

WT UNIT-1 COMPLETE

Internet Protocols:

- A network can be defined as a group of computers and other devices connected to exchange data.
- Each host on the Internet has a range of IP (Internet protocol) numbers or addresses. •
On the other hand, The Routing or communication protocols specifies how routers communicate with each other.
- Example: AODV, ZRP etc.
- Set of rules, standards Use for data exchange in between Client and Server.
- Types:
 1. Transmission Control Protocol (TCP)
 2. Internet Protocol (IP)
 3. User Datagram Protocol (UDP)
 4. Post office Protocol (POP)
 5. Simple mail transport Protocol (SMTP)
 6. File Transfer Protocol (FTP)
 7. HyperText Transfer Protocol (HTTP)
 8. HyperText Transfer Protocol Secure (HTTPS)

It is a protocol defined in the TCP/IP model used for sending the packets from source to destination. The main task of IP is to deliver the packets from source to the destination based on the IP addresses available in the packet headers. IP defines the packet structure that hides the data which is to be delivered as well as the addressing method that labels the datagram with a source and destination information.

An IP protocol provides the connectionless service, which is accompanied by two transport protocols, i.e., TCP/IP and UDP/IP, so internet protocol is also known as TCP/IP or UDP/IP.

The first version of IP (Internet Protocol) was IPv4. After IPv4, IPv6 came into the market, which has been increasingly used on the public internet since 2006.

History of Internet Protocol

The development of the protocol gets started in 1974 by **Bob Kahn and Vint Cerf**. It is used in conjunction with the Transmission Control Protocol (TCP), so they together named the TCP/IP

The first major version of the internet protocol was IPv4, which was version 4. This protocol was officially declared in RFC 791 by the Internet Engineering Task Force (IETF) in 1981.

After IPv4, the second major version of the internet protocol was IPv6, which was version 6. It was officially declared by the IETF in 1998. The main reason behind the development of IPv6 was to replace IPv4. There is a big difference between IPv4 and IPv6 is that IPv4 uses 32 bits for addressing, while IPv6 uses 128 bits for addressing.

Internet Addressing or IP Addressing

- Addresses provide information on how to locate something, e.g., what route to take from one node to another.
- Internet addresses combine:
 - a routing portion, known as the network part
 - a name portion known as the host part

An IP address is a unique identifier assigned to the computer which is connected to the internet. Each IP address consists of a series of characters like 192.168.1.2. Users cannot access the domain name of each website with the help of these characters, so DNS resolvers are used that convert the human-readable domain names into a series of characters. Each IP packet contains two addresses, i.e., the IP address of the device, which is sending the packet, and the IP address of the device which is receiving the packet.

Types of IP addresses

IPv4 addresses are divided into two categories:

- **Public address**
- **Private address**

ISP: Internet Service Provider

ISP stands for Internet Service Provider. It is a company that provides access to the internet and similar services such as Website designing and virtual hosting. For example, when you connect to the Internet, the connection between your Internet-enabled device and the internet is executed through a specific transmission technology that involves the transfer of information packets through an Internet Protocol route.



Data is transmitted through different technologies, including cable modem, dial-up, DSL, high speed interconnects. Accordingly, based on the method of data transmission, the Internet access provided by ISPs can be divided into many types, some of which are as follows:

Dial-up Internet access: It is the oldest technology to provide Internet access by modem to modem connection using telephone lines. In this method, the user's computer is connected to a modem with a telephone line. This method has become outdated today due to slow connection speed. However, in remote areas, this method can be used where the broadband network is not available.

DSL: DSL, which stands for 'digital subscriber line' is an advanced version of the dial-up Internet access method. It uses high frequency to execute a connection over the telephone network and allows the internet and the phone connection to run on the same telephone line. This method offers an Asymmetric Digital Subscriber (ADSL), where the upload speed is less than the download speed, and a Symmetric Digital Subscriber Line (SDSL), which offers equal upload and download speeds. Out of these two, ADSL is more popular among users and is popularly known as DSL.

Wireless Broadband (WiBB): It is a modern broadband technology for Internet access. It allows high-speed wireless internet within a large area. To use this technology, you are required to place a dish on the top of your house and point it to the transmitter of your Wireless Internet Service Provider (WISP).

