Cisco Networking Academy
Mind Wide Open

Chapter 3: Network Protocols and Communications

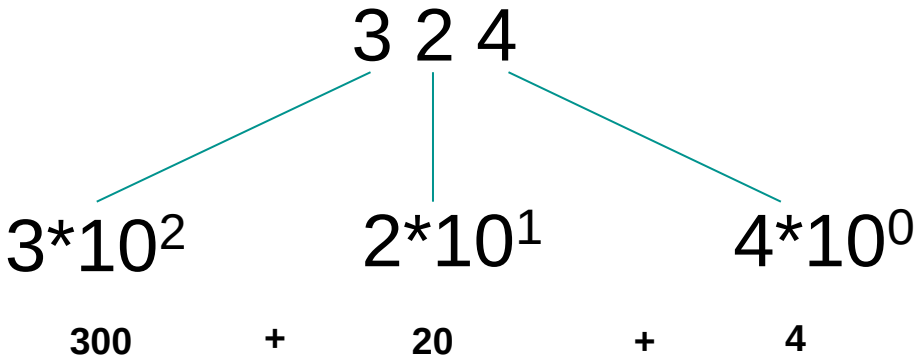
Introduction to Networks v5.1

Marvin Krym

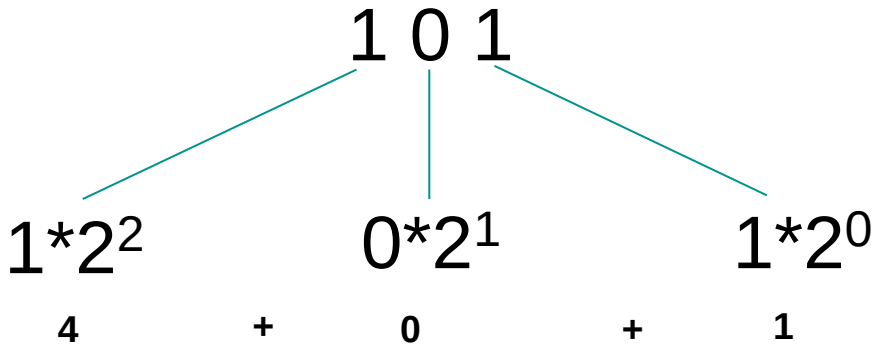
Fundamentals

Introducing Binary

- Decimal (Base 10) notation using positional representation
- Decimal uses 10 digits: 0-9



- Binary (Base 2) notation using positional representation
- Binary uses 2 digits: 0-1

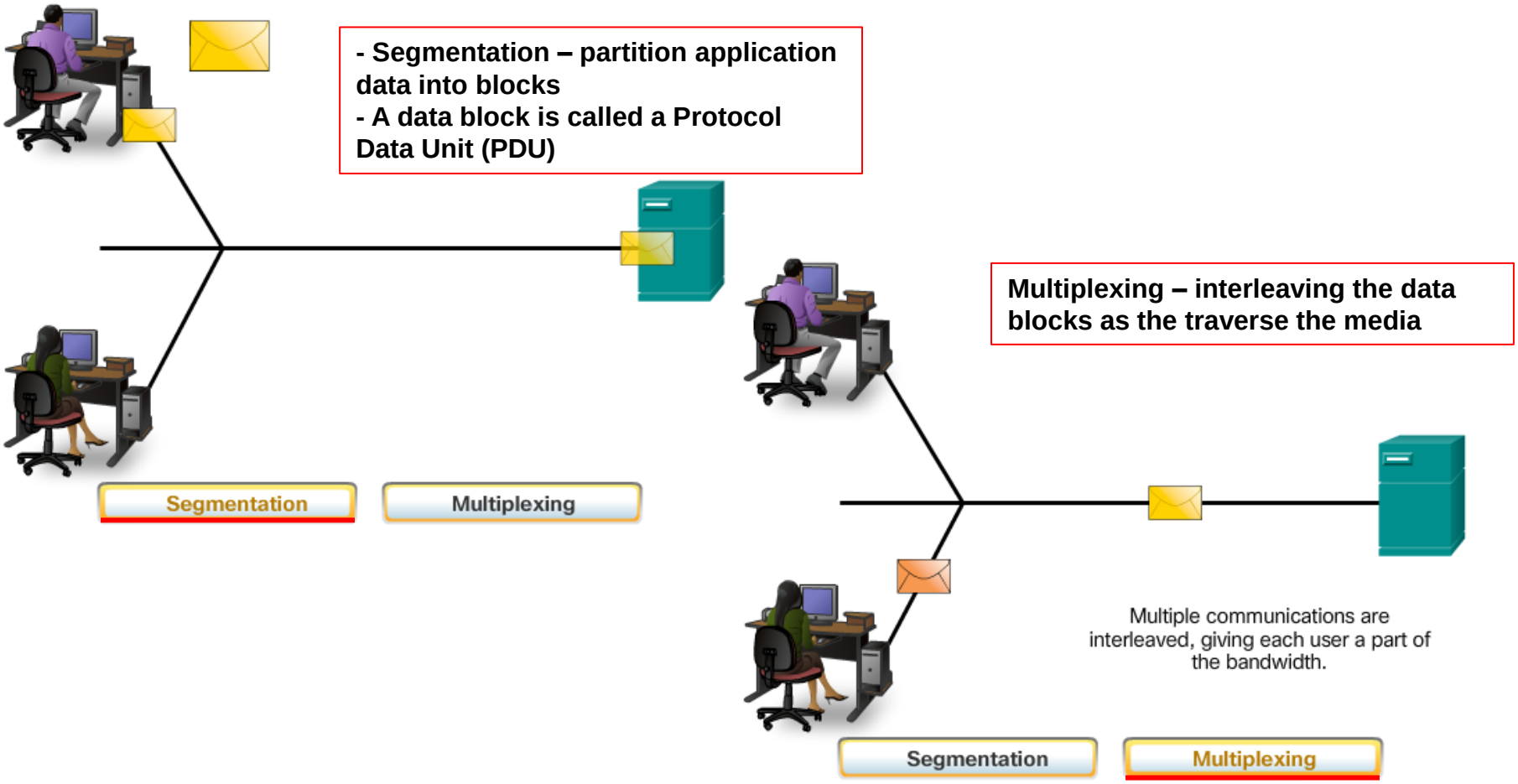


Digital Data Transmission

- Data is represented by decimal numbers: 357889512098
- In Computing and Telecommunications, data is represented and transmitted as binary: 11010010011010110110100
- You will need to convert between decimal and binary notations

