



The OSI Model

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Objectives

- Describe a general model of communication
- Describe the OSI reference model
- Compare the OSI model and the TCP/IP model

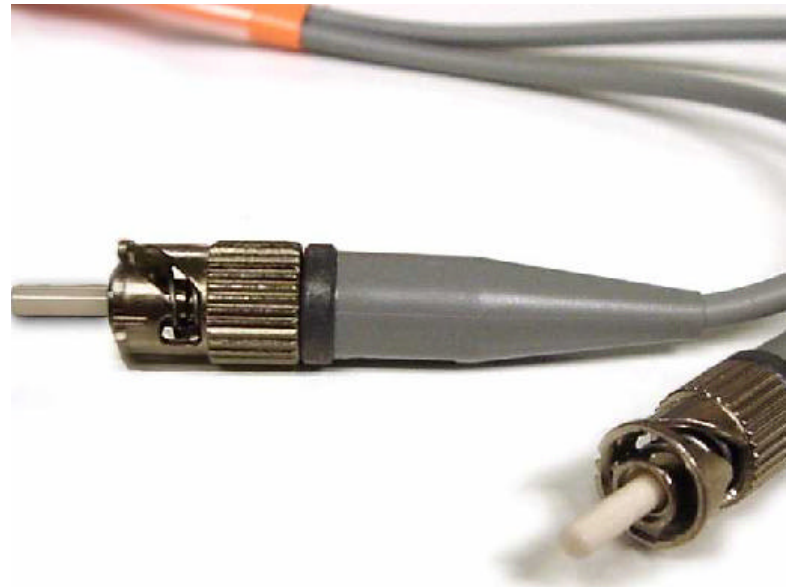
A General Model of Communication

- Source, Destination, and Data Packets
 - All communications originate at a source and travel to a destination.
 - Information that travels on a network is referred to as a data, packet, or data packet.

A General Model of Communication (cont.)

- Media
 - Telephone wires (UTP)
 - Category 5 UTP (used for 10BaseT Ethernet)
 - Coaxial cables
 - Optical fibers (thin glass fibers that carry light)
- Protocol
 - All devices on a network need to speak the same language
 - Set of rules that makes communication both possible and more efficient

Media



ISO and the OSI Model



International Organization for Standardization

The Evolution of ISO Networking Standards

- Two Problems
 - Avoiding duplication of equipment resources
 - Inability to communicate efficiently
- Other Standards-Setting Bodies
 - Internet Engineering Task Force (IETF)
 - Request For Comment (RFC)
 - IEEE 802 project

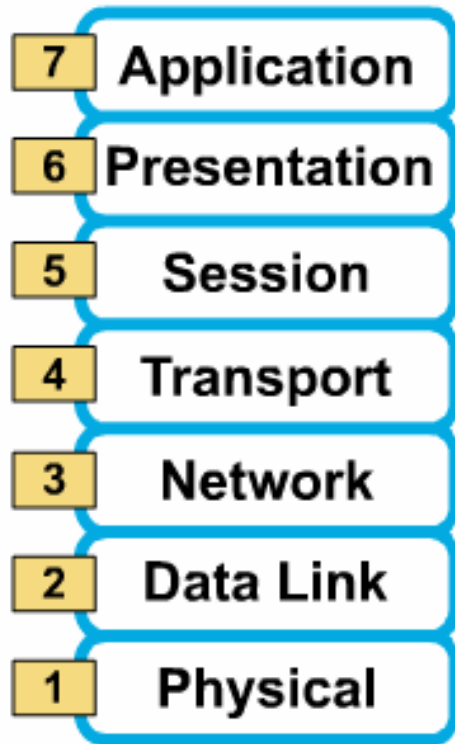
The Purpose of the OSI Reference Model

- It breaks network communication into smaller, simpler parts that are easier to develop.
- It facilitates standardization of network components to allow multiple-vendor development and support.
- It allows different types of network hardware and software to communicate with each other.
- It prevents changes in one layer from affecting the other layers so that they can develop more quickly.
- It breaks network communication into smaller parts to make learning it easier to understand.

