

Unbounded or Unguided Transmission Media

Unguided medium transport electromagnetic waves without using a Physical connection. This type of communication is often referred to as Wireless communication. Signals are normally broadcast through free Space and thus are available to anyone who has a device capable of Receiving them.

Radio Waves

Electromagnetic waves ranging in frequencies between 3 KHz and 1 GHz are normally called radio waves. Radio waves are omnidirectional. When an antenna transmits radio waves, they are propagated in all directions. This means that the sending and receiving antennas do not have to be aligned. A sending

Antenna sends waves that can be received by any receiving antenna. The omnidirectional property has disadvantages, too. The radio waves Transmitted by one antenna are susceptible to interference by another Antenna that may send signals using the same frequency or band.

Radio waves use omnidirectional antennas that send out signals in all Directions.

- AM and FM radio, television

Microwaves

Electromagnetic waves having frequencies between 1 and 300 GHz are called microwaves. Microwaves are unidirectional. When an antenna transmits microwaves, the sending and receiving antennas need to be aligned. The Unidirectional property has an obvious advantage. A pair of antennas Can be aligned without interfering with another pair of aligned Antennas.

The following describes some characteristics of microwaves
Propagation:

- Microwave propagation is line-of-sight. Since the towers with the Mounted antennas need to be in direct sight of each other, towers That are far apart need to be very tall.
- Very high-frequency microwaves cannot penetrate walls. This Characteristic can be a disadvantage if receivers are inside the Buildings.

Used in cellular phones, satellite networks and wireless LANs.

There are 2 types of Microwave Transmission:

1. Terrestrial Microwave

2. Satellite Microwave

Terrestrial Microwave

It is a type of data transmission media which uses microwave line of sight communications between sending and receiving devices located on the ground or on towers.

For increasing the distance served by terrestrial microwave, repeaters can be installed with each antenna. The signal received by an antenna can be converted into transmittable form and relayed to the next antenna. It is an example of telephone systems all over the world.

Satellite Microwave

This is a microwave relay station which is placed in outer space. The satellites are launched either by rockets or space shuttles.

These are positioned 36000 Km above the equator with an orbit speed that exactly matches the rotation speed of the earth. As the satellite is positioned in a geo-synchronous orbit, it is stationary relative to earth and always stays over the same point on the ground. This is usually done to allow ground stations to aim their antennas at a fixed point in the sky.

Infrared Waves

Infrared waves can be used for very short-range communication.

Infrared waves, having high frequencies, cannot penetrate walls. This advantageous characteristic prevents interference between one system and another, a short-range communication system in one room cannot be affected by another system in the next room.

In addition, we cannot use infrared waves outside a building because the sun's rays contain infrared waves that can interfere with the communication. This same characteristic makes infrared signals useless for long-range communication.

Used in remote control, wireless speakers, automatic doors

Homework:

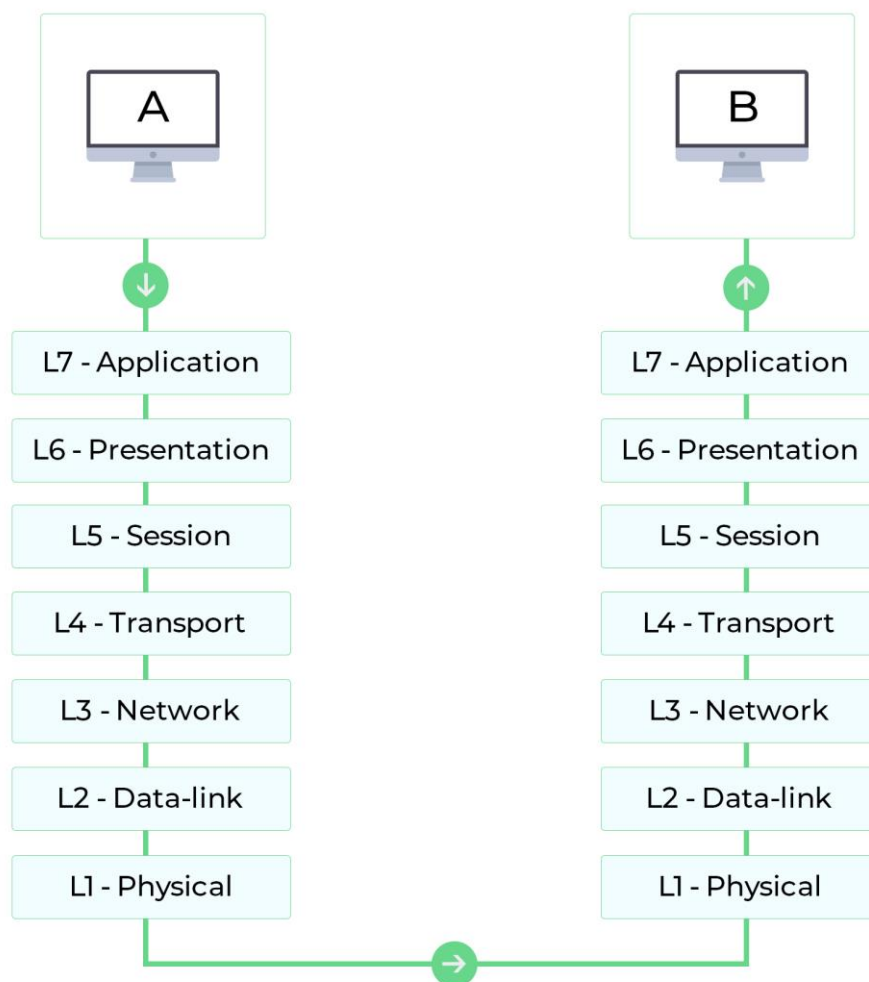
Explain Bluetooth, WIFI and WIMAX in brief.

