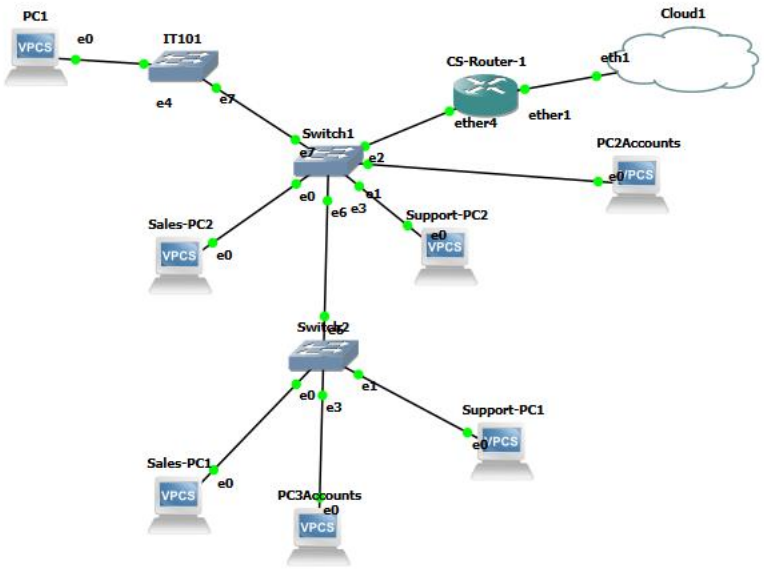
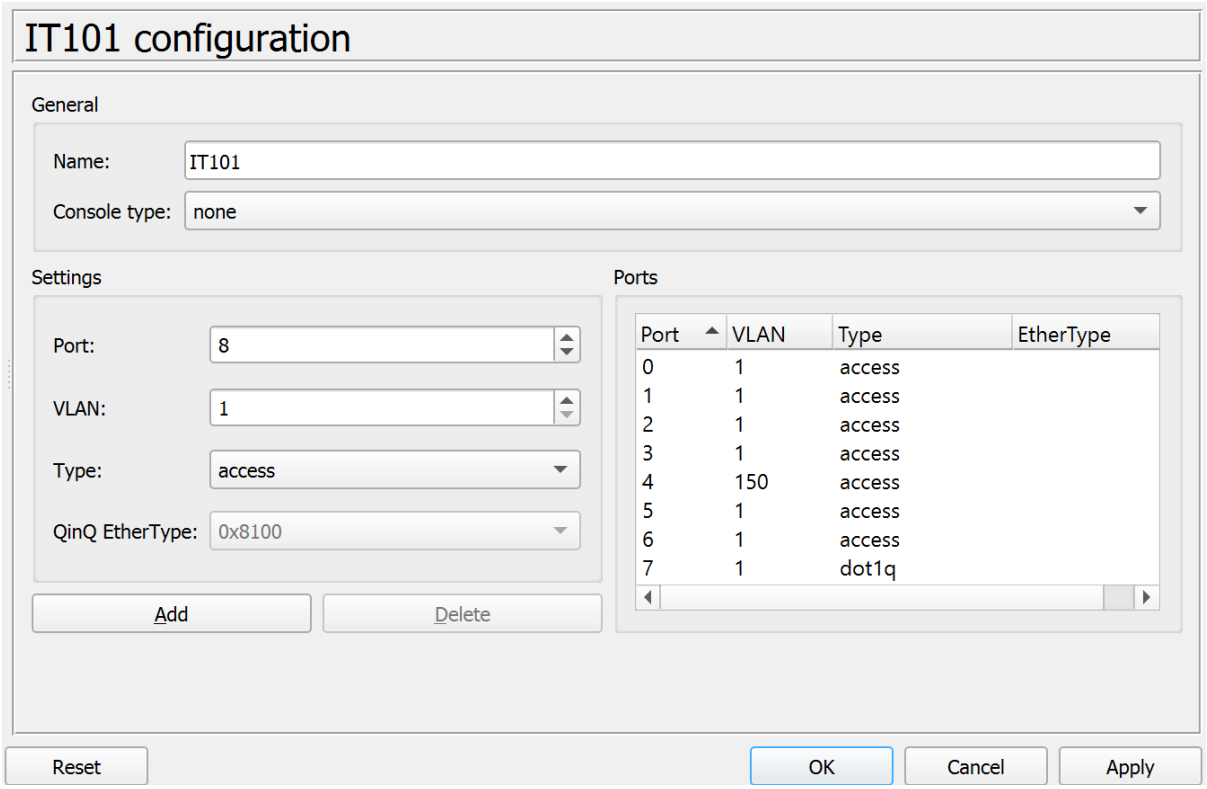
