CCNA 200-301, Volume I

Chapter 1
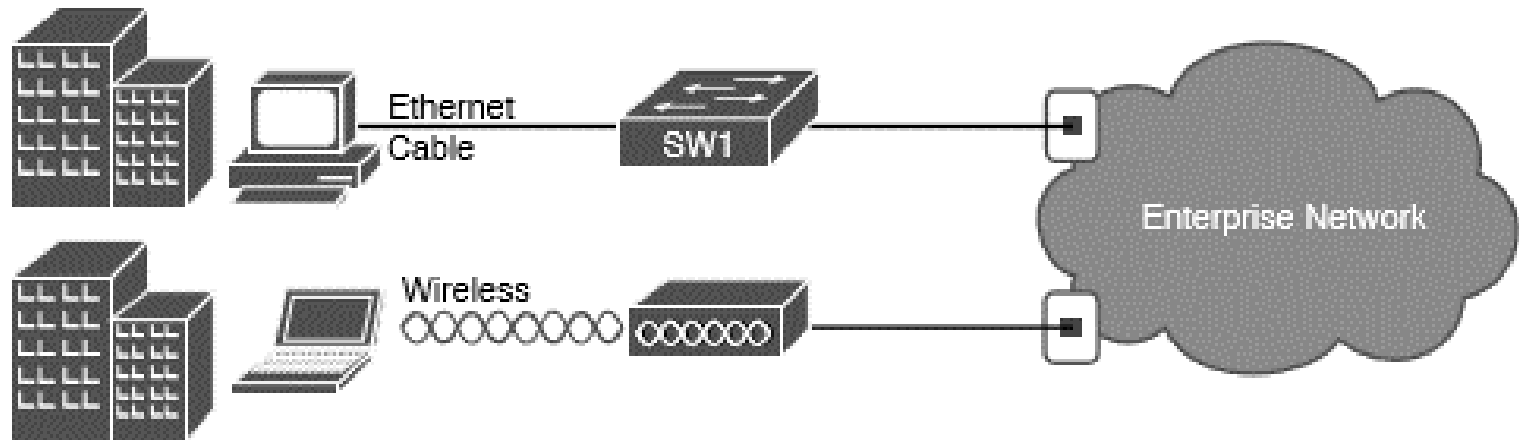
Introduction to TCP/IP Networking
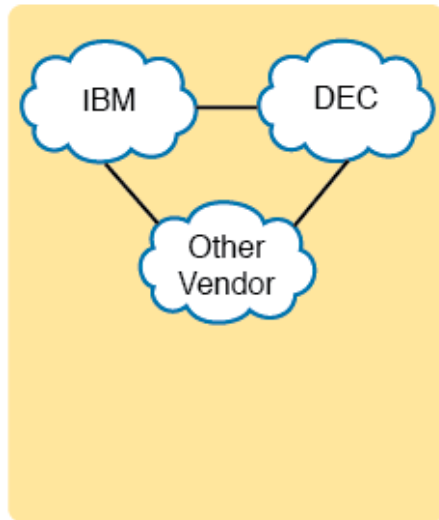
Objectives

- Perspective on Networking
- TCP/IP Networking Model
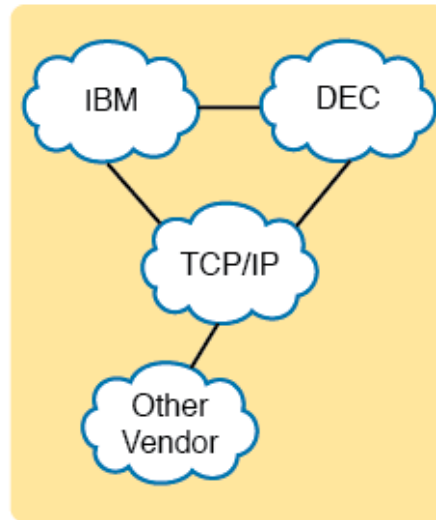- Data Encapsulation Terminology