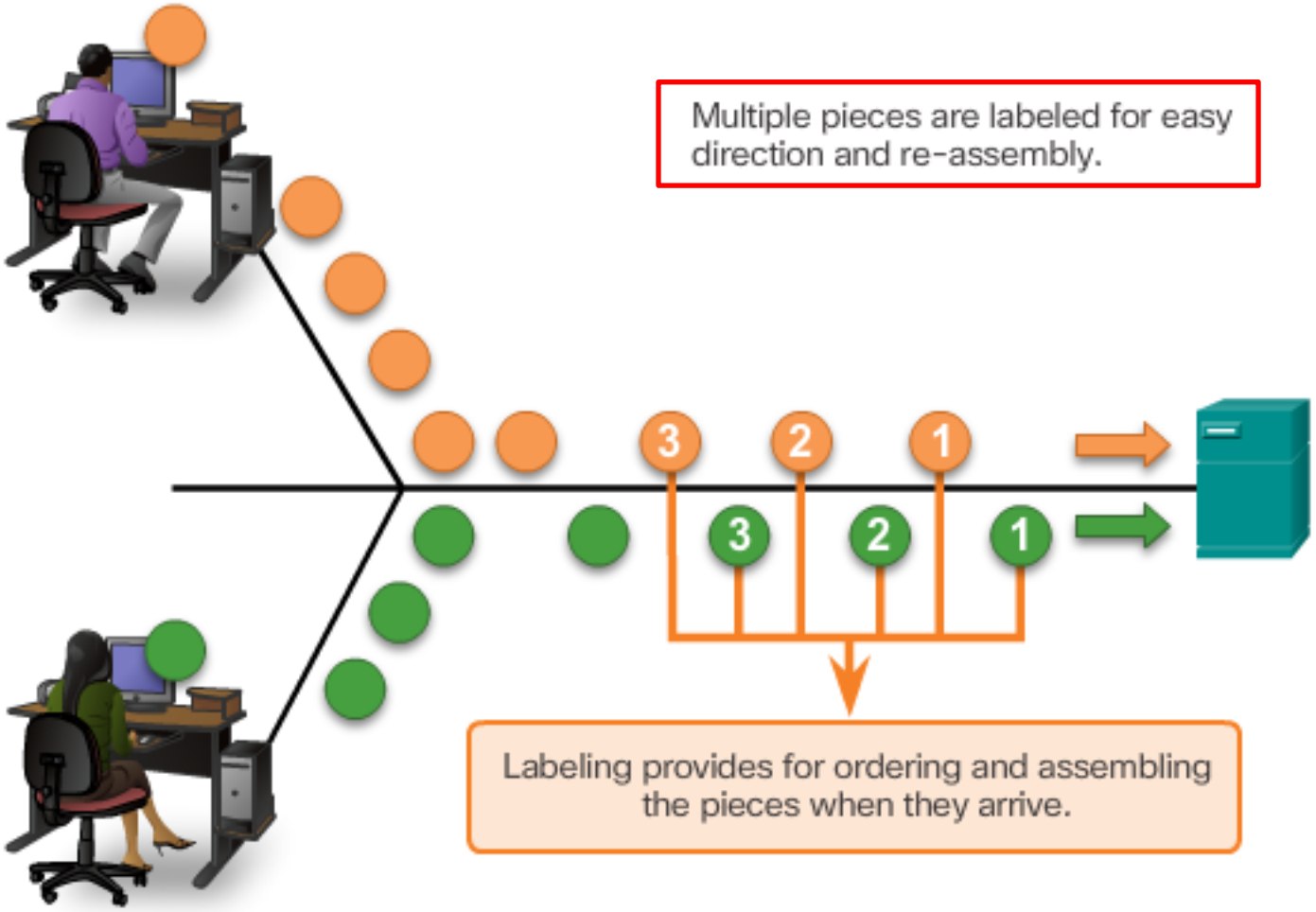
Message Segmentation

Communicating the Message



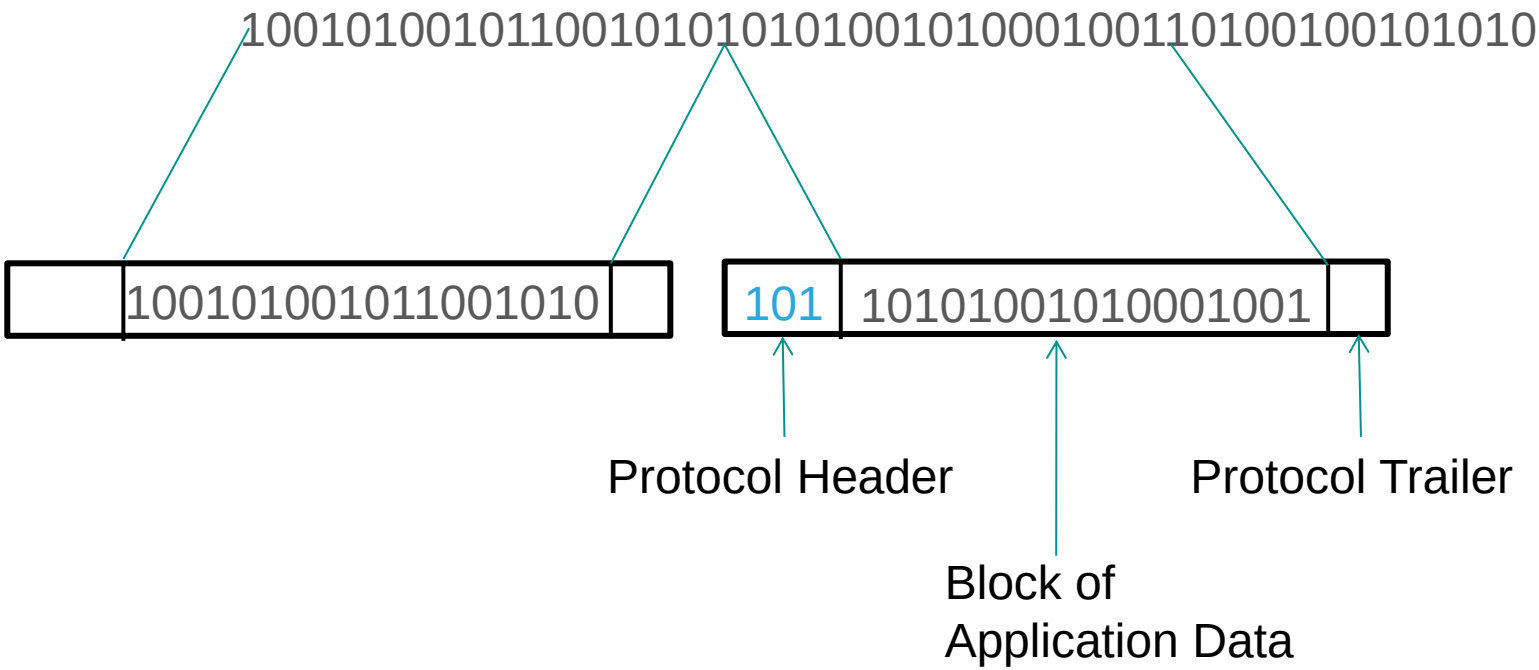
Message Segmentation (cont.)

