Protocols and models

📕 CCNA1v7 Module 3 Protocols and models

👨‍🏫 Pedro Durán

Communication

- **Source** (sender) ➡️ **Channel** (media) ➡️ **Destination** (receiver)
- **Protocol:** rules that communication will follow
  - **Message encoding:** encoding (info->form for transmission)/decoding
  - **Message formatting and encapsulation**: specific format or structure
  - **Message size:** encoding in appropiate format for the medium
  - **Message timing:** Flow control (rate), Response Timeout, Access method
  - **Message delivery options:** Unicast (1-1), Multicast (1-many), Broadcast (1-all)

Network Protocols

Network Protocols define a common set of rules.

Functions:

- **Addressing:** Identifies sender and receiver
- **Reliability:** Provides guaranteed delivery
- **Flow Control:** Ensure data flows at an efficient rate
- **Sequencing:** Uniquely labels each transmitted segment of data
- **Error Detection:** Determines if data became corrupted during transmission
- **Application Interface:** Process-to-process communications between network apps

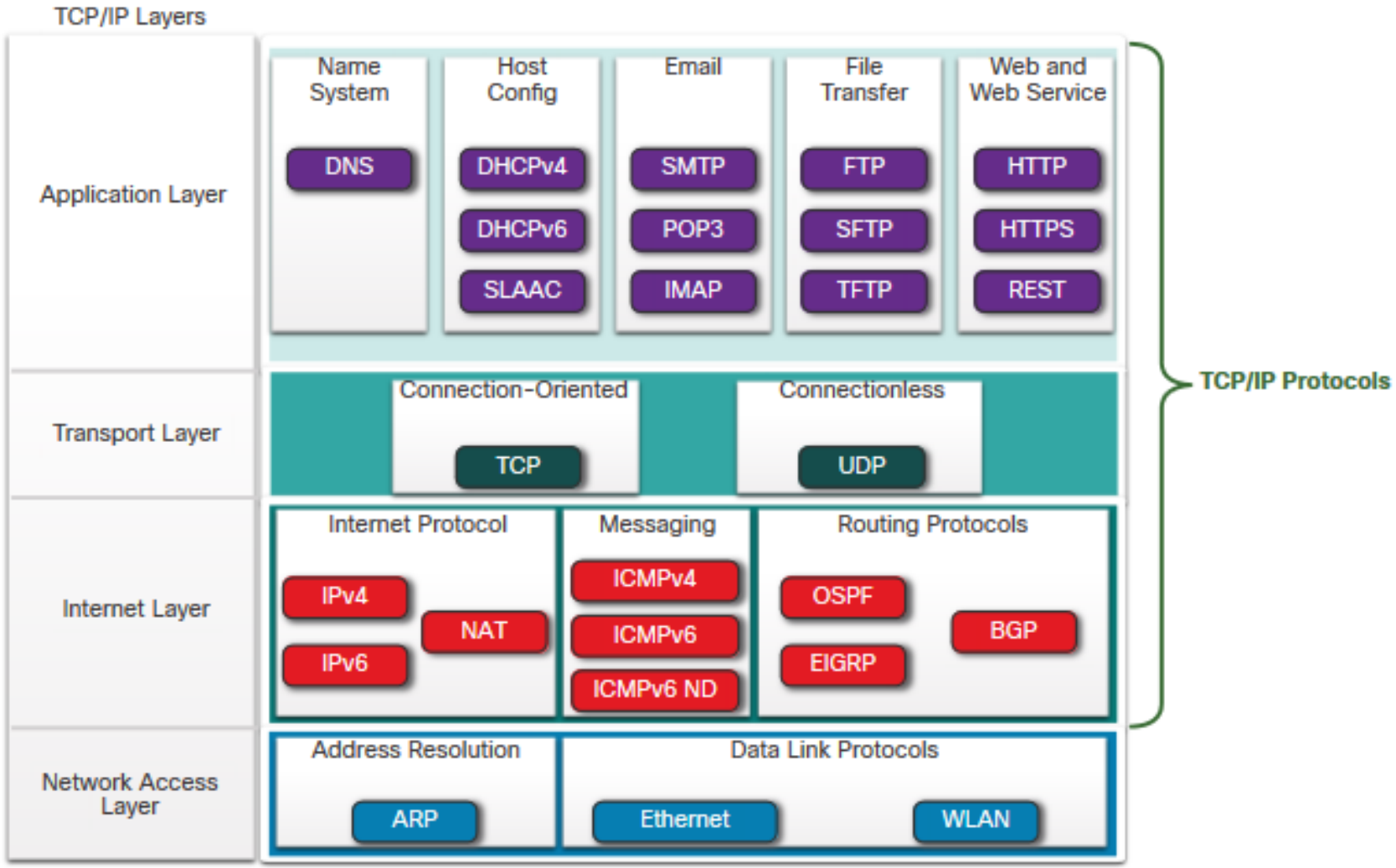
Protocol Suites

Group of inter-related protocols necessary to perfom a communication.
Protocols are viewed in terms of layers.

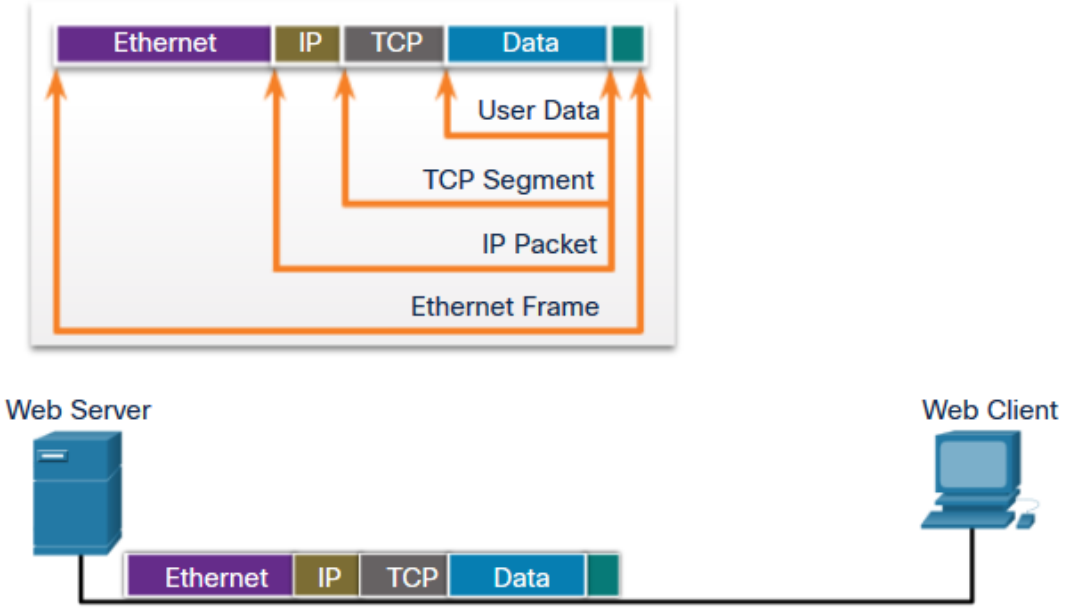
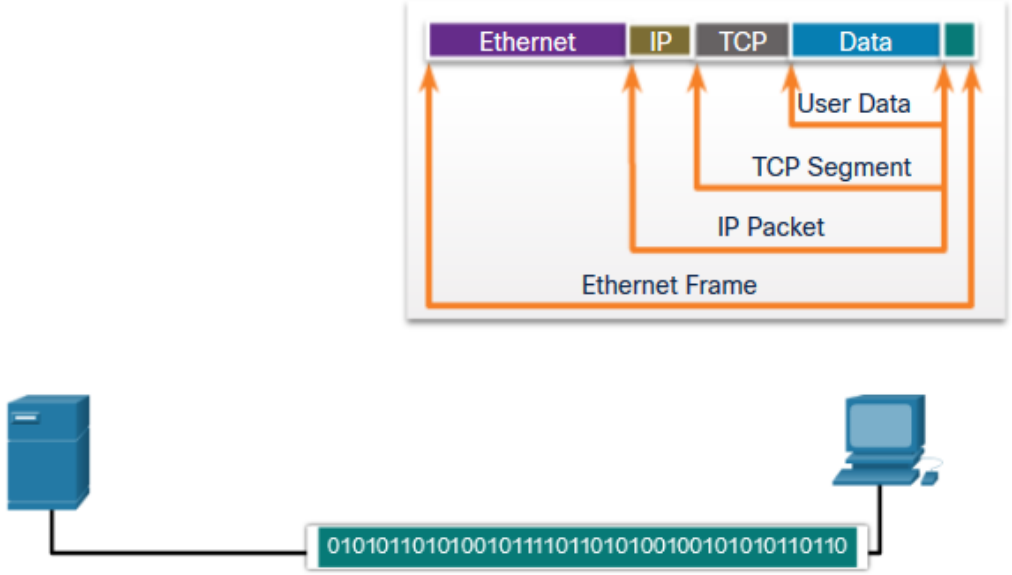
Examples:

