

# CCNA 200-301, Volume 2

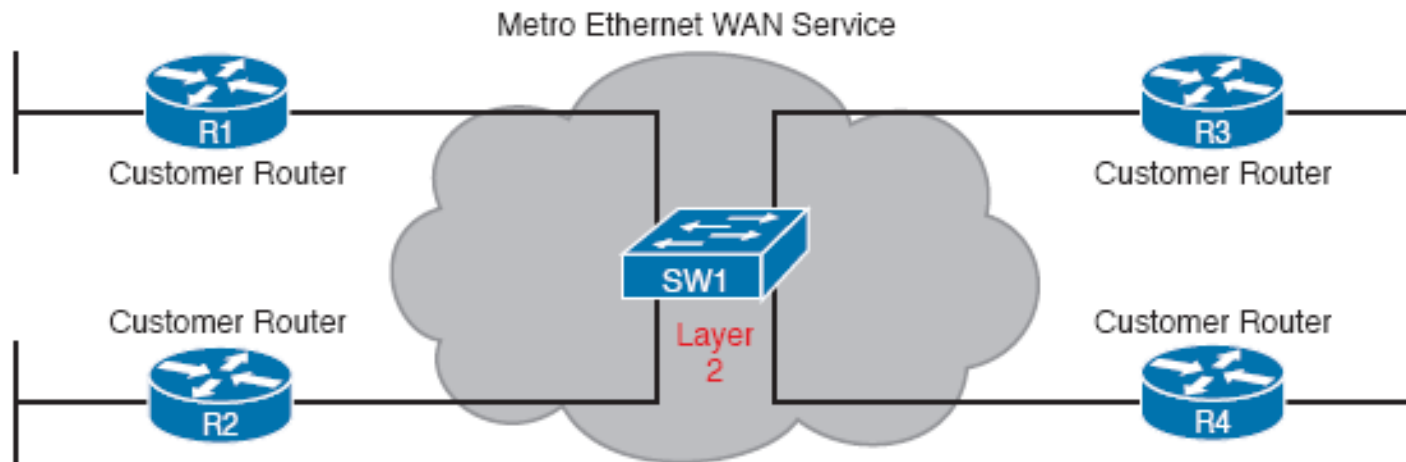
## Chapter 14

### WAN Architecture

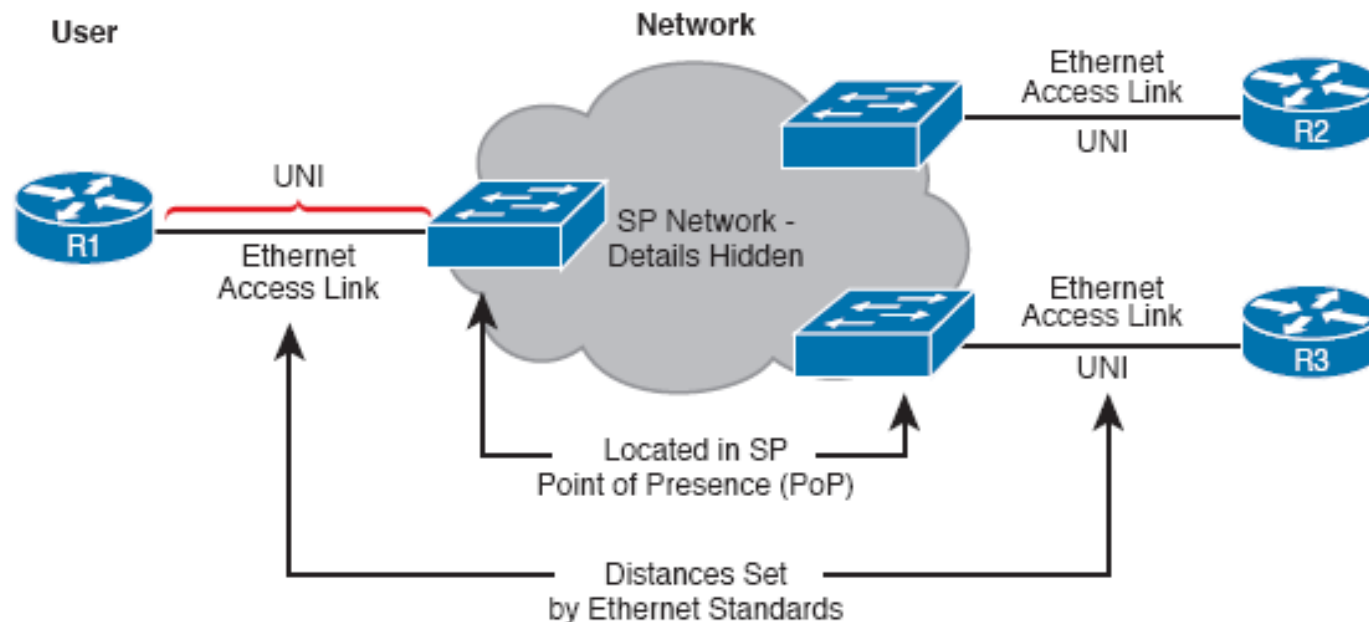
# Objectives

- Describe characteristics of network topology architectures
  - WAN
- Describe remote access and site-to-site VPNs

# Metro Ethernet Concept as a Large Ethernet Network



# Ethernet Access Links into a Metro Ethernet Service



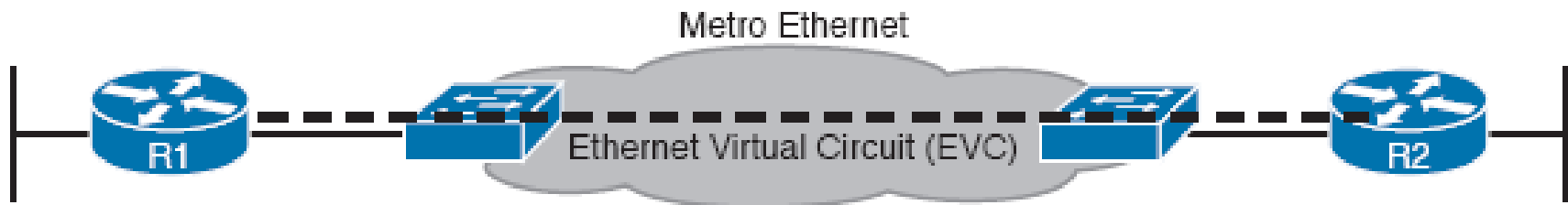
# IEEE Ethernet Standards Useful for Metro Ethernet Access

Name	Speed	Distance
100Base-LX10	100 Mbps	10 Km
1000Base-LX	1 Gbps	5 Km
1000Base-LX10	1 Gbps	10 Km
1000Base-ZX	1 Gbps	100 Km
10GBase-LR	10 Gbps	10 Km
10GBase-ER	10 Gbps	40 Km

