Router3 Forwarding:

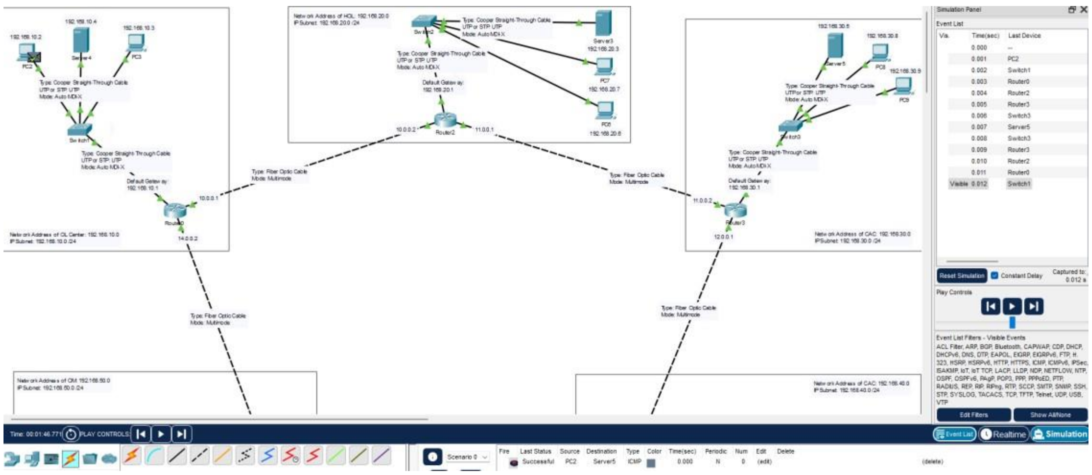
- Router3 forwards the acknowledgment to Router0 based on its updated routing table.

7.11. Router0 Decision Again:

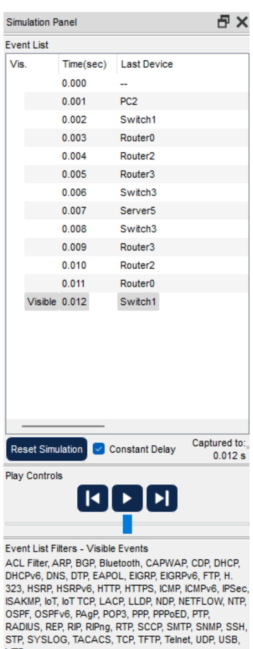
- Router0 directly forwards the acknowledgment to PC2 as it already knows where to send it due to its routing table that already has the destination IP address, which is PC2 (198.162.10.2).

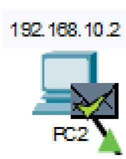
7.12. Acknowledgment Arrival at PC2.

- The acknowledgment packet finally reaches PC2.
- This is the end of the completed transmission.

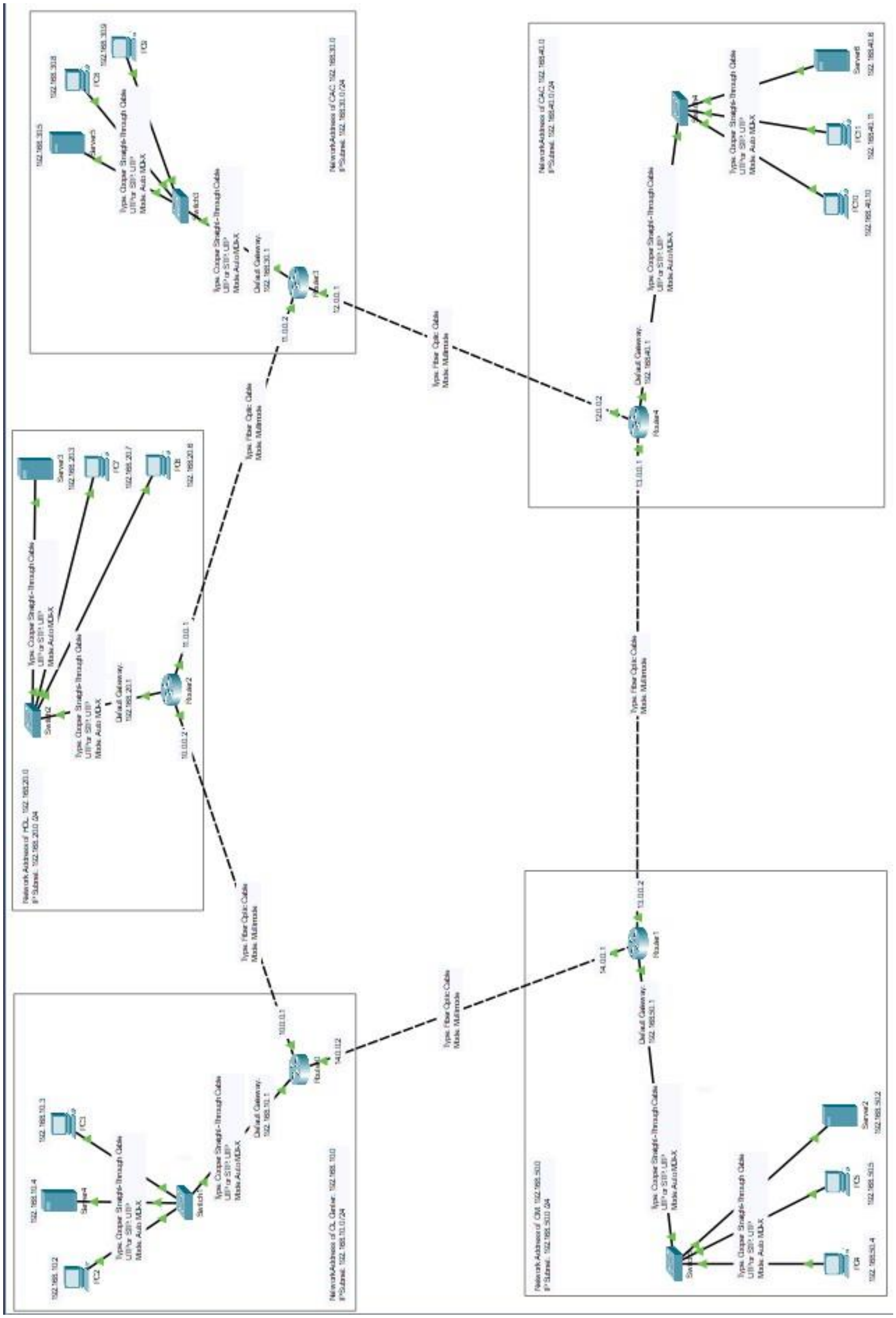


Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC2	Server5	ICMP		0.000	N	0	(edit)	





8. Overview of the Logical Mode:



9. Reference:

Brush, K. (2022, December 21). *What is routing information protocol (RIP) and how does it work?*. Networking. https://www.techtarget.com/searchnetworking/definition/Routing-Information-Protocol#:~:text=Routing%20Information%20Protocol%20(RIP)%20is,group%20of%20local%20area%20networks