- **Internet Protocol Suite or TCP/IP:** maintained by IETF
- **OSI (Open Systems Interconnections):** developed by ISO and ITU
- **AppleTalk**
- **Novell Netware**

TCP/IP Protocol Suite



TCP/IP Communication Process

A web server encapsulating and sending a web page to a client	A client de-encapsulating the web page for the web browser
	

Standards organizations

- Vendor-neutral
- Non-profit organizations
- Establish to develop and promote the concept of open standards.

Internet Standards

- ISOC, IAB, IETF, IRTF, ICANN, IANA

Electronic and Communications Standards

- IEEE, EIA, TIA, ITU-T

Reference Layered Models

2 layered models describe network operations:

- **Open System Interconnection (OSI) Reference Model**
- **TCP/IP Reference Model**

Benefits of using a layered model:

- Assist in protocol design
- Faster competition because products from different vendors can work together
- Prevent technology or capability changes in one layer from affecting other layers
- Provide a common language to describe networking functions and capabilities

The OSI Reference Model

Layer 7	**Application**	Software protocols ie; http, smtp, pop3, imap, ect…
Layer 6	**Presentation**	Gets the Data ready for the application layer by providing translation services like **compression/decompression** and **encryption/decryption**
Layer 5	**Session**	**Provides dialog control** by allowing multiple streams of data from different sources to be properly combined or synchronized.
Layer 4	**Transport**	Handles the **End-to-End** communication. Can provide reliability by using **Connection-Oriented Communication** via TCP.
Layer 3	**Network**	Routing, IP addresses, ICMP, ARP, Routers and Firewalls
Layer 2	**Data Link**	Switches/Bridges, MAC addresses, PPP, HDLC
Layer 1	**Physical**	Hubs, Repeaters, Media(Cable/Radio Frequency), RS-232, CSU/DSU, Bits