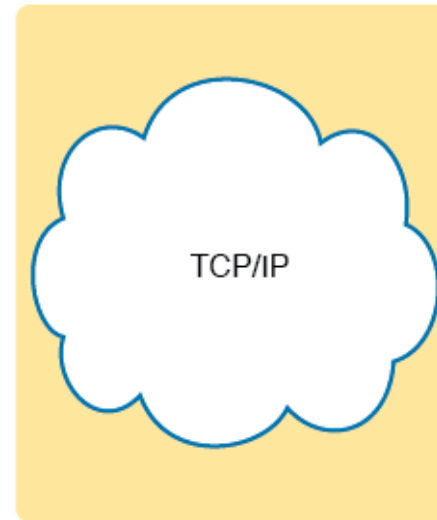# Two Major Branches of Networking Enterprise Network

TCP/IP Networking Model

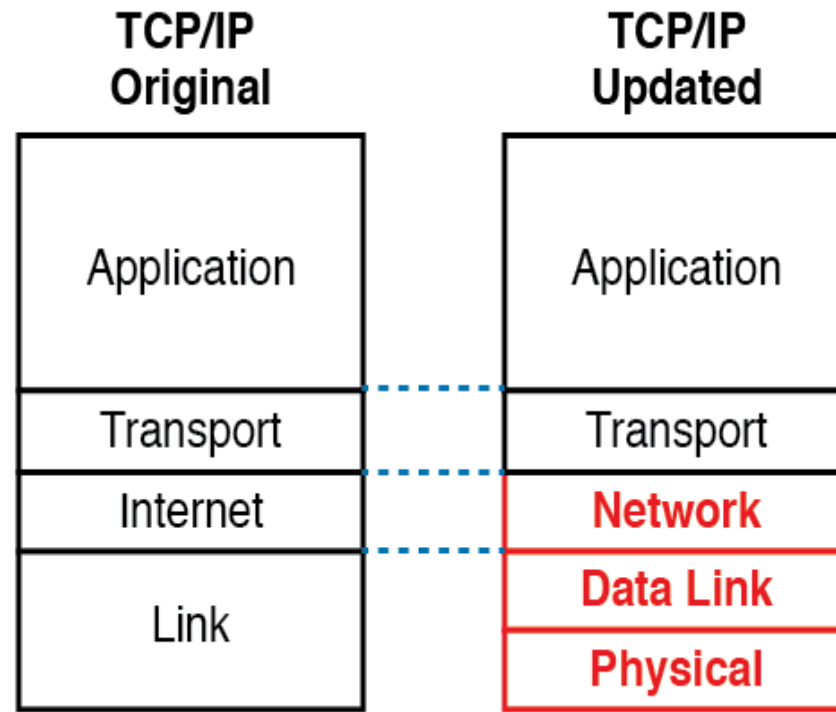Historical Progression: Proprietary Models to Open TCP/IP

The Two TCP/IP Networking Models

TCP/IP Original	TCP/IP Updated
Application	Application
Transport	Transport
Internet	**Network**
Link	**Data Link**
	Physical

TCP/IP Architectural Model and Example Protocols

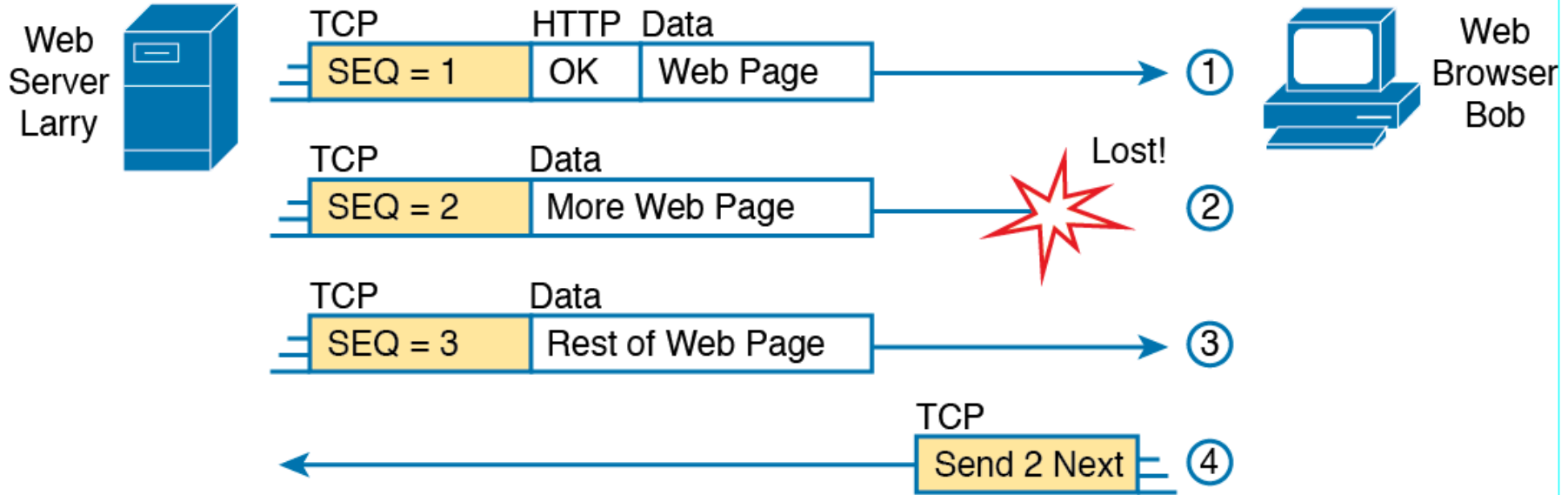| TCP/IP Architecture Layer	Example Protocols
Application	HTTP, POP 3, SMTP
Transport	TCP,UDP
Internet	IP, ICMP
Data Link & Physical	Ethernet, 802.11 (Wi-Fi) TCP/IP

