Chapter -1

Fundamentals of WEB *

Definition: Web Programming

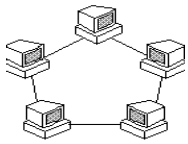
- It is the process of developing a webpage , website or a web application for Internet.
- The most common languages used for **Web programming** are XML, HTML, JavaScript, Perl 5 and PHP.

Web Concepts

- Web concepts essential for the development of a web are:
- Internet
- www
- Web Browser
- Web Server
- Protocols
- Languages

Network

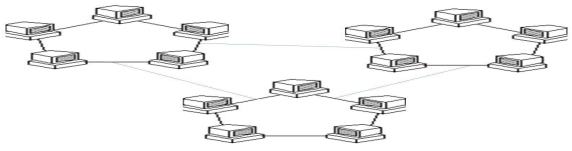
- Two or more computers that are connected with one another for the purpose of communicating data electronically.



- Types – LAN,WAN,MAN

*Internet

- It is defined as the network of network.
- It is the **largest computer network** that connects millions of people together.
- The **Internet** is a global wide area network that connects computer systems across the world.



Internet Protocol - IP

•It is a set of programs or rules that computers used to communicate over the internet.

•It is a protocol which deals with how data is sent from one computer to another on the Internet.

*IP Address

- It is the **Unique Identification Number** of a computer system.
- Every machine on the internet has an IP address.
- Its purpose is to identify the system from many.
- An IP address is a number used to label any device connected to a network.

Eg: 216.72.61.136

- An IP address will be in decimal format , it consists of 4 parts and it is separated with **dots**.
- Since it is in decimal format it has to be converted in binary format.
- Therefore the above IP address can be written in binary format as

  11011000.00011011.11001110.11010111

- 11011000.00011011.11001110.11010111
- The 4 numbers in the IP Address are known as **Octets.**
- Thus an IP Address consists of 32 bits of numbers.

Since it is in Number format of the IP address is not easy for the users to remember, and therefore **Domain Name** is introduced.

*Domains & Sub-Domains

- ***Domain Name**: Domain name is an **identification string for the IP Address** which is used to remember the IP Address.
- It is a unique & easy-to-remember address.
- Eg: google.com

Levels of Domain Names

- **I Level Domain** - Also called **top level** of the DN eg:-.com , . org
- **II Level Domain** - yahoo ,gmail etc(Domain Name)

- **III Level Domain** – Also known as **sub-domain** eg:

***Domain Name System(DNS)**

- DNS is a database System that **converts the domain name into IP address .** Since the DN is in human readable form it has to be converted to machine readable IP Address and therefore DNS provide this service.

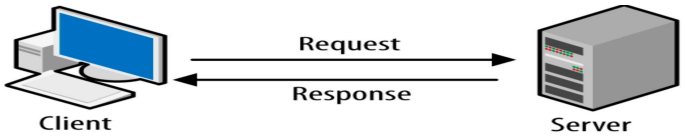
*World Wide Web -www or **W3**

- It is commonly known as **web**.
- It consists of a collection of **websites** or **web** pages.
- A web is a way to access the information on the internet.
- A web is just one way that the information can be transmitted (send & receive) over the internet.
- It is a **subset of the Internet** consists of the pages that can be accessed by a Web browser.
- Internet can only be accessed by the help of a **web browser.**
- Web is just a portion of the internet and internet is considered as a large container. (Hotel & Menu)
- Web is also used for email purpose which relies on two protocols **SMTP**(Simple Mail Transfer Protocol) and **FTP**(File Transfer Protocol).
- **HTTP** – An important protocol which is the only one protocol over the web to transmit data.

*** Web Browser**

- A **web browser** (commonly referred to as a **browser**) is an application software for accessing the Internet . When a user requests a **web** page from a particular website, the **web browser** retrieves the necessary content from a **web** server and then displays the page on the user's device.

Web Browser & Web Server follow



s the **client – server** technology.

***Popular examples of Web Browsers**

- Google Chrome
- Opera
- Internet Explorer
- Mozilla Firefox
- Netscape Navigator
- Brave
- Apple Safari
- Microsoft Edge

Functions of a Web Browser

- The main function is to retrieve information from the internet and making it available for users.
- Granting permission to access internet.
- Interact with HTML tags to display web pages.
- Visiting any website can be done using a web browser.
- Multiple web pages can be opened at the same time on a web browser.

*Web Server

- Web server is a **service provider** system which will wait for the request from the web browser and respond by sending required data back to web browser.
- A **web server** is software that uses **HTTP** (Hypertext Transfer Protocol) and other protocols to respond to client requests made over the World Wide **Web**.
-

Functions of a Web server

- Serve the end user requests.
- Its main purpose is to serve the web page ie, to respond to the request made by the client.
- Stores and secures website data.
- It helps in loading web pages.
-

***Examples of Web Servers**

- Apache HTTP Server
- Microsoft Internet Information services- MIIS

***Difference between Apache HTTP Server & MIIS**

- Apache is available for a range of OS including UNIX,LINUX & WINDOWS.
- It is an open source product and hence it is designed for general purpose applications.
- It works only in WINDOWS operating system
- It is Vendor Specific and hence it is used for specific purpose applications.

*** Uniform Resource Locator- URL**

- A **URL** is a unique **identifier** used to locate a **resource** on the internet. It is also referred to as a **web address**.

  Eg: **http://www.example.com/index.html**

- It is a **fancy name for the IP Address** which is used to find and locate **where exactly your file is & what is its purpose** or what the web browser has to do with it.
- URLs consist of multiple parts -- including a **protocol** and **domain name** -- that tell a web browser how and where to retrieve a resource.
- End users use URLs by typing them directly into the address bar of a browser .

