

TCP & UDP

◆ TCP (Transmission Control Protocol)

Key Characteristics:

- **Connection-oriented:** Requires a connection to be established (3-way handshake).
- **Reliable:** Guarantees delivery, correct order, and error-checking.
- **Flow control and congestion control:** Built-in mechanisms to manage data rate and avoid congestion.
- **Slower** than UDP due to overhead from reliability features.

Common Use Cases:

- Web browsing (HTTP/HTTPS)
- Email (SMTP, IMAP, POP3)
- File transfer (FTP, SFTP)
- Remote access (SSH, Telnet)

Header Size:

- 20–60 bytes (more than UDP due to extra control information)

◆ UDP (User Datagram Protocol)

Key Characteristics:

- **Connectionless:** No handshake; data sent without setup.
- **Unreliable:** No guarantees of delivery, order, or error checking.
- **Lightweight and faster:** Lower latency and less overhead.
- **No flow or congestion control.**

Common Use Cases:

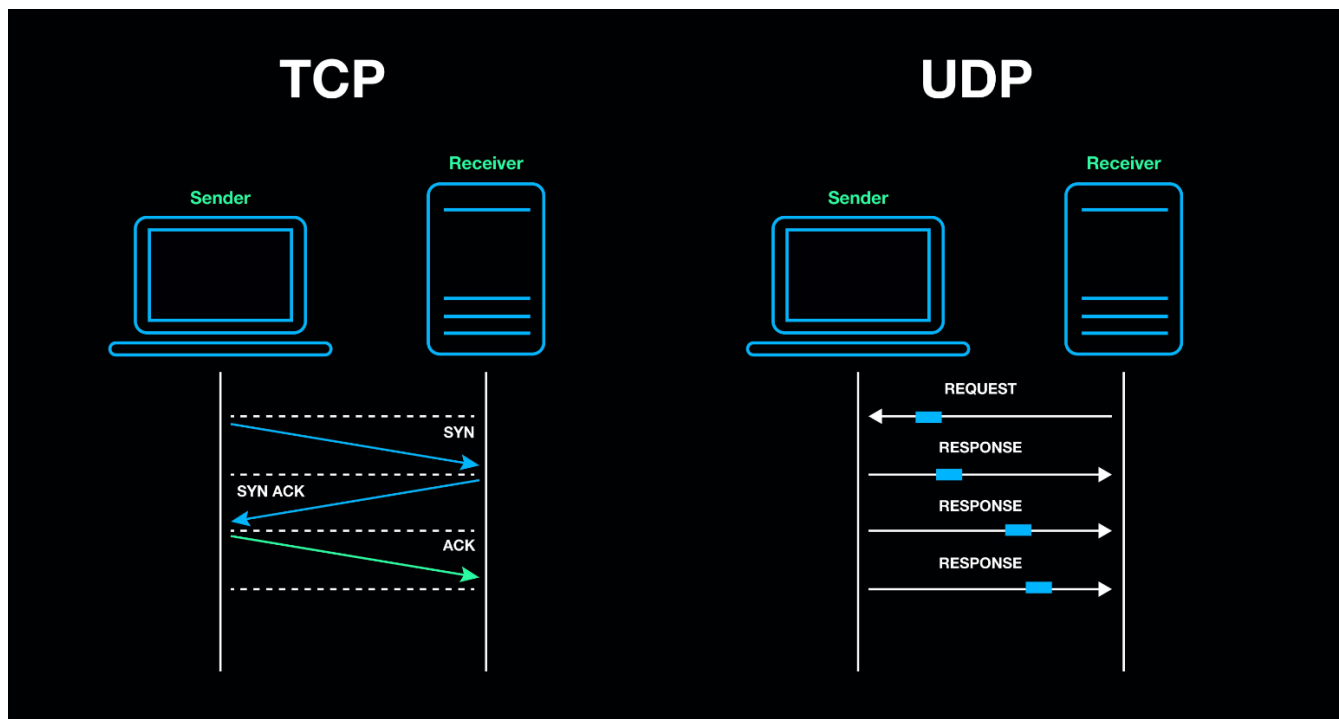
- Streaming media (audio/video)
- Online gaming
- DNS lookups
- VoIP (Voice over IP)
- Broadcast and multicast

Header Size:

- 8 bytes (minimal control information)

◆ Comparison Table

Feature	TCP	UDP
Connection	Yes (3-way handshake)	No
Reliability	Yes	No
Ordering	Guaranteed	Not guaranteed
Speed	Slower	Faster
Overhead	Higher	Lower
Use Cases	Reliable data transfer	Real-time applications
Flow/Congestion Control	Yes	No
Packet Loss Handling	Retransmits lost packets	Packet loss possible



TCP	UDP
Connection-oriented protocol	Datagram oriented protocol
The data delivery is guaranteed and hence it's reliable	The data delivery is not guaranteed and hence not completely reliable
Data sequencing takes place	No data sequencing
It is comparatively slower	RTSP (Real-Time Streaming Protocol)
The header length is 20-80 bytes	The fixed length header is of 8 Bytes
Offers congestion control solution	Doesn't offer congestion control solution
Error checking and error recovery takes place	Basic error checking is done, but no error recovery process takes place
Heavier compared to UDP and requires three data packets before setting up a connection for data transmission	It is lightweight