

Lecture 7a - Inter-VLAN Routing

○ Type

Lecture

○ Materials

Empty

○ Reviewed

✓

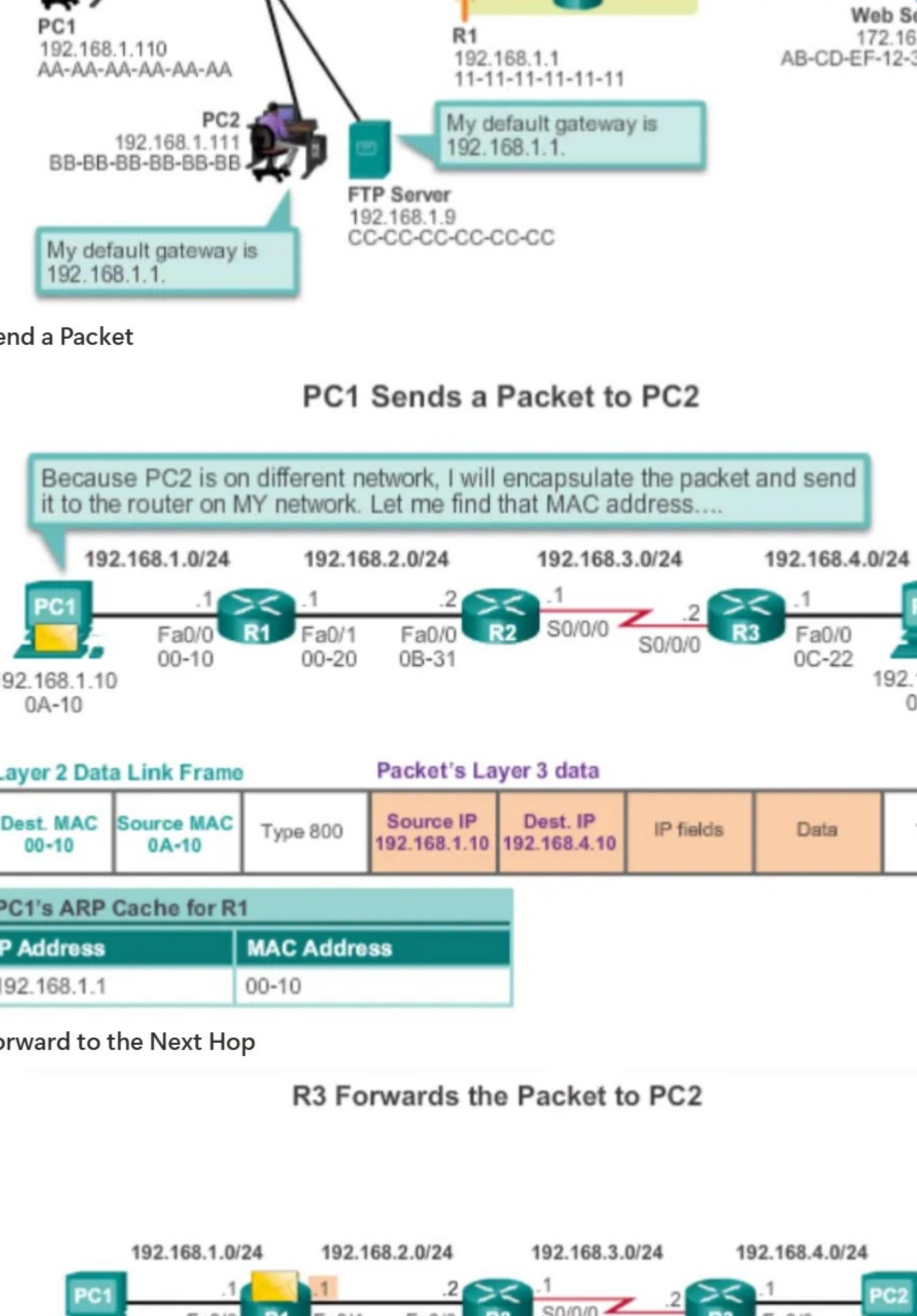
- 1. Review - Routing
- 2. Review - VLANs
- 3. Inter-vlan Routing Basics
- 4. Router Interfaces
- 5. Interfaces and Subinterfaces

1. Review - Routing

- The router is responsible for the routing of traffic between networks.