Write 2-2 advantages and disadvantages of radio waves, microwaves, satellite communication, and infrared waves.

OSI MODEL

It was developed by ISO – ‘International Organization of Standardization’, in 1984. It is a 7 layer architecture with each layer having specific functionality to perform. All these 7 layers work collaboratively to transmit the data from one person to another across the globe.

An OSI reference model of network is ISO (International standard organization) certified model that entirely describes how information is transmitted from an application of one computer to another computer.



Physical layer:– It is responsible for transmitting raw bits from one node to another node through communication channel. It provides the mechanical, electrical, functional and procedural standards for the physical transmission of data.

Data link Layer: It is responsible for moving frames from one node to another node. It provides different facilities such as physical addressing, data framing, flow control, error control, and access control.

Network Layer: It is responsible for delivery of packets from source host to destination host. It provides the different facilities such as logical addressing, routing etc. It is an agent for establishing the connection between heterogeneous network as well as different operational control procedures for inter-network communication.

Transport Layer: It is responsible for delivery of message from one application to another application. It is also known as end-to-end layer. It provides different facilities such as flow control, error control, and connection control. It divides the message into blocks and transports them.

Session Layer: It is responsible for establishing, maintaining and organizing the interaction or session between two devices. It is responsible for opening sessions, when data is being transferred and closing when communication ends.

Presentation layer: It deals with the syntax and semantics of data of the information exchanged between 2 systems. It is responsible for converting the data into standard format.

Deals with How 2 devices should encrypt and decrypt data.

Application Layer: It is responsible for providing networking services to the user. Used by end user software such as web browsers and email clients.

USED FOR FILE TRANSFER, REMOTE LOGIN, ACCESSING DATABASE, EMAIL

Examples are: HTTP, FTP, SMTP, POP, TCP, HTTPS, and TELNET

OSI Model Layer 1: The Physical Layer

Hub, Repeater, Modem, Cables are Physical Layer devices.

OSI Model Layer 2: Data Link Layer

*** Switch & Bridge are Data Link Layer devices.

OSI Model Layer 3: The Network Layer

** Network layer is implemented by networking devices such as routers.

OSI Model Layer 4: Transport Layer

The services provided by the transport layer: Connection-oriented service and Connectionless service.

Some examples are: TCP, UDP

OSI Model Layer 5: The Session Layer

Examples of session layer protocols include X.225 and Zone Information Protocol

(ZIP).

OSI Model Layer 6: The Presentation Layer

OSI Model Layer 7: Application Layer

Ex: Application – Browsers, Skype Messenger etc.

Services supported are: HTTP, TELNET, DHCP, SMTP, FTP...etc.

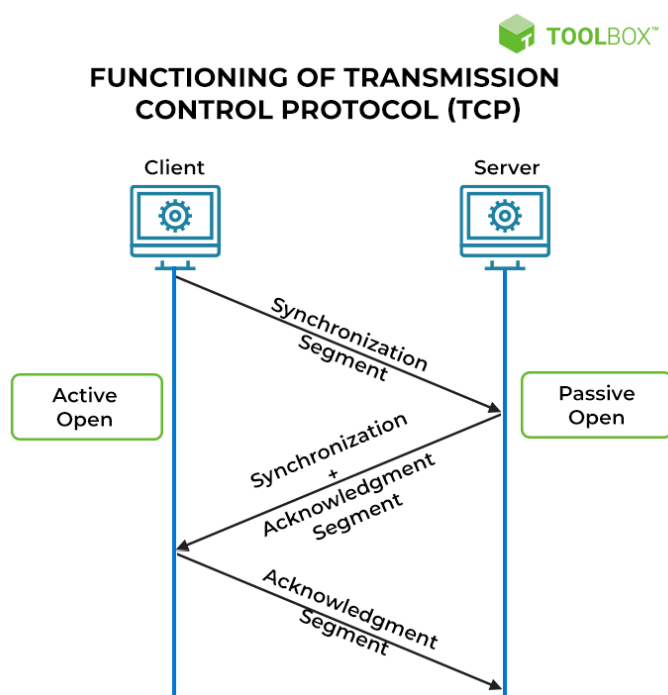
***Application Layer is also called Desktop Layer.*

