

BCA Optimized Notes by Yash

Semester IV - Computer Networking

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Unit 1

Networks

A computer network is a system that connects two or more computing devices for transmitting and sharing information.

- ARPANET
 - ARPANET (Advanced Research Projects Agency Network) was the first wide-area packet-switched network with distributed control and one of the first computer networks to implement the TCP/IP protocol suite.
 - Both technologies became the technical foundation of the Internet.
- OSI
 - OSI (Open System Interconnection) is a layered structure for network communication.
 - It was later changed to ISO, i.e. International Standard Organization.

Standards

In networking, standards provide a set of guidelines.

- ANSI
 - The ANSI (American National Standards Institute) is a private non-profit organization that oversees the development of various standards in the United States of America.
- Manufacturing Standards
 - There are two standards provided by manufacturers, namely De Facto and De Jure.
 - The De Facto standards are based on factors, while De Jure standards are approved by the government.
- Other Standards
 - The IEEE (Institute of Electrical and Electronics Engineers) standards are used by engineers.
 - The ITU-T (International Telecommunication Union Telecommunication Standardization Sector) standards are used for telecommunication.
 - The CCITT (Consultative Committee for International Telegraphy and Telephony) standards were earlier versions of the ITU-T standards.
 - The EIA (Electronic Industries Association) standards are used for electronic devices.

Protocols

In networking, protocols provide a set of rules.

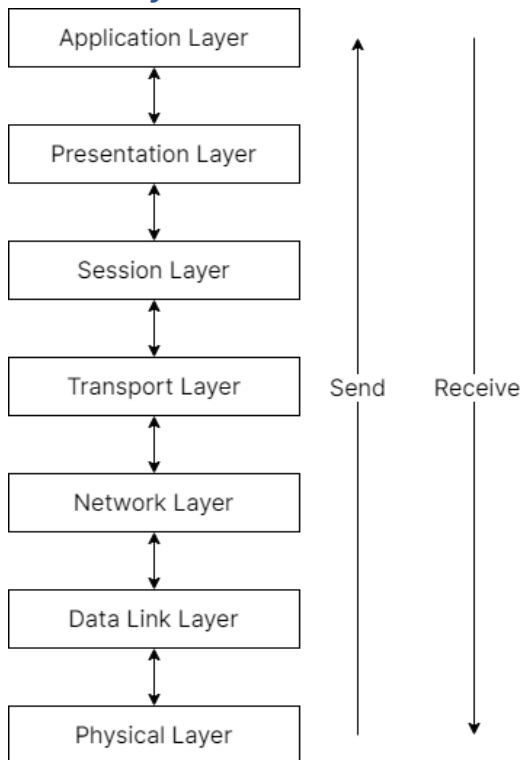
Key Elements

- Syntax
Provides structure
- Semantic
Provides formatting
- Timelines
Manages the timing

Various Protocols

- ICANN
 - ICANN (Internet Corporation for Assigned Names and Numbers) is the non-profit corporation that oversees IP address allocation, protocol parameters, DNS (Domain Name System) management, and root server functions.
 - The IANA (Internet Assigned Number Authority) previously performed these services.
- TCP/IP
 - TCP/IP (Transmission Control Protocol/Internet Protocol) is a suite of protocols that allow the exchange of messages over a network.
- UDP
 - UDP (User Datagram Protocol) is a communication protocol used for time-sensitive transmissions.
 - Datagram means "connectionless".
- SCTP
 - SCTP (Stream Controlled Transmission Protocol) is a connection-oriented protocol transmitting multiple streams of data between two end points at the same time that have established a connection in network.

OSI Layered Structure



Physical Layer

- The physical layer converts any data into binary format.
- It uses signals, and also has hubs (passive, active) and switches.

Data Link Layer

- The binary data is converted into a frame format in the data link layer.
- This layer includes bridges and gateways.
- This layer also focuses on detecting errors, and controlling data.

Network Layer

- The binary frames are arranged into a packet in the network layer.
- This packet includes a source and destination address.
- This layer also includes fragmentation, used to fragment the data.
- Like the data link layer, the network layer also focuses on detecting errors and controlling data.

Associated Protocols

- ARP
 - The ARP (Address Resolution Protocol) is used to find IP addresses.
- RARP
 - The RARP (Reverse Address Resolution Protocol) is used to find physical addresses i.e. MAC (Media Access Control) addresses.
- ICMP
 - The ICMP (Internet Control Message Protocol) is used to report error messages and perform diagnostics in the case of an error.
- IGMP
 - The IGMP (Internet Group Message Protocol) allows several devices to share one IP address so they can all receive the same data.

Transport Layer

- The transport layer sends packets to the destination address.
- It is done in a process-to-process mode.
- This layer also segments data in a process known as segmentation.
- Like the data link layer and the network layer, the transport layer also focuses on detecting errors and controlling data.

Session Layer

- The session layer is used to establish data connections, convert segmented data into a session, and synchronizing data.

Presentation Layer

- The presentation layer is used for security, allowing the encryption and decryption of data.
- It also compresses data.

Application Layer

- The actual applications are in the application layer.
- Commonly used applications include telnet, emails, DNS, FTP (File Transfer Protocol), TFTP (Trivial File Transfer Protocol).