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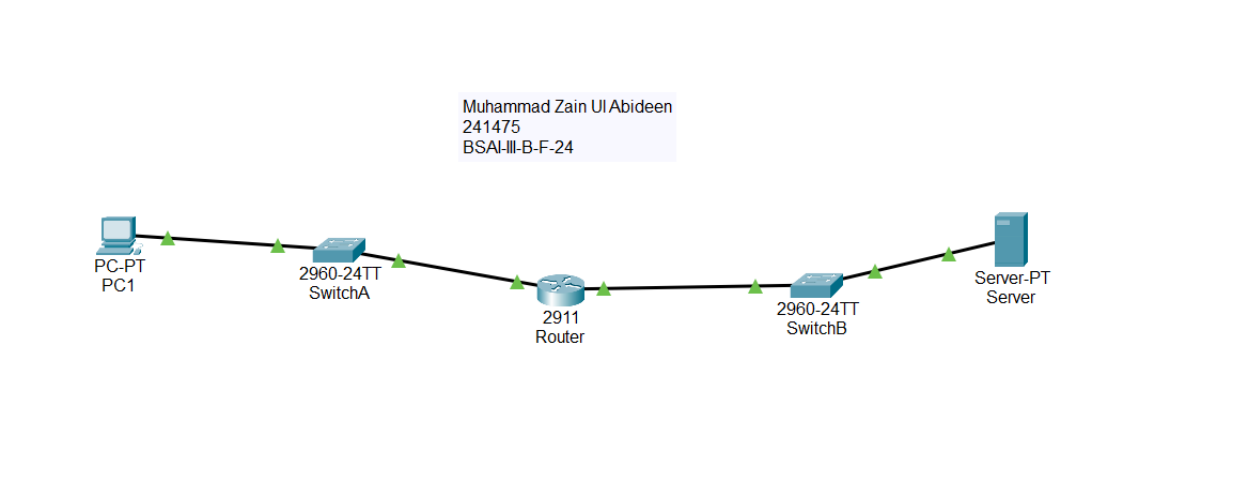
Section	BSAI-III-B-F-24
Task	Assignment
Instructor	Ma’am Amna Sarwar
Submitted on	14/10/2025

Question No. 1:

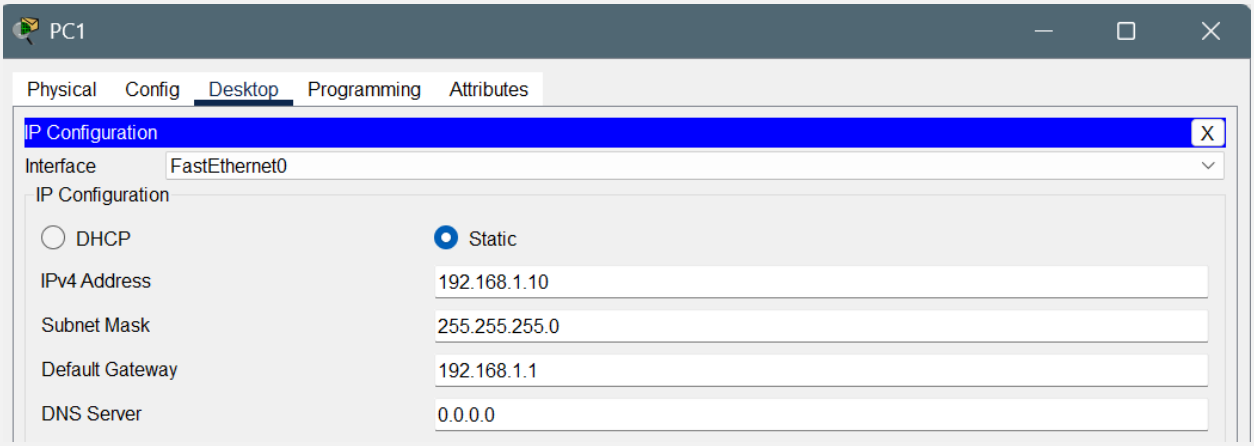
You are required to design and implement your own network scenario in Cisco Packet Tracer that demonstrates data communication between two end devices located in different area. Your network should clearly show how each layer of the OSI model participates in the end-to-end communication between a Sender and a Receiver. You are encouraged to use creativity while setting up your network.

