

What is TCP and UDP?

Both **TCP (Transmission Control Protocol)** and **UDP (User Datagram Protocol)** are **Transport Layer protocols** in the **OSI Model (Layer 4)**.

They are used to **send data** from one computer to another over a network, but they work in **different ways**.

1. TCP – Transmission Control Protocol

Features:

- **Connection-oriented:** Connection is established before data is sent.
- **Reliable:** Ensures data is delivered without error, in order.
- **Error Checking:** Uses checksums, acknowledgments, and retransmissions.
- **Slower, but more secure and accurate.**

How it works:

- Uses **3-way handshake** (SYN → SYN-ACK → ACK).
- Splits data into packets.
- Tracks all packets.
- Resends if any packet is lost.

Used For:

- Web browsing (**HTTP, HTTPS**)
- Email (**SMTP, IMAP, POP3**)
- File transfers (**FTP**)

Example:

Watching a YouTube video via browser – TCP ensures all parts of the page load correctly.

2. UDP – User Datagram Protocol

Features:

- **Connectionless:** No connection is made before sending data.
- **Unreliable:** No guarantee of delivery or order.
- **No error correction** (fast but risky).
- **Faster, with low latency.**

How it works:

- Just sends packets (called datagrams).
- No handshake, no tracking.
- If packets are lost or arrive out of order, no correction is done.

Used For:

- Live video streaming
- Online gaming
- Voice calls (VoIP)

- DNS (Domain Name System)

 **Example:**

Watching a live cricket match – UDP ensures speed; a lost packet won't stop the match.

 **TCP vs UDP Comparison**

Feature	TCP	UDP
Connection	Connection-oriented	Connectionless
Reliability	Reliable	Not reliable
Speed	Slower	Faster
Data Order	Maintains order	No guarantee of order
Error Checking	Yes (with acknowledgments)	Minimal
Use Cases	Web, Email, FTP, Files	Video, Audio, Games, DNS
Overhead	More (due to control bits)	Less

 **Simple Analogy:**

- TCP is like a **phone call** – you say "hello", wait for a reply, talk in order, and say "bye".
- UDP is like **sending a postcard** – no confirmation, no guarantee it arrives, but it's quick.