Wi-Fi Internet: It is the short form for "wireless fidelity," which is a wireless networking technology that provides wireless high-speed Internet connections using radio waves. To use the internet, you are required to be within the range of wi-fi network. It is commonly used in public places such as hotels, airports, restaurants to provide internet access to customers.

ISDN: It is a short form of Integrated Services Digital Network. It is a telephone system network which integrates a high-quality digital transmission of voice and data over the same standard phone line. It offers a fast upstream and downstream Internet connection speed and allows both voice calls and data transfer.

Ethernet: It is a wired LAN (Local Area Network) where computers are connected within a primary physical space. It enables devices to communicate with each other via a protocol (a set of rules or common network language). It may provide different speeds such as 10 Mbps, 100 Mbps and 10 Gbps.

What is the World Wide Web?

World Wide Web, which is also known as a Web, is a collection of websites or web pages stored in web servers and connected to local computers through the internet. These websites contain text pages, digital images, audios, videos, etc. Users can access the content of these sites from any part of the world over the internet using their devices such as computers, laptops, cell phones, etc. The WWW, along with internet, enables the retrieval and display of text and media to your device.



The building blocks of the Web are web pages which are formatted in HTML and connected by links called "hypertext" or hyperlinks and accessed by HTTP. These links are electronic connections that link related pieces of information so that users can access the desired information quickly. Hypertext offers the advantage to select a word or phrase from text and thus to access other pages that provide additional information related to that word or phrase.

A web page is given an online address called a Uniform Resource Locator (URL). A particular collection of web pages that belong to a specific URL is called a website, e.g., *www.facebook.com*, *www.google.com*, etc. So, the World Wide Web is like a huge electronic book whose pages are stored on multiple servers across the world.

Small websites store all of their WebPages on a single server, but big websites or organizations place their WebPages on different servers in different countries so that

when users of a country search their site they could get the information quickly from the nearest server.

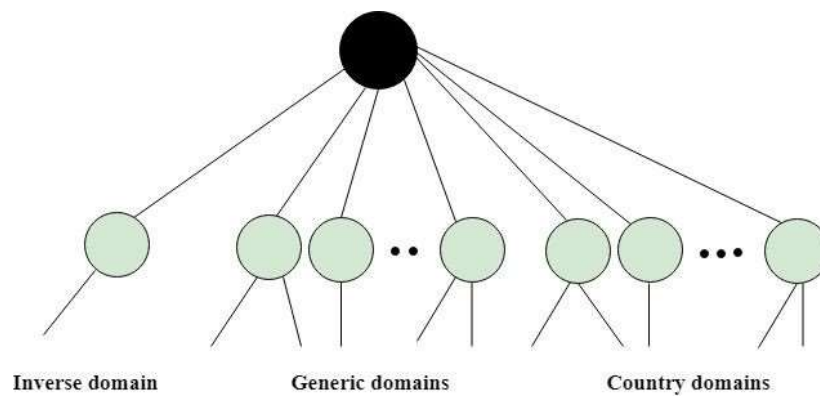
So, the web provides a communication platform for users to retrieve and exchange information over the internet. Unlike a book, where we move from one page to another in a sequence, on the World Wide Web we follow a web of hypertext links to visit a web page and from that web page to move to other web pages. You need a browser, which is installed on your computer, to access the Web.

DNS

An application layer protocol defines how the application processes running on different systems, pass the messages to each other.

- DNS stands for Domain Name System.
- DNS is a directory service that provides a mapping between the name of a host on the network and its numerical address.
- DNS is required for the functioning of the internet.
- Each node in a tree has a domain name, and a full domain name is a sequence of symbols specified by dots.
- DNS is a service that translates the domain name into IP addresses. This allows the users of networks to utilize user-friendly names when looking for other hosts instead of remembering the IP addresses.
- For example, suppose the FTP site at EduSoft had an IP address of 132.147.165.50, most people would reach this site by specifying ftp.EduSoft.com. Therefore, the domain name is more reliable than IP address.

DNS is a TCP/IP protocol used on different platforms. The domain name space is divided into three different sections: generic domains, country domains, and inverse domain.