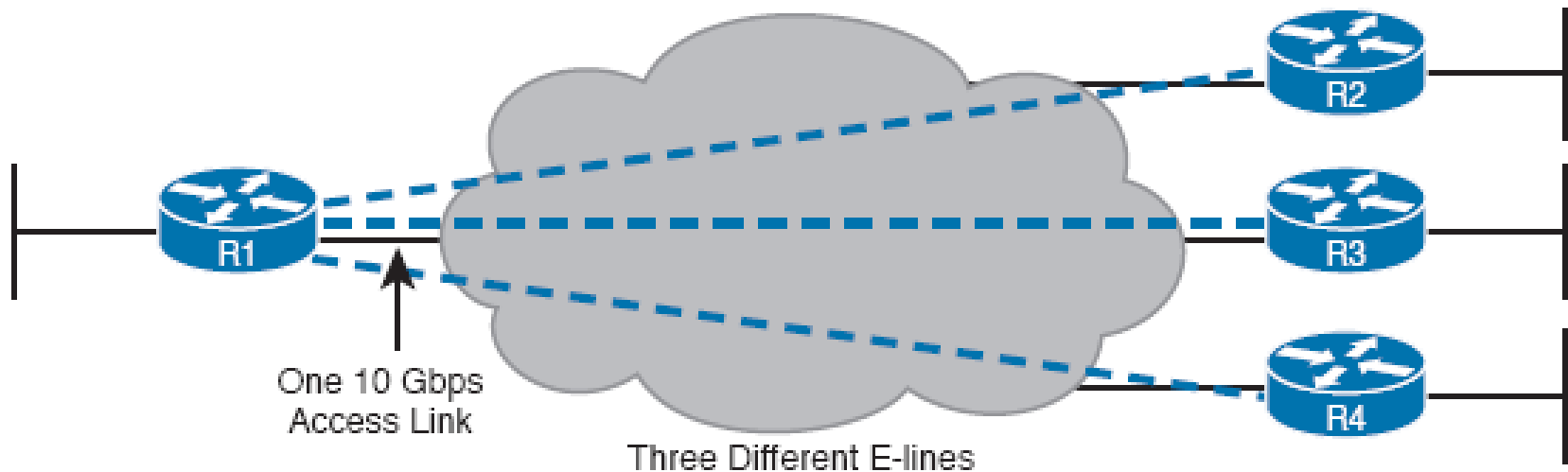
# Three MEF Service Types and Their Topologies

MEF Service Name	MEF Short Name	Topology Terms	Description
Ethernet Line Service	E-Line	point-to-point	Two customer premise equipment (CPE) devices can exchange Ethernet frames, similar to concept of leased line.
Ethernet LAN Service	E-LAN	Full Mesh	Acts like a LAN, in that all devices can send frames to all other devices.
Ethernet Tree Service	E-Tree	Hub-and-spoke; partial mesh; point-to-multipoint	A central site can communicate to a defined set of remote sites, but the remote sites cannot communicate directly.