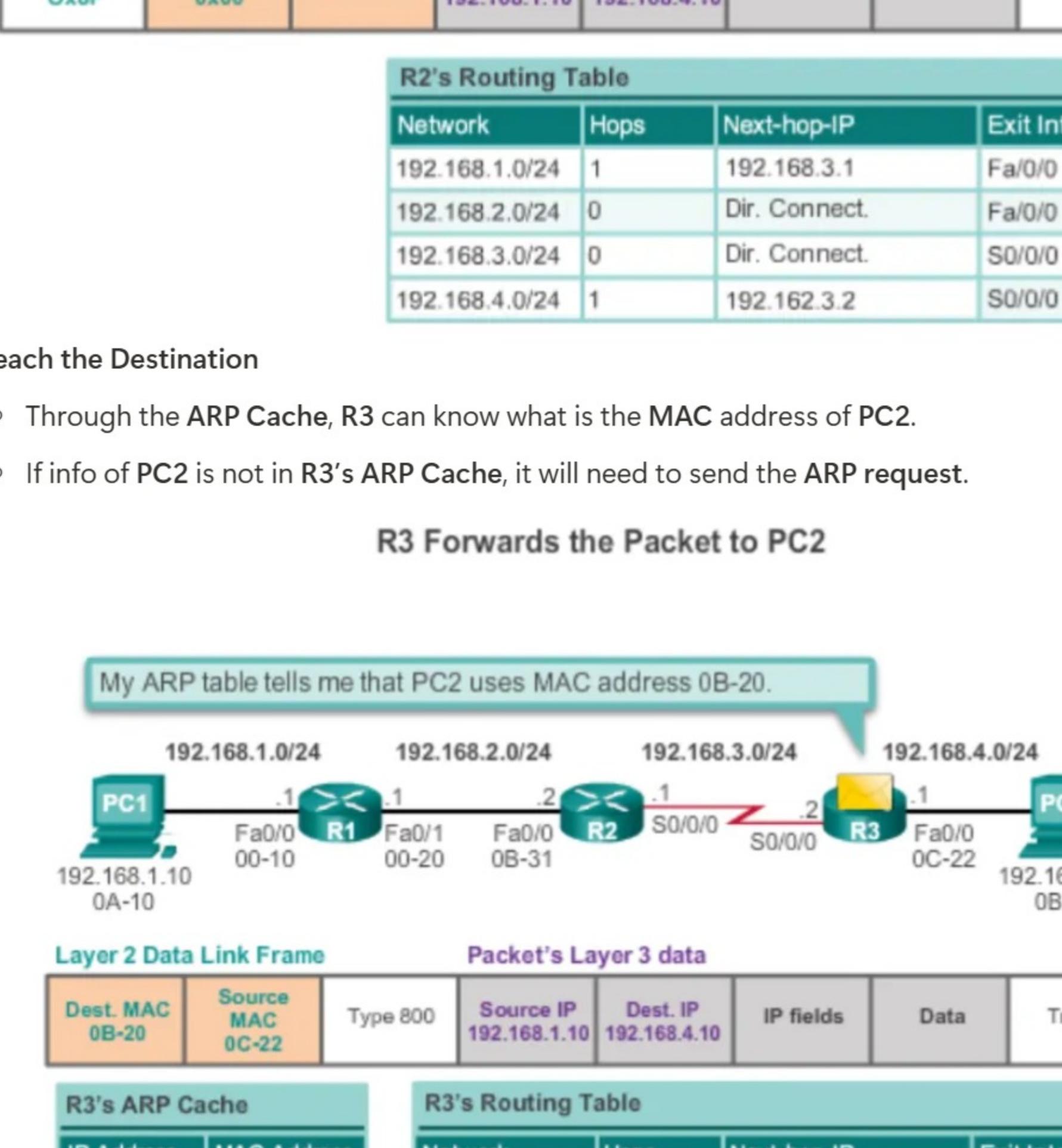
- Up and Down the Stack

Encapsulating and De-Encapsulating Packets



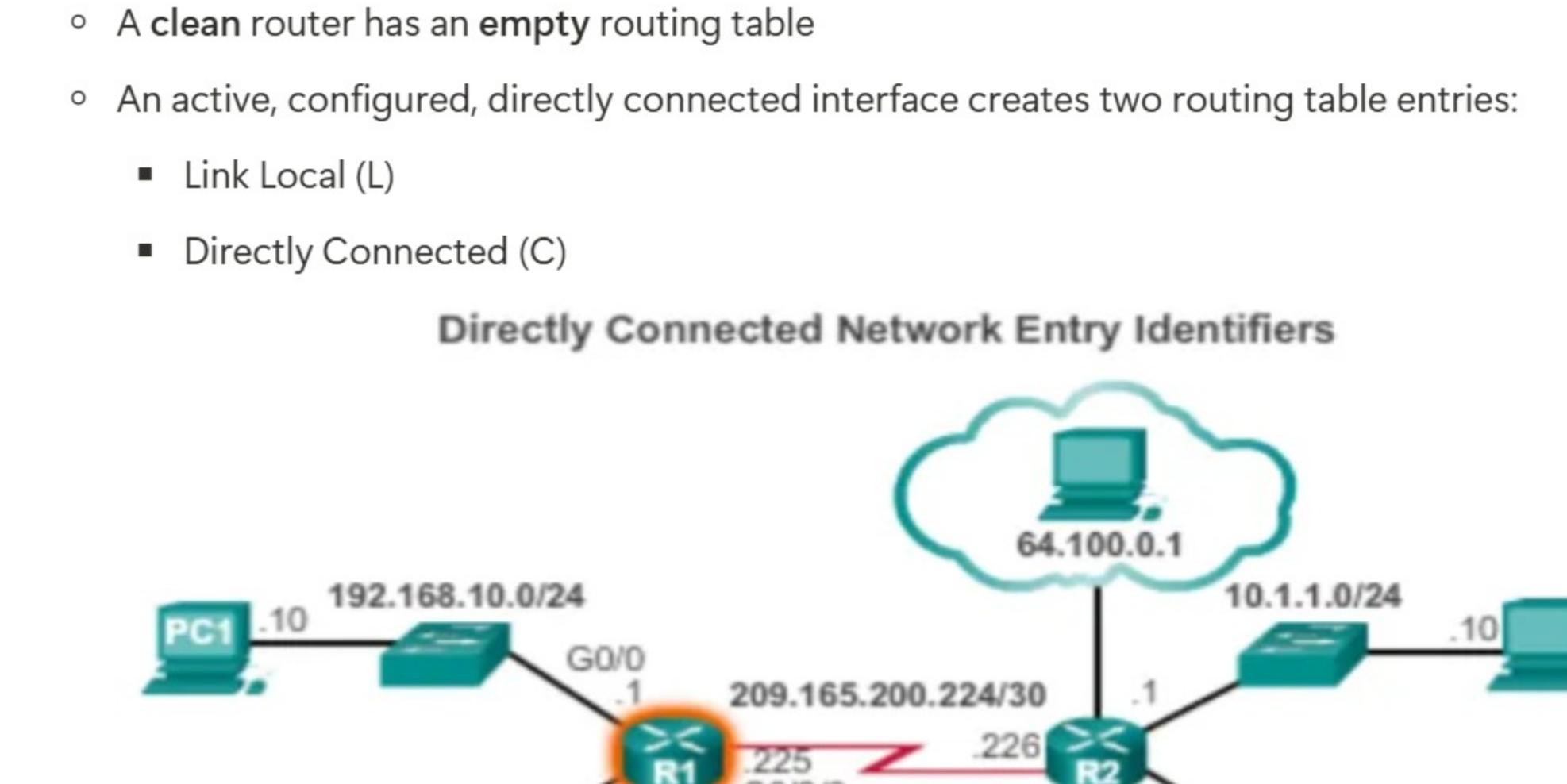
- Default Gateways: To enable network access devices must be configured with the following IP address information
 - IP address - Identifies a unique host on a local network.
 - Subnet mask - Identifies the host's network subnet.
 - Default gateway - Identifies the router a packet is sent to when the destination is not on the same local network subnet.

