

Topic 5: Transport and Application Layer

5.1 Transportation of Data

a) The transport layer is:

- responsible for **logical communications** between applications running on different hosts.
- The link between the application layer and the lower layers that are responsible for **network transmission**.

b) Transport Layer Protocols (TCP)

The transport layer includes the **TCP** and **UDP** protocols.

c) User Datagram Protocol (UDP)

- UDP is a **connectionless** protocol.
- UDP is known as a **best-effort** delivery protocol

d) The Right Transport Layer Protocol for the Right Application

- UDP is also used by **request-and-reply** applications
- TCP is used as the **transport** protocol.

5.2 TCP Overview

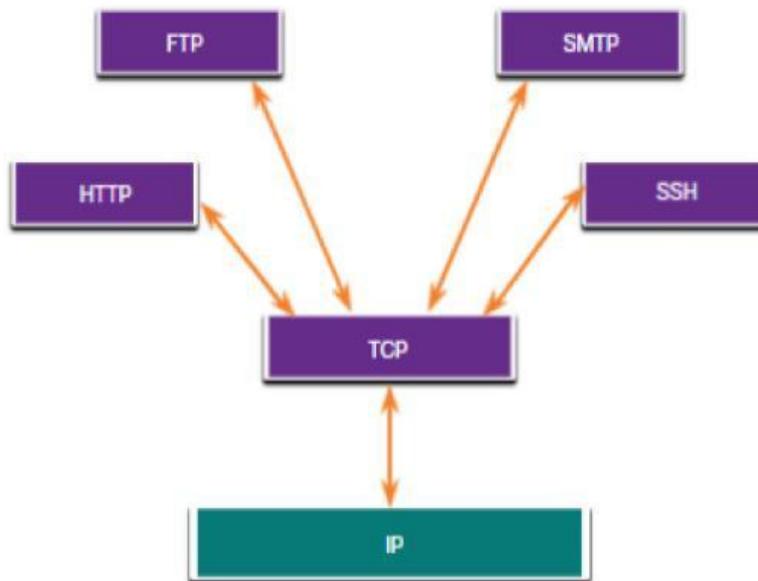
a) TCP Features

| Features | Description |
|------------------------------|--|
| Provides Same-Order Delivery | Because networks may provide multiple routes that can have different transmission rates, data can arrive in the wrong order. |
| Establishes a Session | TCP is a connection-oriented protocol that negotiates and establishes a permanent connection (or session) |
| Ensures Reliable Delivery | TCP ensures that each segment that is sent by the source arrives at the destination. |
| Supports Flow Control | It can request that the sending application reduce the rate of data flow. |

b) TCP Header Fields

| TCP Header Field | Description |
|-----------------------|---|
| Source Port | A 16-bit field used to identify the source application by port number. |
| Destination Port | A 16-bit field used to identify the destination application by port number. |
| Acknowledgment Number | A 32-bit field used to indicate that data has been received and the next byte expected from the source. |
| Sequence Number | A 32-bit field used for data reassembly purposes |
| Header Length | A 4-bit field known as "data offset" that indicates the length of the TCP segment header. |
| Reserved | A 6-bit field that is reserved for future use. |
| Window size | A 16-bit field used to indicate the number of bytes that can be accepted at one time. |
| Control bits | A 6-bit field used that includes bit codes, or flags, which indicate the purpose and function of the TCP segment. |
| Urgent | A 16-bit field used to indicate if the contained data is urgent. |
| Checksum | A 16-bit field used for error checking of the segment header and data. |

c) Applications that use TCP



5.3 UDP Overview

a) UDP Header Fields

| UDP Header Field | Description |
|------------------|---|
| Destination Port | A 16-bit field used to identify the destination application by port number. |
| Checksum | A 16-bit field used for error checking of the datagram header and data |
| Source Port | A 16-bit field used to identify the source application by port number. |
| Length | A 16-bit field that indicates the length of the UDP datagram header. |

b) Applications that use UDP