# Point-to-Point Topology in Metro Ethernet E-Line Service Between Routers

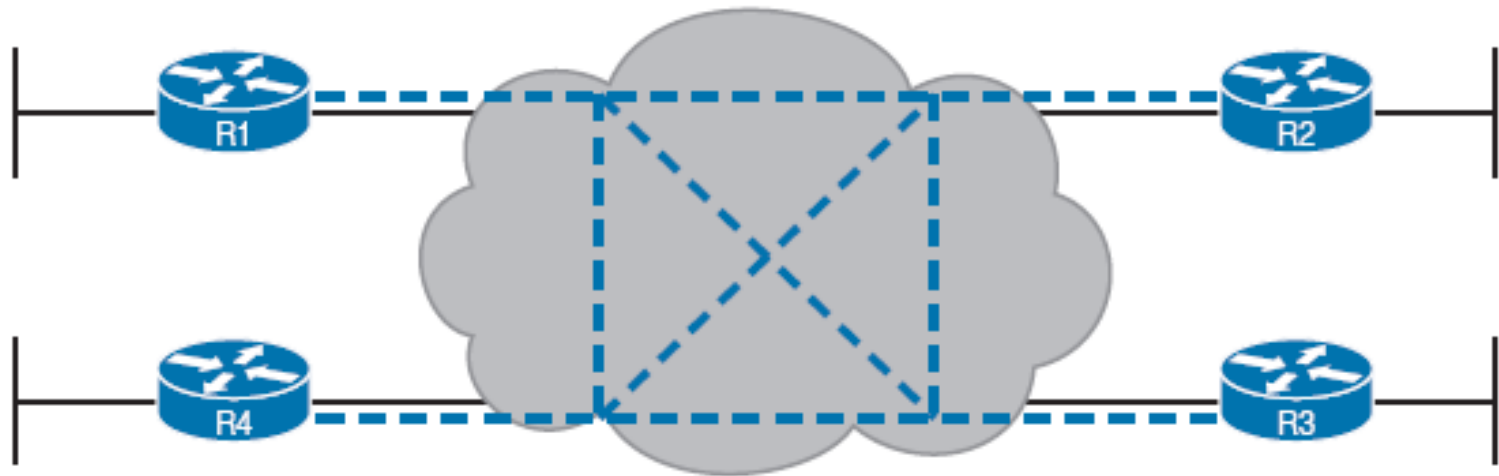


# Using Multiple E-Lines, One for Each Remote Site

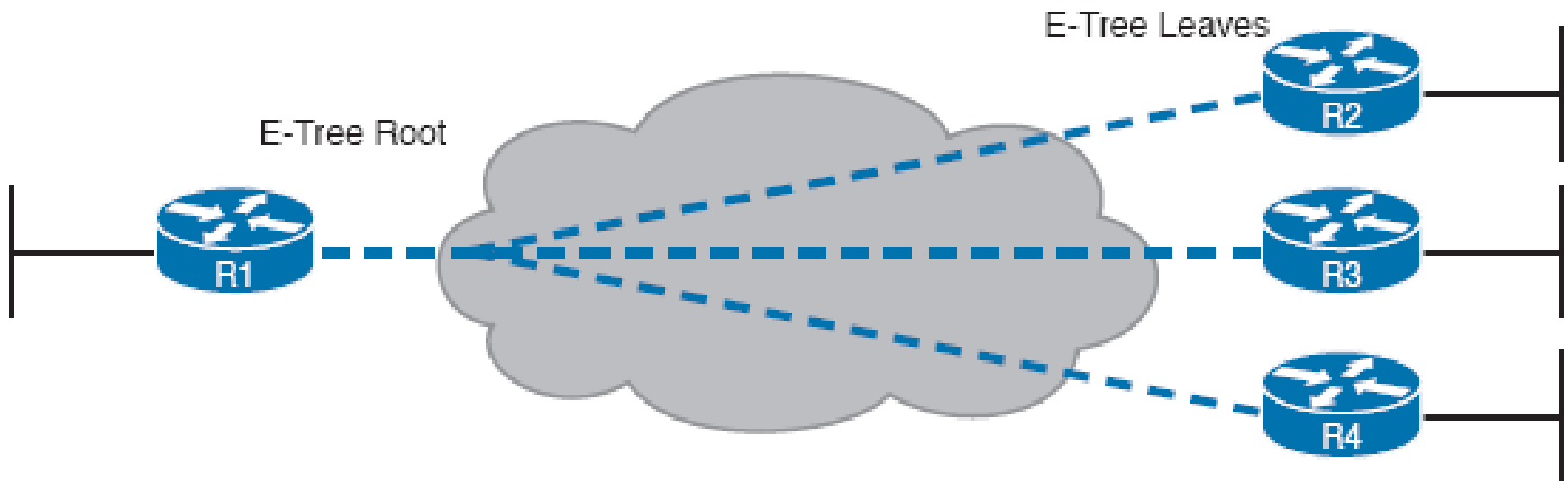




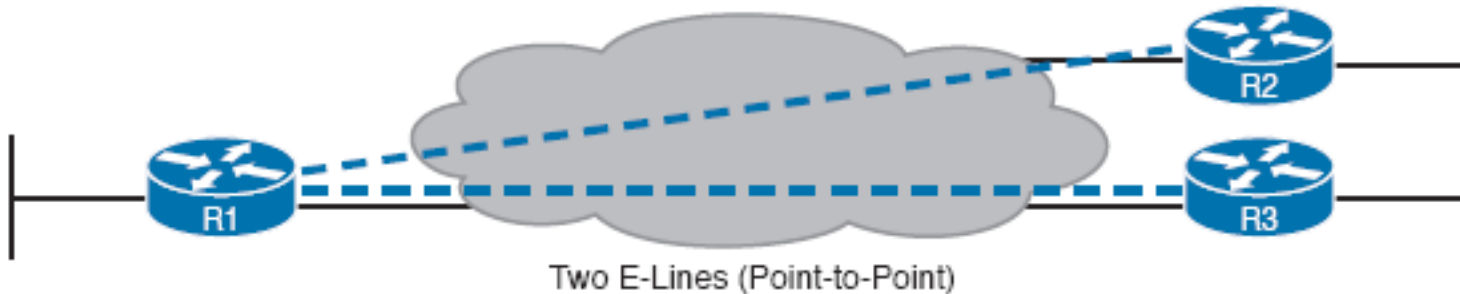
# MetroE Ethernet LAN Service—Any-to-Any Forwarding over the Service



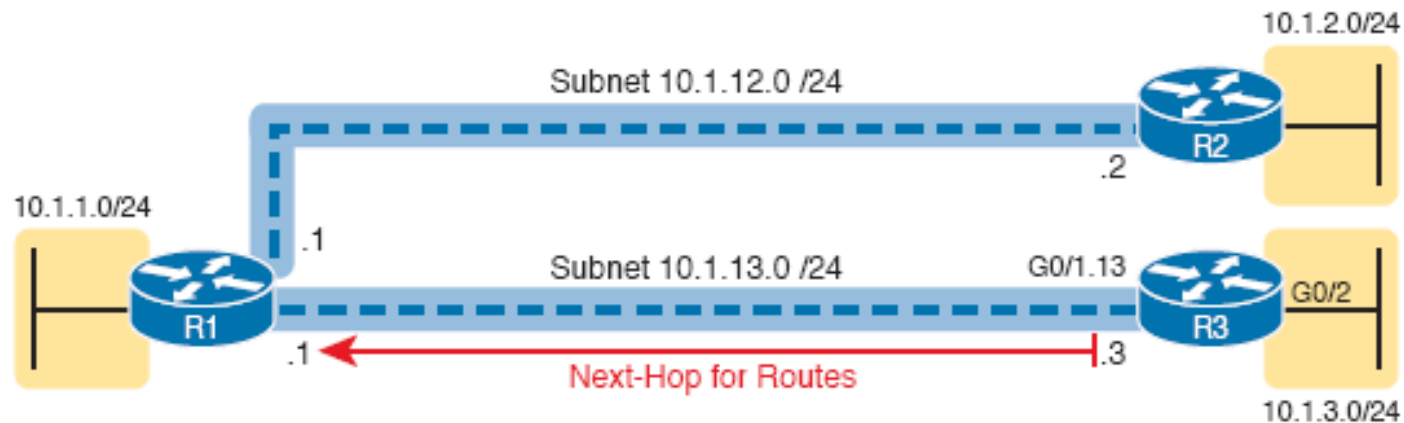
# E-Tree Service Creates a Hub-and-Spoke Topology



# Routing Protocol Neighbor Relationships over Metro Ethernet E-Line



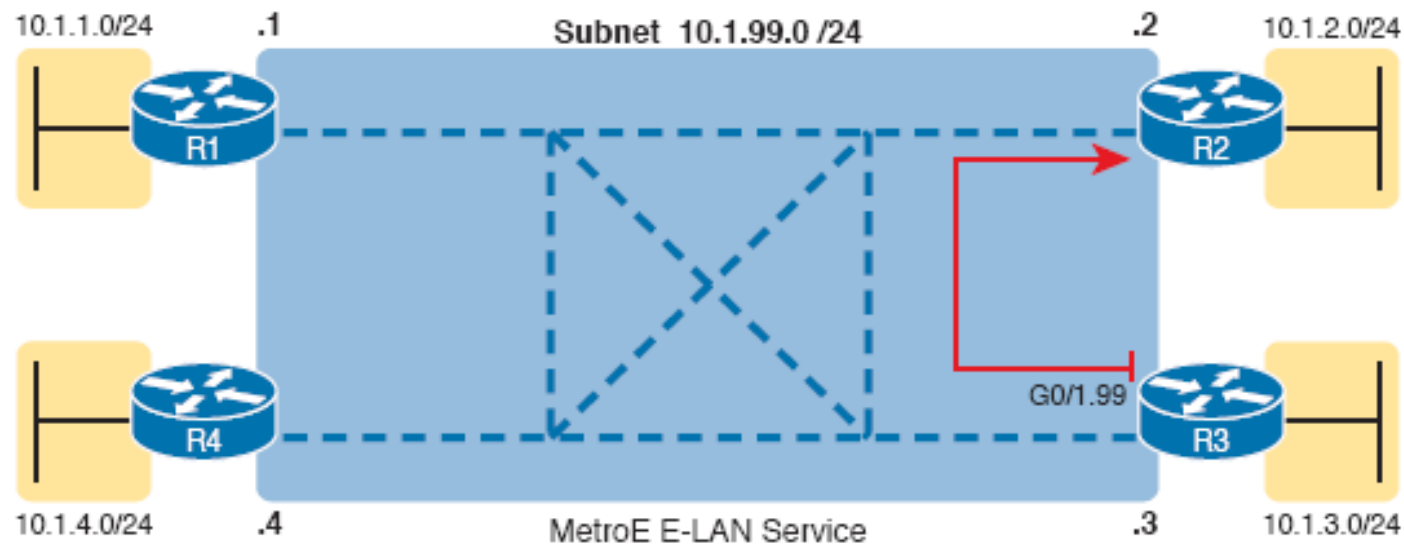
# Layer 3 Forwarding Between Remote Sites—Through Central Site



R3 Routing Table

Code	Subnet	Interface	Next-hop
O	10.1.1.0/24	G0/1.13	10.1.13.1
O	10.1.2.0/24	G0/1.13	10.1.13.1
O	10.1.12.0/24	G0/1.13	10.1.13.1
C	10.1.3.0/24	G0/2	N/A
C	10.1.13.0/24	G0/1.13	N/A

