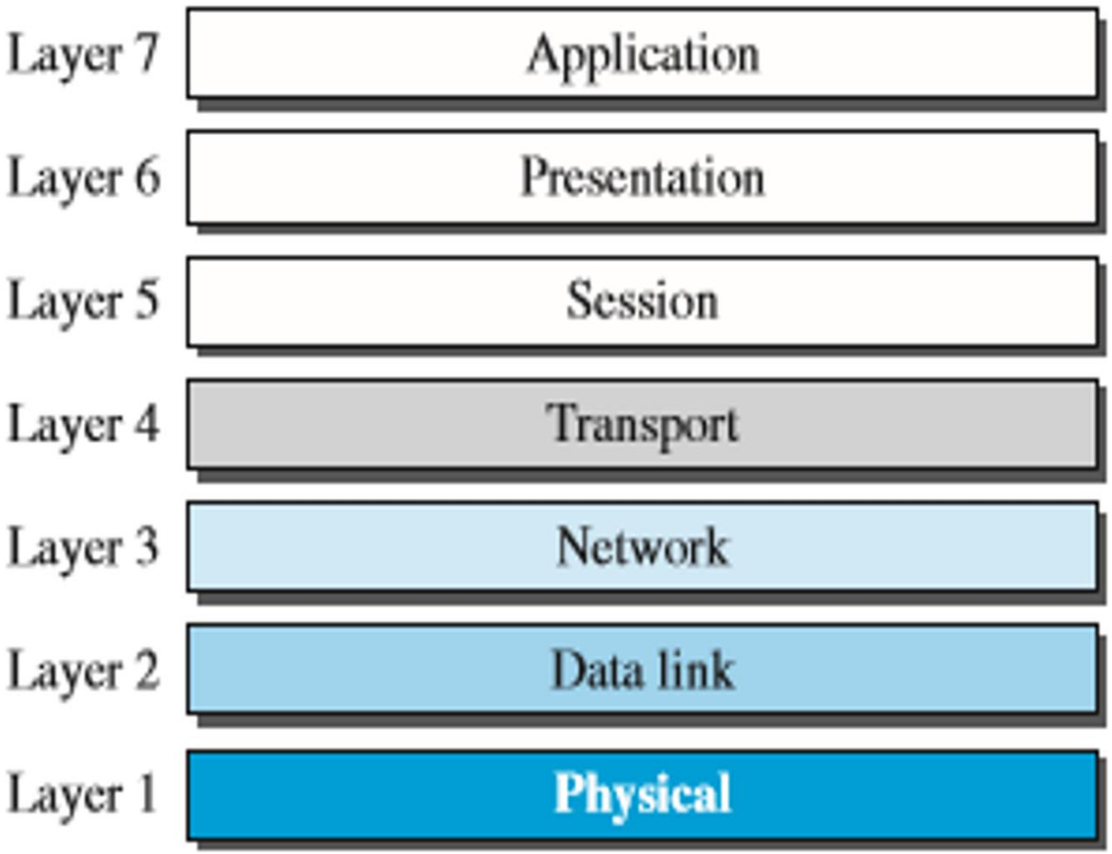
The OSI model