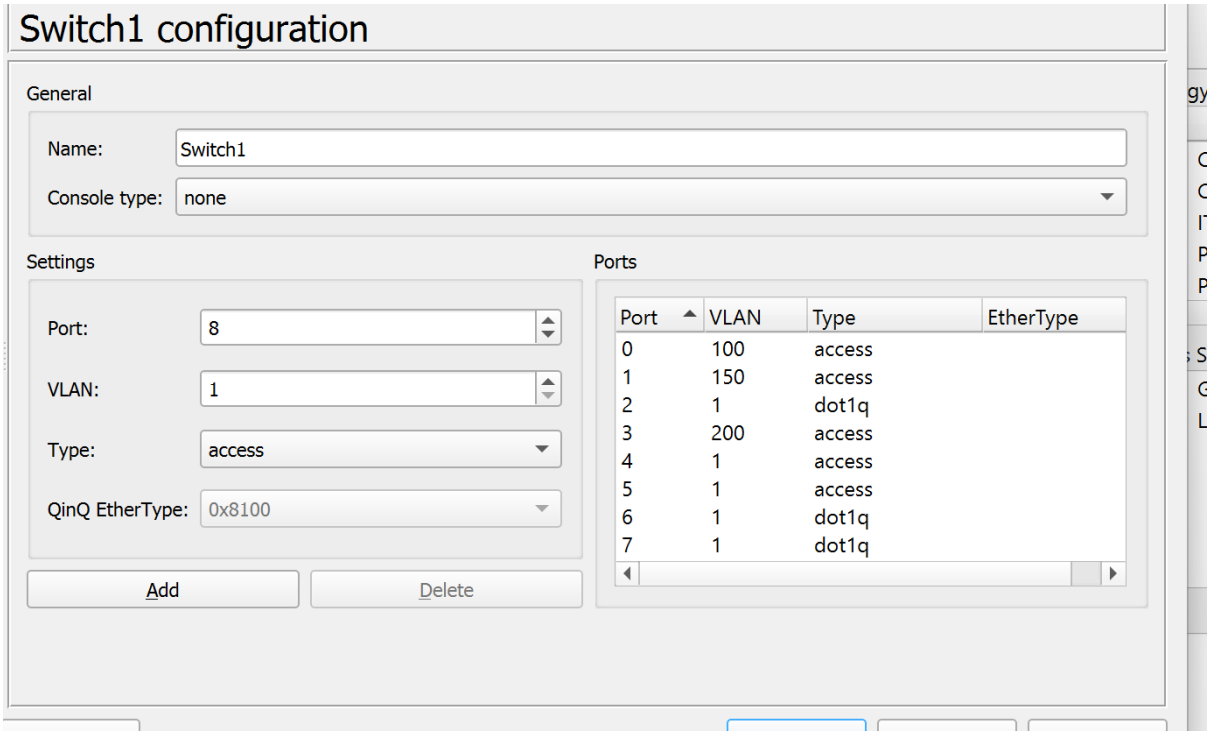
Networks and Data Communications – Assignmnet1 VLAN BASED NETWORK