Communicating the Message



Encapsulation

Process of adding header and trailer information to the data block

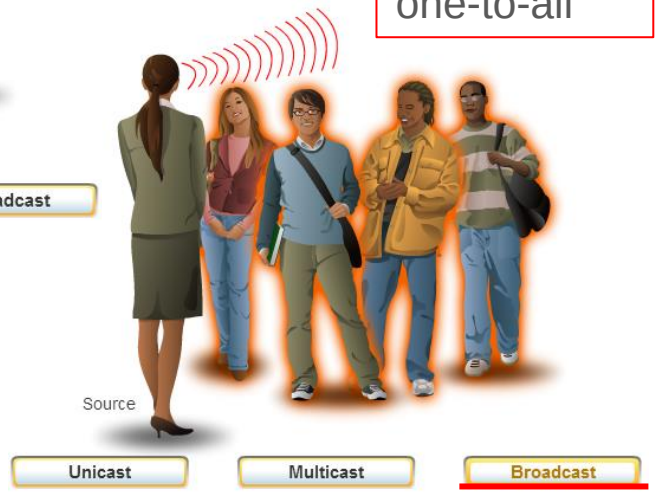


Message Delivery Options

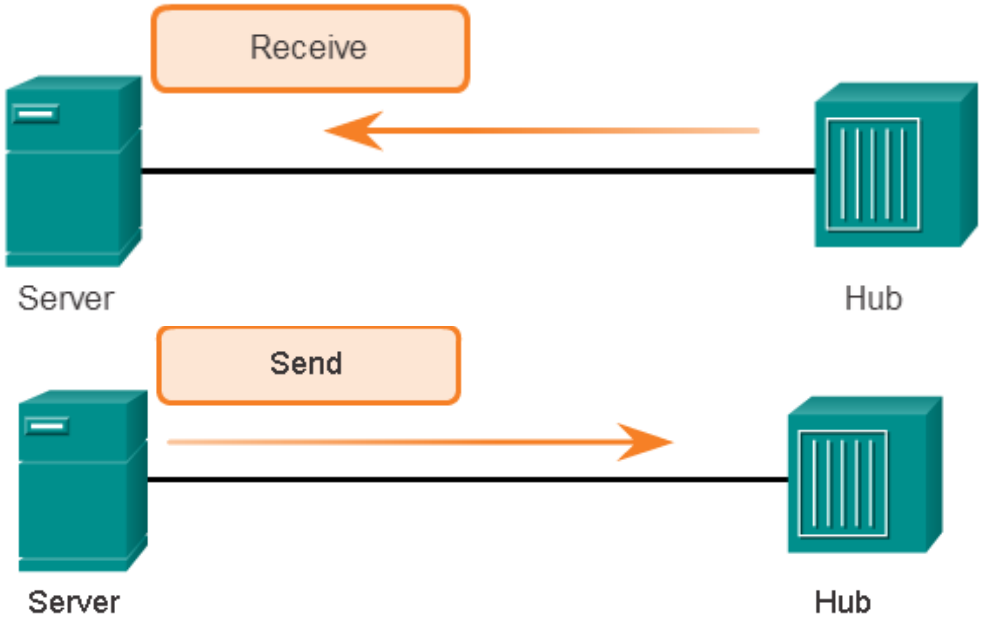
one-to-one

one-to-many

one-to-all

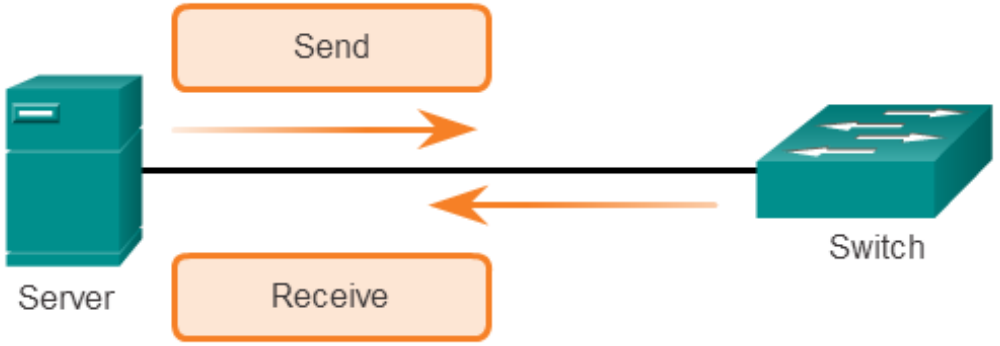


Half and Full Duplex



Half-Duplex Communication

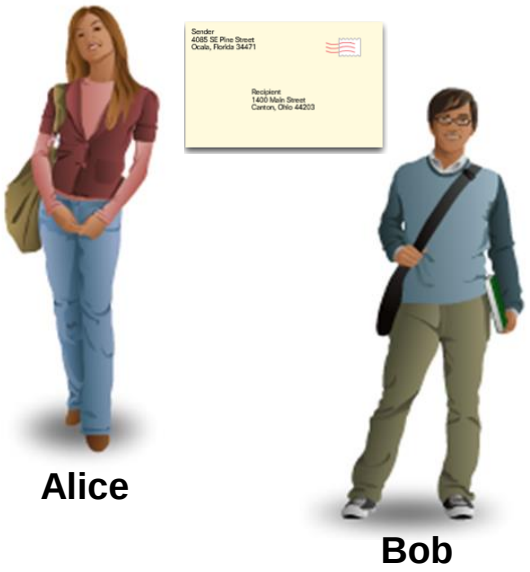
Full-Duplex Communication



Communication Protocols

Communication Protocols

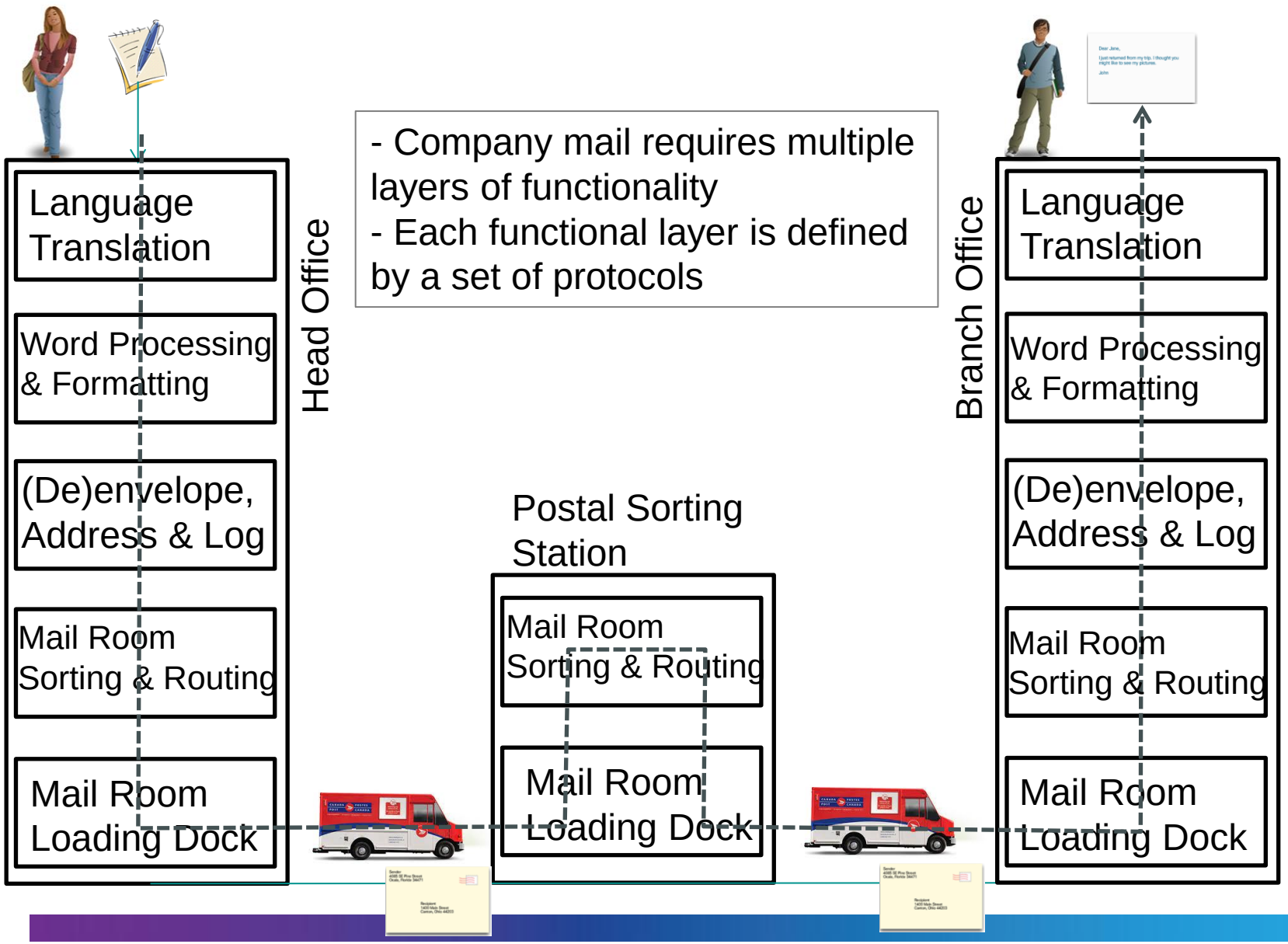
Communications Protocol:
Formal code of behaviour and procedures for information and message exchange



Human Communication Protocol Addresses:

- Encoding: Language
- Message Size: Segmentation
- Timing: Delay
- Error: Avoidance and Correction