Seven Layers of the OSI Reference Model

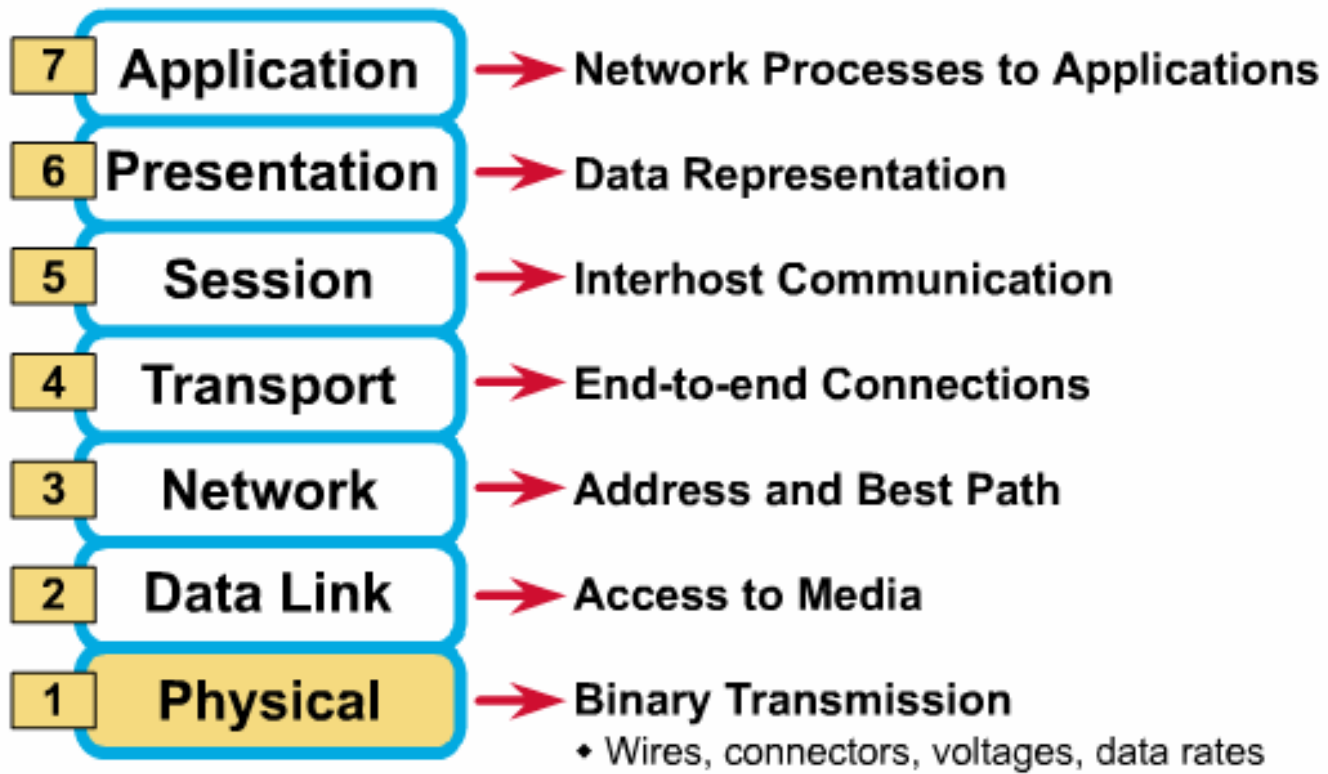
- Layer 7: Application
- Layer 6: Presentation
- Layer 5: Session
- Layer 4: Transport
- Layer 3: Network
- Layer 2: Data Link
- Layer 1: Physical

Why a Layered Model?