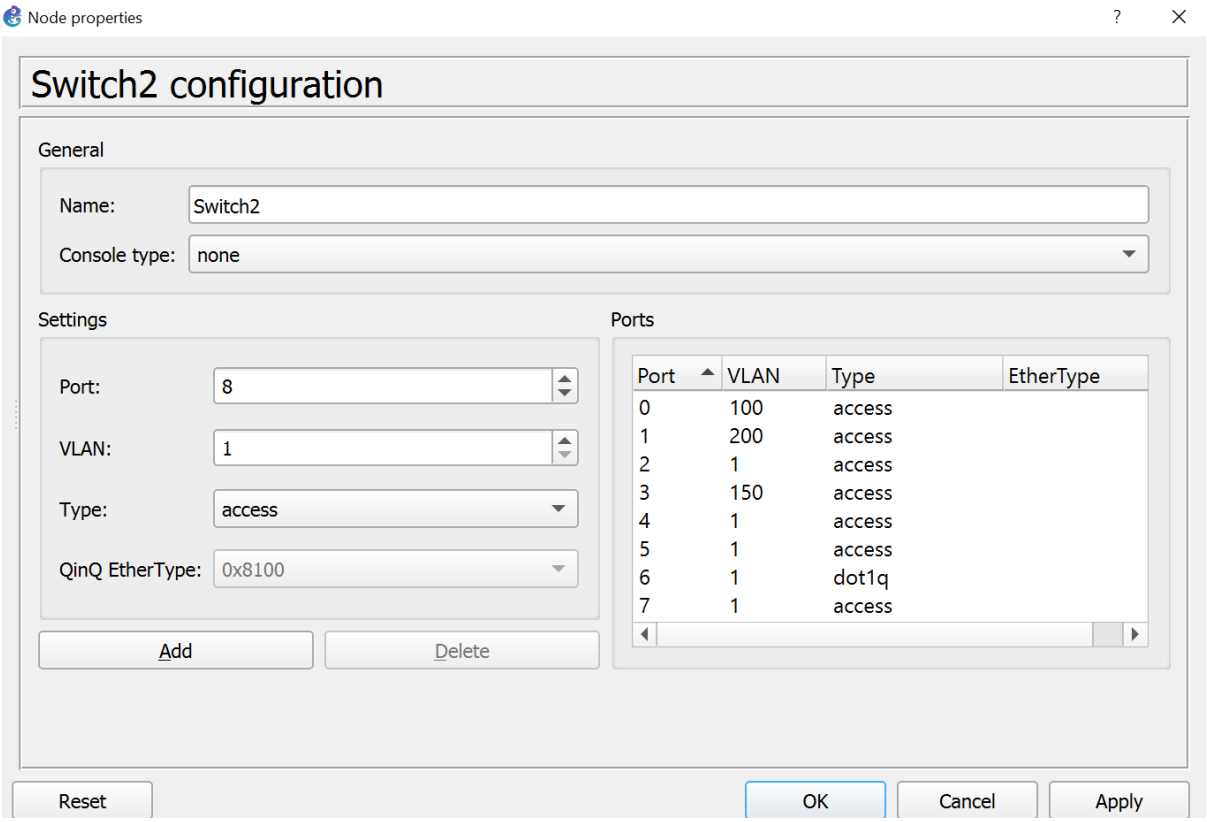


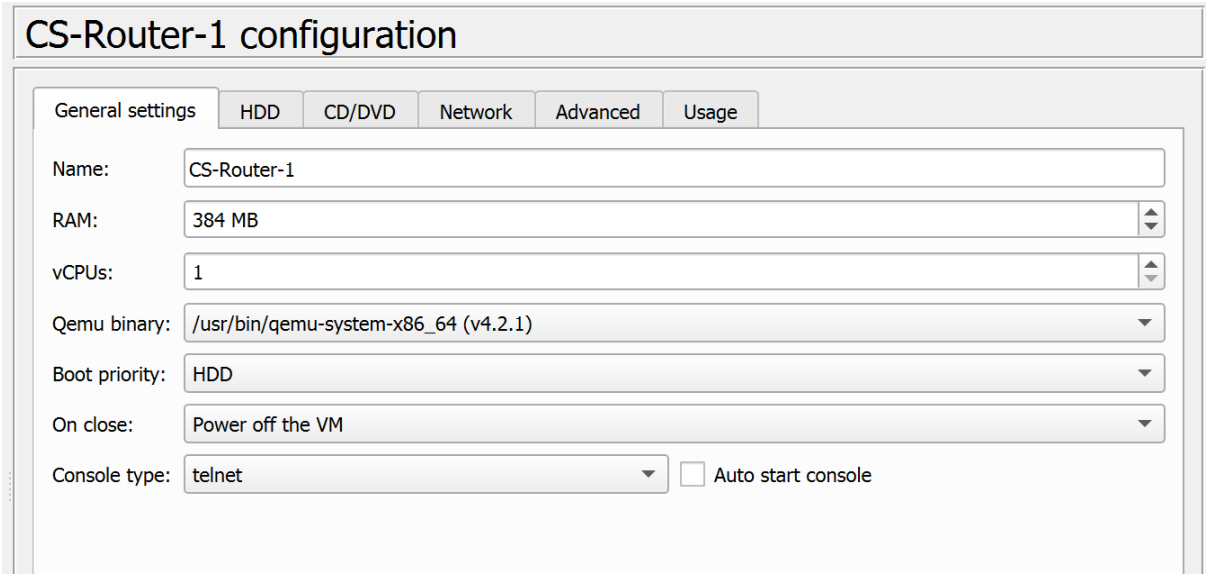

```
#
/interface ethernet
set [ find default-name=ether1 ] disable-running-check=no
set [ find default-name=ether2 ] disable-running-check=no
set [ find default-name=ether3 ] disable-running-check=no
set [ find default-name=ether4 ] disable-running-check=no
/interface vlan
add interface=ether4 name=AccountsDept vlan-id=150
add interface=ether4 name=VLAN100 vlan-id=100
add interface=ether4 name=VLAN200 vlan-id=200
/interface wireless security-profiles
set [ find default=yes ] supplicant-identity=MikroTik
/ip pool
add name=dhcp_pool0 ranges=192.168.100.2-192.168.100.254
add name=dhcp_pool1 ranges=192.168.200.2-192.168.200.254
add name=dhcp_pool2 ranges=192.168.150.2-192.168.150.254
/ip dhcp-server
add address-pool=dhcp_pool0 disabled=no interface=VLAN100 name=dhcp1
add address-pool=dhcp_pool1 disabled=no interface=VLAN200 name=dhcp2
add address-pool=dhcp_pool2 disabled=no interface=AccountsDept name=dhcp3
/ip address
add address=192.168.100.1/24 interface=VLAN100 network=192.168.100.0
add address=192.168.200.1/24 interface=VLAN200 network=192.168.200.0
add address=192.168.150.1/24 interface=AccountsDept network=192.168.150.0
/ip dhcp-client
add disabled=no interface=ether1
/ip dhcp-server network
add address=192.168.100.0/24 dns-server=8.8.8.8 gateway=192.168.100.1
add address=192.168.150.0/24 dns-server=8.8.8.8 gateway=192.168.150.1
add address=192.168.200.0/24 dns-server=8.8.8.8 gateway=192.168.200.1
/system identity
set name=CS-Router-1
[admin@CS-Router-1] >
```