HTTP
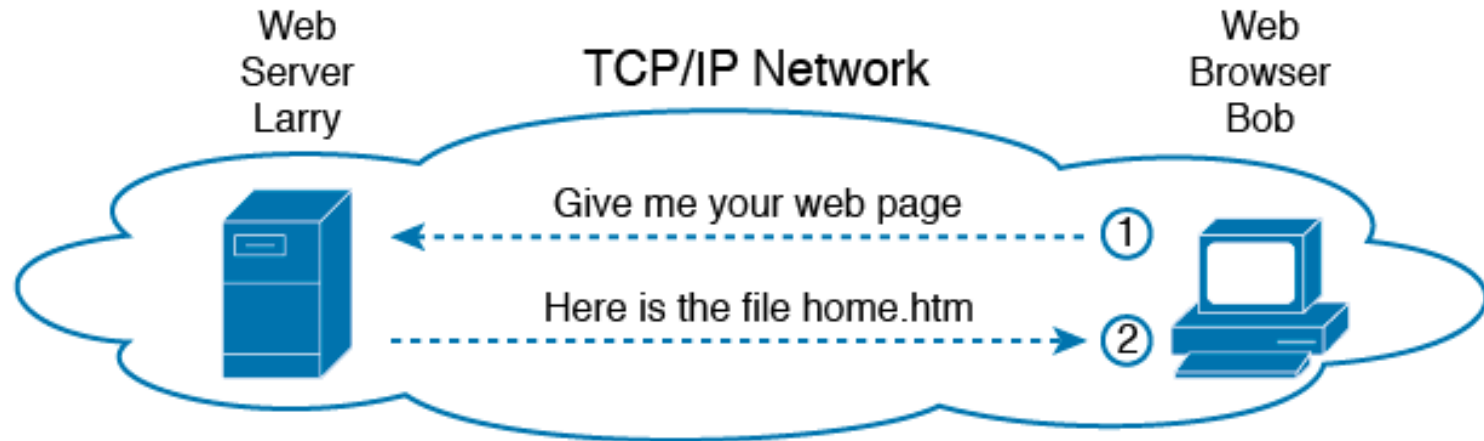
Basic Application Logic to Get a Web Page

