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Topic: Introduction, Design Issues and Functions of Transport Layer

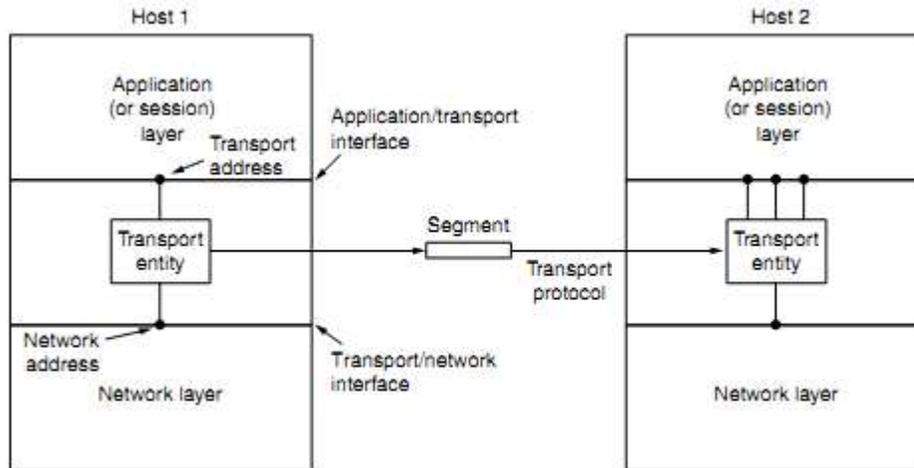
TRANSPORT LAYER

1. Introduction

The **Transport Layer** in the Open System Interconnection (OSI) model is responsible for end-to-end delivery over a network. Whereas the network layer is concerned with the end - to- end delivery of individual packets and it does not recognize any relationship between those packets.

The basic function of the transport layer is to accept data from above, split it up into smaller units if need be, pass these to the network layer, and ensure that the pieces all arrive correctly at the other end. Furthermore, all this must be done efficiently and in a way that isolates the upper layers from the inevitable changes in the hardware technology. The transport layer also determines what type of service to provide to the session layer, and, ultimately, to the users of the network. The most popular type of transport connection is an error-free point-to-point channel that delivers messages or bytes in the order in which they were sent.

- This layer treats each packet independently because each packet belongs to a different message.
- The **transport layer** ensures that each message should reach its destination completely and in order so that it maintains error and flow control to the source to destination to ensure proper data transmission.
- The **transport layer** establishes a connection between two end ports. A connection is a single logical path from source to destination which is associated with all the packets in a message.
- **Transport Layer** uses some standard protocols to enhance its functionalities are TCP(Transmission Control Protocol), UDP(User Datagram Protocol), DCCP(Datagram Congestion Control Protocol), etc.
- The ultimate goal of the transport layer is to provide **efficient, reliable, and cost-effective** data transmission service to its users, normally processes in the application layer. To achieve this, the transport layer makes use of the services pro-vided by the network layer.



2. Design Issues

- Efficient delivery of data with proper correction.
- From the technological changes separate all upper layers.
- Managing error control and flow control.
- Obtaining data from the Session layer, divide it into segments and transmit to the network layer.

3. Functions

Specific functions of the **transport layer** are as follows:

1. Service-point addressing

- Computers often run many programs at the same time. Due to this, source-to-destination delivery means delivery from a specific job (currently running program) on one computer to a specific job (currently running program) on the other system not only one computer to the next.
- For this reason, the **transport layer** added a specific type of address to its header, it is referred to as a service point address or port address.
- By this address each packet reaches the correct computer and also the **transport layer** gets the complete message to the correct process on that computer.

2. Segmentation and Reassembly

- In segmentation, a message is divided into transmittable segments; each segment containing a sequence number. This number enables this layer to reassemble the message.
- Upon arriving at its destination system message is reassembled correctly, identify and replaces packets that were lost in transmission.

3. Connection Control

It can be either of two types:

- i. Connectionless Transport Layer
- ii. Connection Oriented Transport Layer

i) Connectionless Transport Layer

- In this type of transmission, the receiver does not send an acknowledgment to the sender about the receipt of a packet. This is a faster communication technique.

ii) Connection Oriented Transport Layer

- To Create a connection following three steps are possible:
 - Connection establishment
 - Data transfer
 - Connection termination

Connectionless Service is less reliable than connection Oriented Service.

4. Multiplexing and Demultiplexing

- Multiple packets from diverse applications are transmitted across a network needs very dedicated control mechanisms, which are found in the transport layer.
- The transport layer accepts packets from different processes. These packets are differentiated by their port numbers and pass them to the network layer after adding proper headers.
- In Demultiplexing, at the receiver's side to obtain the data coming from various processes. It receives the segments of data from the network layer and delivers it to the appropriate process running on the receiver's machine.

5. Flow control

- The transport layer also responsible for the flow control mechanism between the adjacent layers of the TCP/IP model.
- It does not perform across a single link even it performs an end-to-end node.
- By imposing flow control techniques data loss can be prevented from the cause of the sender and slow receiver.
- For instance, it uses the method of sliding window protocol in this method receiver sends a window back to the sender to inform the size of the data is received.

6. Error Control

- Error Control is also performed end to end like the data link layer.

- In this layer to ensure that the entire message arrives at the receiving transport layer without any error (damage, loss or duplication). Error Correction is achieved through retransmission of the packet.
- The data has arrived or not and checks for the integrity of data, it uses the ACK and NACK services to inform the sender.