CCNA 200-301, Volume I

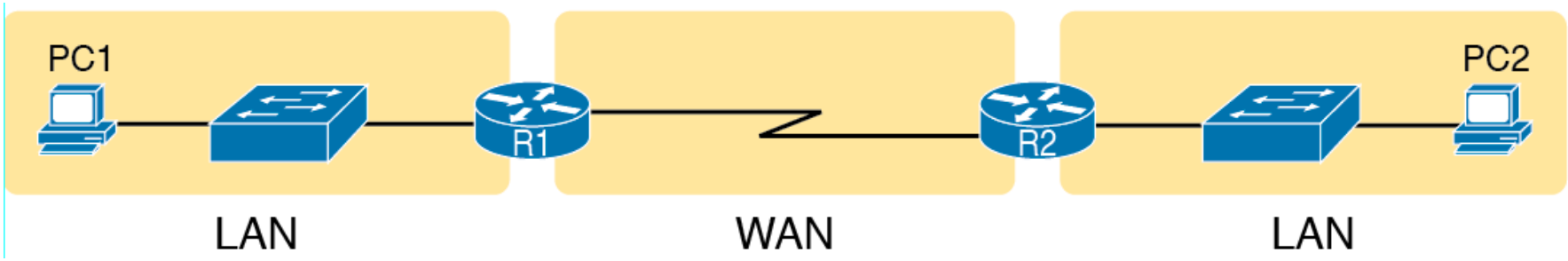
Chapter 3

Fundamentals of WANs and IP Routing

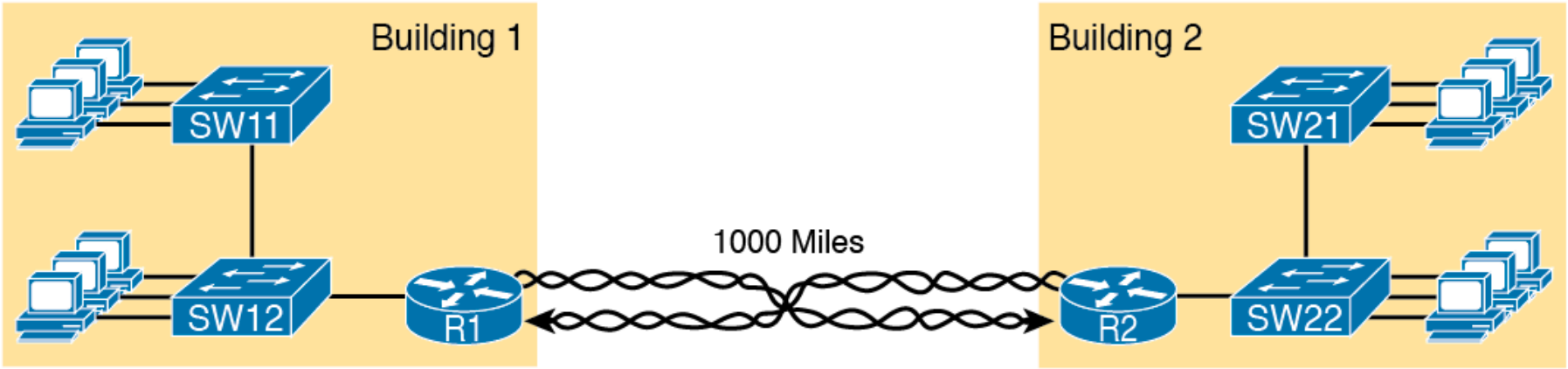
Objectives

- Leased Line WANs
- Ethernet as a WAN technology
- Accessing the Internet

Small Enterprise Network with One Leased Line



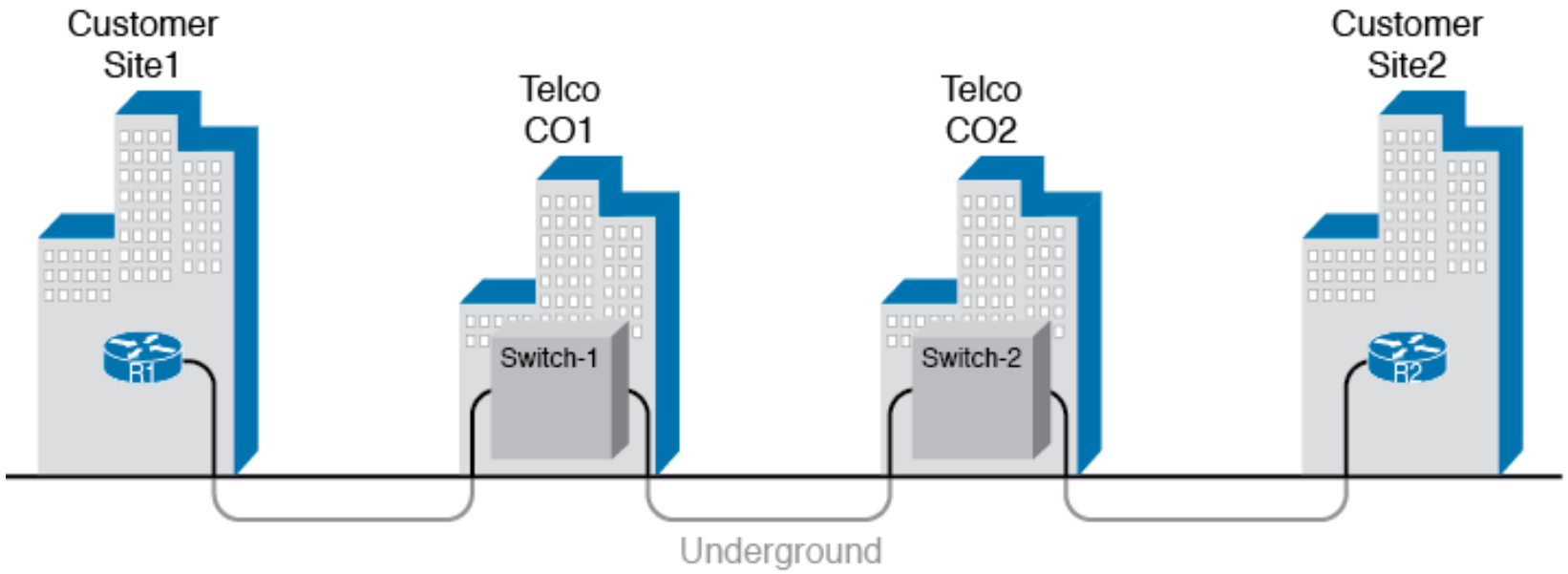
Conceptual View of the Leased-Line Service



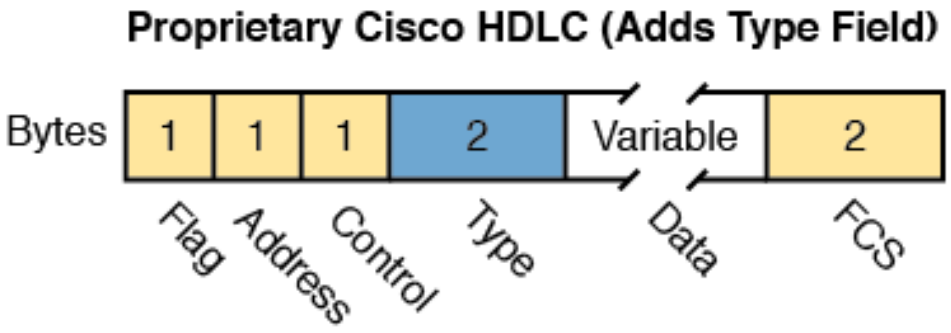
Different Names for a Leased Line

Name	Meaning or Reference
Leased circuit, Circuit	The words “line” and “circuit” are often used as synonyms in Telco terminology; circuit makes reference to the electrical circuit between the two endpoints.
Serial link, Serial line	The words “link” and “line” are also often used as synonyms. “Serial” in this case refers to the fact that the bits flow serially, and that routers use serial interfaces.
Point-to-point link, Point-to-point line	These terms refer to the fact that the topology stretches between two points, and two points only. (Some older leased lines allowed more than two devices.)
T1	A specific type of leased line that transmits data at 1.544 Megabits per second (1.544 Mbps).
WAN link, Link	Both these terms are very general, with no reference to any specific technology.
Private line	This term refers to the fact that the data sent over the line cannot be copied by other telco customers, so the data is private.