HTTP (continued)
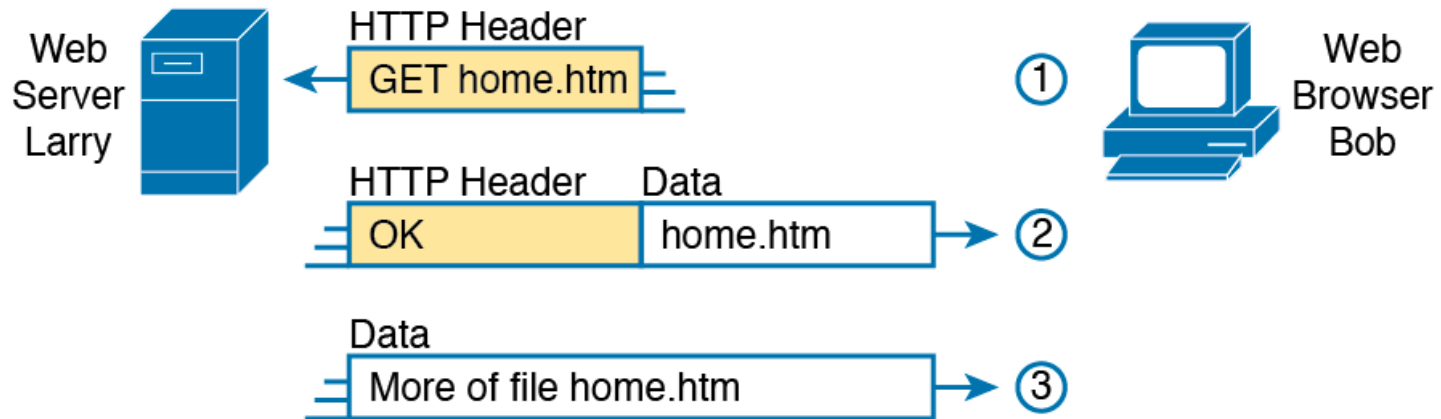
HTTP Get Request, HTTP Reply, and one Data-Only Message

TCP/IP Transport Layer

TCP Error-Recovery Services as Provided to HTTP

Same-Layer and Adjacent-Layer Interaction

Concept	Description
Same-layer interaction on different computers	The two computers use a protocol to communicate with the same layer on another computer. The protocol defines a header that communicates what each computer wants to do.
Adjacent-layer interaction on the same computer	On a single computer, one lower layer provides a service to the layer just above. The software or hardware that implements the higher layer requests that the next lower layer perform the needed function.