Generic Domains

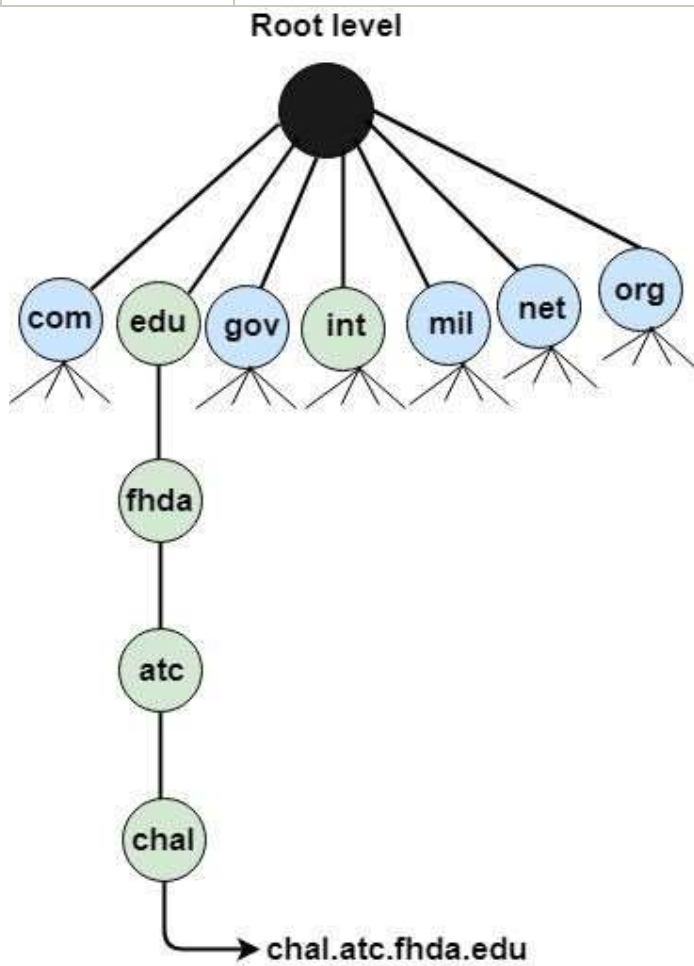
- It defines the registered hosts according to their generic behavior.
- Each node in a tree defines the domain name, which is an index to the DNS database.
- It uses three-character labels, and these labels describe the organization type.

Label	Description
aero	Airlines and aerospace companies
biz	Businesses or firms
com	Commercial Organizations

coop	Cooperative business Organizations
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edu	Educational institutions
gov	Government institutions
info	Information service providers
int	International Organizations
mil	Military groups
museum	Museum & other nonprofit organizations
name	Personal names

net	Network Support centers
org	Nonprofit Organizations
pro	Professional individual Organizations



Country Domain

The format of country domain is same as a generic domain, but it uses **two-character country abbreviations** (e.g., us for the United States) in place of three character organizational abbreviations.

Inverse Domain

The inverse domain is used for mapping an address to a name. When the server has received a request from the client, and the server contains the files of only authorized clients. To determine whether the client is on the authorized list or not, it sends a query to the DNS server and ask for mapping an address to the name.

Working of DNS

- DNS is a client/server network communication protocol. DNS clients send requests to the server while DNS servers send responses to the client.
- Client requests contain a name which is converted into an IP address known as a forward DNS lookups while requests containing an IP address which is converted into a name known as reverse DNS lookups.
- DNS implements a distributed database to store the name of all the hosts available on the internet.
- If a client like a web browser sends a request containing a hostname, then a piece of software such as **DNS resolver** sends a request to the DNS server to obtain the IP address of a hostname. If DNS server does not contain the IP address associated with a hostname, then it forwards the request to another DNS server. If IP address has arrived at the resolver, which in turn completes the request over the internet protocol.

URL: Uniform Resource Locator

URL stands for Uniform Resource Locator. It is the address of a resource, which can be a specific webpage or a file, on the internet. It is also *known as web address* when it is used with http. It was created in 1994 by Tim Berners-Lee. URL is a

specific character string that is used to access data from the World Wide Web. It is a type of URI (Uniform Resource Identifier).