- Transmission Method

E.g. Mail Communication Protocol



Standards Bodies

Standards: An agreed set of principles and procedures

Internet Engineering Task Force
- Develops Internet standards
- Part of The Internet Society (ISOCC)
- www.ietf.org

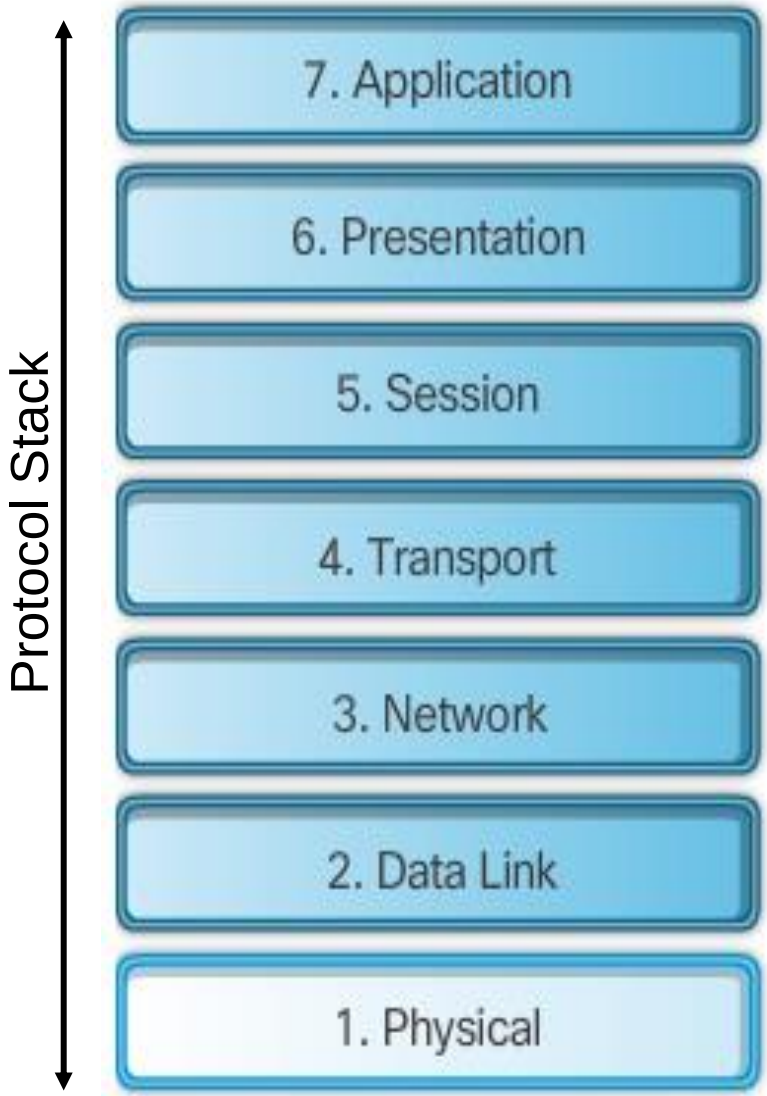
International Telecommunications Union
- Develops Telecommunications Standards
- Part of the United Nations,
- www.itu.int

Institute of Electrical and Electronics Engineers
- Develops Media Interface Standards
- www.ieee.org

The OSI Reference Model – ITU Standard

OSI: Open System Interconnect

Basic Function



Protocols used by application software

Formatting and representation of data to the user

Opens, closes and manages sessions (i.e. dialog)

