UNIT II TRANSPORT LAYER 9

Introduction - Transport-Layer Protocols: UDP – TCP: Connection Management – Flow control -Congestion Control - Congestion avoidance (DECbit, RED) – SCTP – Quality of Service

2.1 Introduction

- The transport layer is the fourth layer of the OSI model and is the core of the Internet model.
- It responds to service requests from the session layer and issues service requests to the network Layer.
- The transport layer provides transparent transfer of data between hosts.
- It provides end-to-end control and information transfer with the quality of service needed by the application program.
- It is the first true end-to-end layer, implemented in all End Systems (ES).

TRANSPORT LAYER FUNCTIONS / SERVICES

- The transport layer is located between the network layer and the application layer.
- The transport layer is responsible for providing services to the application layer; it receives services from the network layer.
- The services that can be provided by the transport layer are
    1. Process-to-Process Communication
    2. Addressing : Port Numbers
    3. Encapsulation and Decapsulation
    4. Multiplexing and Demultiplexing
    5. Flow Control
    6. Error Control
    7. Congestion Control

2.2 TRANSPORT LAYER PROTOCOLS

- Three protocols are associated with the Transport layer.
- They are

  (1) UDP –User Datagram Protocol

  (2) TCP – Transmission Control Protocol

  (3) SCTP - Stream Control Transmission Protocol

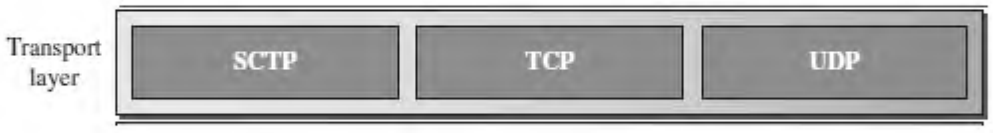
- Each protocol provides a different type of service and should be used appropriately

UDP - UDP is an unreliable connectionless transport-layer protocol used for its simplicity and efficiency in applications where error control can be provided by the application-layer process.

TCP - TCP is a reliable connection-oriented protocol that can be used in any application where reliability is important.

SCTP - SCTP is a new transport-layer protocol designed to combine some features of UDP and TCP in an effort to create a better protocol for multimedia communication.

Position of transport-layer protocols in the TCP/IP protocol suite



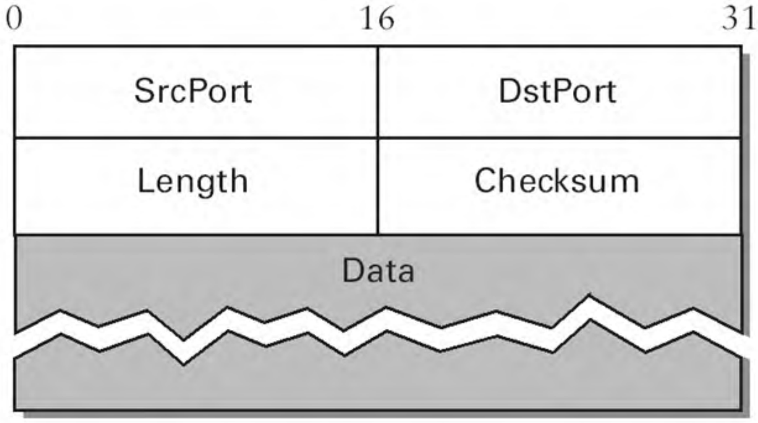
2.3 USER DATAGRAM PROTOCOL (UDP)

- User Datagram Protocol (UDP) is a connectionless, unreliable transport protocol.
- UDP adds process-to-process communication to best-effort service provided by IP.
- UDP is a very simple protocol using a minimum of overhead.
- UDP is a simple demultiplexer, which allows multiple processes on each host to communicate.
- UDP does not provide flow control , reliable or ordered delivery.
- UDP can be used to send small message where reliability is not expected.

- Sending a small message using UDP takes much less interaction between the sender and receiver.
- UDP allow processes to indirectly identify each other using an abstract locator called port or mailbox

UDP DATAGRAM (PACKET) FORMAT

- UDP packets are known as user datagrams .
- These **user datagrams,** have a fixed-size header of 8 bytes made of four fields, each of 2 bytes (16 bits).



Source Port Number

- Port number used by process on source host with 16 bits long.

- If the source host is client (sending request) then the port number is an temporary one requested by the process and chosen by UDP.

- If the source is server (sending response) then it is well known port number.

Destination Port Number

- Port number used by process on Destination host with 16 bits long.
- If the destination host is the server (a client sending request) then the port number is a well known port number.
- If the destination host is client (a server sending response) then port number is an temporary one copied by server from the request packet.

Length

- This field denotes the total length of the UDP Packet (Header plus data)
- The total length of any UDP datagram can be from 0 to 65,535 bytes.

Checksum

- UDP computes its checksum over the UDP header, the contents of the message body, and something called the pseudoheader.
- The pseudoheader consists of three fields from the IP header—protocol number, source IP address, destination IP address plus the UDP length field.

Data

- Data field defines tha actual payload to be transmitted.
- Its size is variable**.**

UDP SERVICES

Process-to-Process Communication

• UDP provides process-to-process communication using socket addresses**,** a combination of IP addresses and port numbers.

Connectionless Services

- UDP provides a connectionless service.
- There is no connection establishment and no connection termination.
- Each user datagram sent by UDP is an independent datagram.
- There is no relationship between the different user datagrams even if they are coming from the same source process and going to the same destination program.
- The user datagrams are not numbered.
- Each user datagram can travel on a different path.

Flow Control

- UDP is a very simple protocol.
- There is no flow control, and hence no window mechanism.
- The receiver may overflow with incoming messages.
- The lack of flow control means that the process using UDP should provide for this service, if needed.

Error Control

- There is no error control mechanism in UDP except for the checksum.
- This means that the sender does not know if a message has been lost or duplicated.
- When the receiver detects an error through the checksum, the user datagram is silently discarded.
- The lack of error control means that the process using UDP should provide for this service, if needed.

Checksum

- UDP checksum calculation includes three sections: a pseudoheader, the UDP header, and the data coming from the application layer.
- The pseudoheader is the part of the header in which the user datagram is to be encapsulated with some fields filled with 0s.