INSTRUCTOR
ALTON

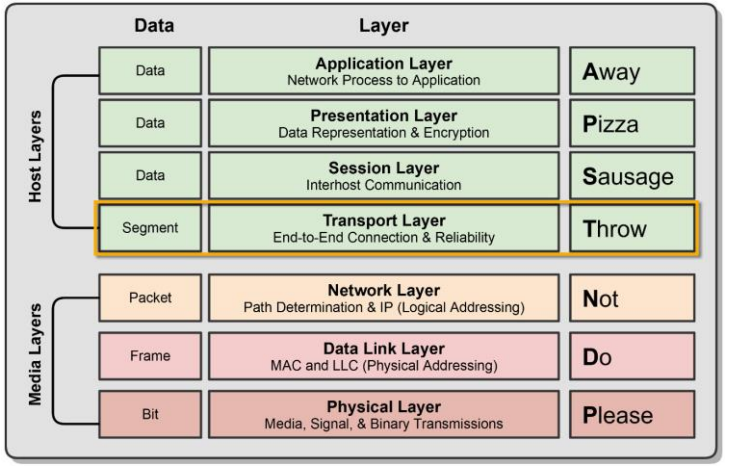
TCP vs. UDP

Transport Layer Protocols

- **TCP** (Transmission Control Protocol): Connection-Oriented
- **UDP** (User Datagram Protocol): Connectionless

TCP is the most widely used Transport Layer protocol because it is connection-oriented, which provides packet delivery reliability, i.e., guaranteed delivery.

UDP, being connectionless, is considered to be unreliable; however, it is more lightweight than TCP and often used for streaming or real-time data.



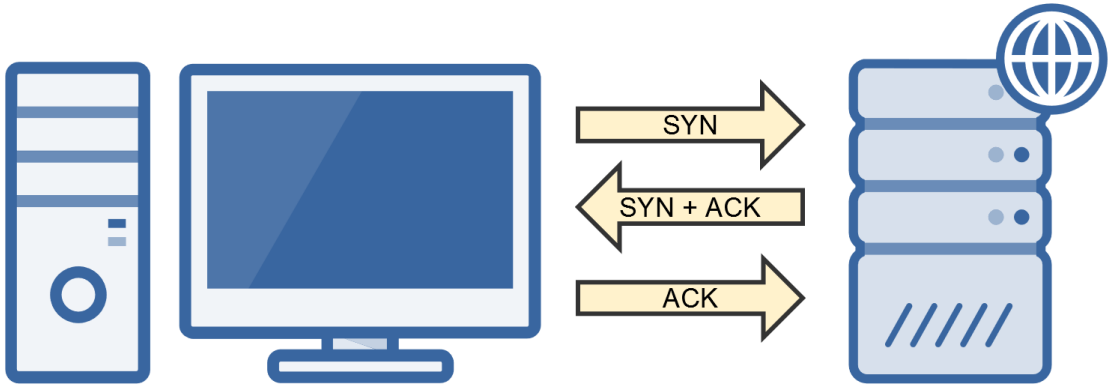
TCP Reliability

- TCP utilizes the following features to ensure reliable delivery of data.
  - **3-Way Handshake** creates a virtual connection between the source and destination before data is sent.
  - **Acknowledgment** is required before the next segment is sent.
  - **Checksum** that detects corrupted data.
  - **Sequence Numbers** that detect missing data and reassemble them in the correct order.
  - **Retransmission** that will retransmit lost or corrupt data.

- **Note**: TCP header is 20 bytes in size, whereas the UDP header is only 8 bytes.

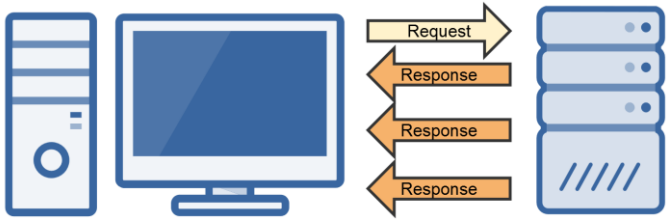
TCP Three-Way Handshake

- A connection must be established before data is transmitted, called the three-way handshake.
  - SYN → SYN / ACK → ACK
- Creates a Virtual Connection Between 2 Devices



"Best Effort" UDP

- A scaled-down, economic version of TCP
  - Connectionless & Unreliable
  - No Data Retransmissions
  - "Best Effort"
- Faster than TCP
  - Smaller Header & Connectionless
- Primarily used for protocols that favor:
  - Low-Latency, i.e., Faster Speeds
  - Can Tolerate Data Loss



"Best Effort" UDP

- Example UDP Use-Cases
  - VoIP Phone Calls
  - Live Video Streams
  - Live Audio Streams
  - Online Gaming
  - Certain Network Management Protocols
    - DNS
    - DHCP
    - NTP