Mnemonics

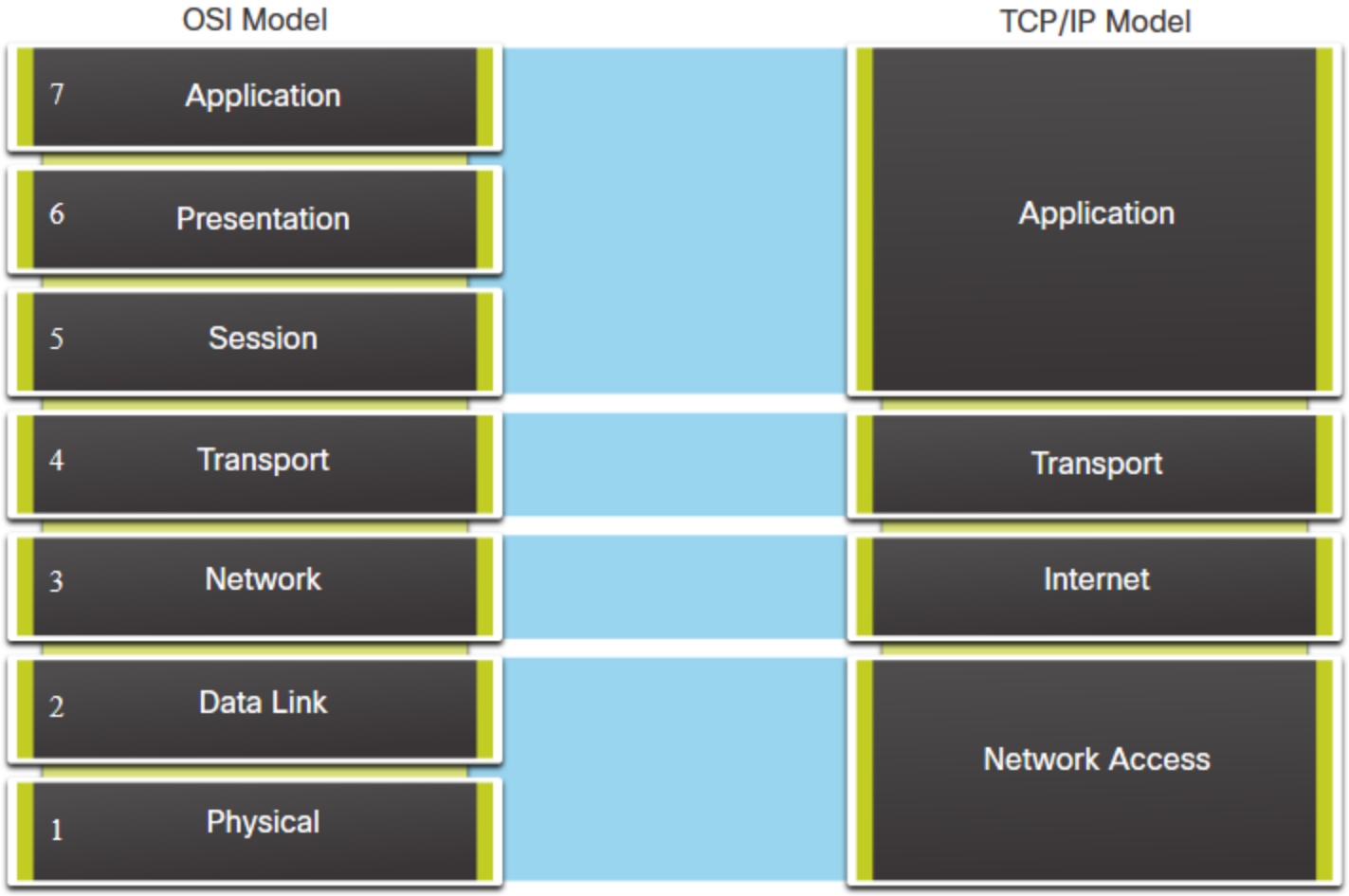
All People Seem To Need Data Processing or Please Do Not Throw Sausage Pizza Away