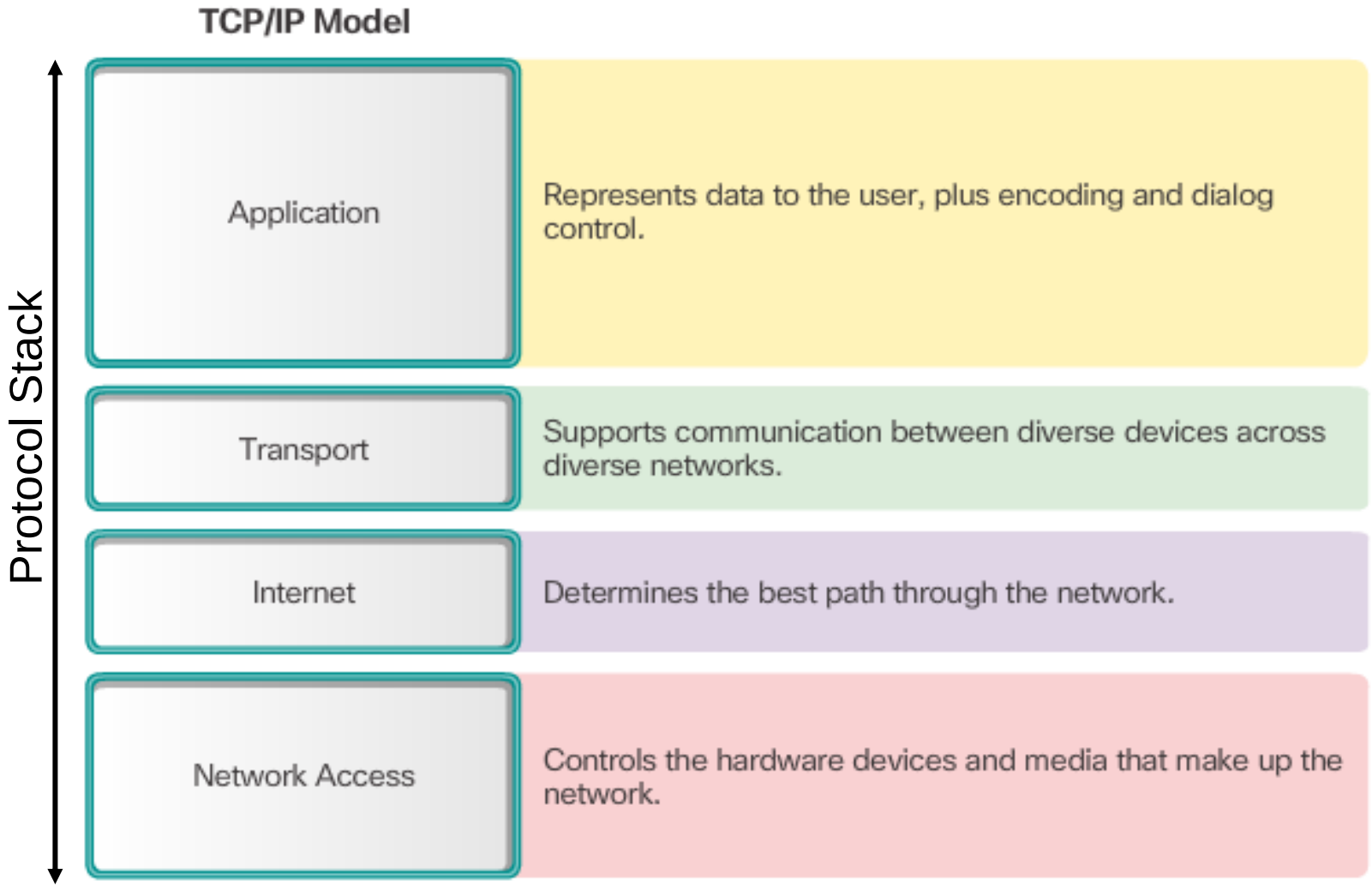
Manages Source to Destination connection

Determines best paths through the network
Manages routing and forwarding

Manages device-to-device link connection

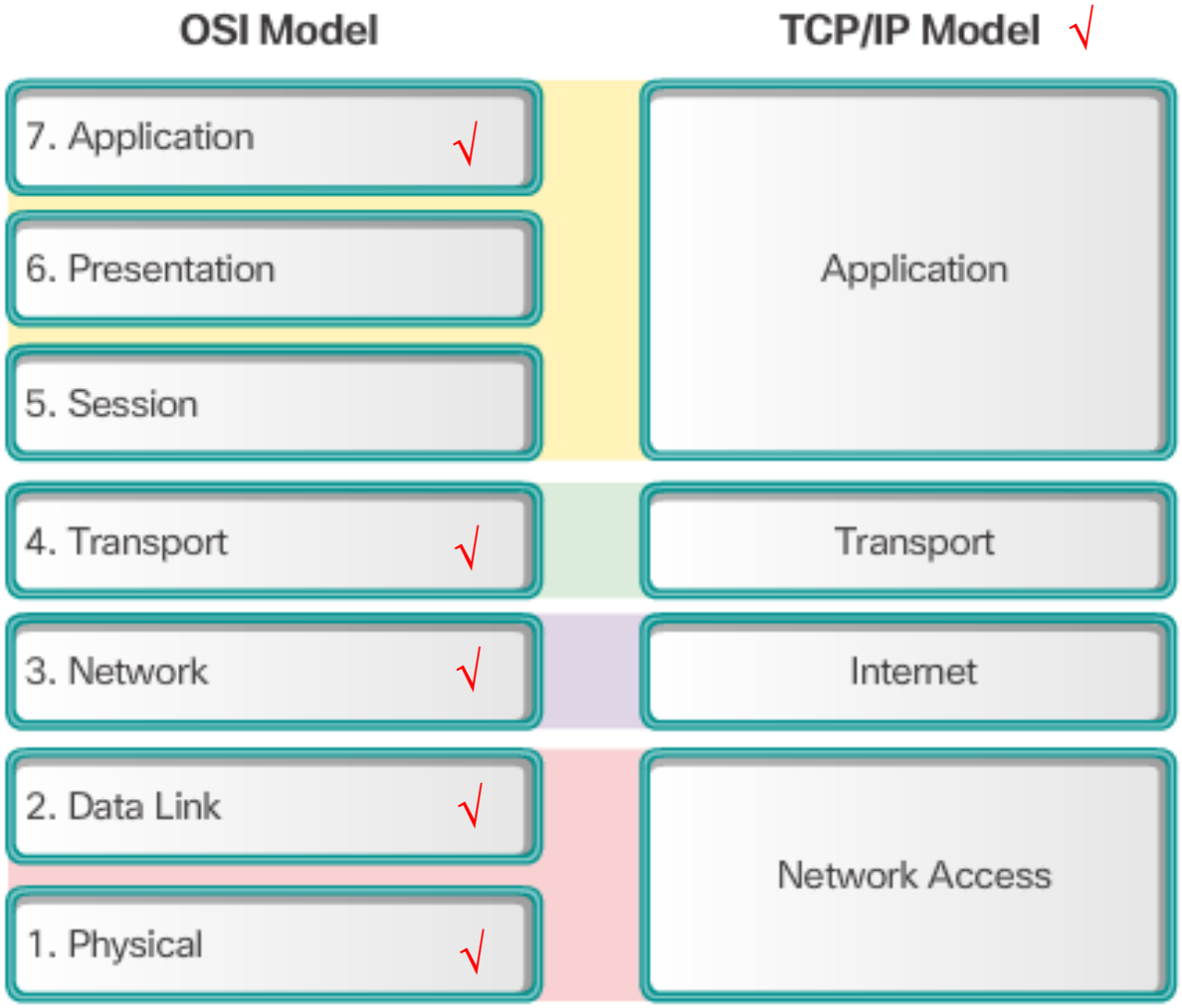
Transmission of bits on the physical medium
Controls hardware devices that connect media