(a) Draw and configure the complete network topology in Cisco Packet Tracer using correct cabling, IP addressing, and device configuration. (5 Marks)

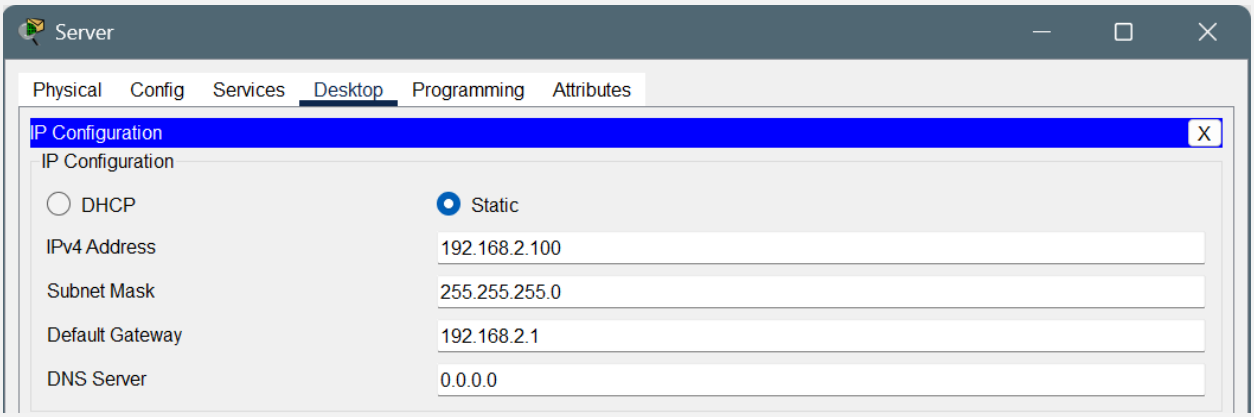
- **A. Network Topology**
  - **Full workspace showing PC1, SwitchA, Router (R1), SwitchB, and Server.**