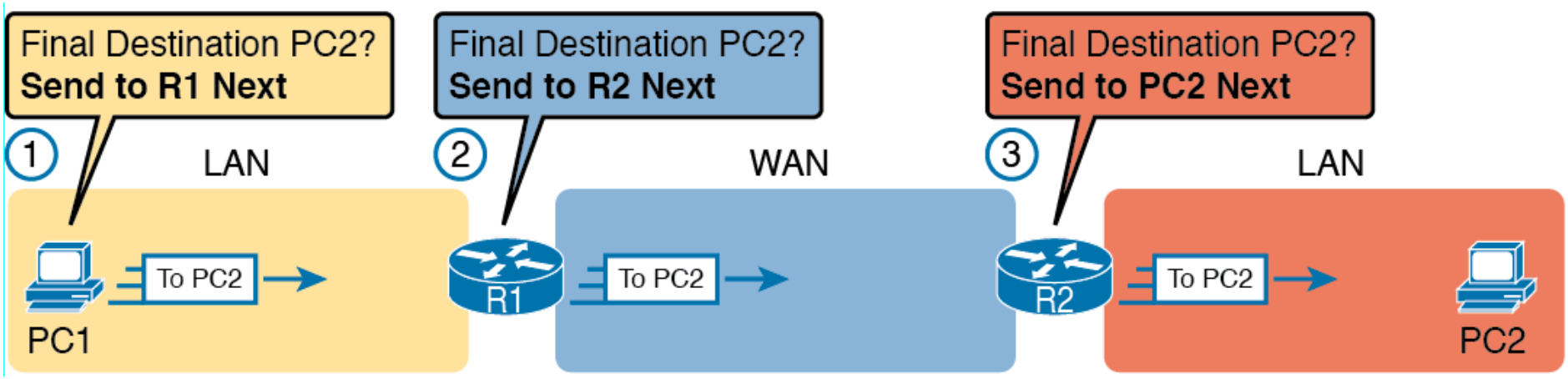
Possible Cabling Inside a Telco for a Short Leased Line