Postal Service Forwarding (Routing) Letters
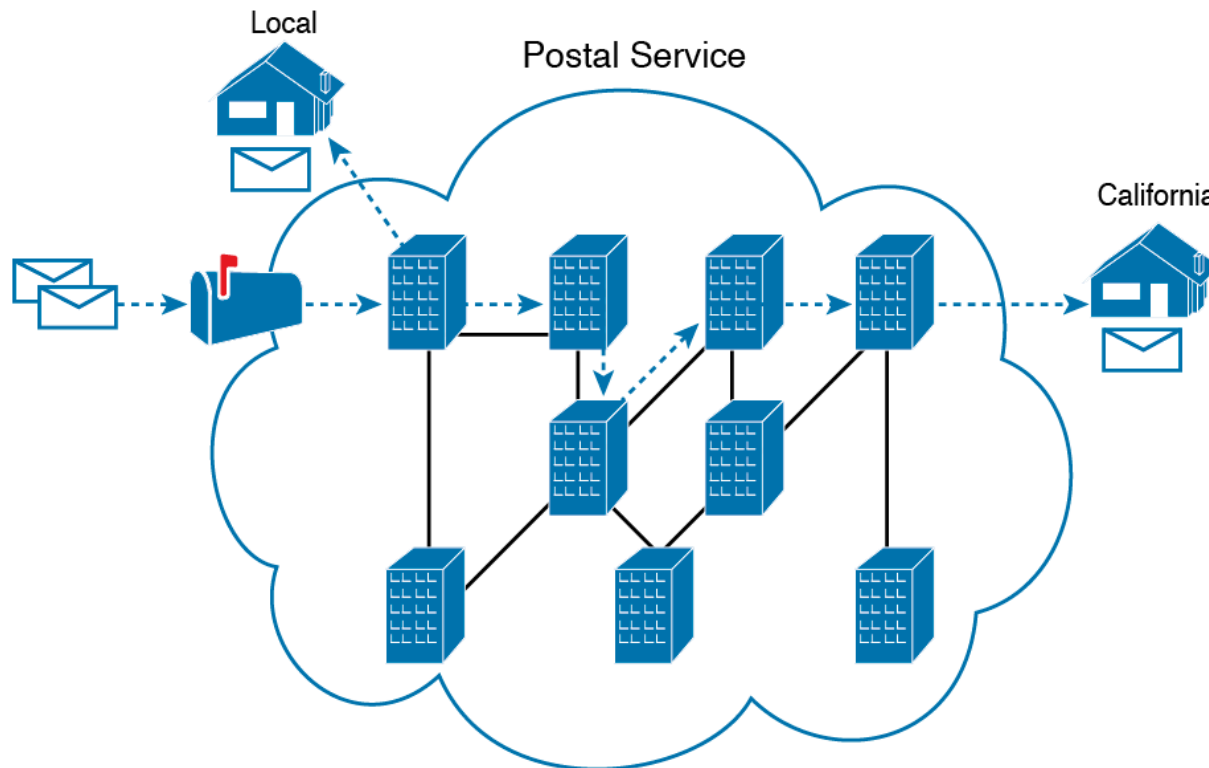
Simple TCP/IP Network
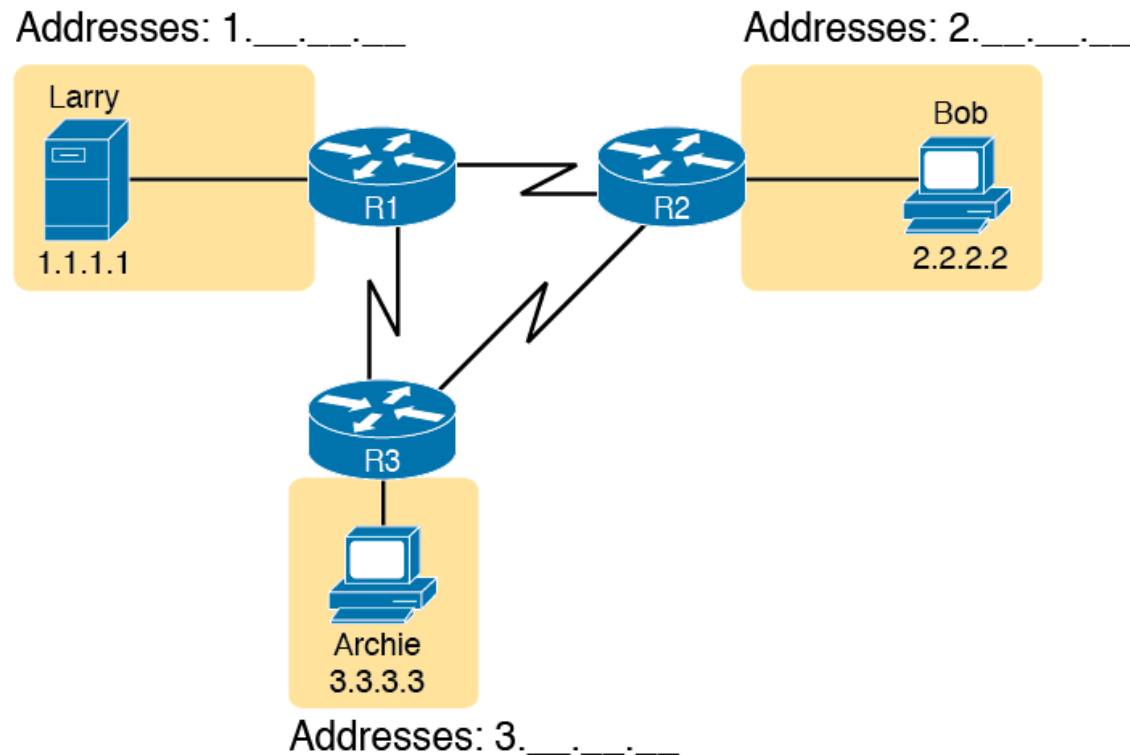
Basic Routing Example