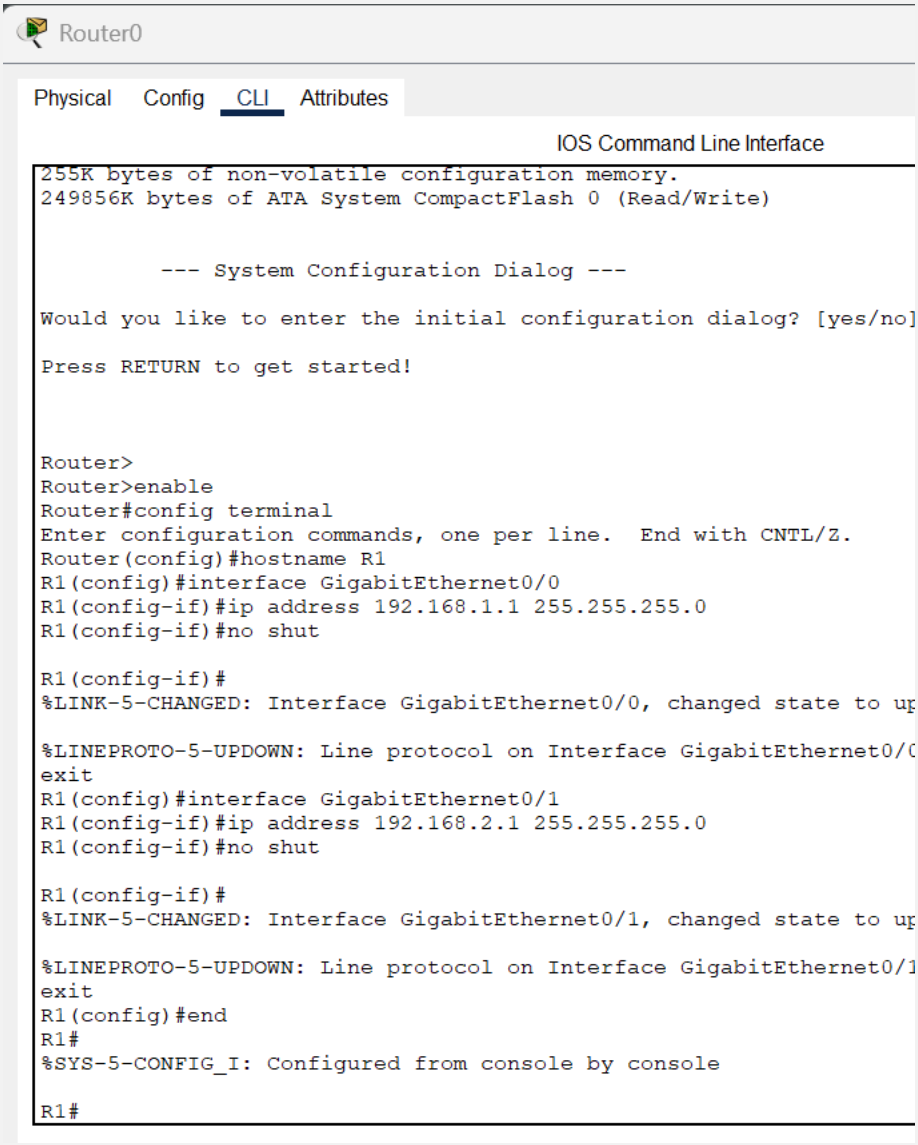
PC1 Config



Server

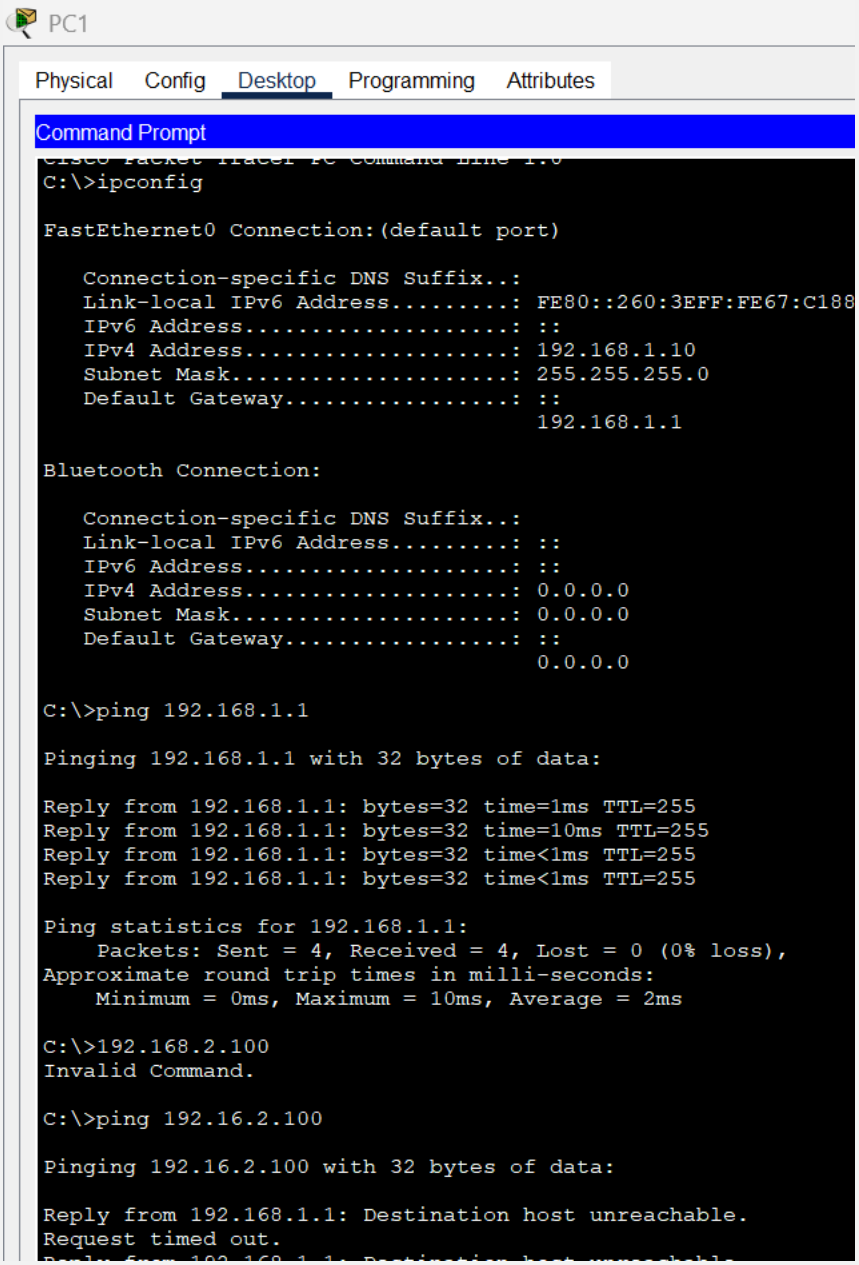


Configure the router R1

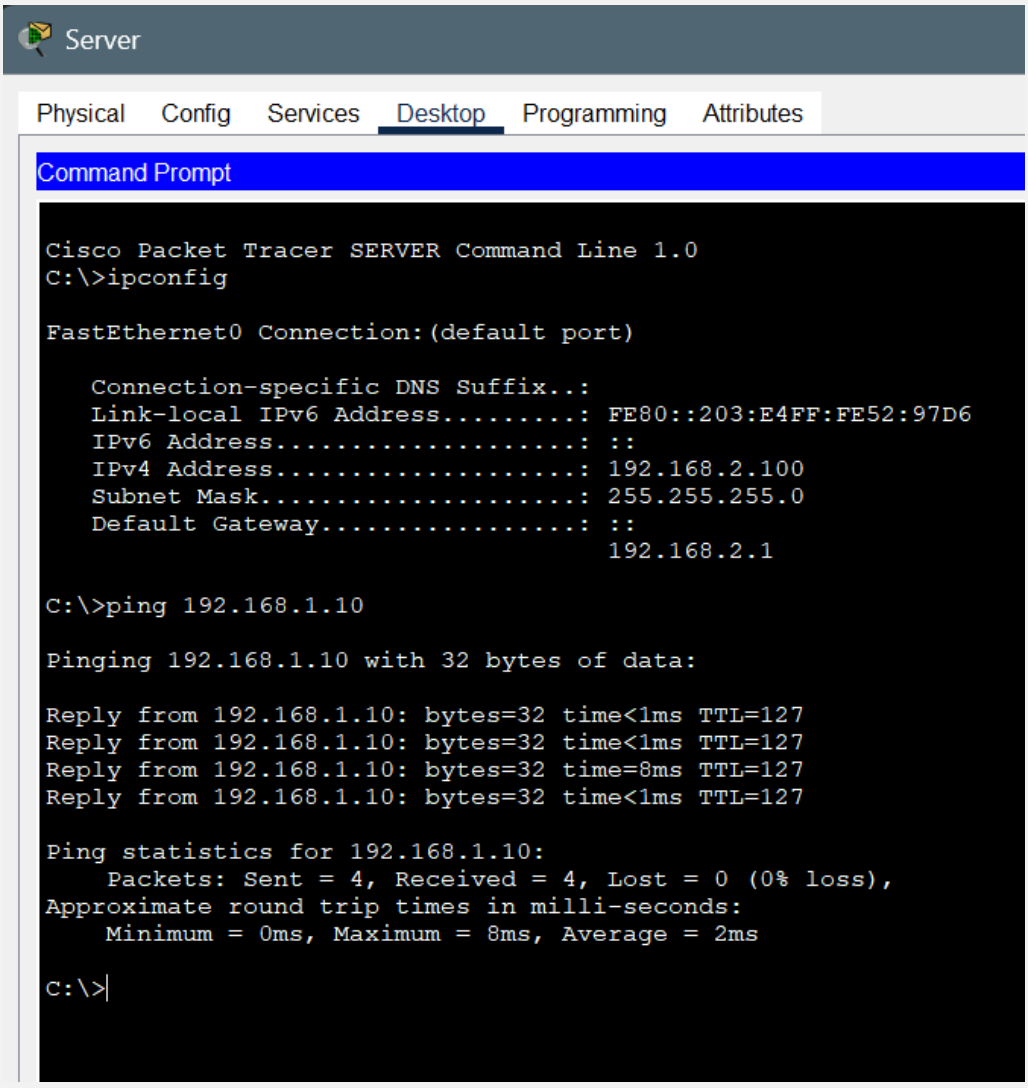


Quick verification

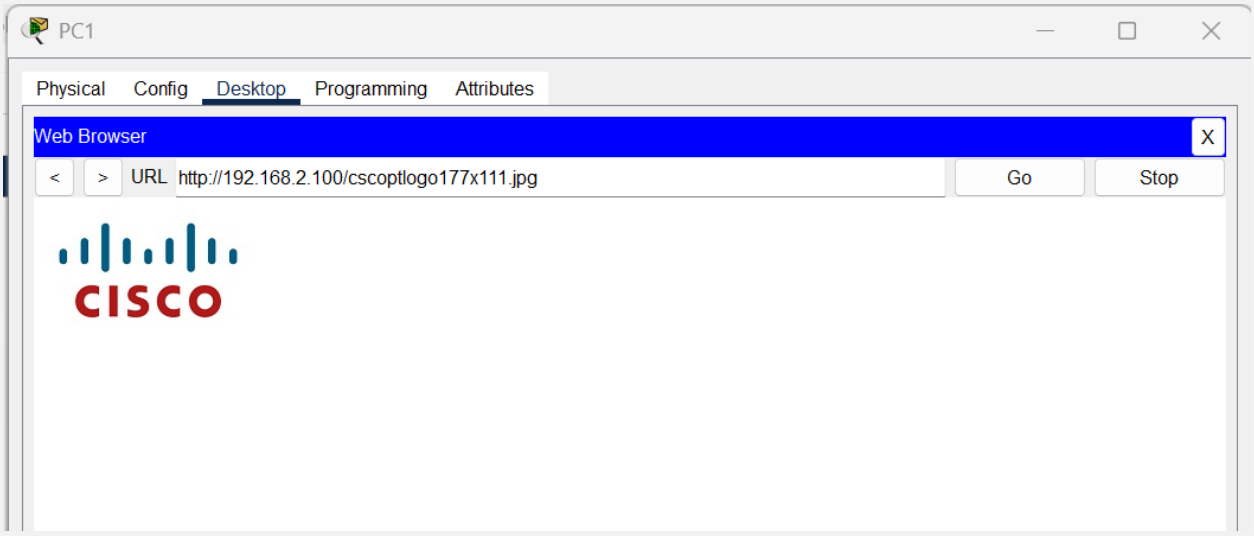
From PC1



From Server

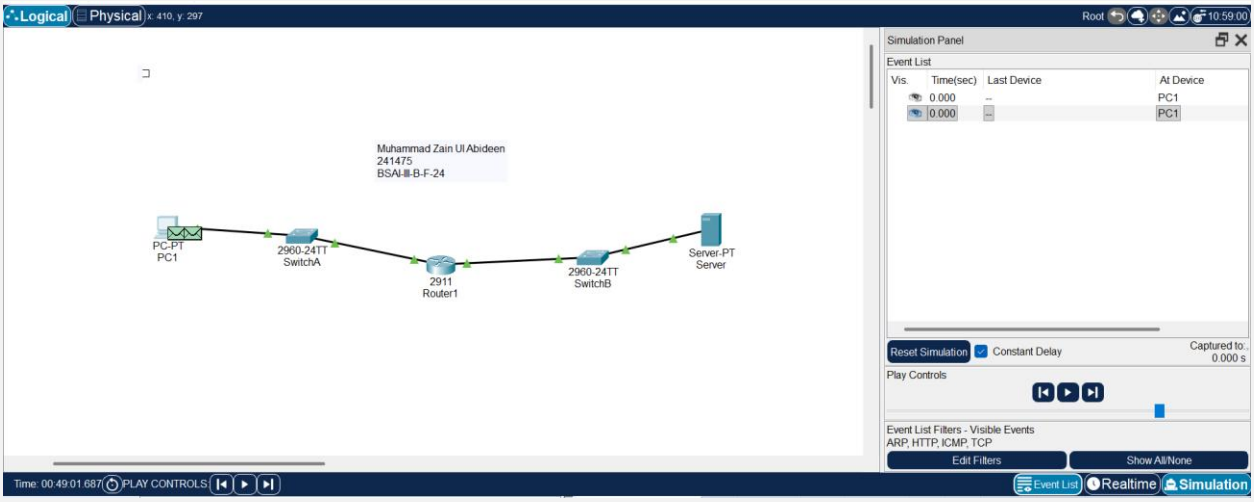

Server
Physical
Config
Services
Desktop
Programming
Attributes
Command Prompt
Cisco Packet Tracer SERVER Command Line 1.0
C:\>ipconfig
FastEthernet0 Connection:(default port)
Connection-specific DNS Suffix..:
Link-local IPv6 Address.....: FE80::203:E4FF:FE52:97D6
IPv6 Address.....: ::
IPv4 Address.....: 192.168.2.100
Subnet Mask.....: 255.255.255.0
Default Gateway.....: ::
192.168.2.1
C:\>ping 192.168.1.10
Pinging 192.168.1.10 with 32 bytes of data:
Reply from 192.168.1.10: bytes=32 time<1ms TTL=127
Reply from 192.168.1.10: bytes=32 time<1ms TTL=127
Reply from 192.168.1.10: bytes=32 time=8ms TTL=127
Reply from 192.168.1.10: bytes=32 time<1ms TTL=127
Ping statistics for 192.168.1.10:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 8ms, Average = 2ms
C:\>

Basic connectivity completed as PC1 shows:



The results show successful ping replies from the Server to the PC1, confirming proper routing and addressing.
The router's interface status and routing table confirm that both networks (192.168.1.0/24 and 192.168.2.0/24) are directly connected.
The ARP table shows correct MAC–IP mappings.

(c) Encapsulation Process (Sender to Receiver)