Every URL contains the following information:

- The scheme name or protocol.
- A colon, two slashes.
- A host, normally called a domain name but sometimes as a literal IP address.
- A colon followed by a port number.
- Full path of the resource.

The URL of a web page is displayed above on the page in the address bar. A typical URL looks like this:

`http://www.javatpoint.com/full-form`

The above URL contains:

- **protocol:** http
- **host or domain:** www.javatpoint.com
- **Path of the resource:** /full-form

A URL can be entered manually by typing it in the address bar of your web browser. If the URL does not contain a valid server, a browser may display a "Server not found" error and if the path in the URL is incorrect, the browser may display a "404 error". A URL does not contain spaces and uses forward slashes to represent different directories. So, dashes and underscores are



used separate the words of a web address.

What is URI

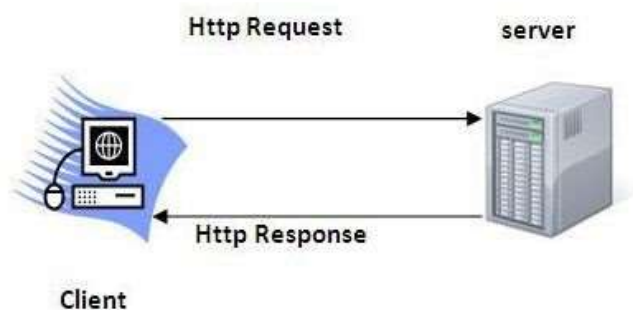
URI stands for Uniform Resource Identifier. It is a generic term for all the name and addresses which show objects on the World Wide Web. It is generally a sequence of characters which identifies a logical resource or the name and location of a file or resource in a uniform format.

A URI can be of two types: Uniform Resource Locator (URL) and Uniform Resource Names (URNs). It enables resources to be accessed by other computers across a network or over the World Wide Web.

HTTP (Hyper Text Transfer Protocol)

The Hypertext Transfer Protocol (HTTP) is application-level protocol for collaborative, distributed, hypermedia information systems. It is the data communication protocol used to establish communication between client and server.

HTTP is TCP/IP based communication protocol, which is used to deliver the data like image files, query results, HTML files etc on the World Wide Web (WWW) with the default port is TCP 80. It provides the standardized way for computers to communicate with each other.



The Basic Characteristics of HTTP (Hyper Text Transfer Protocol):

- It is the protocol that allows web servers and browsers to exchange data over the web.
- It is a request response protocol.
- It uses the reliable TCP connections by default on TCP port 80.
- It is stateless means each request is considered as the new request. In other words, server doesn't recognize the user by default.

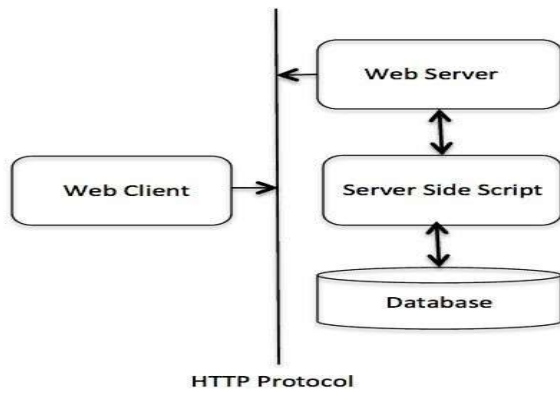
The Basic Features of HTTP (Hyper Text Transfer Protocol):

There are three fundamental features that make the HTTP a simple and powerful protocol used for communication:

- **HTTP is media independent:** It specifies that any type of media content can be sent by HTTP as long as both the server and the client can handle the data content.
- **HTTP is connectionless:** It is a connectionless approach in which HTTP client i.e., a browser initiates the HTTP request and after the request is sent the client disconnects from server and waits for the response.
- **HTTP is stateless:** The client and server are aware of each other during a current request only. Afterwards, both of them forget each other. Due to the stateless nature of protocol, neither the client nor the server can retain the information about different request across the web pages.

The Basic Architecture of HTTP (Hyper Text Transfer Protocol):

The below diagram represents the basic architecture of web application and depicts where HTTP stands:



What is a Browser?