FER Trabaja en un SPA

Ferrari Es Rápido Tiene Siempre Potencia Avanzada

Al Principio Siempre Tienes Razón En Francia

OSI and TCP/IP Model Comparison



Data Encapsulation - Segmenting and sequencing

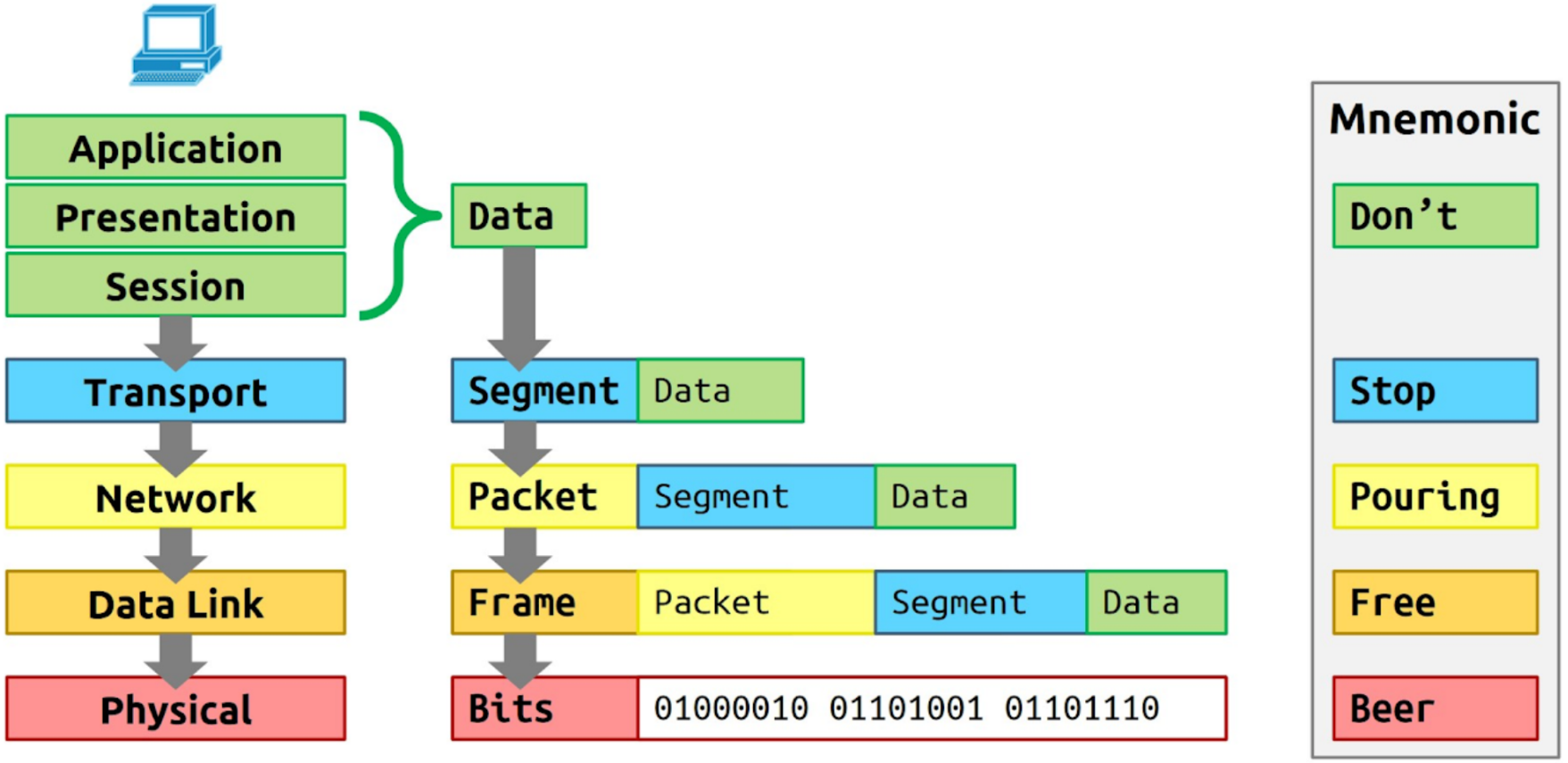
- **Segmenting:** process of breaking up messages into smaller units
- **Multiplexing:** process of taking multiple streams of segmented data and interleaving them together.
- **Sequencing:** process of numbering the segments so that the message may be reassembled at the destination. (TCP)

Segmenting messages has 2 primary benefits:

- 1️⃣ **Increases speed** - Large amounts of data can be sent over the network without tying up a communications link.
- 2️⃣ **Increases efficiency** - Only segments which fail to reach the destination need to be retransmitted, not the entire data stream.

Protocol Data Unit (PDU)

PDU (Protocol Data Unit): represents a unit of data specified in the protocol of a given layer, which consists of protocol control information and user data.