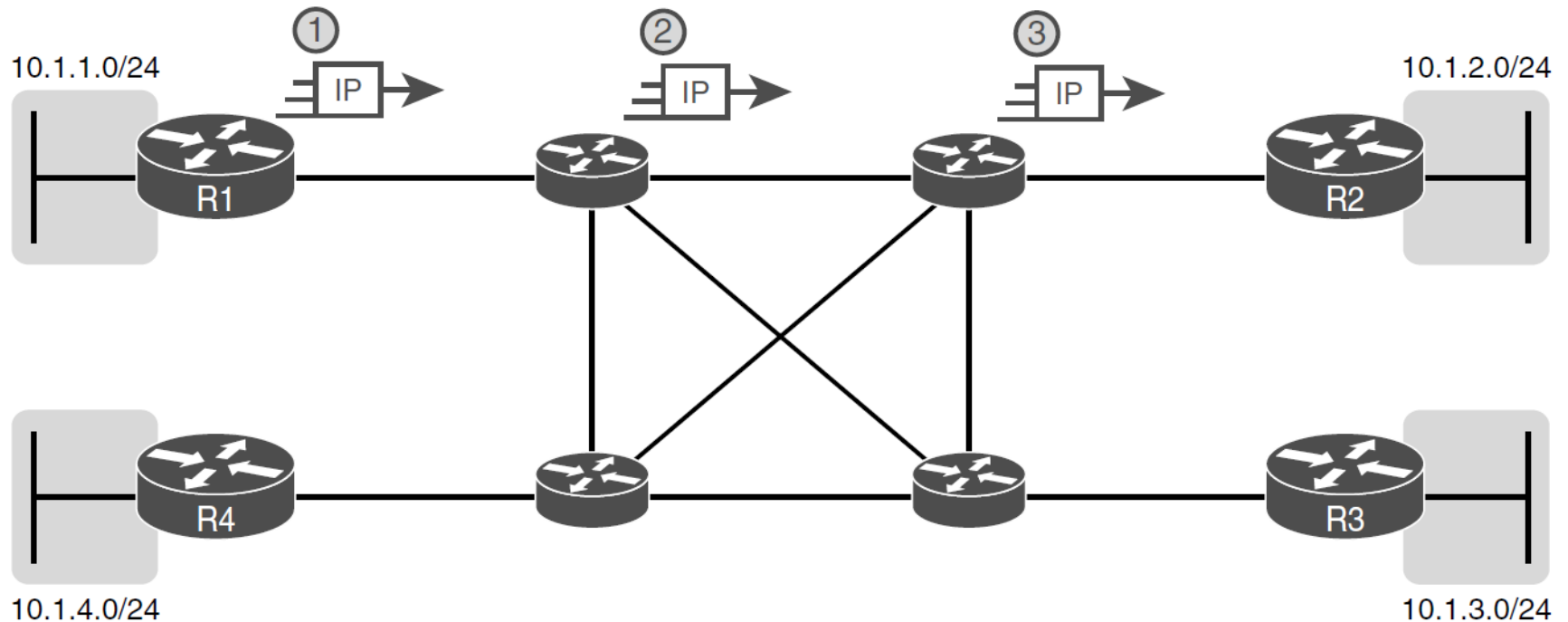
# Layer 3 Forwarding Between Sites with E-LAN Service



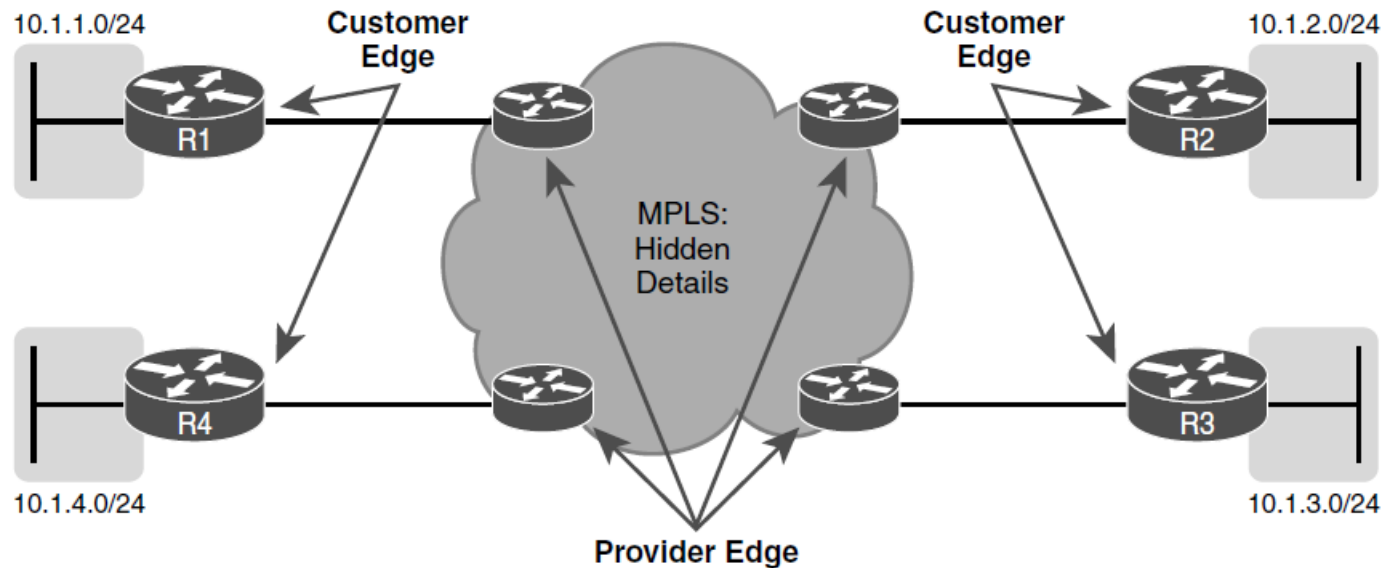
R3 Routing Table (OSPF Routes Only)

Subnet	Interface	Next-hop
10.1.2.0/24	G0/1.99	10.1.99.2
10.1.1.0/24	G0/1.99	10.1.99.1
10.1.4.0/24	G0/1.99	10.1.99.4