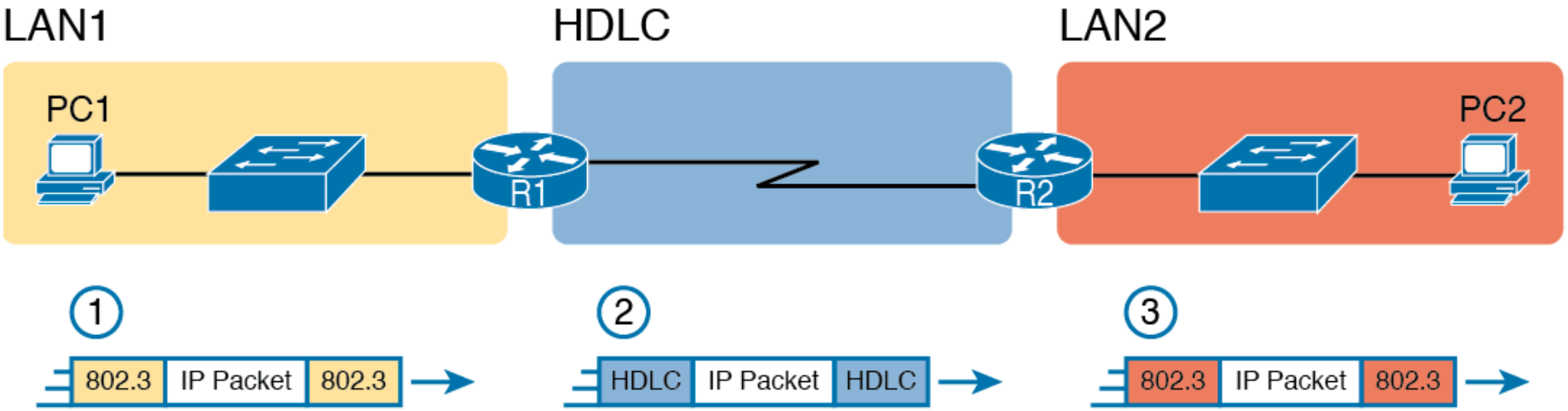
HDLC Framing



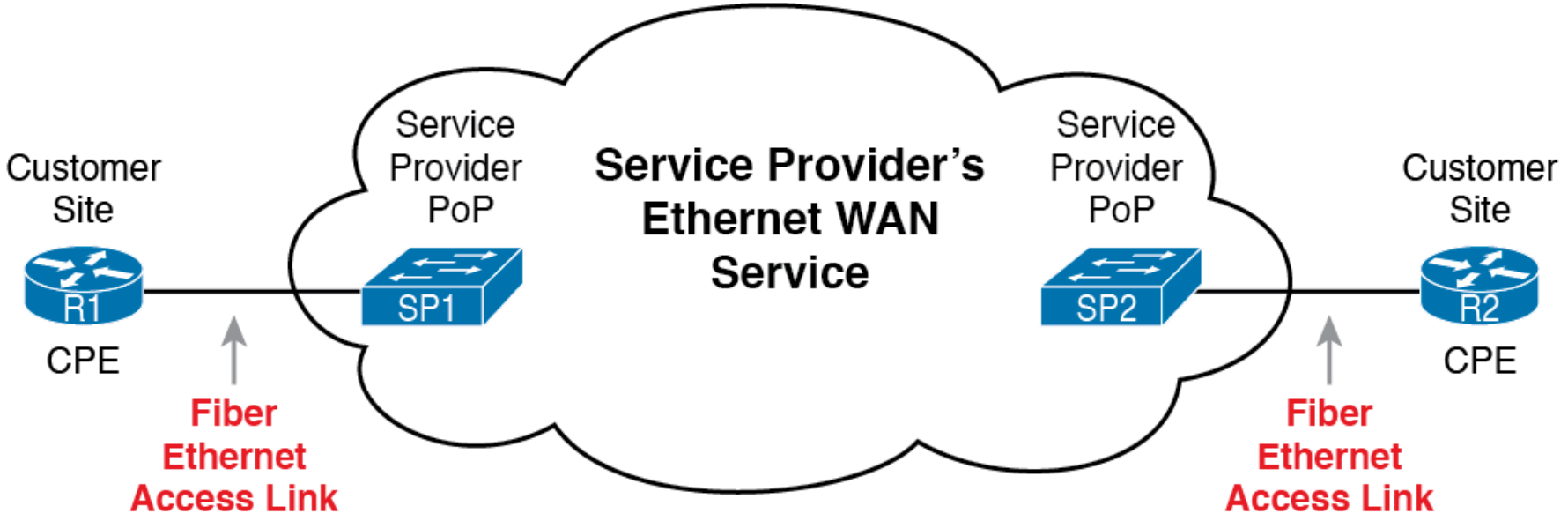
IP Routing Logic over LANs and WANs



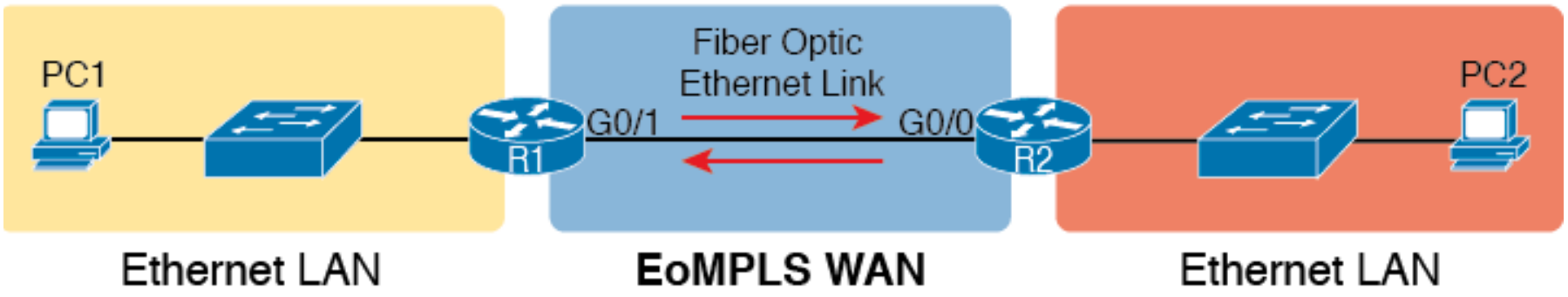