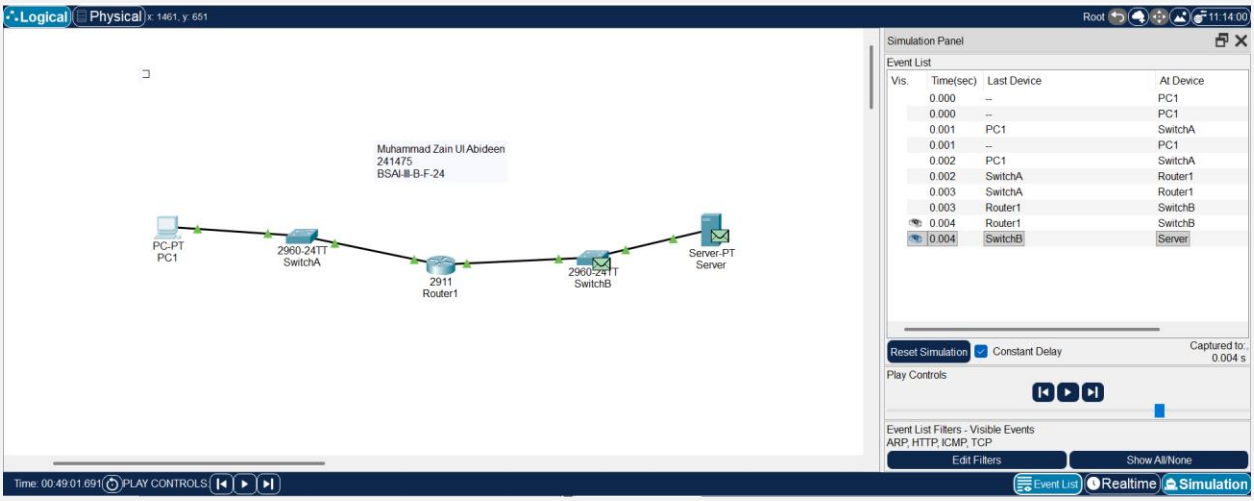


When PC1 sends an HTTP request to the Server (192.168.2.100), each layer of the OSI model performs encapsulation:

1. **Application Layer**: Browser forms an HTTP GET request.
2. **Transport Layer:** TCP adds source port (ephemeral) and destination port 80.
3. **Network Layer:** IP adds source IP 192.168.1.10 and destination IP 192.168.2.100.
4. **Data Link Layer:** Ethernet adds source MAC of PC1 and destination MAC of Router R1.
5. **Physical Layer:** The frame is converted to bits and sent on the wire.

At Router R1, the Ethernet header is removed, the IP header is inspected, and a new Ethernet header is added for the next network (R1 → Server). The IP header remains unchanged, ensuring end-to-end addressing.

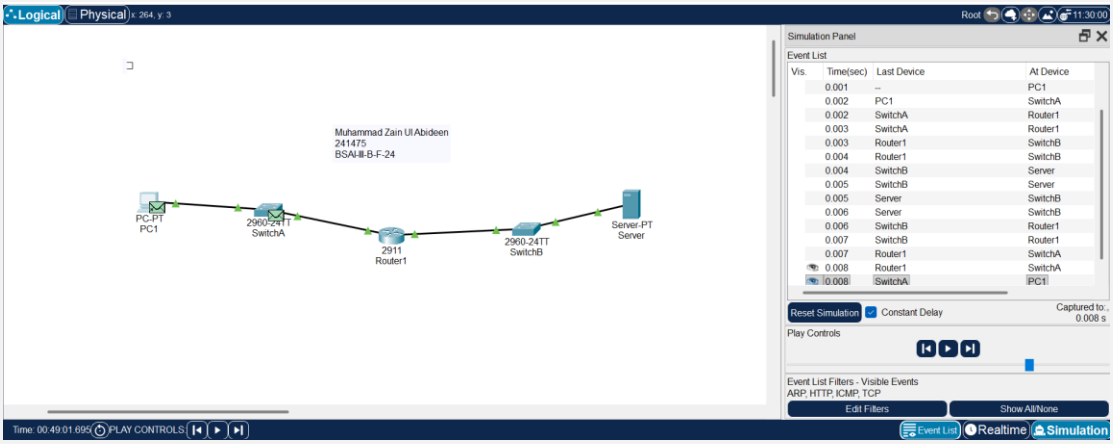
(d) Decapsulation Process (Receiver side)



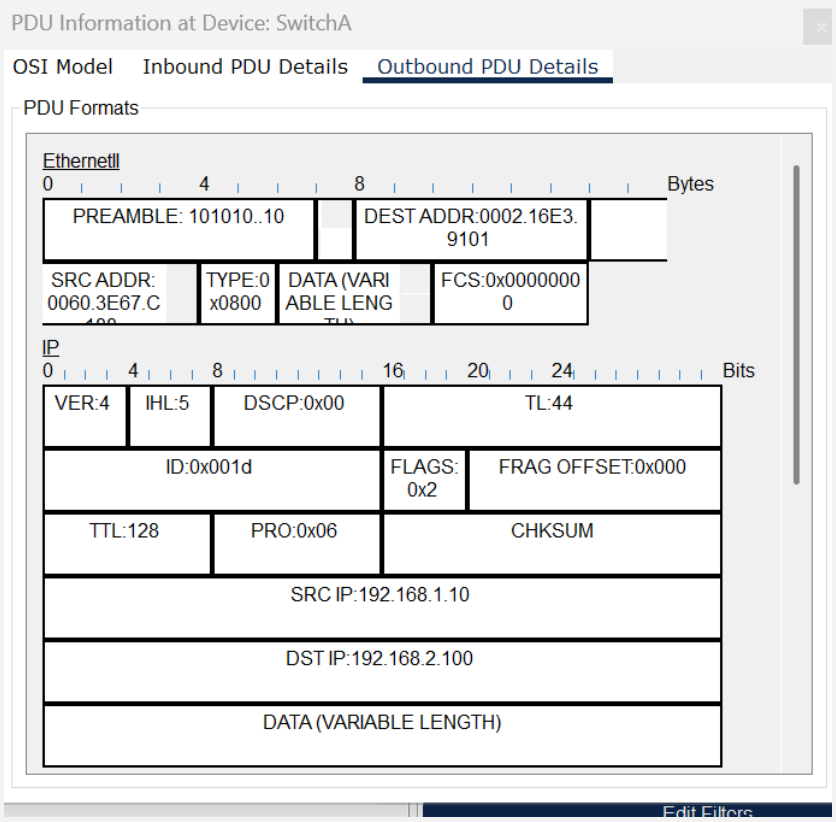
At the Server (192.168.2.100), the reverse process occurs:

1. **Physical Layer:** The bits are received and reassembled into a frame.
2. **Data Link Layer:** The Ethernet header is removed (destination MAC matched).
3. **Network Layer:** The IP header is inspected and stripped off.
4. **Transport Layer:** TCP checks the port number (80) and sequence numbers.
5. **Application Layer:** The HTTP request is processed, and the server responds with an HTTP 200 OK message back to the client.

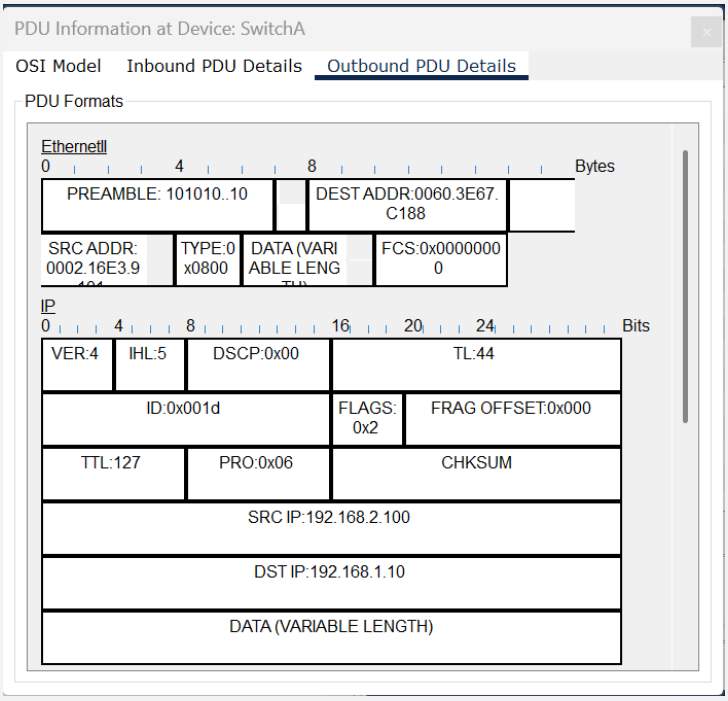
The same encapsulation/decapsulation process repeats in reverse for the response.