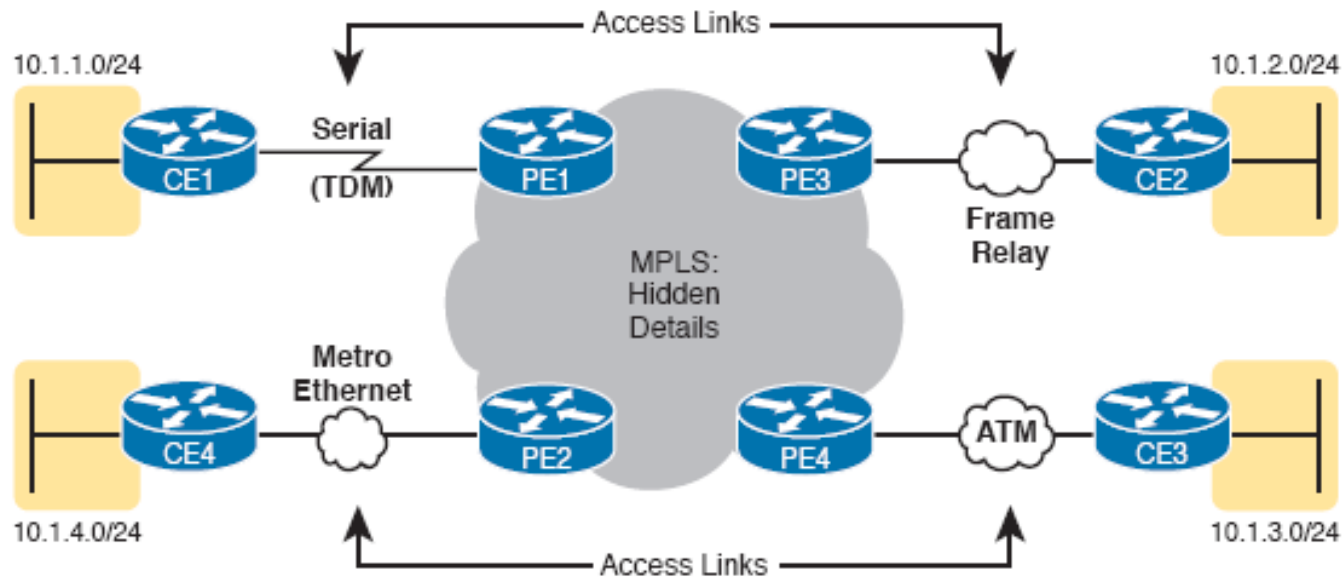
# Basic IP Routing of IP Packets



# MPLS Layer 3 Design, with PE and CE Routers

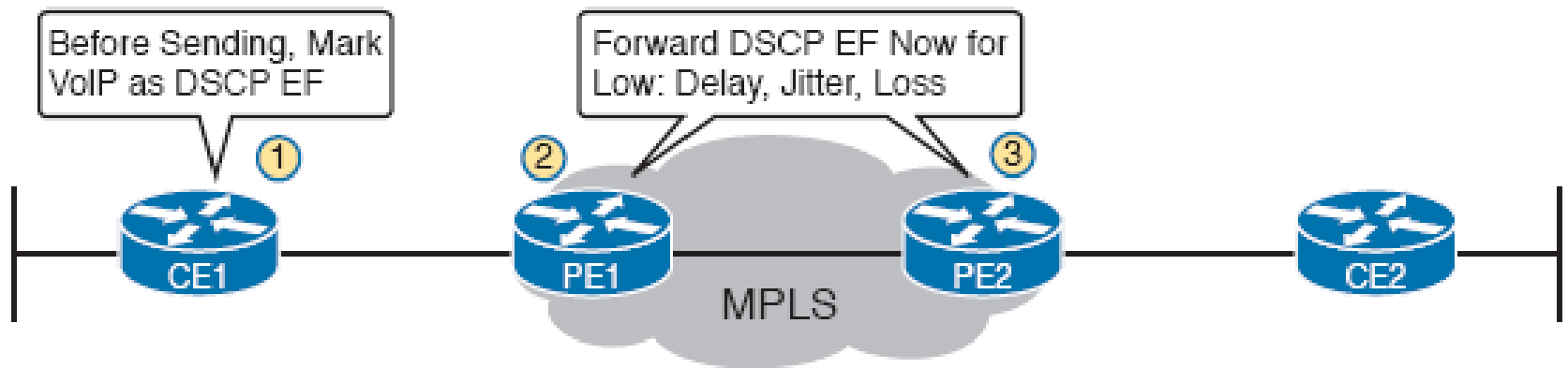


# Popular MPLS Access Link Technologies

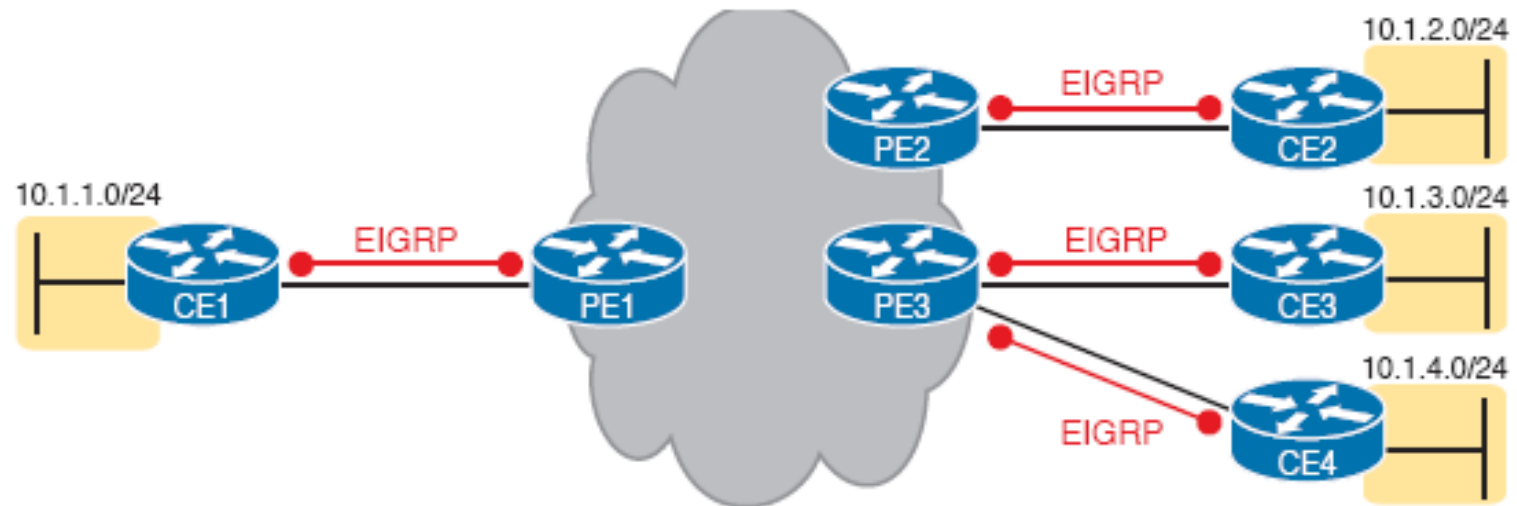




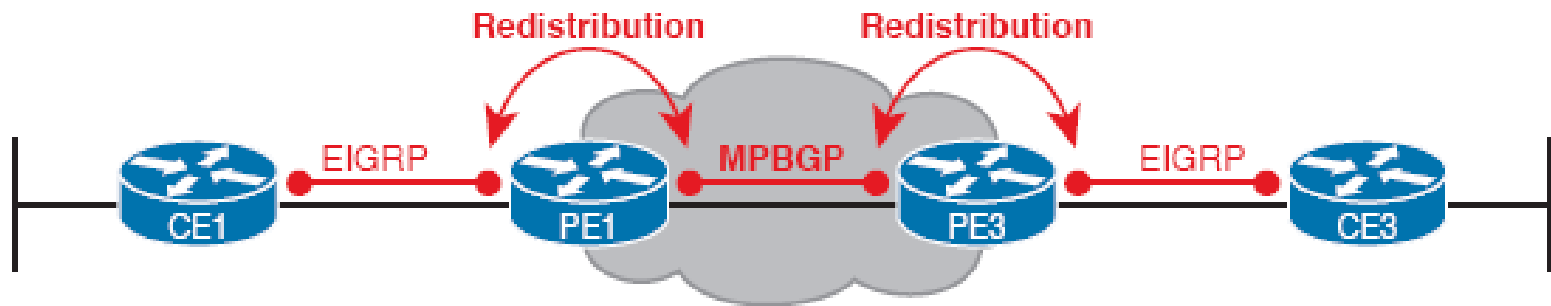
# MPLS VPN QoS Marking and Reaction in the MPLS WAN



