TCP / UDP

Transport Protocols

https://github.com/DelfinoRT

The transport protocols provide services to their upper layers at well-defined interface points, which are also referred as ports. The IP address and the port are an important combination to set up a transport, connection, or stream.
TCP and UDP are the most widely used Internet protocols among which TCP is connection oriented − once a connection is established, data can be sent bidirectional. UDP is a simpler, connectionless Internet protocol. Multiple messages are sent as packets in chunks using UDP.

Transmission Control Protocol (TCP)

TCP Segment

Destination port	Source port	Sequence number	Checksum	Flags	Acknowledgement	Data

- Provides reliable **connection-oriented** delivery of packets, and is suitable for the **session-oriented protocols**, it **rearranges packets in order** during transit and lost data is re-transmitted automatically..
- **Offers handshake**, connection must be established prior to transmission (**SYN, SYN-ACK, ACK**).
- **Provides flow control** using congestion avoidance algorithms.
- Relatively slow.
- **Point to point** transmission.
- Requires more computing resources as compared to UDP.
- Security: **TLS/SSL**.
- Has a **(20-60) bytes** variable length header (**TCP Segment**).
- TCP provides reliability and safety. TCP is designed to cope with the whole spectrum of network failures via **error checking and recovery**.
- TCP is used by **HTTP, HTTPs, FTP, SMTP. POP3, IMAP4** and **Telnet**.
- Data is read as a **byte stream**, no distinguishing indications are transmitted to signal message (segment) boundaries.

User Datagram Protocol (UDP)

UDP Datagram

Destination port	Source port	Lenght	Checksum	Data

- Provides unordered **connectionless** delivery of IP **datagrams,** which find an excellent application in carrying multimedia traffic. Due to the real-time nature of sampled audio and video data, the TCP features of re-transmissions, flow control, and reordering are not appropriate.
- Offers error checking but **no error recovery**, just discards error packets.
- **Does not offer handshake** to perform the connection, data is sent without setup.
- **No flow control.**
- Relatively fast.
- Supports **multicast transmission**.
- Security: **DTLS**.
- Has an **8 bytes** fixed-length header (**UDP Datagram**).
- UDP is a "**send and forget**" protocol, it is used by applications that have no requirement for an answer, typically, and don't really care if the other end received the message.
- UDP is used by **DNS, DHCP, TFTP, SNMP, RIP**, and **VoIP.**
- Packets are **sent individually** and are checked for integrity only if they arrive. Packets have definite boundaries which are honored upon receipt, meaning a read operation at the receiver socket will yield an entire message as it was originally sent.