The TCP/IP Protocol Stack Model – IETF Standard



OSI Model and TCP/IP Model Comparison

ALL PEOPLE SEEM TO NEED DATA PROCESSING



Examples

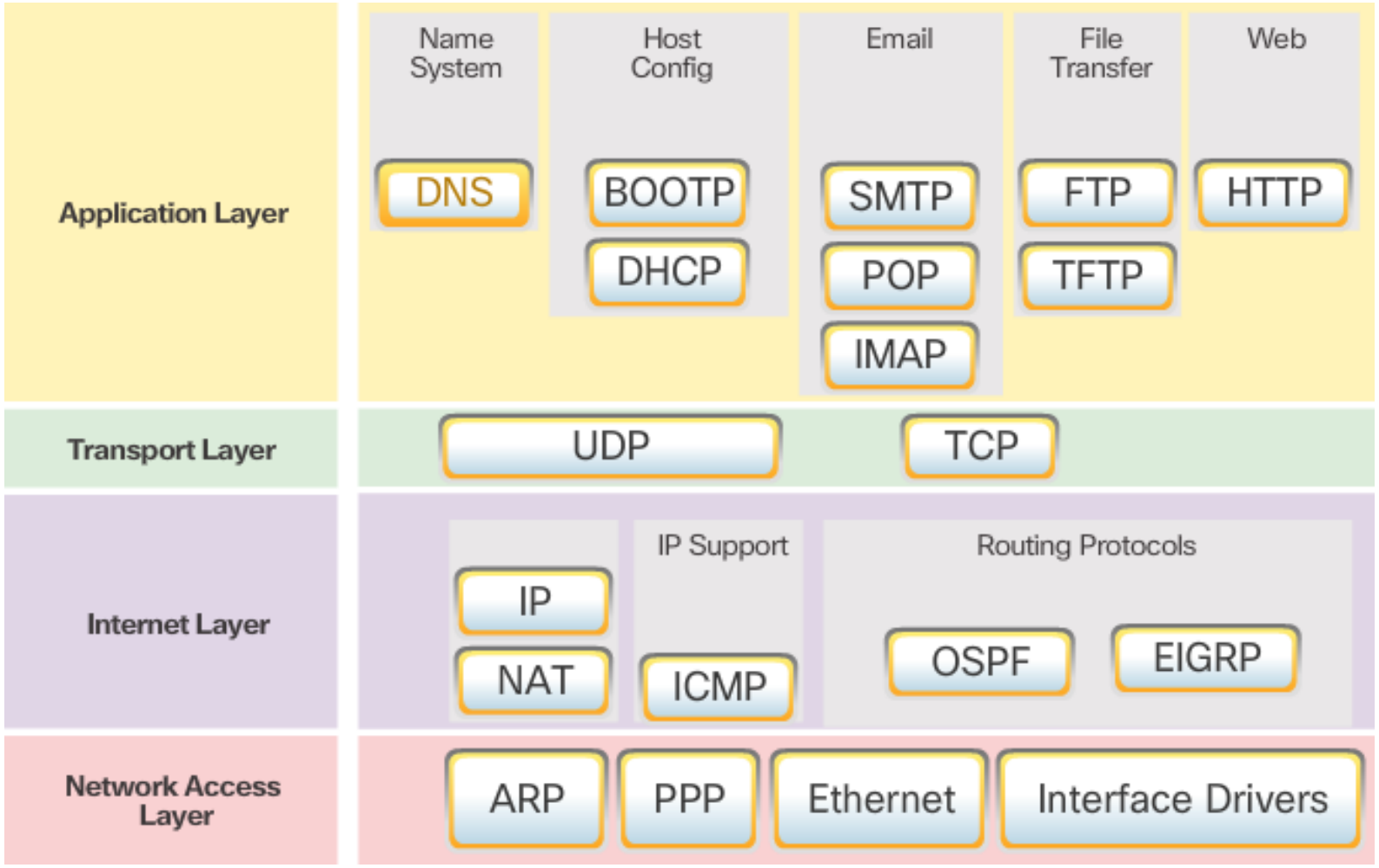
HTTP: Internet Browsing
FTP: File Transfer Protocol
TFTP: Trivial File Transfer
SMTP: eMail
DHCP: Dynamic Host Config
DNS: Domain Name System