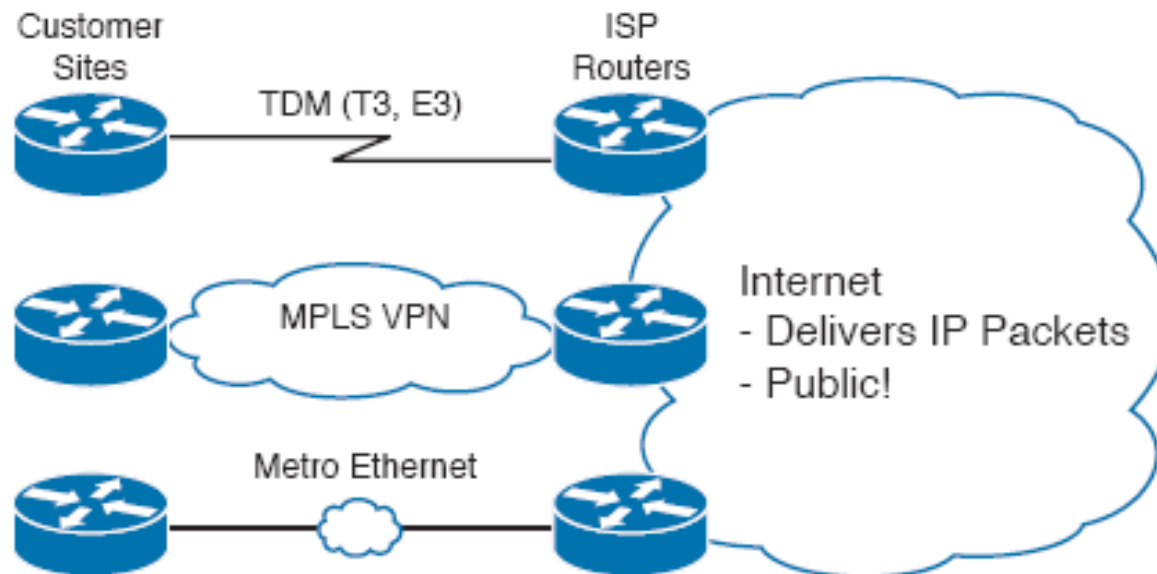
# Routing Protocol Neighbor Relationships with MPLS Customer Edge



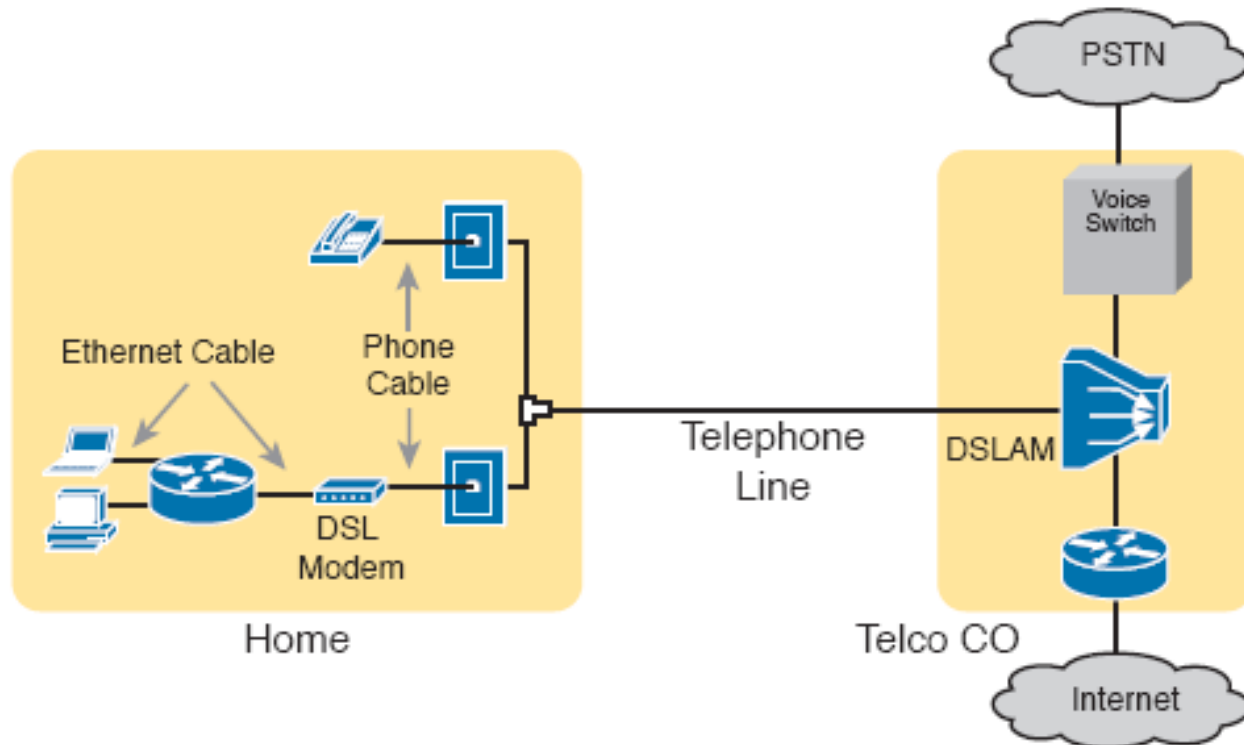
# MPLS VPN Using Redistribution with MPBGP at PE Router



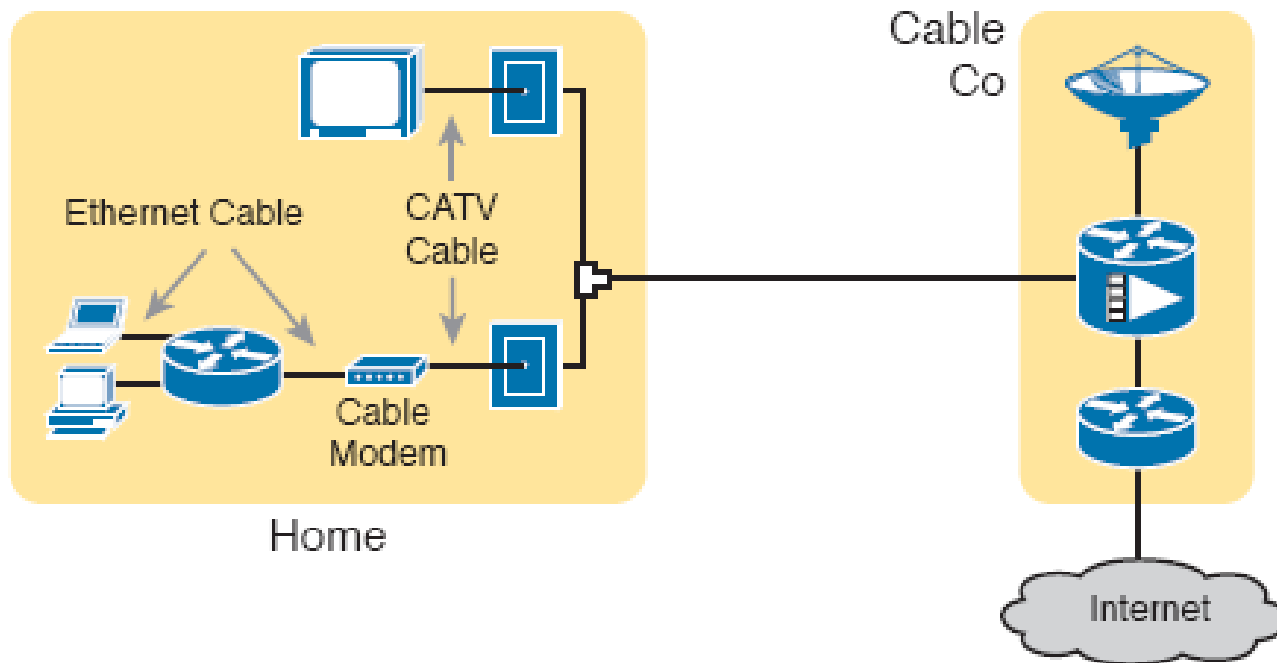
# Three Examples of Internet Access Links for Companies