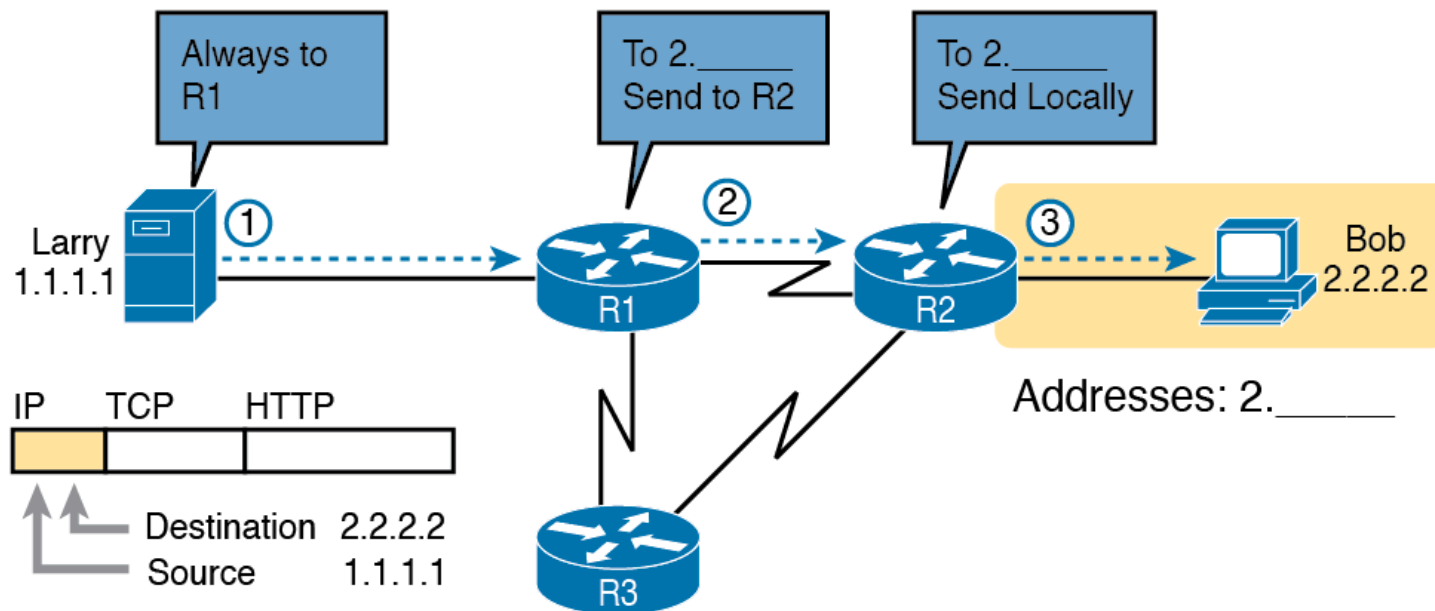
Ethernet
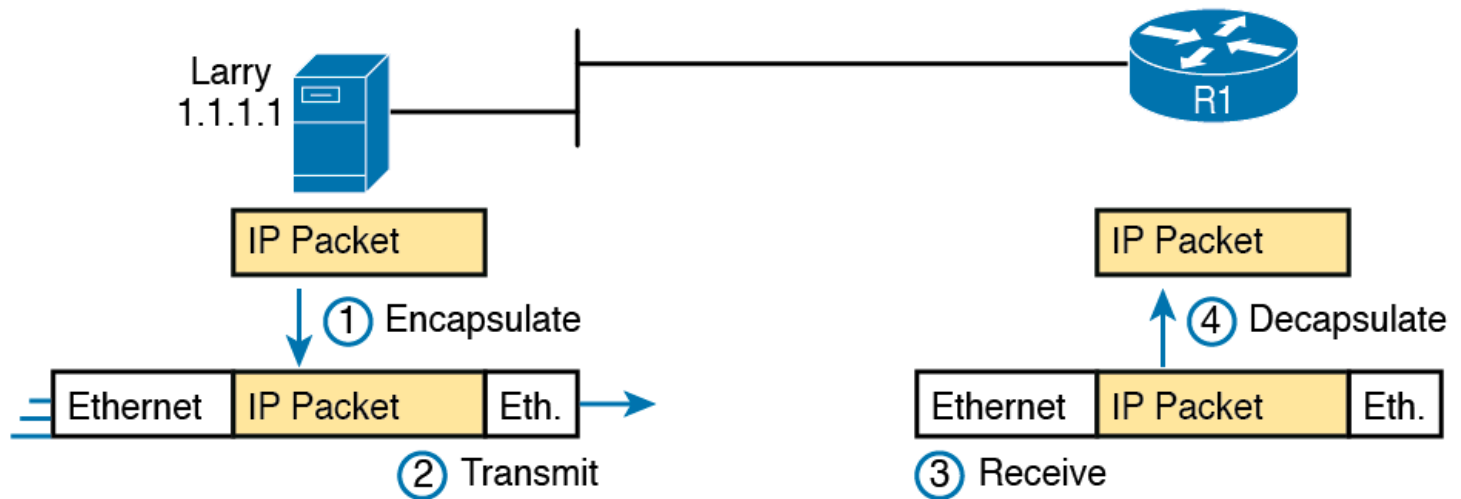
Larry Using Ethernet to Forward an IP Packet to Router R1