- ♦ Reduces complexity
- ♦ Standardizes interfaces
- ♦ Facilitates modular engineering
- ♦ Ensures interoperable technology
- ♦ Accelerates evolution
- ♦ Simplifies teaching and learning

Layers with Functions



The Seven Layers of the OSI Reference Model

- The Application (Upper) Layers
 - Layer 7: Application
 - Layer 6: Presentation
 - Layer 5: Session
- The Data Flow (Lower) Layers
 - Layer 4: Transport
 - Layer 3: Network
 - Layer 2: Data Link
 - Layer 1: Physical

The Application (Upper) Layers

- Application
 - User interface
 - Examples – Telnet, HTTP
- Presentation
 - How data is presented
 - Special processing, such as encryption
 - Examples – ASCII, EMCDIC, JPEG
- Session
 - Keeping different applications' data separate
 - Examples – Operating system/application access scheduling

The Data Flow (Lower) Layers

- Transport
 - Reliable or unreliable delivery
 - Error correction before transmit
 - Examples: TCP, UDP, SPX
- Network
 - Provide logical addressing which routers use for path determination
 - Examples: IP, IPX

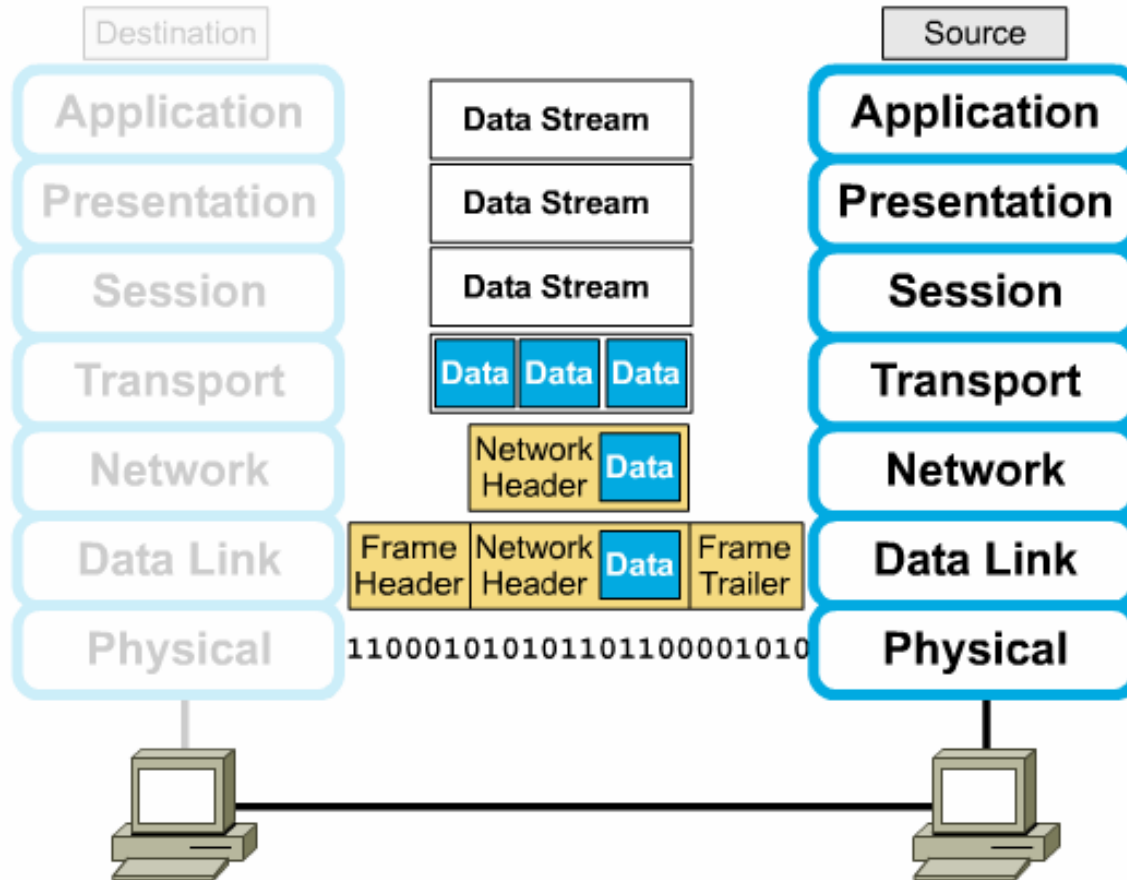
The Lower Layers (cont.)