Configuration


IT101 configuration
General
Name:
IT101
Console type:
none
Settings
Port:
8
VLAN:
1
Type:
access
QinQ EtherType:
0x8100
Add
Delete
Ports
Port
VLAN
Type
EtherType
0 1 access
1 1 access
2 1 access
3 1 access
4 150 access
5 1 access
6 1 access
7 1 dot1q
Reset
OK
Cancel
Apply


Switch1 configuration
General
Name:
Switch1
Console type:
none
Settings
Port:
8
VLAN:
1
Type:
access
QinQ EtherType:
0x8100
Add
Delete
Ports
Port
VLAN
Type
EtherType
0 100 access
1 150 access
2 1 dot1q
3 200 access
4 1 access
5 1 access
6 1 dot1q
7 1 dot1q





Part 6:

```
PC1> trace 192.168.150.254 -P 1
trace to 192.168.150.254, 8 hops max (ICMP), press Ctrl+C to stop
 1   192.168.150.254   0.255 ms  0.312 ms  0.231 ms
```

```
PC2Accounts> trace 192.168.150.254 -P 1
trace to 192.168.150.254, 8 hops max (ICMP), press Ctrl+C to stop
 1   192.168.150.254   0.249 ms  0.194 ms  0.168 ms
```

```
PC3Accounts> trace 192.168.150.254 -P 1
traceroute to 192.168.150.254, 8 hops max
 1 192.168.150.254     0.001 ms
```

Results:

- The results from the traceroute commands show the network path and the latency for packets traveling from the different source devices to the destination IP address 192.168.150.254.

PC1:

- The trace route results indicate that PC1 reached the destination (192.168.150.254) in a single hop.
- The RTT values for PC1 are low (0.255 ms, 0.312 ms, 0.231 ms), reinforcing the idea that the destination is in the same local network or VLAN as PC1.

PC2Accounts:

- The traceroute results indicate that PC2Accounts reached the destination (192.168.150.254) in a single hop.
- The RTT values are still very low (0.249 ms, 0.194 ms, 0.168 ms), indicating that the destination is close to the network, possibly within the same local network or VLAN.

PC3Accounts:

- The traceroute results indicate that PC3Accounts reached the destination (192.168.150.254) in a single hop.
- The round-trip time (RTT) is extremely low, with "0.001 ms" indicating that the destination is likely in the same local network or VLAN as PC3Accounts. Such a low RTT suggests minimal latency.

In all these cases, the results suggest that the destination IP address (192.168.150.254) is directly reachable from these source devices without traversing multiple network hops. This typically means that the destination is located in the same local network, VLAN, or subnet as the source devices. The low RTT values further indicate that the network latency is minimal, which is ideal for communication within a local network. The traceroute shows efficient and direct connectivity between the source and destination devices with minimal network latency.