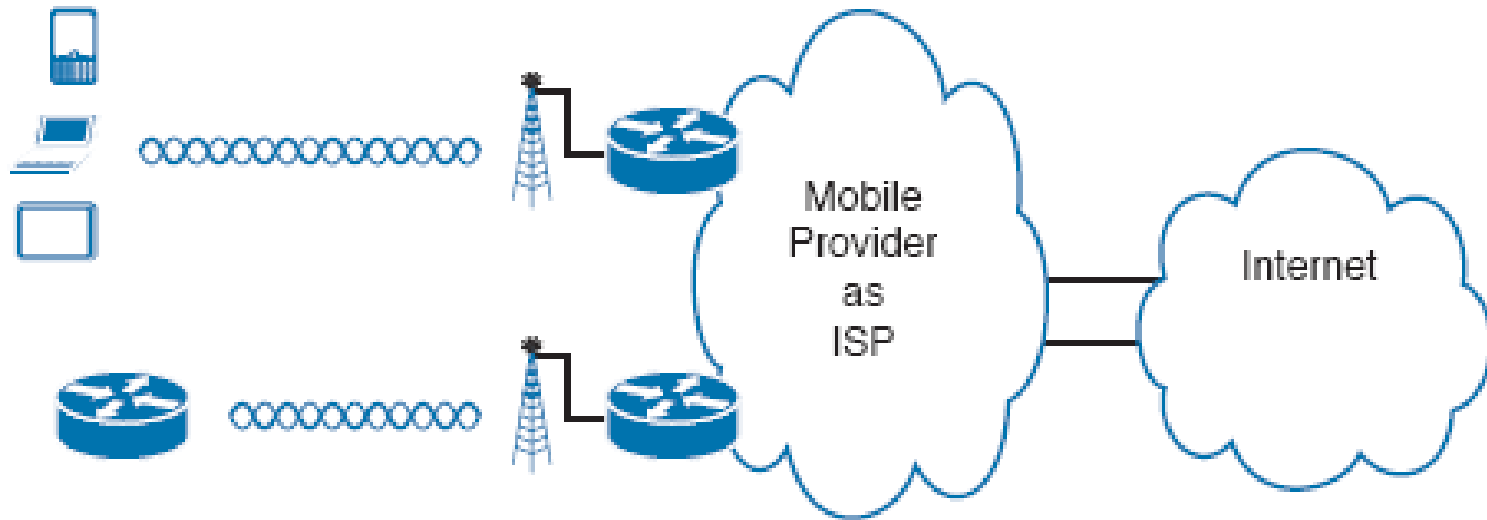
# Wiring and Devices for a Home DSL Link



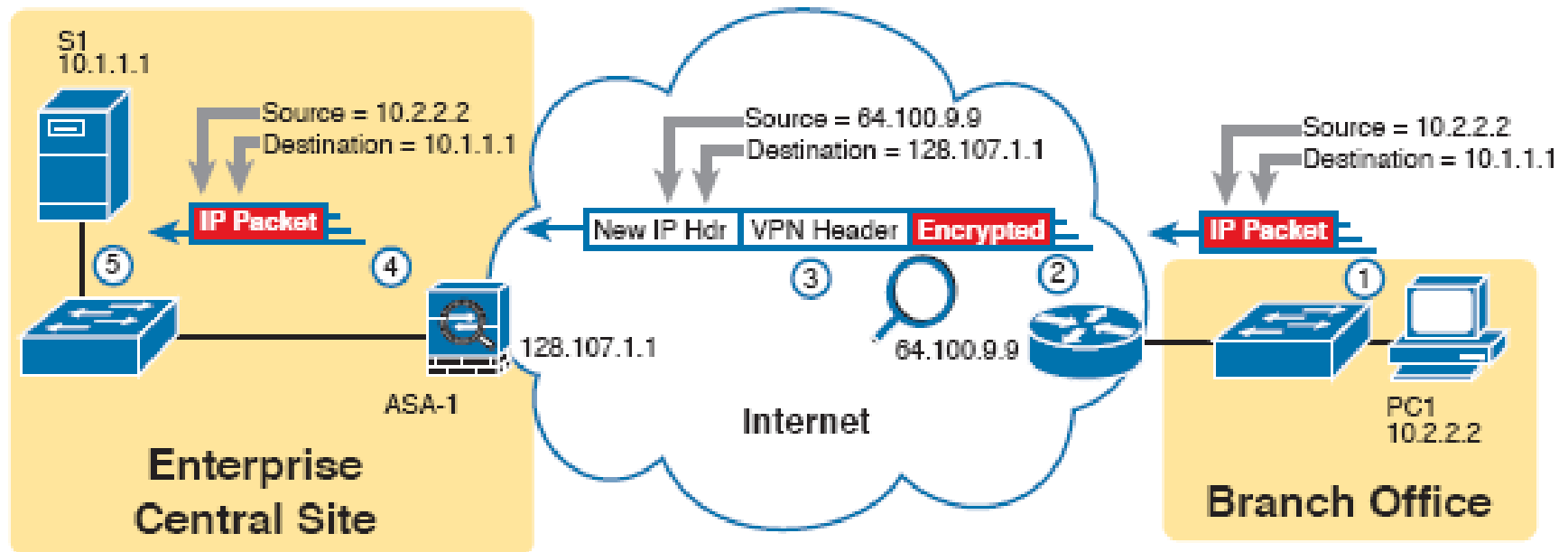
# Wiring and Devices for a Home Cable Internet Link