TCP: Transmission Control
UDP: User Datagram Protocol

IPv4: Internet Protocol v4
IPv6: Internet Protocol v6

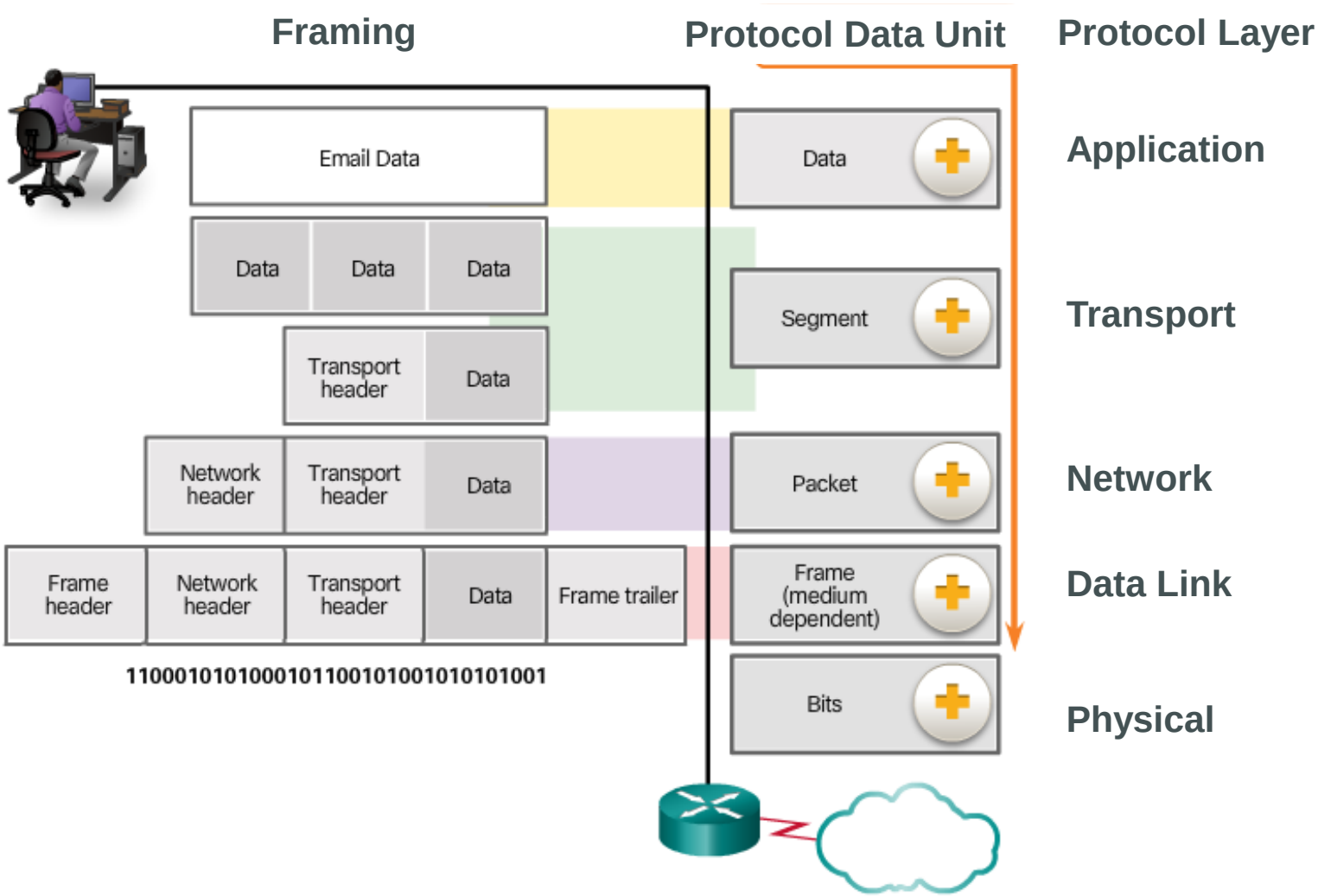
Wired Ethernet
Wireless Ethernet: Wi-Fi

TCP/IP Protocol Suite



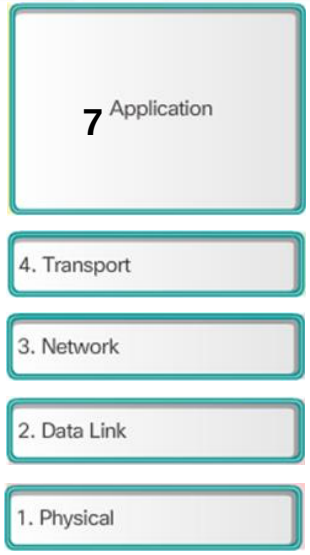
Protocol Data Units

- Segmentation – partition of application data into blocks of data
- A data block is called a Protocol Data Unit (PDU)