Part 7: calling VPC with VLAN 100 from VPC with VLAN 150

```
PC1> trace 192.168.100.254 -P 1
trace to 192.168.100.254, 8 hops max (ICMP), press Ctrl+C to stop
 1   192.168.150.1   0.742 ms  0.625 ms  0.602 ms
 2   192.168.100.254   1.343 ms  1.252 ms  1.429 ms
```

Results: the trace route indicates a successful traceroute from PC1 to the destination IP address (192.168.100.254)

Trace Route Command:

- The traceroute command is initiated with the target IP address 192.168.100.254 and a maximum hop count of 8.

Hop 1 (192.168.150.1):

- The first hop, 192.168.150.1, is the network's initial point of contact and represents the originating device's local gateway or router.

- The round-trip times (RTT) for this first hop are recorded as 0.742 ms, 0.625 ms, and 0.602 ms. These RTT values indicate the time taken for the traceroute packet to travel from the source (PC1) to the first network device (the local gateway) and back.
- Low RTT values such as these suggest efficient and low-latency communication within the local network. It indicates that the packet reached the local gateway very quickly and returned without notable delay.
- Based on this information, we can conclude that the destination IP address (192.168.100.254) was successfully reached within the first hop. This suggests that the destination is directly accessible from the originating device (PC1) and is likely located within the same local network or VLAN as PC1.

Hop 2 (192.168.100.254):

- The second hop represents the destination IP address itself, 192.168.100.254. In this case, the traceroute has successfully reached the intended destination.
- The round-trip times (RTT) for this second hop are recorded as 1.343 ms, 1.252 ms, and 1.429 ms. These RTT values indicate the time it took for the traceroute packet to travel from the source (PC1) to the destination IP address (192.168.100.254) and return.
- The RTT values are slightly higher compared to the first hop, which is expected because they encompass the complete journey from PC1 to the final destination. However, the RTT values are still relatively low, suggesting that the communication to and from the destination is efficient and experiences only minimal latency.
- The traceroute has successfully reached the destination within the second hop, indicating that PC1 can directly communicate with the destination IP address (192.168.100.254) without the need to traverse multiple network devices, such as routers or gateways.

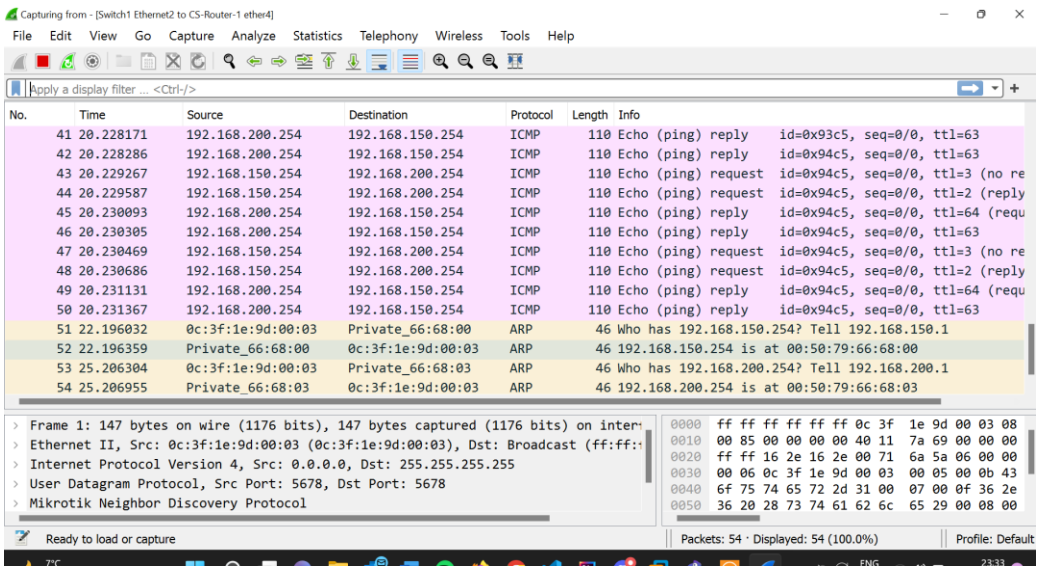
Based on the information, the destination IP address (192.168.100.254) was successfully reached in the first and second hop. This suggests that the destination is directly accessible from the originating device, likely within the same local network or VLAN.