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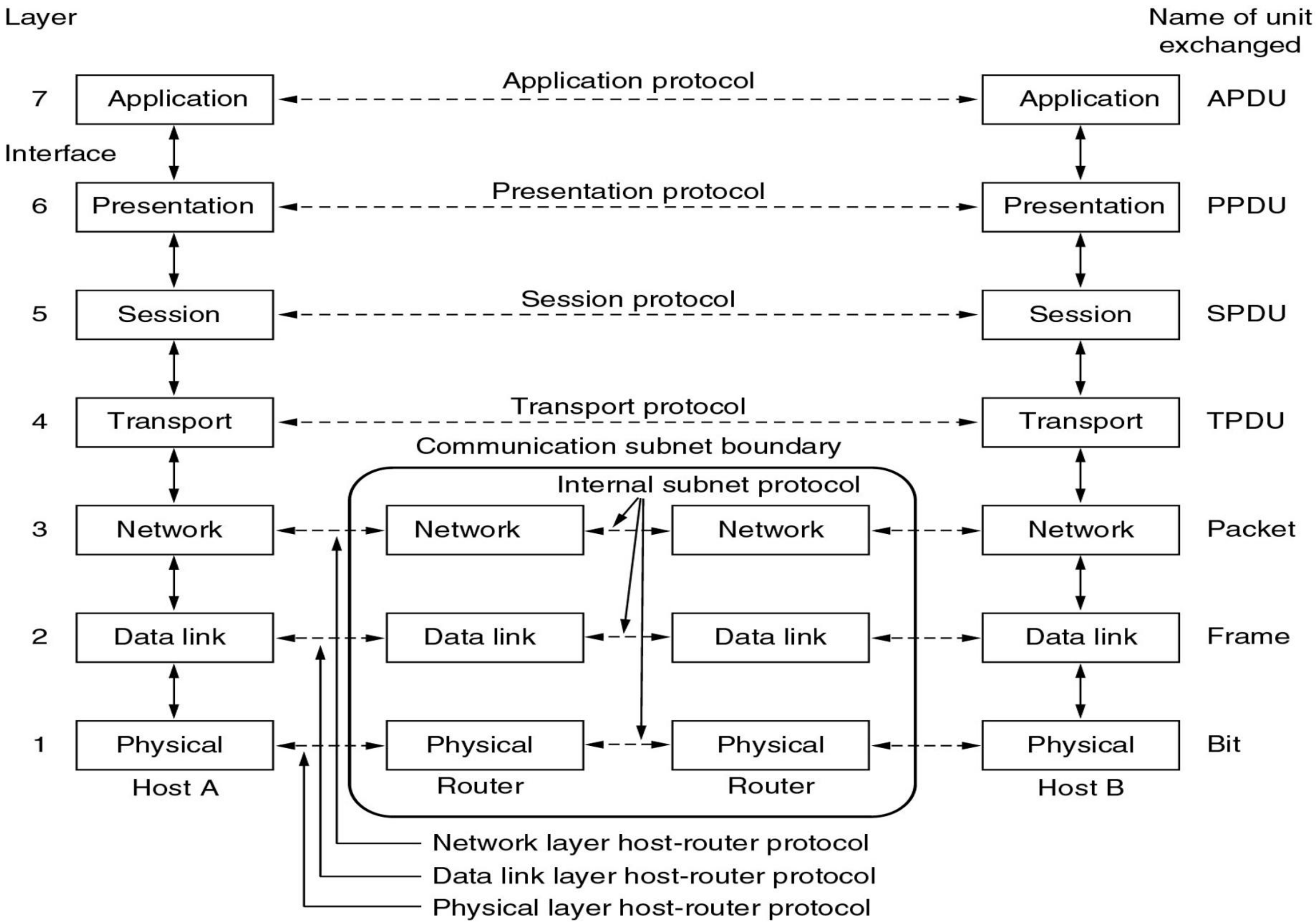