Where is the Protocol Stack

Laptop



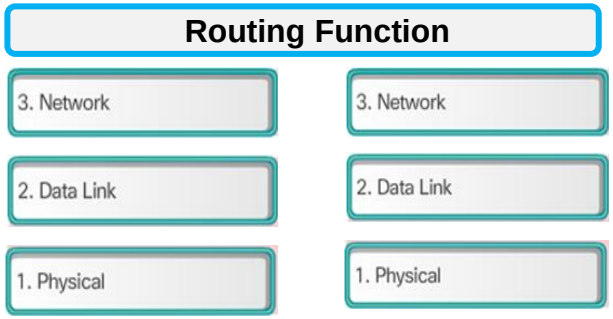
Interface 1

example mapping

software

hardware

Router

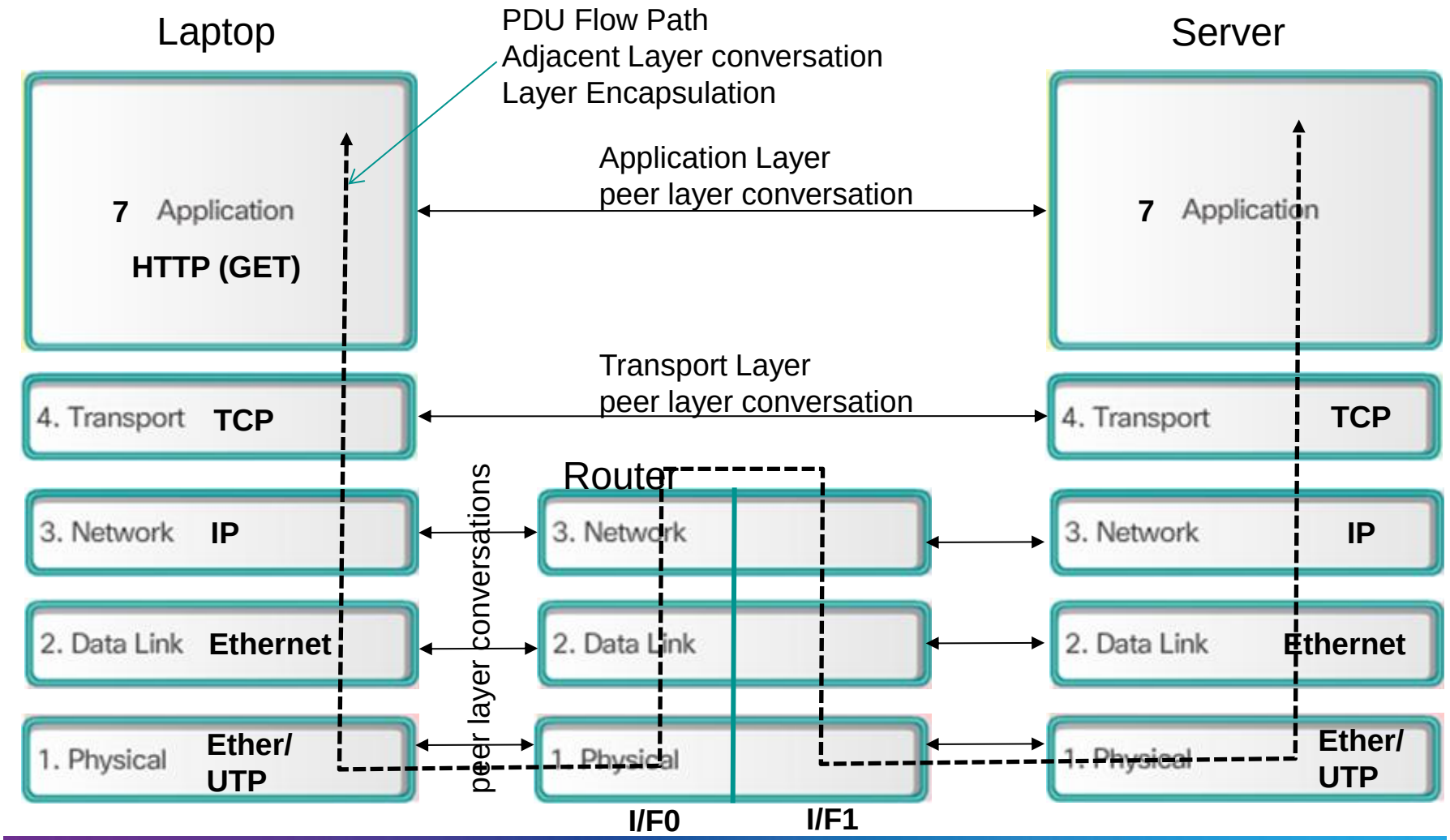


Interface 1

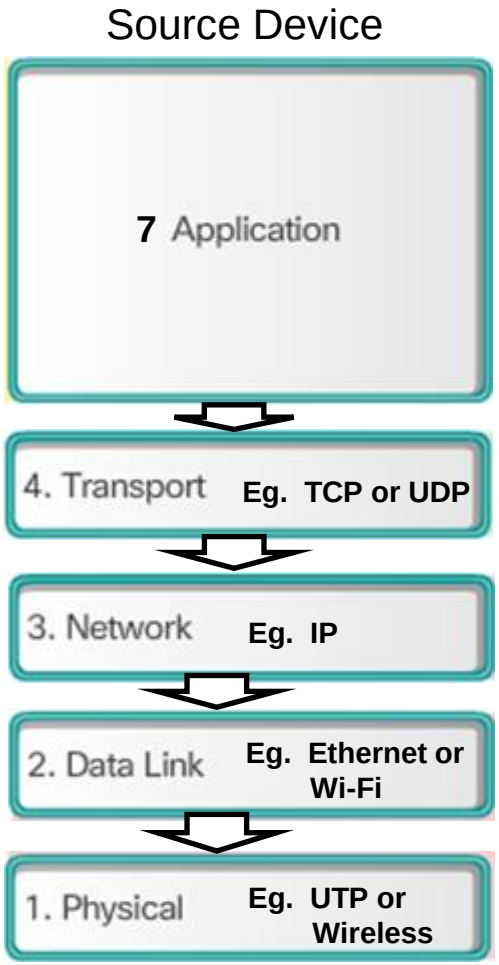
Interface 2

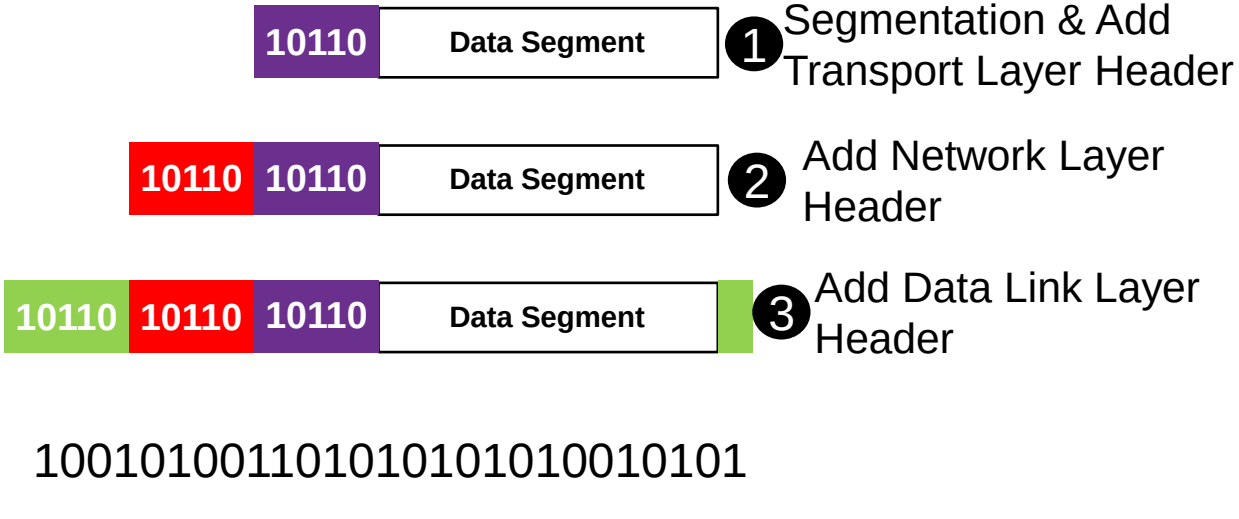
- A protocol stack resides at each interface
- Each Layer 3 Interface has an IP Address

Protocol Flows

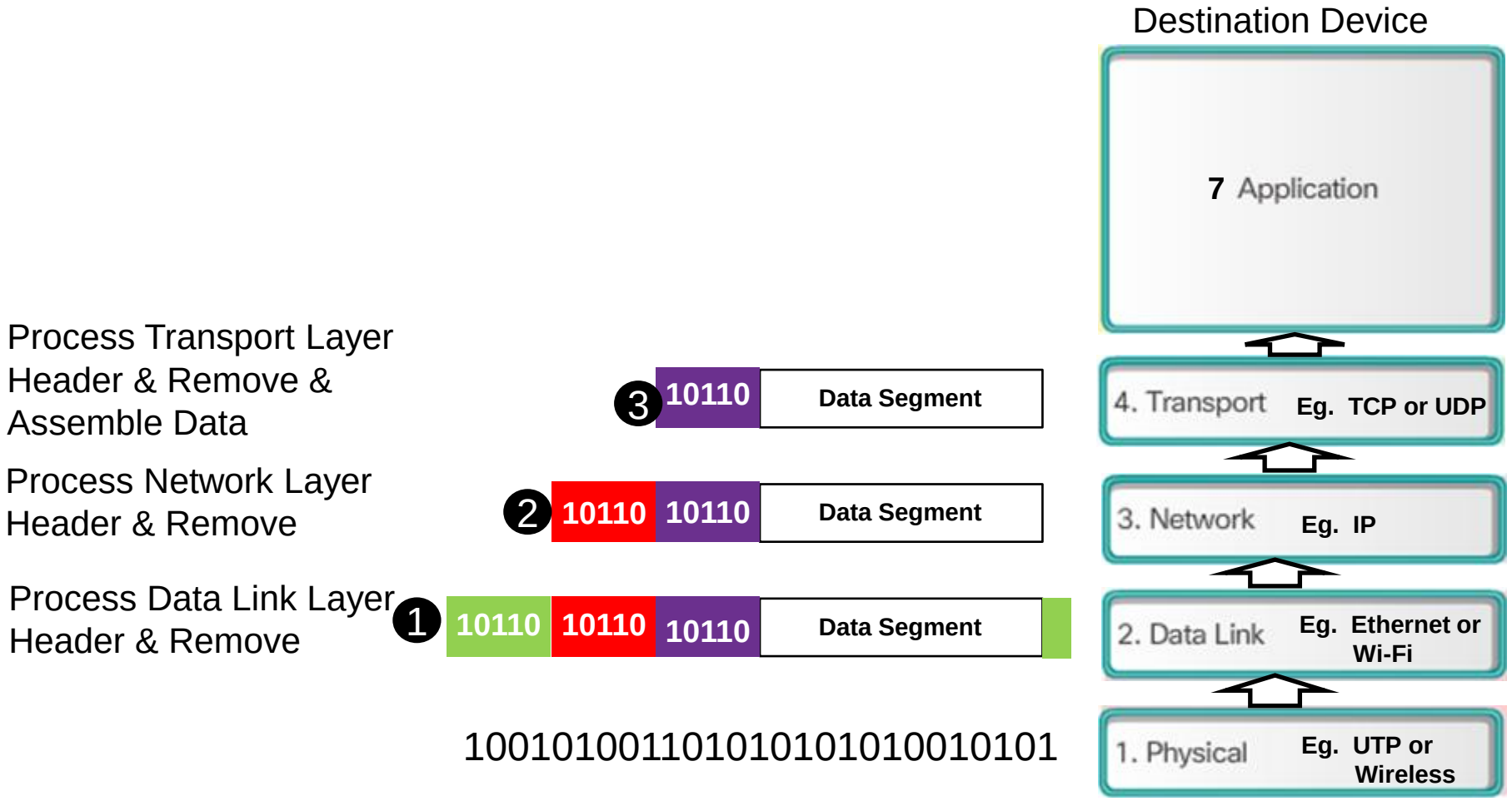


Moving Data Through the Stack





Moving Data Through the Stack



Thank you.

Cisco Networking Academy

Mind Wide Open