General Concept of Routers De-encapsulation and Re-encapsulating IP Packets



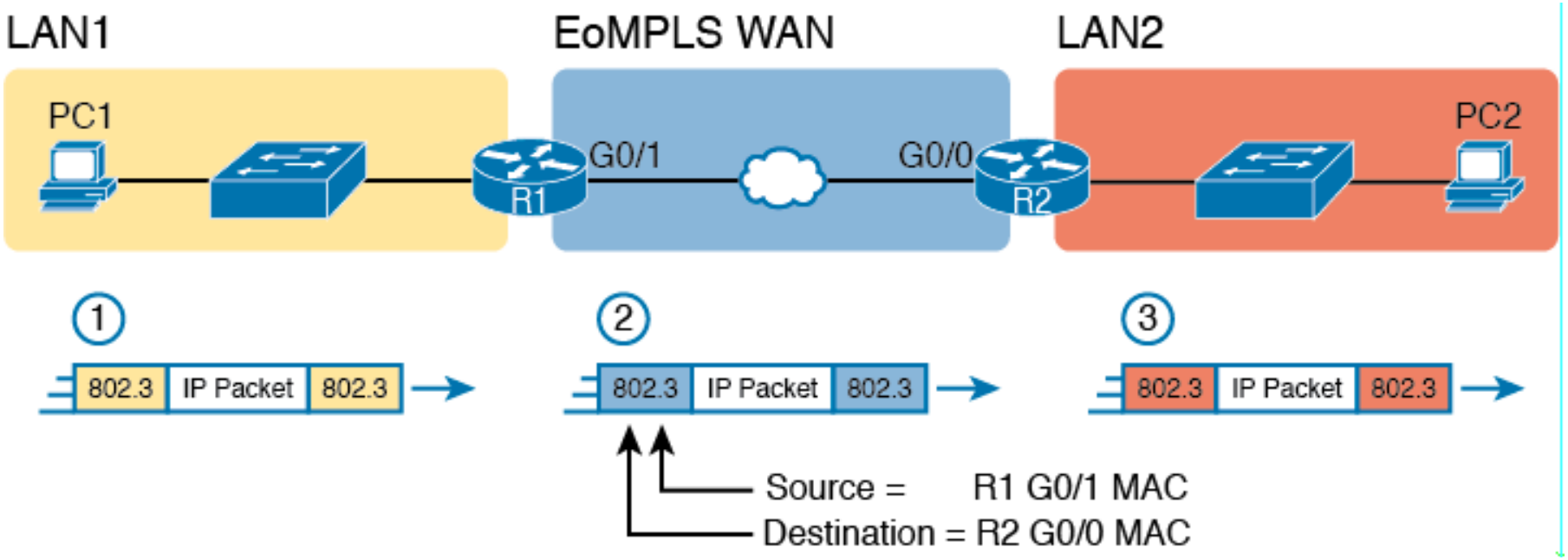
Fiber Ethernet Link to Connect CPE Router to a Service Provider's WAN