Donde Se Pueden Tirar Bombas

Layer 3 Logical Address

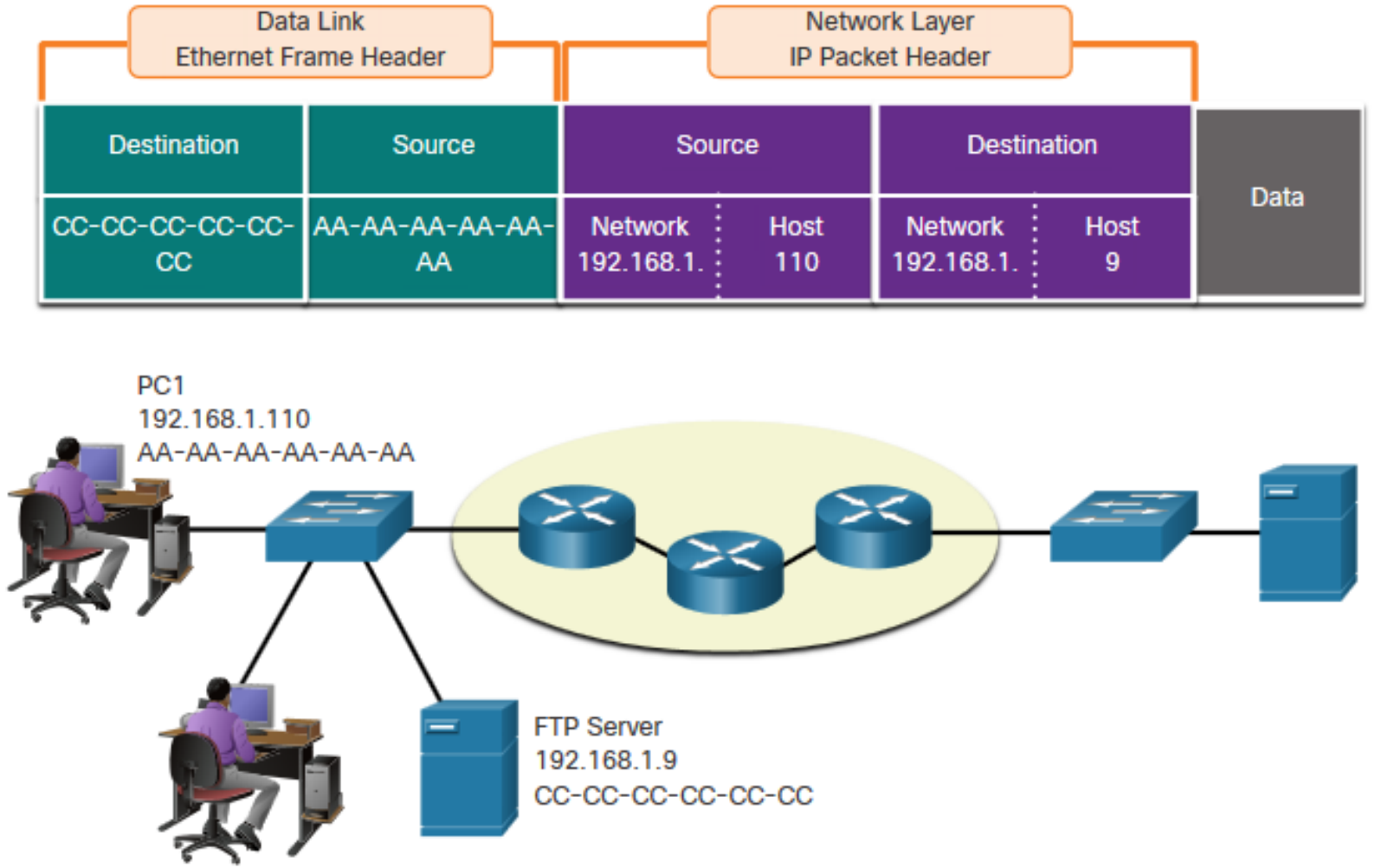
IP Packet contains 2 addresses:

- Source IP Address
- Destination IP Address

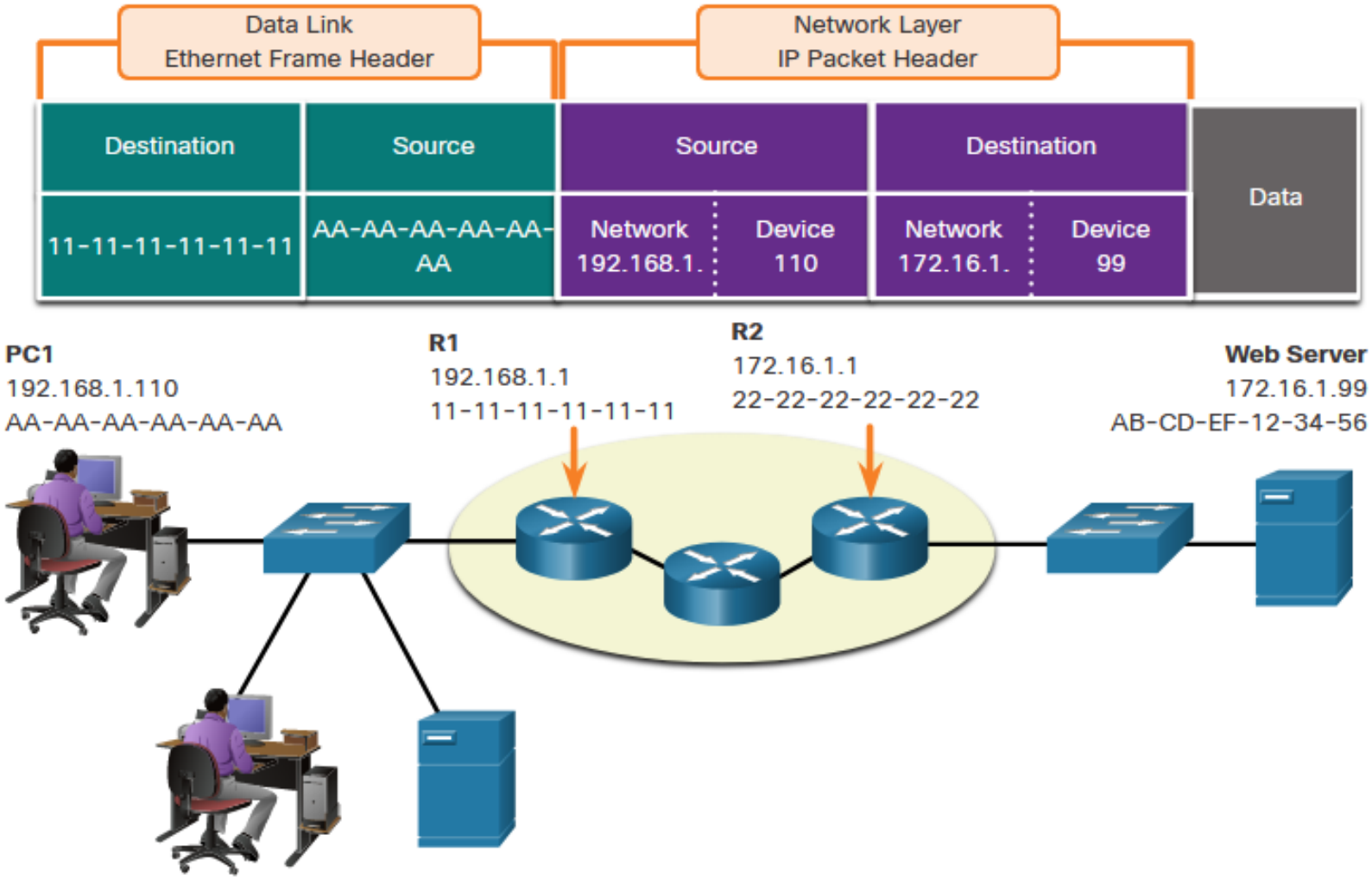
IP Address contains 2 parts:

- Network Portion (IPv4) or Prefix (IPv6)
- Host Portion (IPv4) or Interface ID (IPv6)

Devices on the Same Network



Devices on a Remote Network



Data Link Addresses