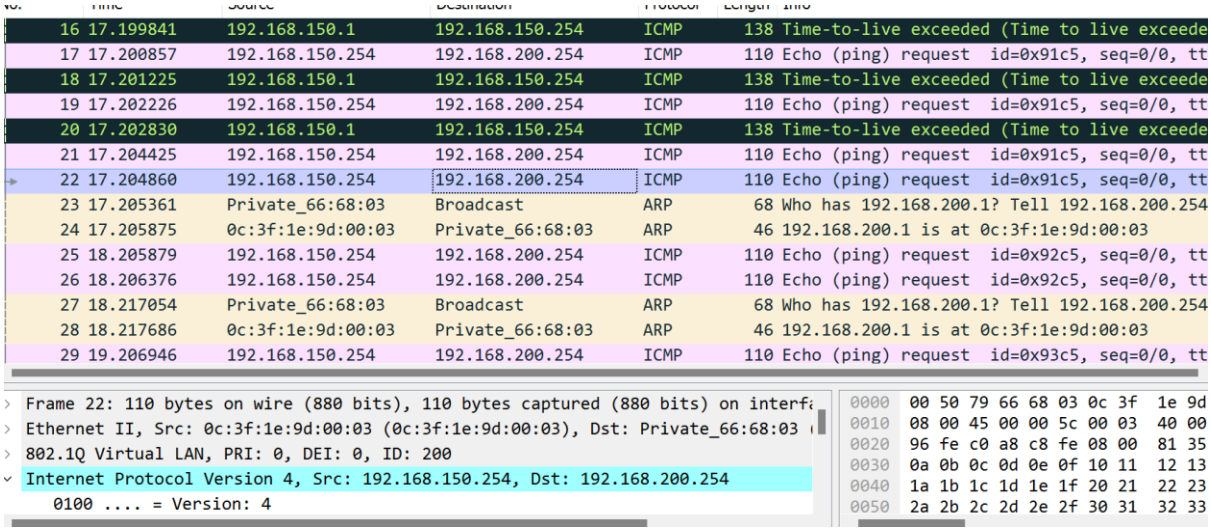
Part 8: Packet capture

Ping VPC VLAN 200 with 150 VLAN VPC:

```
PC1> trace 192.168.200.254 -P 1
trace to 192.168.200.254, 8 hops max (ICMP), press Ctrl+C to stop
 1   192.168.150.1   0.892 ms  0.680 ms  1.310 ms
 2      *   *   *
 3   192.168.200.254   14.983 ms  4294966.972 ms  4294965.708 ms
```

Packet Capture:





Explain Results:

1. The packet capture commences with an ARP request from the VPC in VLAN 150, which is sent as a broadcast to resolve the MAC address associated with the IP address of the destination VPC in VLAN 200.

2. The router, operating as a Layer 3 device, intercepts the ARP request and responds by providing its own MAC address as the gateway for VLAN 150. This ARP reply enables the initiating VPC to learn the router's MAC address.

3. Following the acquisition of the router's MAC address, the VPC in VLAN 150 sends an ICMP Echo Request (ping) to the router's MAC address. This ICMP Echo Request signifies the initiation of a ping operation from VLAN 150 to VLAN 200.
4. To facilitate the routing of traffic from VLAN 150 to VLAN 200, the router encapsulates the ICMP Echo Request packet with an 802.1Q tag designating VLAN 200.
4. This 802.1Q tag explicitly specifies VLAN 200, allowing the router to correctly direct the packet to the intended VLAN.
5. The router forwards the tagged frame to the switch, which receives it and recognizes the VLAN tag for VLAN 200. The switch uses this tag to direct the packet to the devices in VLAN 200.
6. The VPC in VLAN 200 receives the ICMP Echo Request with the VLAN 200 tag and processes it as an incoming ping request.
7. The VPC in VLAN 200 responds to the ICMP Echo Request with an ICMP Echo Reply. This reply is sent without any VLAN tag, as it is intended for the router to route back to VLAN 150.
8. The switch, aware of the VLANs and their corresponding ports, adds an 802.1Q tag indicating VLAN 150 to the ICMP Echo Reply before forwarding it to the router.
9. The router receives the ICMP Echo Reply with the VLAN 150 tag. It processes the packet and then removes the 802.1Q tag, allowing it to route the reply back to VLAN 150.
10. The VPC in VLAN 150 receives the ICMP Echo Reply without any VLAN tag and processes it, completing the ping operation from VLAN 150 to VLAN 200.