Five Steps of Data Encapsulation: TCP/IP

Perspective on Encapsulation and "Data"

The letters LH and LT stand for link header and link trailer, respectively, and refer to the data link layer header and trailer.

OSI Networking Model

OSI Model Compared to the Two TCP/IP Models

OSI Reference Model Layer Definitions
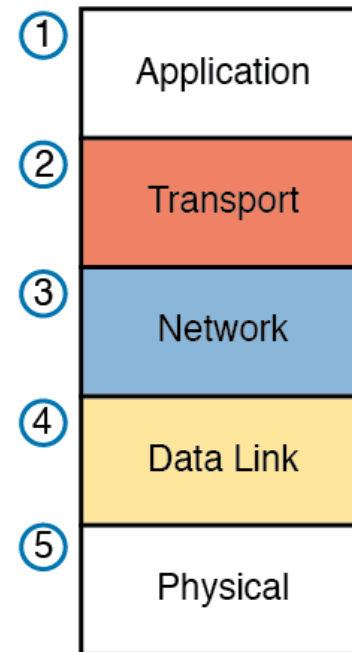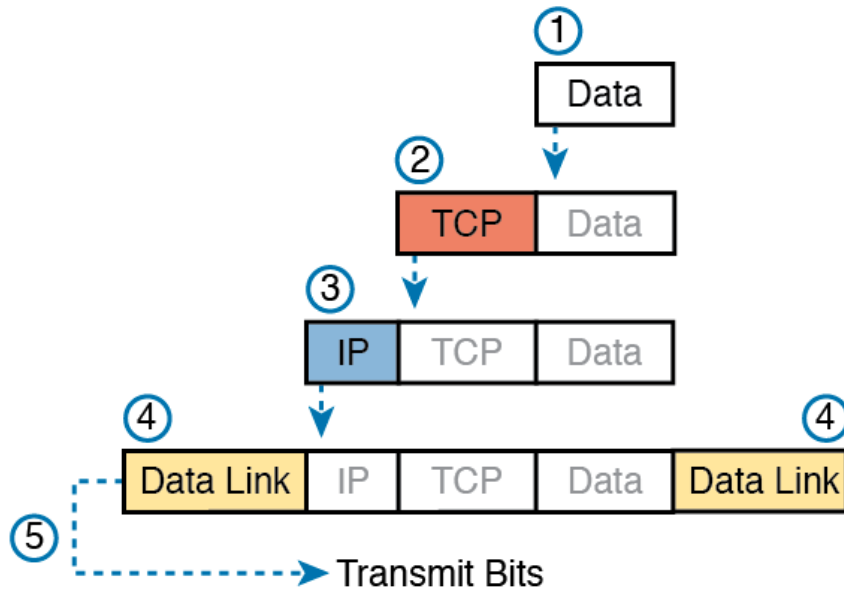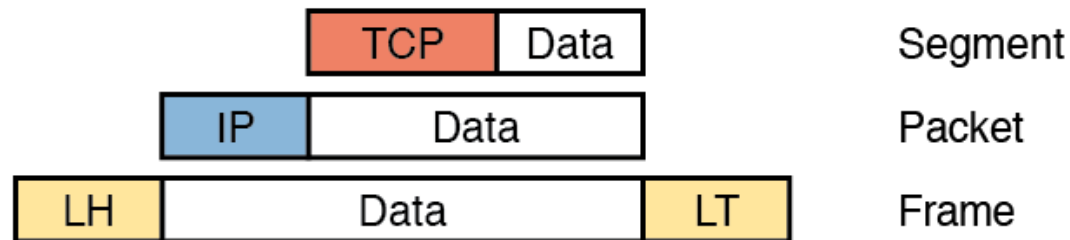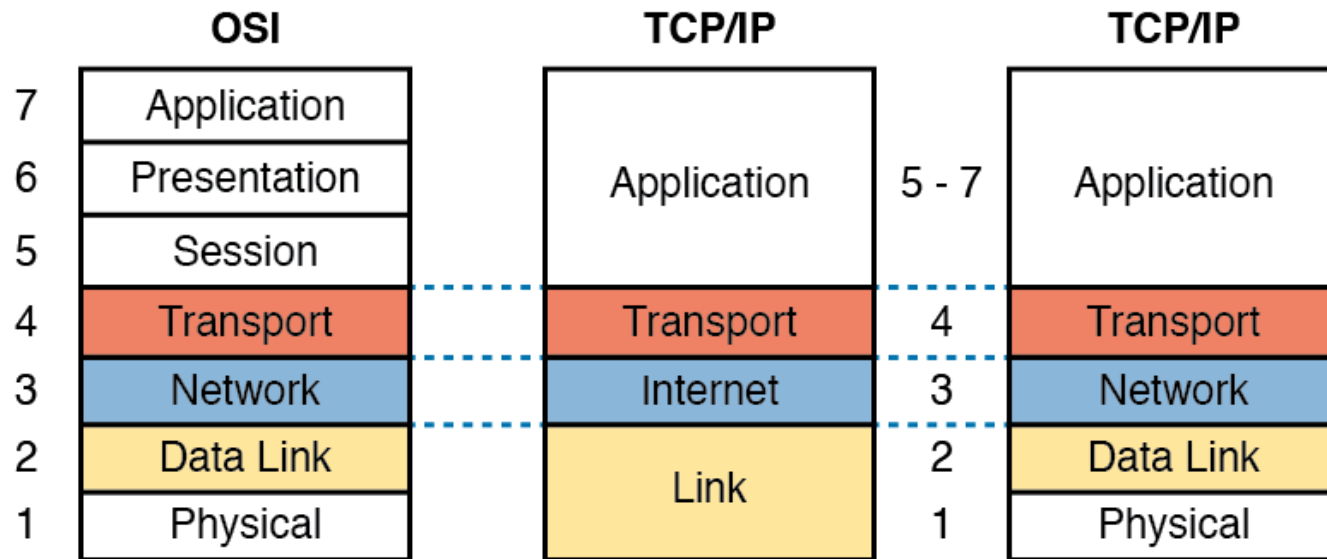
Layer		Functional Description
7	All	Application layer. This layer provides an interface between the communications software and any applications that need to communicate outside the computer on which the application resides. It also defines processes for user authentication.
6	People	Presentation layer. This layer's main purpose is to define and negotiate data formats, such as ASCII text, EBCDIC text, binary, BCD, and JPEG. Encryption is also defined by OSI as a presentation layer service
5	Seem	Session layer. This layer defines how to start, control, and end conversations (called sessions). This includes the control and management of multiple bidirectional messages so that the application can be notified if only some of a series of messages are completed. This allows the presentation layer to have a seamless view of an incoming stream of data.
4	To	Transport layer. This layer's protocols provide a large number of services, as described in Chapter 5, "Fundamentals of TCP/IP Transport and Applications." Although OSI Layers 5 through 7 focus on issues related to the application, Layer 4 focuses on issues related to data delivery to another computer (for instance, error recovery and flow control).