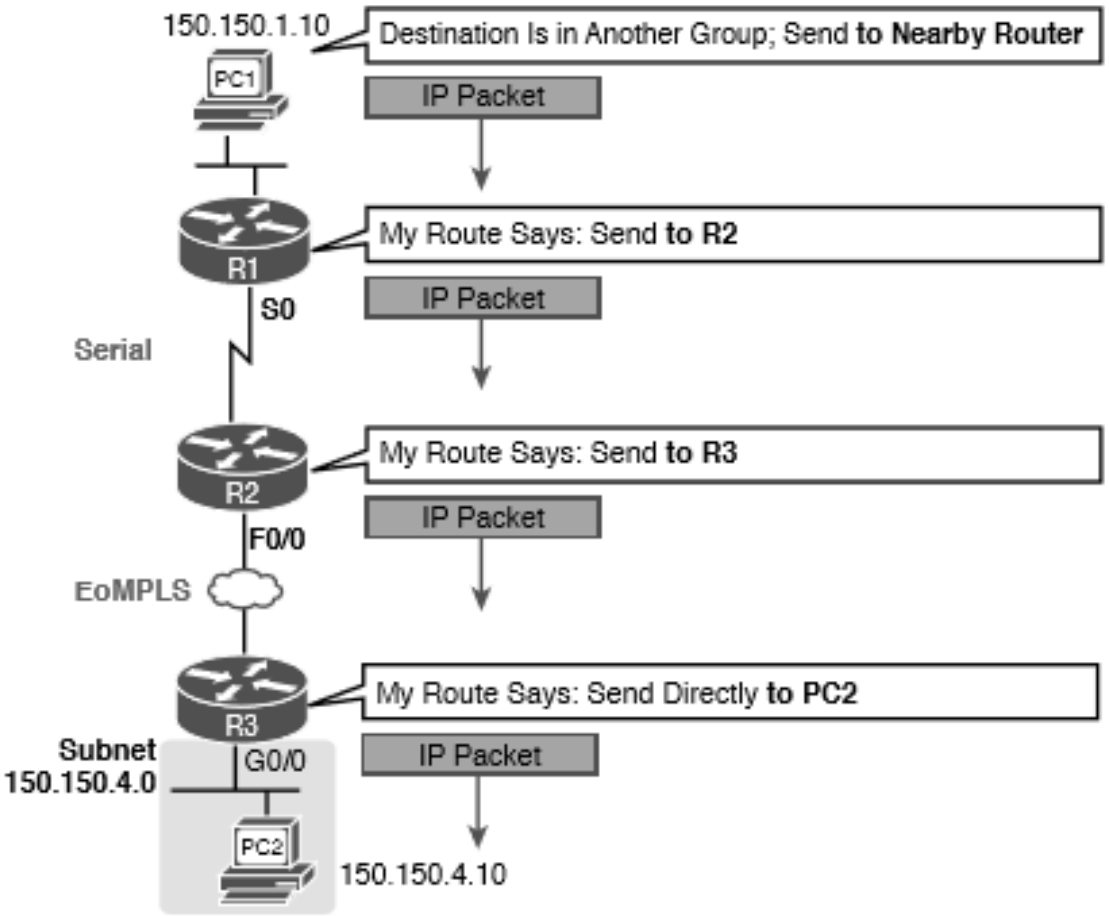
EoMPLS Acting like a Simple Ethernet Link Between Two Routers