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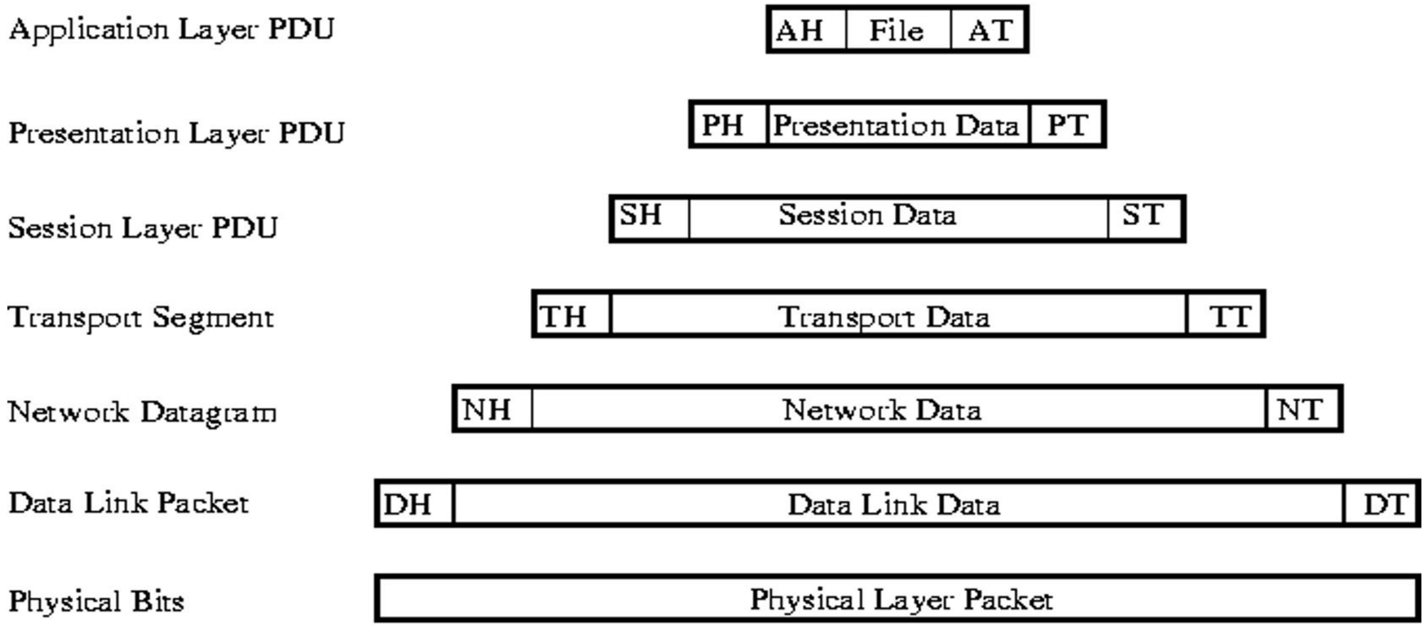


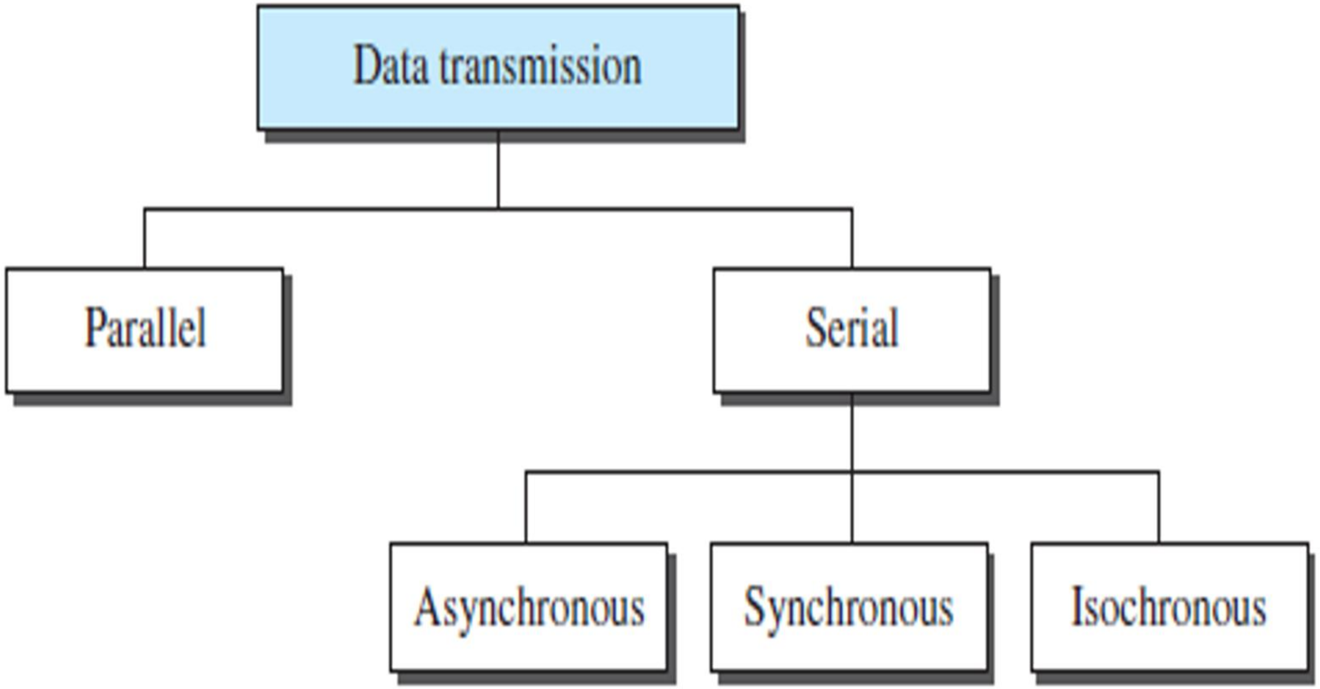
- Each layer may add a Header and a Trailer to its Data (which consists of the next higher layer's Header, Trailer and Data as it moves through the layers). The Headers contain information that specifically addresses layer-to-layer communication. For example, the Transport Header (TH) contains information that only the Transport layer sees. All other layers below the Transport layer pass the Transport Header as part of their Data.