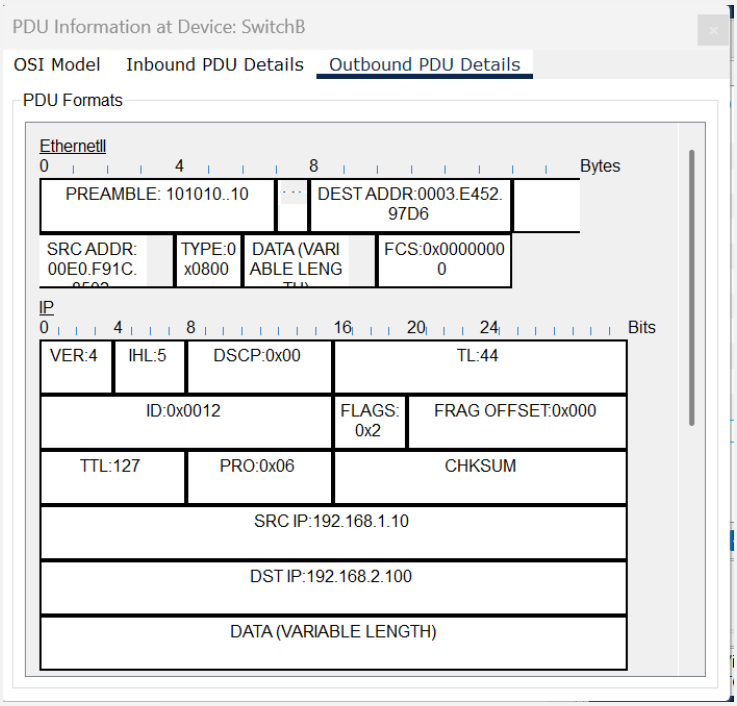
1. ARP Request



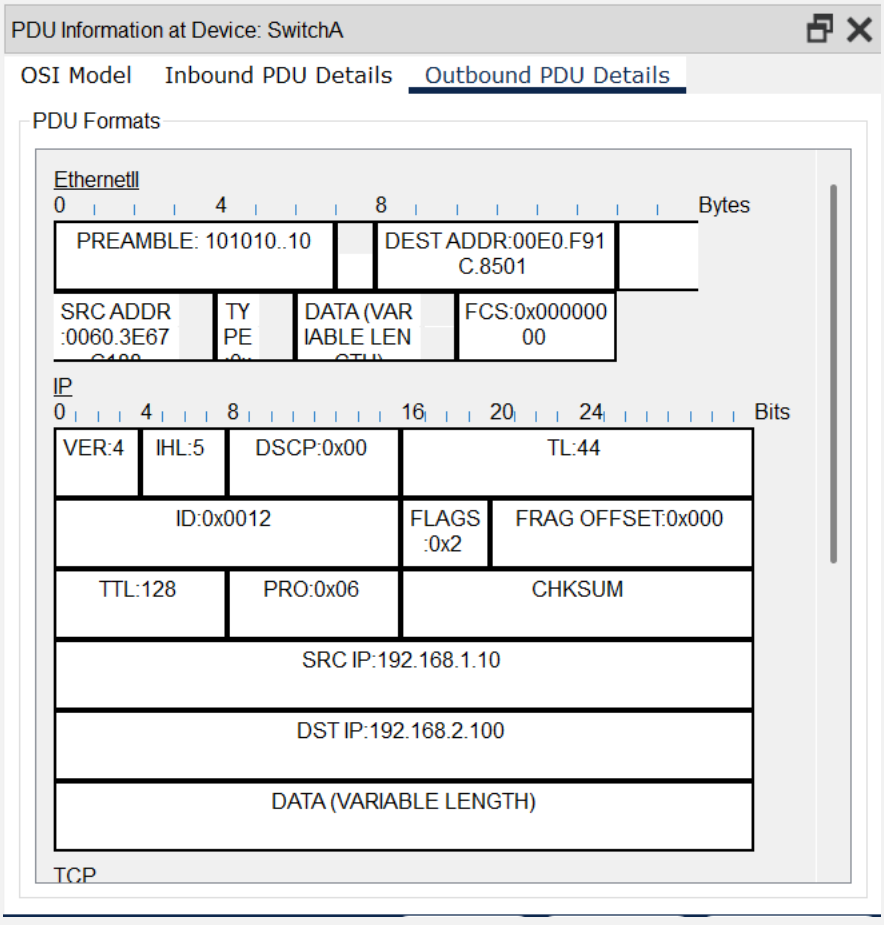
2. ARP Reply



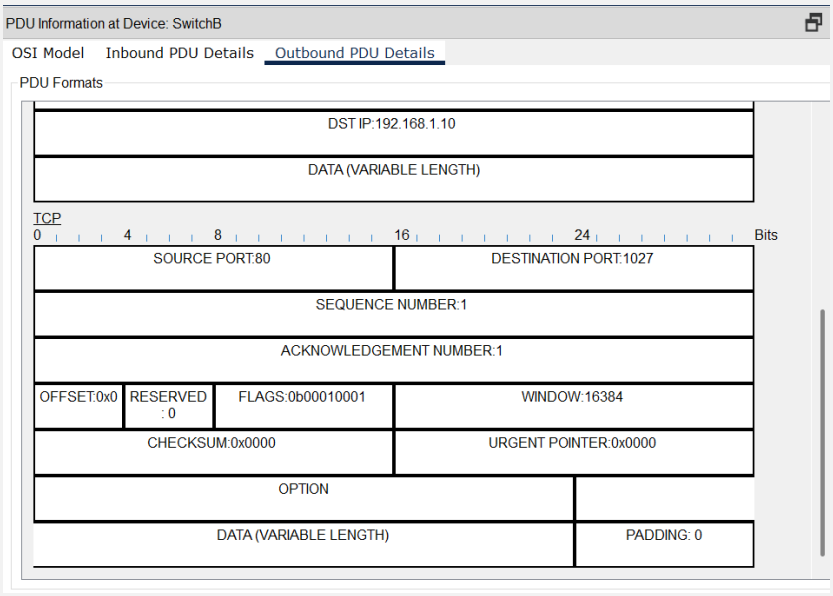
3. Router Forwarding



4. HTTP GET



5. **HTTP 200 OK**



The screenshot shows data moving across the network, demonstrating encapsulation at each layer. MAC addresses change hop-to-hop, while IP addresses remain constant.

(f) Conclusion

In conclusion, the designed topology successfully demonstrates end-to-end communication between two different network areas. The simulation clearly shows encapsulation and decapsulation processes across OSI layers, verifying that data is transmitted reliably between sender and receiver through a router.