Routing over an EoMPLS Link



Routing Logic: PC1 Sending an IP Packet to PC2



Network Layer and Data-Link Layer Encapsulation

R1 Routing Table

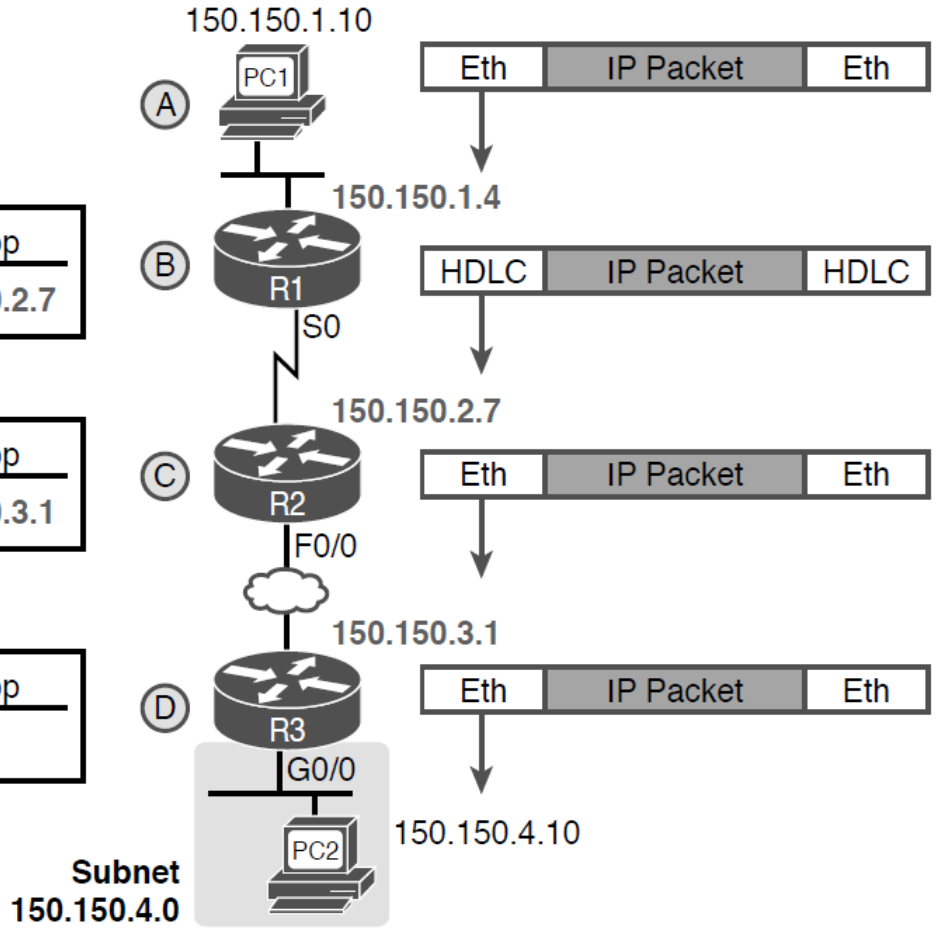
Subnet	Interface	Next Hop
150.150.4.0	Serial0	**150.150.2.7**

R2 Routing Table

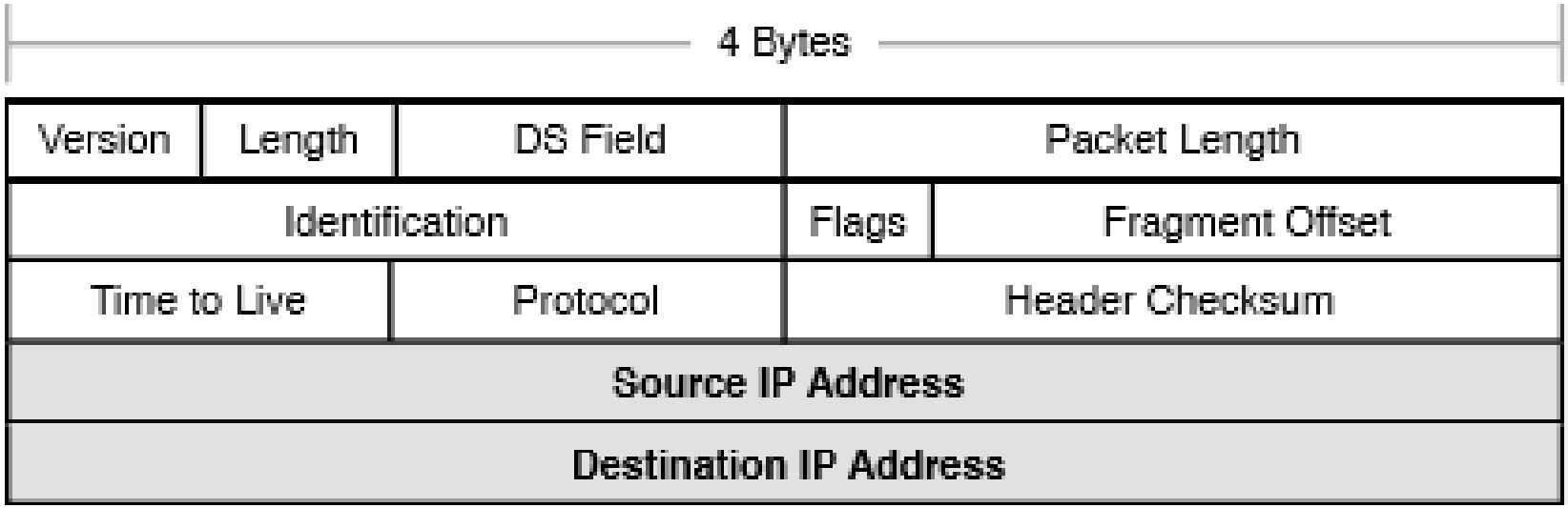
Subnet	Interface	Next Hop
150.150.4.0	FastEth0/0	**150.150.3.1**