Destination MAC Address	Source MAC Address	Source IP Address	Destination MAC Address	Data
11-11-11-11-11-11	AA-AA-AA-AA-AA-AA	192.168.1.110	172.16.1.99	



- Send a Packet

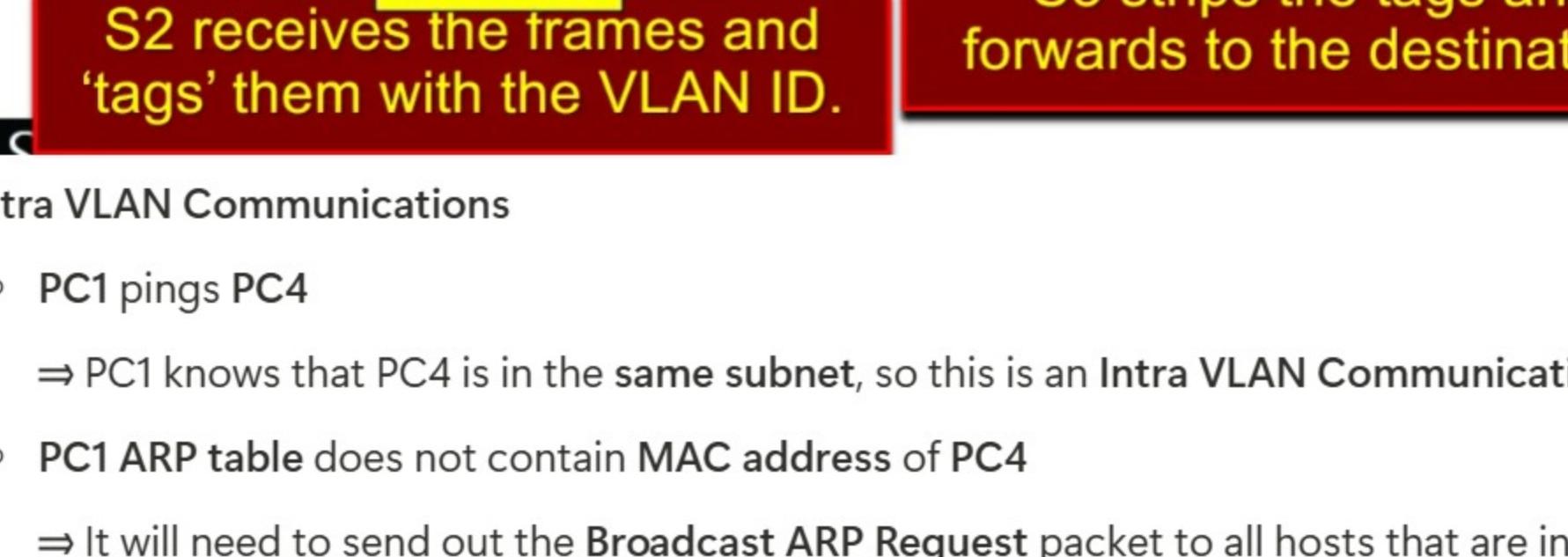
PC1 Sends a Packet to PC2



Layer 2 Data Link Frame		Packet's Layer 3 data					
Dest. MAC	Source MAC	Type 800	Source IP	Dest. IP	IP fields	Data	Trailer
00-10	00-10	800	192.168.1.10	192.168.4.10			
PC1	PC1						