- The ***Physical Layer***
  - Establishes the physical characteristics of the network (e.g., the type of cable, connectors, length of cable, etc.)
  - Defines the electrical characteristics of the signals used to transmit the data (e.g. signal voltage swing, duration of voltages, etc.)
  - Transmits the binary data (bits) as electrical or optical signals depending on the medium.
- The ***Data Link Layer***
  - Defines how the signal will be placed on or taken off the NIC. The data frames are broken down into individual bits that can be translated into electric signals and sent over the network. On the receiving side, the bits are reassembled into frames for processing by upper levels.
  - Error detection and correction is also performed at the data link layer. If an acknowledgement is expected and not received, the frame will be resent. Corrupt data is also identified at the data link layer.
  - Because the Data-Link Layer is very complex, it is sometimes divided into sublayers (as defined by the IEEE 802 model). The lower sublayer provides network access. The upper sublayer is concerned with sending and receiving packets and error checking.

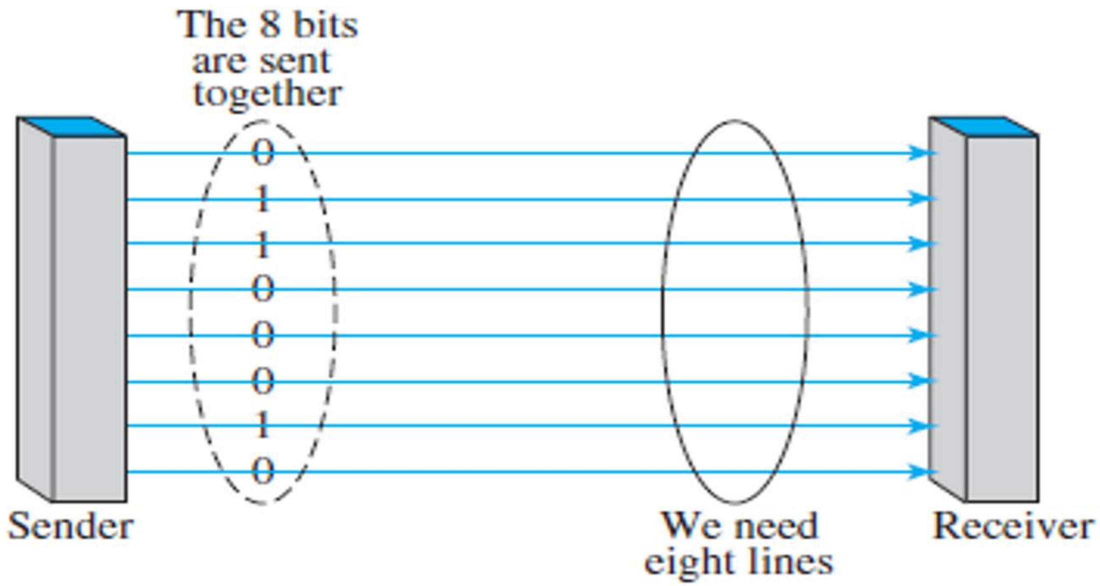
- The *Network Layer*
  - Primarily concerned with addressing and routing. Logical addresses (e.g., an IP address) are translated into physical addresses (i.e., the MAC address) for transmission at the network layer. On the receiving side, the translation process is reversed.
  - It is at the network layer where the route from the source to destination computer is determined. Routes are determined based on packet addresses and network conditions. Traffic control measures are also implemented at the network layer.
- The ***Transport Layer***
  - On the sending side, messages are packaged for efficient transmission and assigned a tracking number so they can be reassembled in proper order. On the receiving side, the packets are reassembled, checked for errors and acknowledged.
  - Performs error handling in that it ensures all data is received in the proper sequence and without errors. If there are errors, the data is retransmitted.