A browser is a software program that is used to explore, retrieve, and display the information available on the World Wide Web. This information may be in the form of pictures, web pages, videos, and other files that all are connected via hyperlinks and categorized with the help of URLs (Uniform Resource Identifiers). For example, you are viewing this page by using a browser.

A browser is a client program as it runs on a user computer or mobile device and contacts the web server for the information requested by the user. The web server sends the data back to the browser that displays the results on internet supported devices. On behalf of the users, the browser sends requests to web servers all over the internet by using **HTTP** (Hypertext Transfer Protocol). A browser requires a smartphone, computer, or tablet and internet to work.

Cookies

A cookie is a small piece of information that is persisted between the multiple client requests.

A cookie has a name, a single value, and optional attributes such as a comment, path and domain qualifiers, a maximum age, and a version number.

How Cookie works

By default, each request is considered as a new request. In cookies technique, we add cookie with response from the servlet. So cookie is stored in the cache of the browser. After that if request is sent by the user, cookie is added with request by default. Thus, we recognize the user as the old user.

Types of Cookie

There are 2 types of cookies in servlets.

- 1) Non-persistent cookie
- 2) Persistent cookie

Non-persistent cookie

It is valid for single session only. It is removed each time when user closes the browser.

Persistent cookie

It is valid for multiple session . It is not removed each time when user closes the browser. It is removed only if user logout or signout.

Advantage of Cookies

Simplest technique of maintaining the state.

Cookies are maintained at client side.

Disadvantage of Cookies

It will not work if cookie is disabled from the browser.

Only textual information can be set in Cookie object.

Note: Gmail uses cookie technique for login. If you disable the cookie, gmail won't work.

Web Server

A web server offers web pages or other content to the web browser by loading the information from a disc and transfer files by using a network to the user's **web browser**. It is used by a computer or collection of computers to provide content to several users over the internet. This exchange was done with the help of **HTTP** communicating between the browser and the server. There are some examples of web servers given below; you can also download these web servers from given below *download links*:

- Apache: <https://www.apache.org/>
- Tomcat: <https://tomcat.apache.org/>
- Nginx: <https://www.nginx.com/>
- Savant: <http://savant.sourceforge.net/>
- Boa: <http://www.boa.org/>
- FoxServ: <http://www.foxserv.net/>
- IIS: <https://www.iis.net/>
- Lighttpd: <https://www.lighttpd.net/>

Proxy server

A computer server that acts as an intermediary between a client and a server known as a **proxy server**. It is a part of another computer or gateway server that isolates a local network from outside networks. **It takes requests from the client and passes it to another server for processing**. It receives the requested information from the second server. Then, it replies to the original client as if it is giving a reply own self.

A proxy server loads the page faster and reduces the network bandwidth as it caches all pages that accessed through the network. A page that is not in proxy server cache, it accesses this page via its own IP address. Thereafter, it caches that page and sends it to the user.

Web-application

A web-application is an application program that is usually stored on a remote server, and users can access it through the use of **Software** known as **web-browser**.



Another definition

It is a type of computer program that usually runs with the help of a web browser and also uses many web technologies to perform various tasks on the internet.

A web application can be developed for several uses, which can be used by anyone like it can be used as an individual or as a whole organization for several reasons.

In general, a web application can contain online shops (or we can also say them ecommerce shops), webmail's, calculators, social media platforms, etc. There is also some kind of web application that usually requires a special kind of web browser to

access them. We cannot access those kinds of web applications by using regular web-browsers. However, most of the web applications available on the internet can be accessed using a **standard web browser**.

If we talk about the web application in general, a web application usually uses a combination of the server-side scripts such as **PHP, ASP**, for handling the information/ data storage and retrieval of the data.

Some of them also use the client-side scripts such as **Javascript, HTML** to represent the data/information in front of the users, and some of the web applications are also using both **server-side** and **client-side** at the same time.

It allows the users to communicate with the organization or companies by using the online form, online forums, shopping carts, content management system, and much more.

Apart from that web applications also allow its users to create documents, share them, or share the data/ information. By using the web application, users can collaborate on same projects by event when they are not available on the same geographical location.

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