- Forward to the Next Hop

R3 Forwards the Packet to PC2

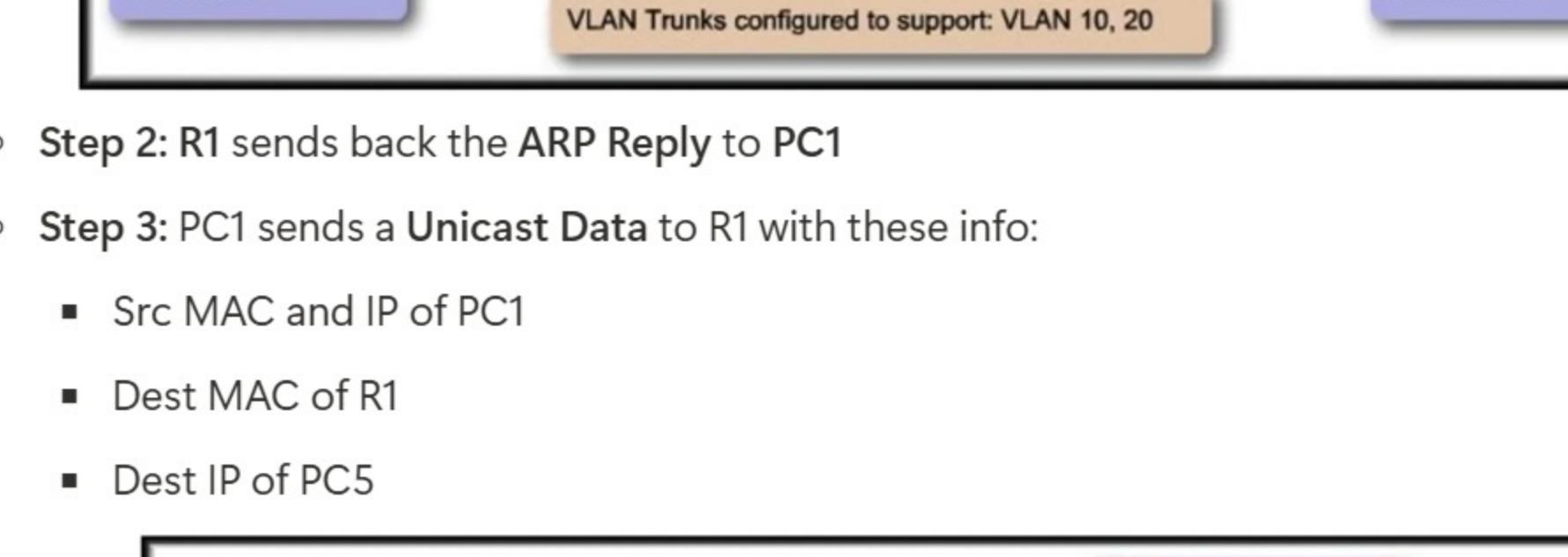


Layer 2 Data Link Frame		Packet's Layer 3 data					
Dest. MAC	Source MAC	Type 800	Source IP	Dest. IP	IP fields	Data	Trailer
0B-21	0B-20	800	192.168.1.10	192.168.4.10			
R3	R3						

- Packet Routing

- From R2 to R3 is a point-to-point encapsulation.
⇒ No need for source and destination MAC addresses.