- Data Link
 - Combines bits into bytes and bytes into frames
 - Access to media using MAC address
 - Error detection not correction
 - Examples: 802.3/802.2, HDLC
- Physical
 - Moves bits between devices
 - Specifies voltage, wire speed, and pin-out cables
 - Examples: EIA/TIA-232, V.35

The OSI Model

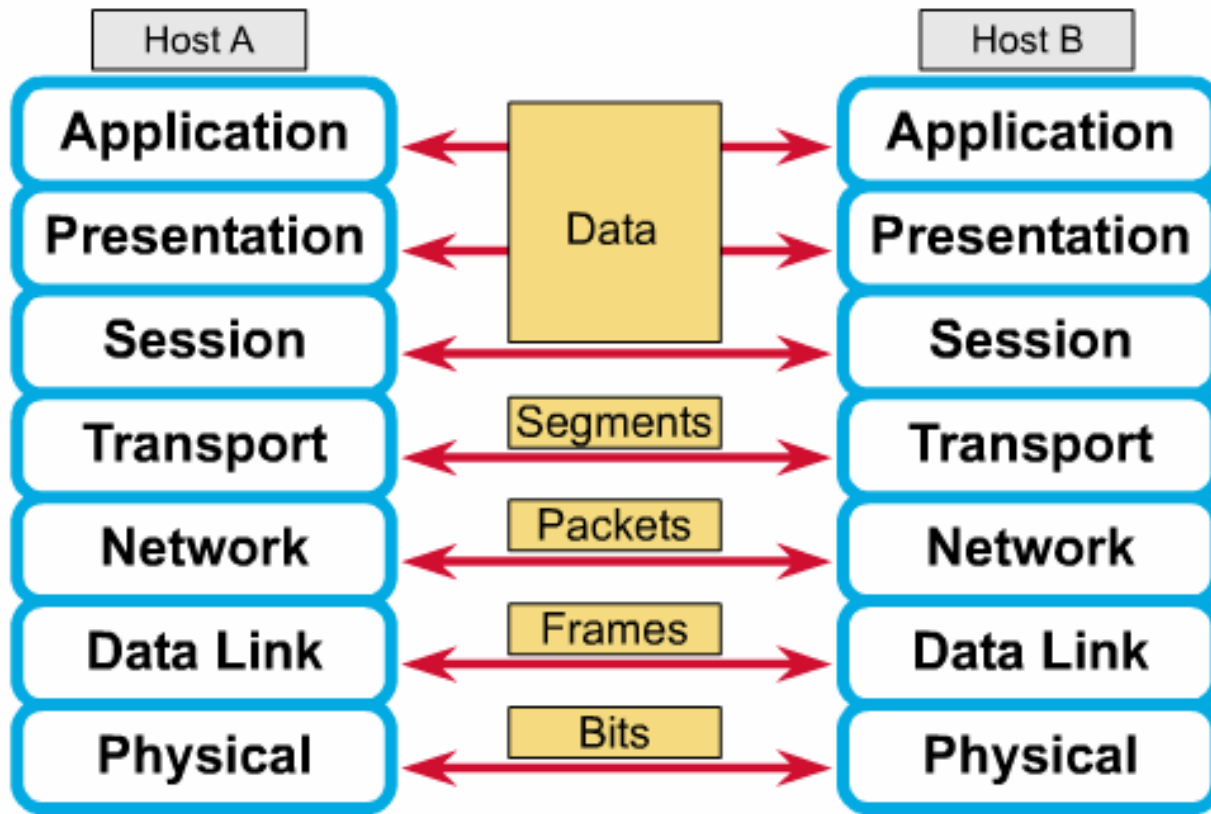
- Application – think of browsers
- Presentation – think of common data format
- Session – think of dialogs and conversations
- Transport – think of flow control and reliability
- Network – think of path selection, routing, and logical addressing
- Data Link – think of frames and media access control
- Physical – think of signals and media

Encapsulation



The lower layers use encapsulation to put the protocol data unit (PDU) from the upper layer into its data field and to add headers and trailers that the layer can use to perform its function.