R3 Routing Table

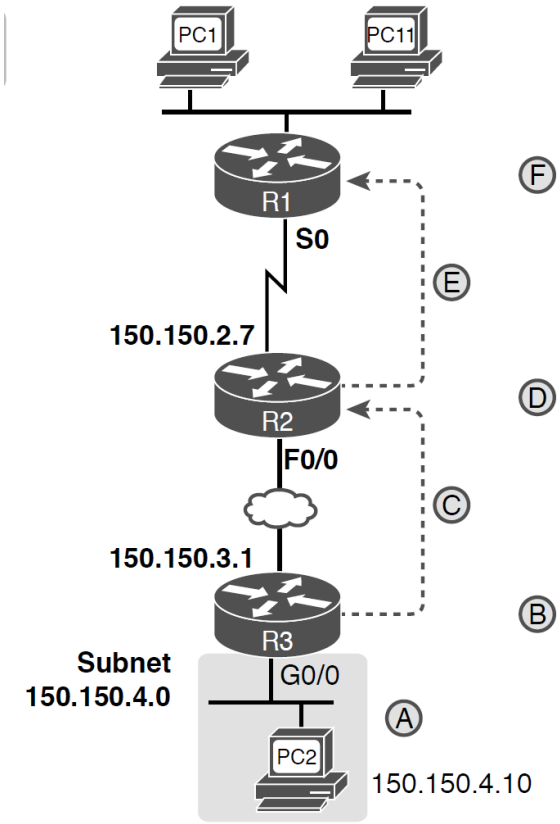
Subnet	Interface	Next Hop
150.150.4.0	Gigabit0/0	N/A