R2 Forwards the Packet to R3

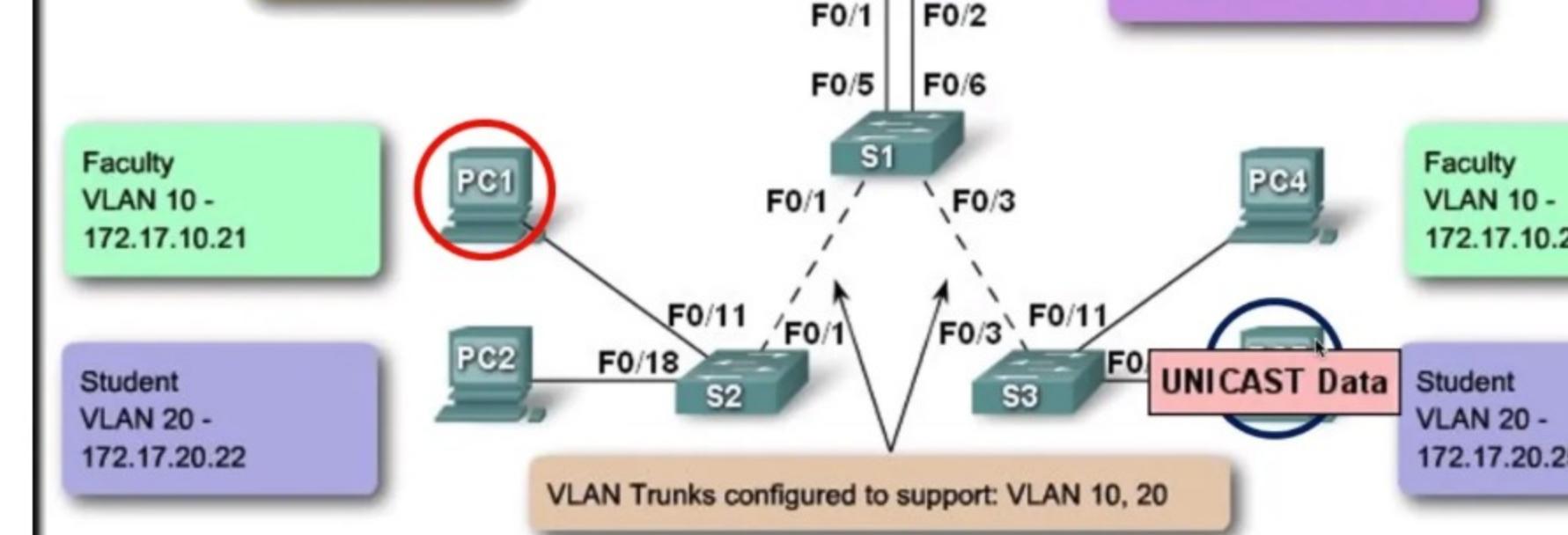


Layer 2 Data Link Frame		Packet's Layer 3 data					
Address 0x8F	Control 0x00	Type 800	Source IP	Dest. IP	IP fields	Data	Trailer
0B-21	0B-20	800	192.168.1.10	192.168.4.10			
R2	R2						

- Reach the Destination

- Through the ARP Cache, R3 can know what is the MAC address of PC2.
◦ If info of PC2 is not in R3's ARP Cache, it will need to send the ARP request.

R3 Forwards the Packet to PC2



Layer 2 Data Link Frame		Packet's Layer 3 data					
Dest. MAC	Source MAC	Type 800	Source IP	Dest. IP	IP fields	Data	Trailer
0B-20	0B-22	800	192.168.4.10	192.168.4.10			
R3	R3						

- Directly Connected Interfaces

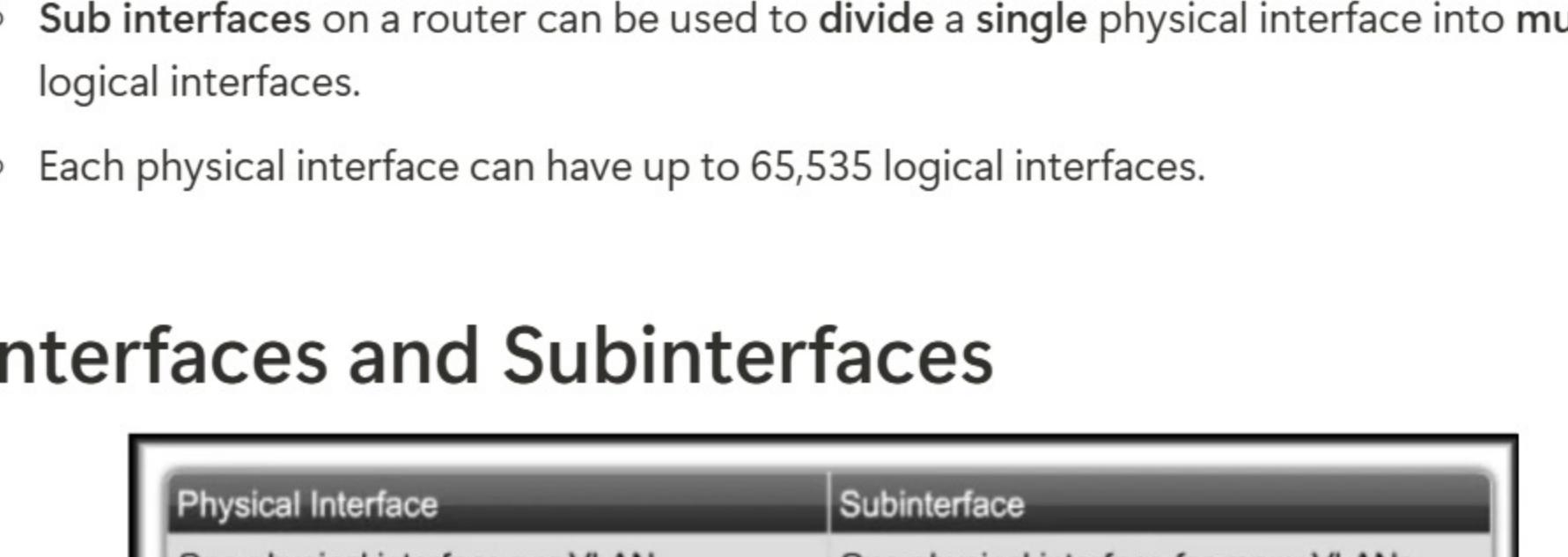
- In this Unit, we build “one-hop” networks. The router is connected to all subnets
- A clean router has an empty routing table