Names for Data at Each Layer



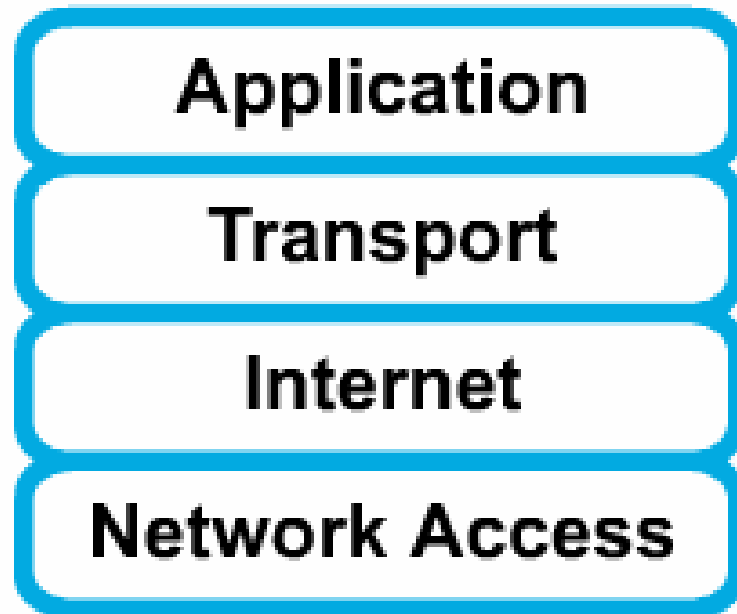
De-Encapsulation

- When the data link layer receives the frame, it does the following:
 - It reads the physical address and other control information provided by the directly connected peer data link layer.
 - It strips the control information from the frame, thereby creating a datagram.
 - It passes the datagram up to the next layer, following the instructions that appeared in the control portion of the frame.

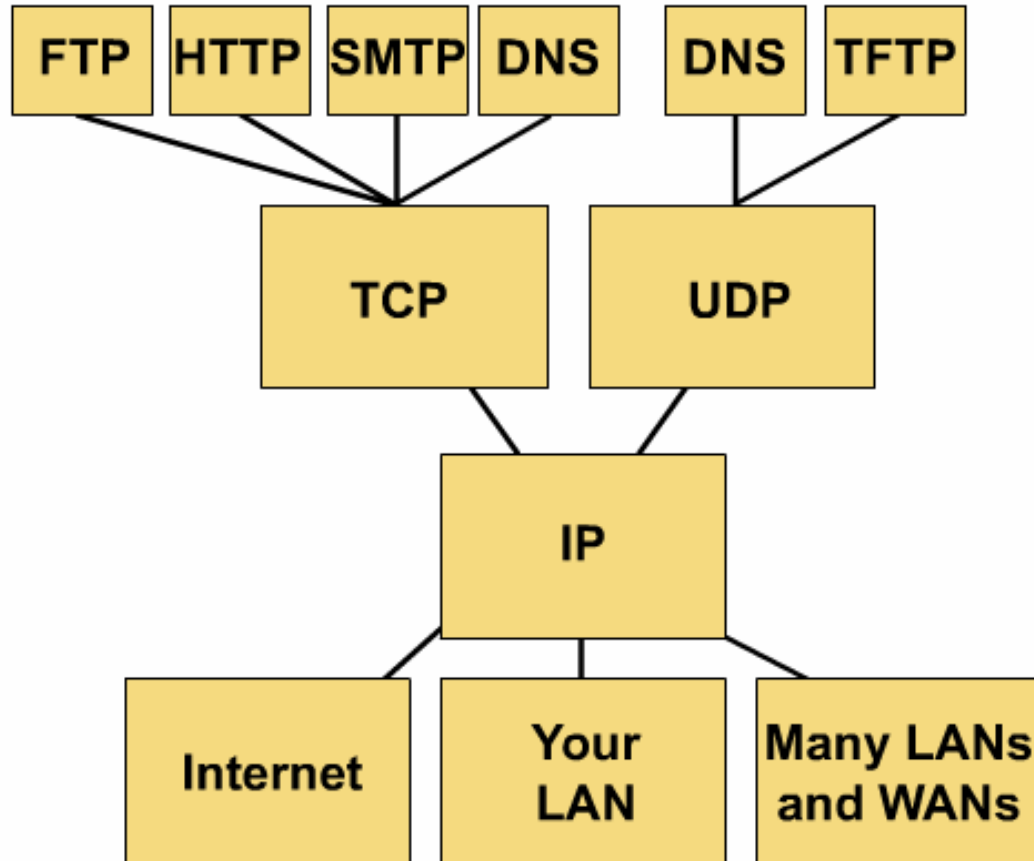
Mapping Business Needs to a Hierarchical Model