Types of protocol:

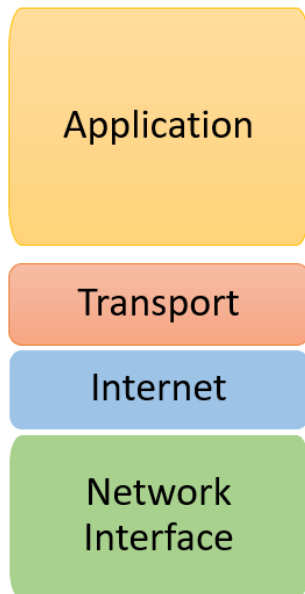
TCP/IP protocol:

TCP/IP stands for Transmission Control Protocol/ Internet Protocol. TCP/IP Stack is specifically designed as a model to offer highly reliable and end-to-end byte stream over an unreliable internetwork.

TCP is a transport layer protocol that provides a reliable stream delivery and virtual connection service to applications through the use of sequenced acknowledgement. TCP is a connection-oriented protocol, as it requires a connection to be established between applications before data transfer. Through flow control and acknowledgement of data, TCP provides extensive error checking. TCP ensures sequencing of data, meaning the data packets arrive in order at the receiving end. Retransmission of lost data packets is also feasible with TCP.



Four Layers of TCP/IP model



Internet layer is also known as network layer

And Network interface layer is also known as data link layer.

UDP (USER DATAGRAM PROTOCOL)

UDP is a connectionless transport layer protocol that provides a simple but unreliable message service. Unlike TCP, UDP adds no reliability, flow control, or error recovery functions. UDP is useful in situations where the reliability mechanisms of TCP are not necessary. Retransmission of lost data packets isn't possible with UDP.

Internet protocol

The Internet Protocol (IP) is a [protocol](#), or set of rules, for routing and addressing [packets](#) of data so that they can travel across networks and arrive at the correct destination. Data traversing the Internet is divided into smaller pieces, called packets. IP information is attached to each packet, and this information helps [routers](#) to send packets to the right place.

Simple Mail Transfer Protocol (SMTP)

It is an application layer protocol that helps to transmit e-mail messages to the mail-server.

Using SMTP, a client can transfer an email to another client on the same network or another network through a relay or gateway access available to both networks.

POP and POP3: Post Office Protocol (version 3)

The Post Office Protocol is also an email protocol. Using this protocol, the end user can download emails from the mail server to their own email client. Once the emails are downloaded locally, they can be read without an internet connection. Also, once the emails are moved locally, they get deleted from the mail server, freeing up space.

POP3 is not designed to perform extensive manipulations with the messages on the mail server, unlike IMAP4. POP3 is the latest version of the Post Office Protocol.

IMAP and IMAP4: Internet Message Access Protocol (version 4)

IMAP is an email protocol that lets end users access and manipulate messages stored on a mail server from their email client as if they were present locally on their remote device.

IMAP follows a client-server model, and lets multiple client's access messages on a common mail server concurrently. IMAP includes operations for creating, deleting, and renaming mailboxes; checking for new messages; permanently removing messages; setting and removing flags; and much more.