# Wireless Internet Access Using 3G/4G/5G Technology

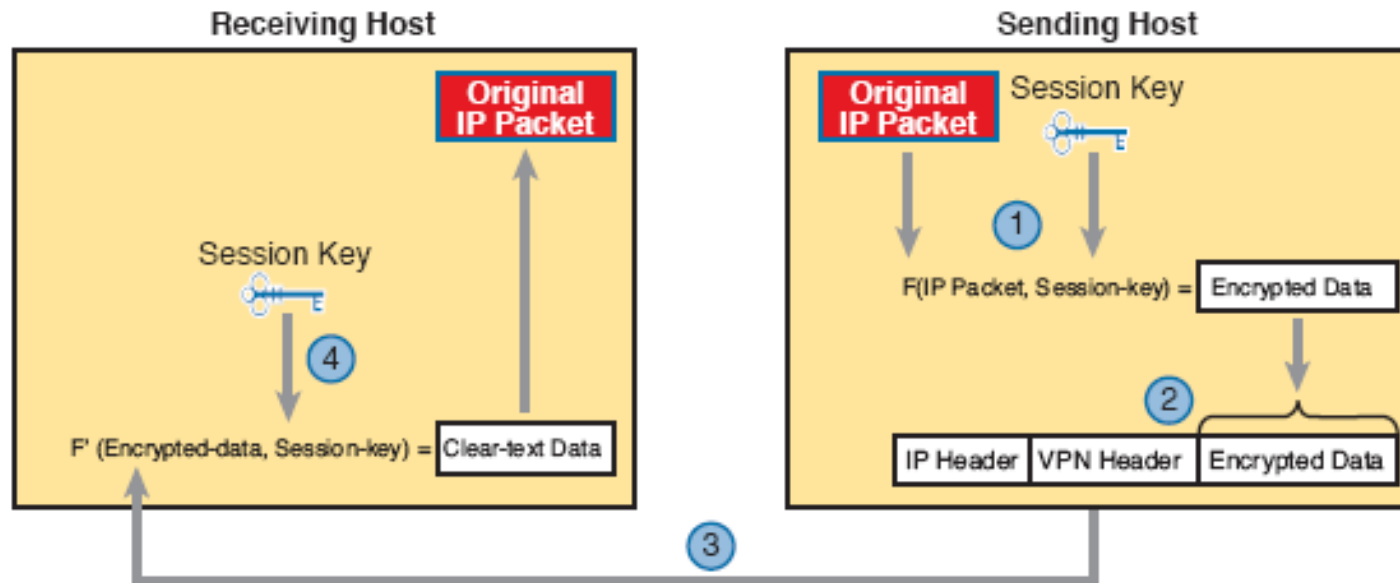


# VPN Tunnel Concepts for a Site-to-Site Intranet VPN

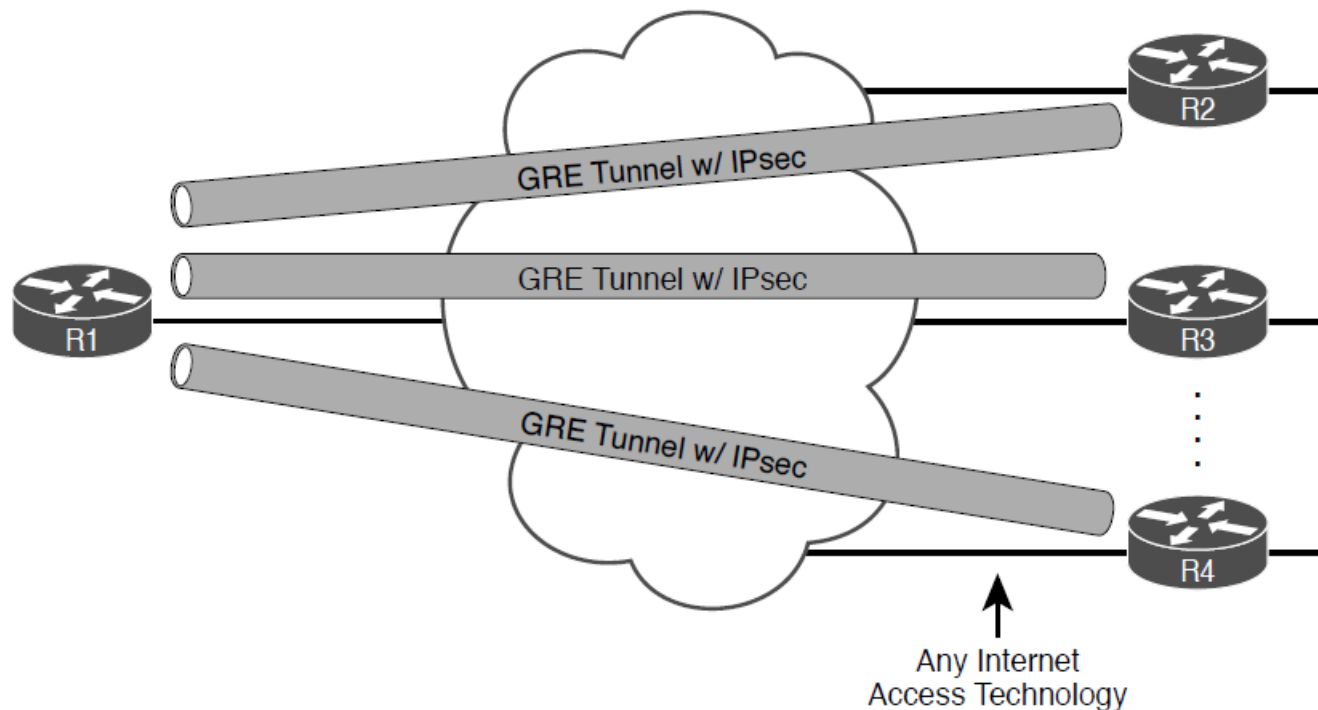




# Basic IPsec Encryption Process



# Site-to-Site VPN Tunnels with GRE and IPsec



# Remote Access VPN Options (TLS)

Cisco AnyConnect  
Secure Mobility Client



Internet

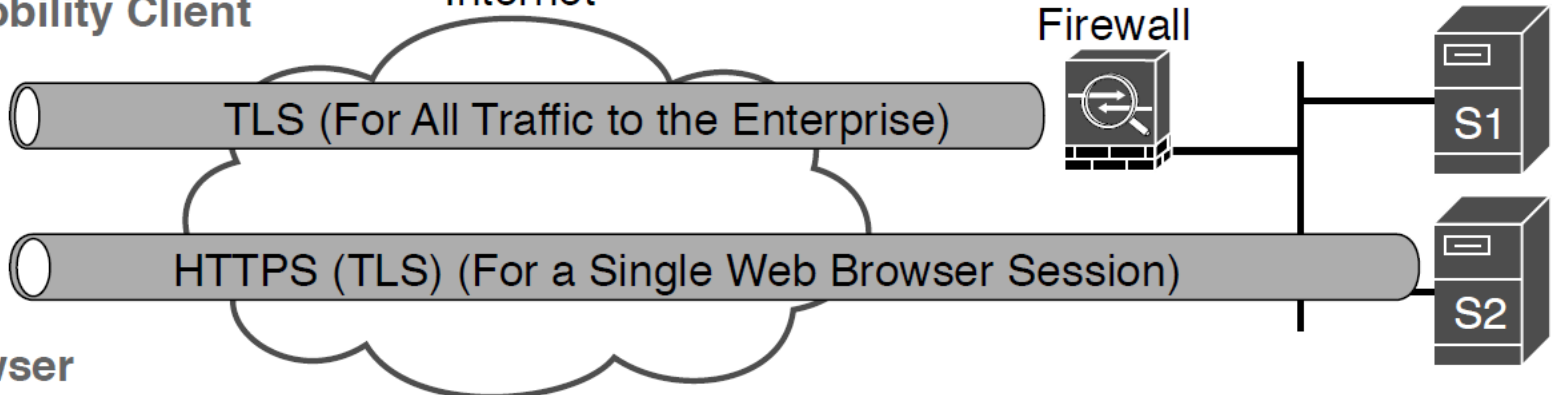
TLS (For All Traffic to the Enterprise)

HTTPS (TLS) (For a Single Web Browser Session)

Firewall



Web Browser



# Comparisons of Site-to-Site and Remote Access VPNs

	Remote Access	Site-to-Site
Typical security protocol	TLS	IPsec
Devices supported by one VPN (one or many)	One	Many
Typical use: on-demand or permanent	On-demand	Permanent