OSI Reference Model Layer Definitions (Continued

Layer	Functional Description
3 Need	Network layer. This layer defines three main features: logical addressing, routing (forwarding), and path determination. Routing defines how devices (typically routers) forward packets to their final destination. Logical addressing defines how each device can have an address that can be used by the routing process. Path determination refers to the work done by routing protocols to learn all possible routes, and choose the best route.
2 Data	Data link layer. This layer defines the rules that determine when a device can send data over a particular medium. Data link protocols also define the format of a header and trailer that allows devices attached to the medium to successfully send and receive data
1 Processing	Physical layer. This layer typically refers to standards from other organizations. These standards deal with the physical characteristics of the transmission medium, including connectors, pins, use of pins, electrical currents, encoding, light modulation, and the rules for how to activate and deactivate the use of the physical medium

OSI Reference Model Example Devices and Protocols

Layer Name	Protocols and Specifications	Devices
Application, presentation, session (Layers 5–7)	Telnet, HTTP, FTP, SMTP, POP3, VoIP, SNMP	Hosts, firewalls
Transport (Layer 4)	TCP, UDP	Hosts, firewalls
Network (Layer 3)	IP	Router
Data link (Layer 2)	Ethernet (IEEE 802.3), HDLC	LAN switch, wireless access point, cable modem, DSL modem
Physical (Layer 1)	RJ-45, Ethernet (IEEE 802.3)	LAN hub, LAN repeater, cables

OSI Encapsulation and Protocol Data Units