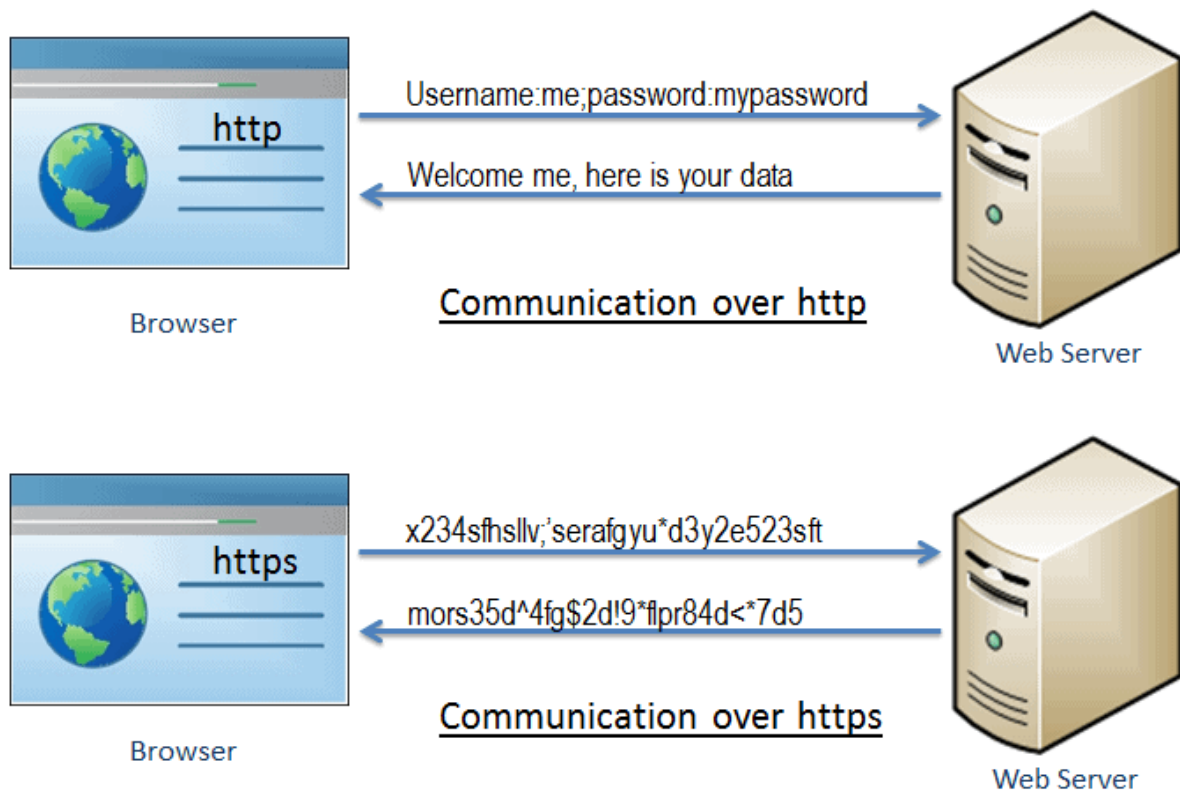
HTTP (Hyper Text transfer Protocol)

HTTP is an application layer protocol used for distributed, collaborative, and hypermedia information systems. It works on a client-server model, where the web browser acts as the client. Data such as text, images, and other multimedia files are shared over the World Wide Web using HTTP.

As a request and response type protocol, the client sends a request to the server, which is then processed by the server before sending a response back to the client.

HTTPS PROTOCOL

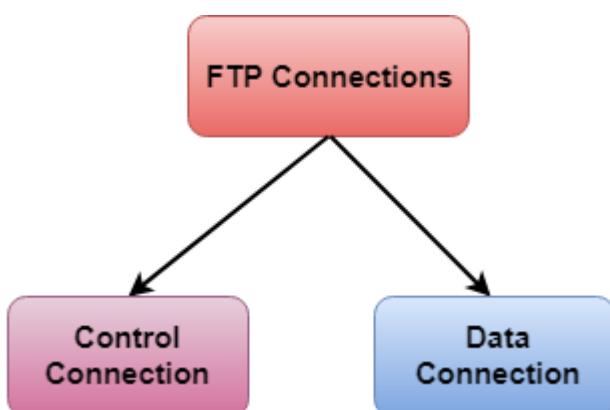
Hypertext transfer protocol secure (HTTPS) is the secure version of [HTTP](#), which is the primary protocol used to send data between a web browser and a website. HTTPS is encrypted in order to increase security of data transfer. This is particularly important when users transmit sensitive data, such as by logging into a bank account, email service, or health insurance provider.



FTP

- FTP stands for File transfer protocol.
- FTP is a standard internet protocol provided by TCP/IP used for transmitting the files from one host to another.
- It is mainly used for transferring the web page files from their creator to the computer that acts as a server for other computers on the internet.
- It is also used for downloading or uploading the files to computer from other servers.

There are two types of connections in FTP:



- **Control Connection:** The control connection uses very simple rules for communication. Through control connection, we can transfer a line of command or line of response at a time. The control connection is made between the control processes. The control connection remains connected during the entire interactive FTP session.
- **Data Connection:** The Data Connection uses very complex rules as data types may vary. The data connection is made between data transfer processes. The data connection opens when a command comes for transferring the files and closes when the file is transferred.

TELENET:

Telnet is a protocol that allows you to connect to remote computers (called hosts) over a [TCP/IP](#) network (such as the internet). Using telnet client software on your computer, you can make a connection to a telnet server (that is, the remote host). Once your telnet client establishes a connection to the remote host, your client becomes a virtual terminal, allowing you to communicate with the remote host from your computer.