- The ***Session Layer***
  - Is responsible for establishing, maintaining, and terminating a connection called a '**session**'.
  - A session is an exchange of messages between computers (a dialog). Managing the session involves synchronization of user tasks and dialog control (e.g., who transmits and for how long). Synchronization involves the use of checkpoints in the data stream. In the event of a failure, only the data from the last checkpoint has to be resent.
  - Logon, name recognition and security functions take place at the Session Layer.
- The ***Presentation Layer***
  - It is responsible for data translation (formatting), compression, and encryption.
  - The Presentation Layer is primarily concerned with translation; interpreting and converting the data from various formats. For example, EBCIDIC characters might be converted into ASCII. It is also where data is compressed for transmission and uncompressed on receipt. Encryption techniques are implemented at the Presentation Layer.
  - The redirector operates at the presentation layer by redirecting I/O operations across the network.
- The ***Application Layer***
  - Provides the operating system with direct access to network services.
  - It serves as the interface between the user and the network by providing services that directly support user applications.

TRANSMISSION MODES

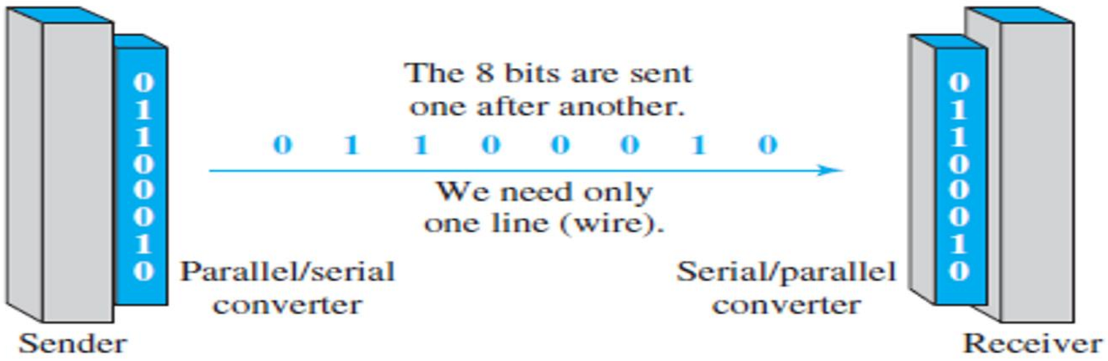


Parallel Transmission



- The mechanism for parallel transmission is a conceptually simple one: Use n wires to send n bits at one time.
- That way each bit has its own wire, and all n bits of one group can be transmitted with each clock tick from one device to another