IPv4 Header, Organized as 4 Bytes Wide for a Total of 20 Bytes



Example of How Routing Protocols Advertise About Networks and Subnets



R1 Routing Table

Subnet	Interface	Next Hop
150.150.4.0	Serial0	150.150.2.7

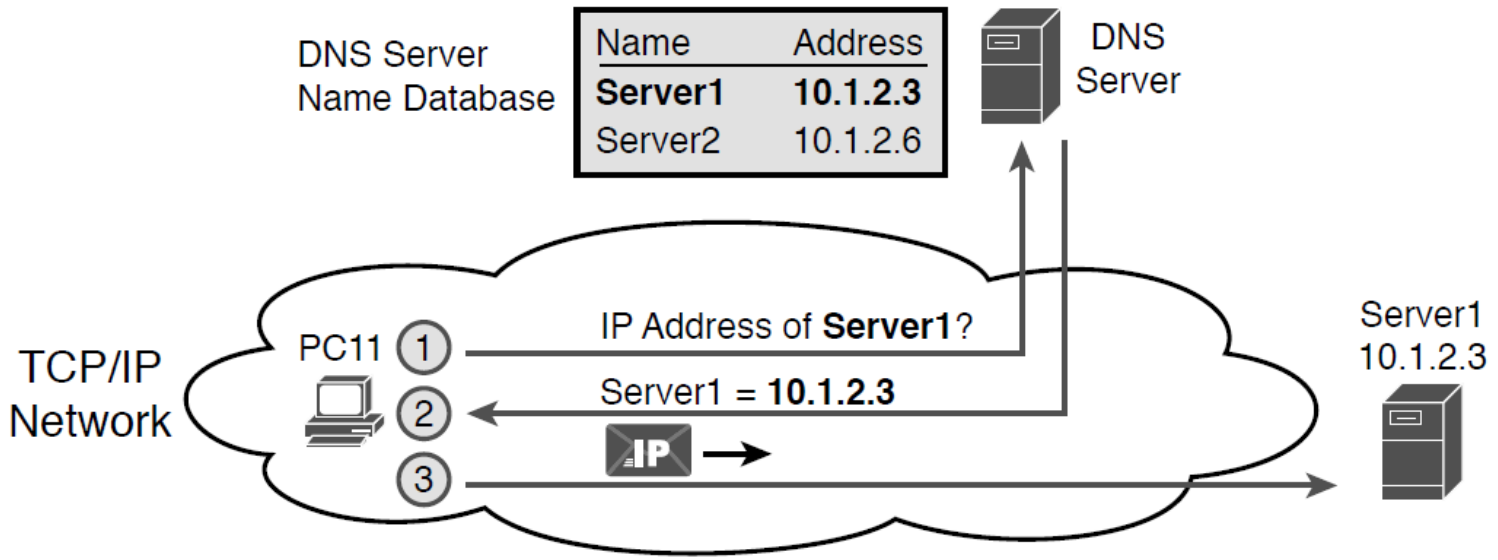
R2 Routing Table

Subnet	Interface	Next Hop
150.150.4.0	FastEth0/0	150.150.3.1

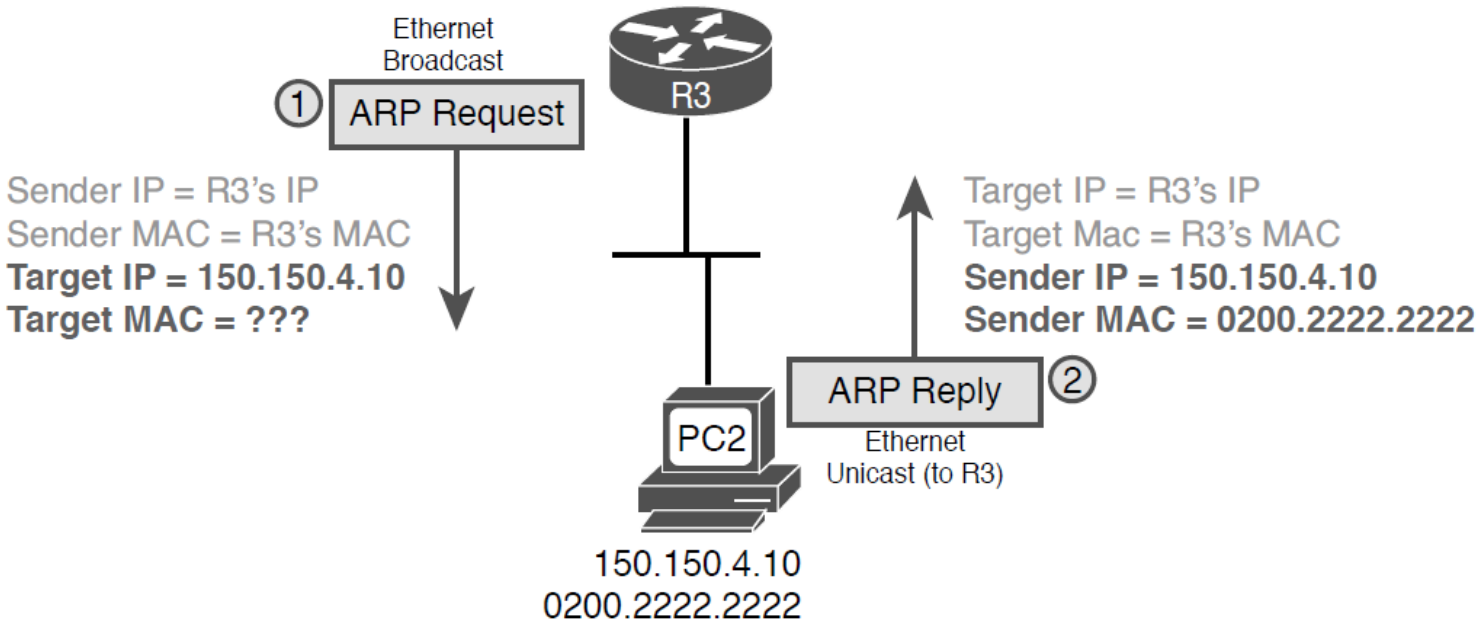
R3 Routing Table

Subnet	Interface	Next Hop
150.150.4.0	Gigabit0/0	N/A

Basic DNS Name Resolution Request



Sample ARP Process



Sample Network, ping Command