- Access Layer
 - Point where users are connected to the network
- Distribution Layer
 - Services that are not local – printers or centralized file storage devices or dial-out access
- Core Layer
 - Backbone

The TCP/IP Reference Model



TCP/IP Protocol Graph

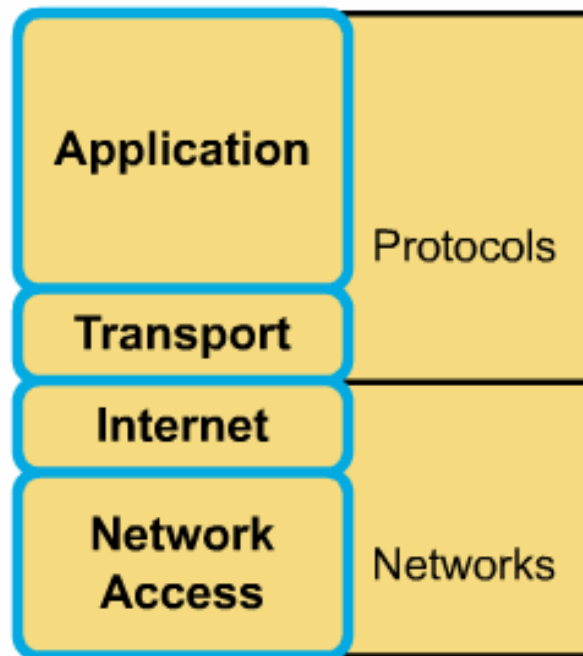


Applications

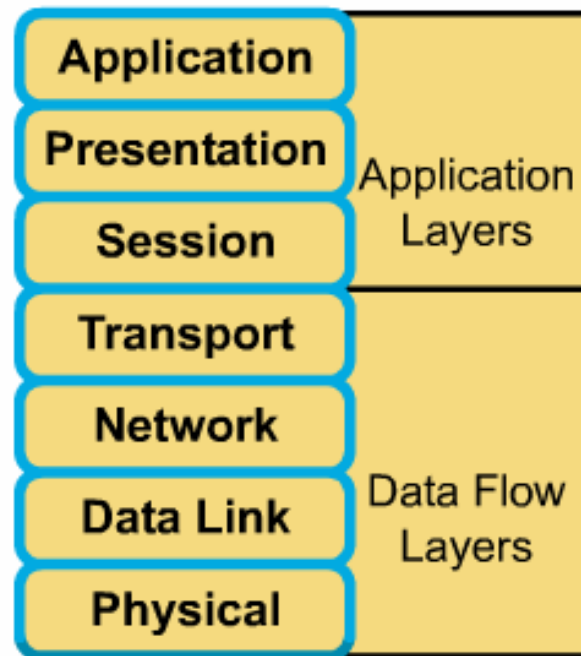
- FTP – File Transfer Protocol
- HTTP – Hypertext Transfer Protocol
- SMTP – Simple Mail Transfer Protocol
- DNS – Domain Name System
- TFTP – Trivial File Transfer Protocol

OSI Model and TCP/IP Model

TCP/IP Model



OSI Model



Use of the OSI Model in the CCNA Curriculum

The OSI Model

| | | |
|---|---------------------|--|
| 7 | Application | FTP, TFTP, HTTP, SMTP, DNS, TELNET, SNMP |
| 6 | Presentation | Very little focus |
| 5 | Session | |
| 4 | Transport | TCP (the Internet) |
| 3 | Network | IP (the Internet) |
| 2 | Data Link | Ethernet (common LAN technology) |
| 1 | Physical | |