

Chapter 5: Transport Layer

The Transport Service: Services Provided to the Upper Layers

The goal of the transport layer is to provide efficient, reliable, and cost-effective service to the application layer. To provide the service, the transport layer uses the service provided by the network layer. Hardware and software within the transport layer that provides service is called the transport layer entity. The transport layer provides two types of service to the application layer: connection-oriented service and connectionless service.

Transport Protocols: UDP, TCP

The two main Transport layer protocols are Transmission Control Protocol (TCP) and User Datagram Protocol (UDP). TCP provides reliable communication between two hosts. Examples include World Wide Web (HTTP), E-mail (SMTP TCP), File Transfer Protocol (FTP), and Secure Shell (SSH). UDP provides unreliable communication between two hosts. Examples include Domain Name System (DNS), Streaming media applications such as movies, Online multiplayer games, Voice over IP (VoIP), and Trivial File Transfer Protocol (TFTP).

Port and Socket

A port is one of the circuit connection points on a front-end processor or local intelligent controller. The TCP and UDP protocols use ports to map incoming data to a particular process running on a computer. At the transport layer, an address is needed to choose among multiple processes running on the destination host called Port Number. A socket is one endpoint of a two-way communication link between two processes running on the network. A socket is bound to a port number so that the TCP layer can identify the application that data is destined to be sent.

Connection Establishment, Connection Release

A TCP uses a 3-way handshaking mechanism to establish the connection between the nodes. The basic steps followed by TCP to establish the connection are as follows: Step 1: Client end system sends SYNchronize packet to server. Step 2: Server end system receives SYN, replies with SYNchronize-ACKnowledgement. Step 3: Client receives SYN-ACK and sends ACKnowledge to server, and Server receives ACK.

Flow Control & Buffering

The transport layer manages end-to-end flow. If the receiver is not able to manage with the flow of data, then data flow should be controlled from the sender side, that part is done on the Transport layer. Data link layer is also doing flow control, but it controls the flow of data between adjacent nodes in the path from source to destination.

Multiplexing & Demultiplexing

In computer networks, multiplexing is a technique by which multiple analog or digital signals are combined into one signal over a shared medium for transmission. Similarly, De-multiplexing is a technique by which a signal received from a shared medium is identified and transmitted to the particular medium or devices.

Congestion Control Algorithm: Token Bucket and Leaky Bucket

Congestion is an important issue that can arise in packet-switched networks. Congestion is a situation in Communication Networks in which too many packets are present in a part of the subnet, and performance degrades. Congestion in a network may occur when the load on the network (i.e., the number of packets sent to the network) is greater than the capacity of the network (i.e., the number of packets a network can handle).