- An active, configured, directly connected interface creates two routing table entries:

- Link Local (L)

- Directly Connected (C)

Directly Connected Network Entry Identifiers



Legend:
- Identifies how the network was learned by the router.
- Identifies the destination network and how it is connected.
- Identifies the interface on the router connected to the destination network.

2. Review - VLANs

- Trunking Operation

Trunking Operation

PC1 and PC3 send a broadcast.

The tagged frames are sent across the trunk links between S2 and S1 and S1 and S3.

S2 receives the frames and ‘tags’ them with the VLAN ID.

S3 strips the tags and forwards to the destination.

PC1 ARP table tells me that PC2 uses MAC address 0B-20.

192.168.1.0/24 192.168.2.0/24 192.168.3.0/24 192.168.4.0/24

192.168.1.10 0A-10 192.168.2.10 0B-20 192.168.3.10 0B-31 192.168.4.10 0B-20

Layer 2 Data Link Frame

Packet's Layer 3 data

Dest. MAC Control Type Source IP Dest. IP IP fields Data Trailer

0B-20 0x00 800 192.168.1.10 192.168.4.10

R3's ARP Cache

IP Address MAC Address

192.168.4.10 0B-20

- Step 3: PC1 sends a Unicast Data to R1 with these info:

- Src MAC and IP of PC1

- Dest MAC of R1

- Dest IP of PC5

R2 Forwards the Packet to R3

R2's Routing Table

Network Hops Next-hop-IP Exit Interface

192.168.1.0/24 0 Dir. Connect. Fa0/0

192.168.2.0/24 0 Dir. Connect. Fa0/1

192.168.3.0/24 1 192.168.2.2 Fa0/1

192.168.4.0/24 2 192.168.2.2 Fa0/1

- Reach the Destination

- Through the ARP Cache, R3 can know what is the MAC address of PC2.

- If info of PC2 is not in R3's ARP Cache, it will need to send the ARP request.

R3 Forwards the Packet to PC2

My ARP table tells me that PC2 uses MAC address 0B-20.

192.168.1.0/24 192.168.2.0/24 192.168.3.0/24 192.168.4.0/24

192.168.1.10 0A-10 192.168.2.10 0B-20 192.168.3.10 0B-31 192.168.4.10 0B-20

Layer 2 Data Link Frame

Packet's Layer 3 data

Dest. MAC Control Type Source IP Dest. IP IP fields Data Trailer

0B-20 0x00 800 192.168.4.10 192.168.4.10

R3's Routing Table

Network Hops Next-hop-IP Exit Interface

192.168.1.0/24 2 192.168.3.1 Fa0/0

192.