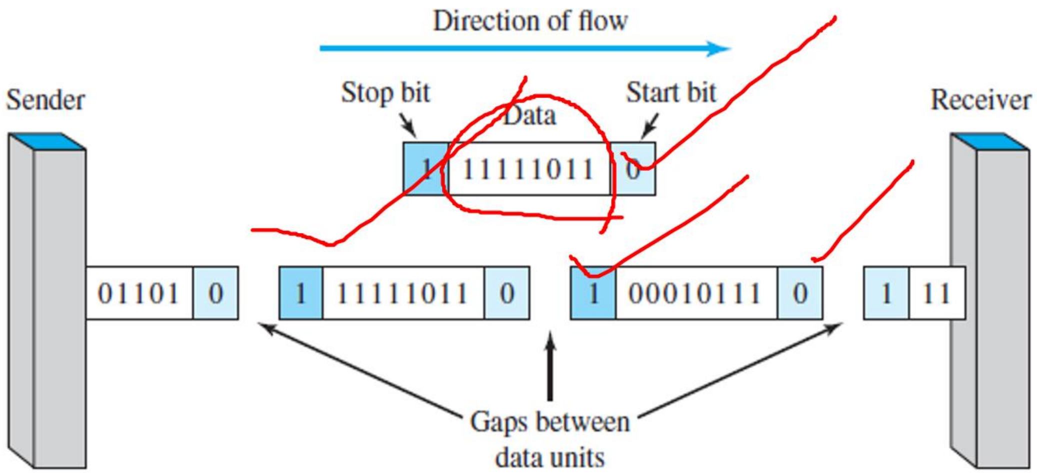
Serial Transmission



➢In serial transmission one bit follows another, so we need only one communication channel rather than n to transmit data between two communicating devices

➢The advantage of serial over parallel transmission is that with only one communication channel, serial transmission reduces the cost of transmission over parallel by roughly a factor of *n*.

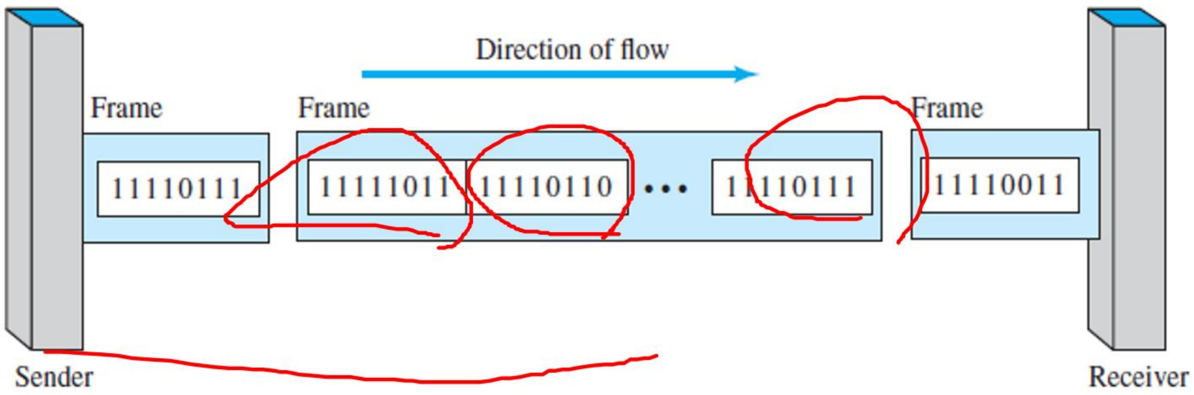
Asynchronous transmission



➢In asynchronous transmission, we send 1 start bit (0) at the beginning and 1 or more stop bits (1s) at the end of each byte. There may be a gap between bytes.

➢Asynchronous here means "asynchronous at the byte level," but the bits are still synchronized; their durations are the same.

Synchronous Transmission



➢In synchronous transmission, we send bits one after another without start or stop bits or gaps. It is the responsibility of the receiver to group the bits.

Isochronous

- In real-time audio and video, in which uneven delays between frames are not acceptable,
- synchronous transmission fails. For example, TV images are broadcast at the rate of 30 images per second; they must be viewed at the same rate.
- If each image is sent by using one or more frames, there should be no delays between frames. For this type of
- application, synchronization between characters is not enough; the entire stream of bits
- must be synchronized. The isochronous transmission

  guarantees that the data arrive at a fixed rate.

Difference between TCP/IP and OSI Model	
TCP/IP	**OSI Model**
The full form of TCP/IP is Transmission Control Protocol/ Internet Protocol.	The full form of OSI is Open Systems Interconnection.
It is a communication protocol that is based on standard protocols and allows the connection of hosts over a network.	It is a structured model which deals which the functioning of a network.
In 1982, the TCP/IP model became the standard language of ARPANET.	In 1984, the OSI model was introduced by the International Organisation of Standardization (ISO).
It comprises of four layers: • Network Interface • Internet • Transport • Application	It comprises seven layers: • Physical • Data Link • Network • Transport • Session • Presentation • Application
It follows a horizontal approach.	It follows a vertical approach.
The TCP/IP is the implementation of the OSI Model.	An OSI Model is a reference model, based on which a network is created.
It is protocol dependent.	It is protocol independent.