Parts of URL

- **The protocol or scheme**. Used to access a resource on the internet. Protocols include **http, https.**

  HTTPS stands for **Hyper Text Transfer Protocol Secure**. HTTP Secure (HTTPS), could be a combination of the Hypertext Transfer Protocol with the SSL(Secure Socket Layer)
- **Host name or domain name**. The unique reference the represents a webpage. eg: yahoo.com
- **Path**. A path refers to a file or location on the web server.

***Multi-Purpose Internet Mail Extensions - MIME**

- Multipurpose Internet Mail Extensions is an Internet standard that extends the format of **email** messages.
- It is an extension which supports www.
- It arranges data in a particular format.
- It accepts and support
  - Text messages with & without ASCII
  - Multimedia messages – both fixed length & variable length.
  - It also supports Binary File.

MIME Types

- **text/plain** - is the default value for textual files. A textual file should be **human-readable and must not contain binary data**.
- **application/octet-stream** - is a binary file.

  MIME type supports – word files , Gif files, pdf , Jpeg

HTTP- Hypertext Transfer Protocol

- HTTP stands for **Hyper Text Transfer Protocol**.
- It is a protocol used to access the data on the World Wide Web (www).
- The HTTP protocol can be used to transfer the data in the form of plain text, hypertext, audio, video, and so on.
- It follows the Client-Server Architecture , where in , a Client will send some message to the server and it will send some response in return.

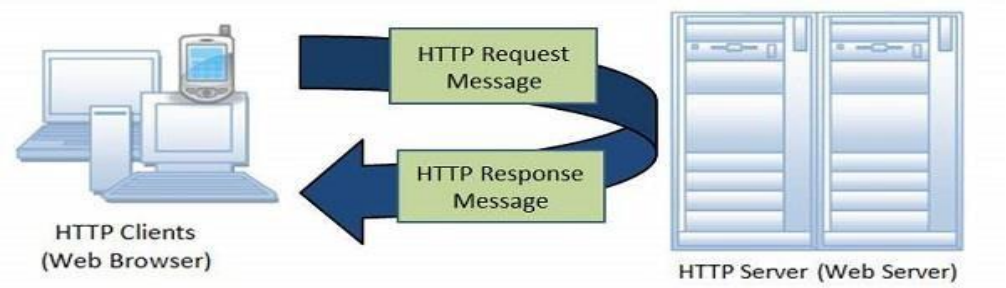
Fig. HTTP Protocol

•This protocol is known as Hyper Text Transfer Protocol because of its **efficiency** that allows a rapid jumps from one document to another document.

•HTTP is similar to SMTP as the data is transferred between client and server. The **HTTP differs** from the SMTP in the way the messages are sent from the client to the server and from server to the client. **SMTP messages are stored and forwarded while HTTP messages are delivered immediately.**

Features of HTTP

- **Connectionless protocol:** HTTP is a connectionless protocol. HTTP client initiates a request and waits for a response from the server. When the server receives the request, the server processes the request and sends back the response to the HTTP client after which the client disconnects the connection. **The connection between client and server exist only during the current request and response time only.**

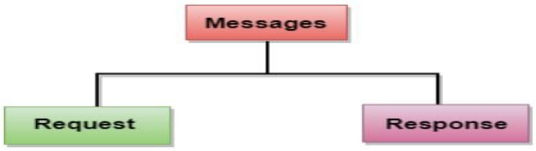


- **Stateless:** HTTP is a stateless protocol because it does not keep a relationship between the request made by the web browser and web server. **That means each time the request made by the web browser will be treated as separate.**

****Types of HTTP Messages**

- HTTP messages are of two types:
  - → **HTTP Request messages**
  - → **HTTP Response Messages**

HTTP client and Server will be communicating by sending and receiving text messages.



- Both the message types follow the same message format.

Ie, Both Request and Response message consists of 3 parts.

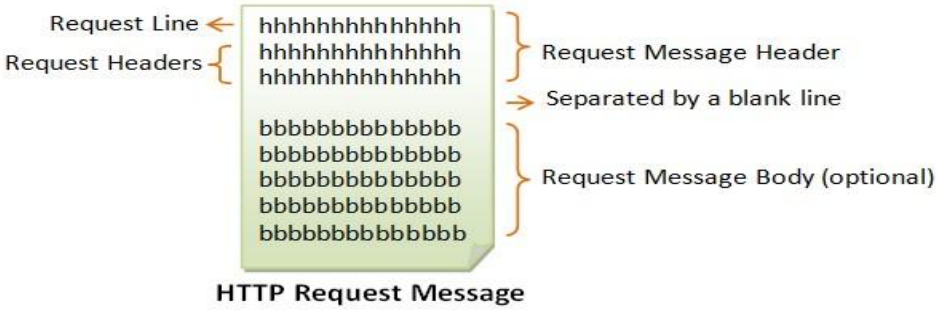
They are:

1. Message Header
2. Blank line separates t
3. he header & the body.
4. Body of the Message

****HTTP Request Messages**

Request Message: The HTTP request message is sent by the **client** that consists of 3 parts

1. A Request Message headers
2. Blank Line
3. Body of the Messages



Explanation

•An HTTP client sends an HTTP request to a server in the form of a request message with **request headers ,blank line** and **the body of the message.**

•**Request-Line**

- The first line of the Request Header is known as **Request Line.** It is having the following Format.
- The Request-Line begins with a **Request method Name**, followed by the **Request-URI** and the **protocol version**.

Syntax

Request_Method_Name Request-URI HTTP-Version

- **Request_Method_Name:-**

  The request **method** indicates the method to be performed on the resource.
- There are several Method names and client can use any of these to send message to the server.
- The method is **case-sensitive** and should always be mentioned in uppercase.

***HTTP request methods**

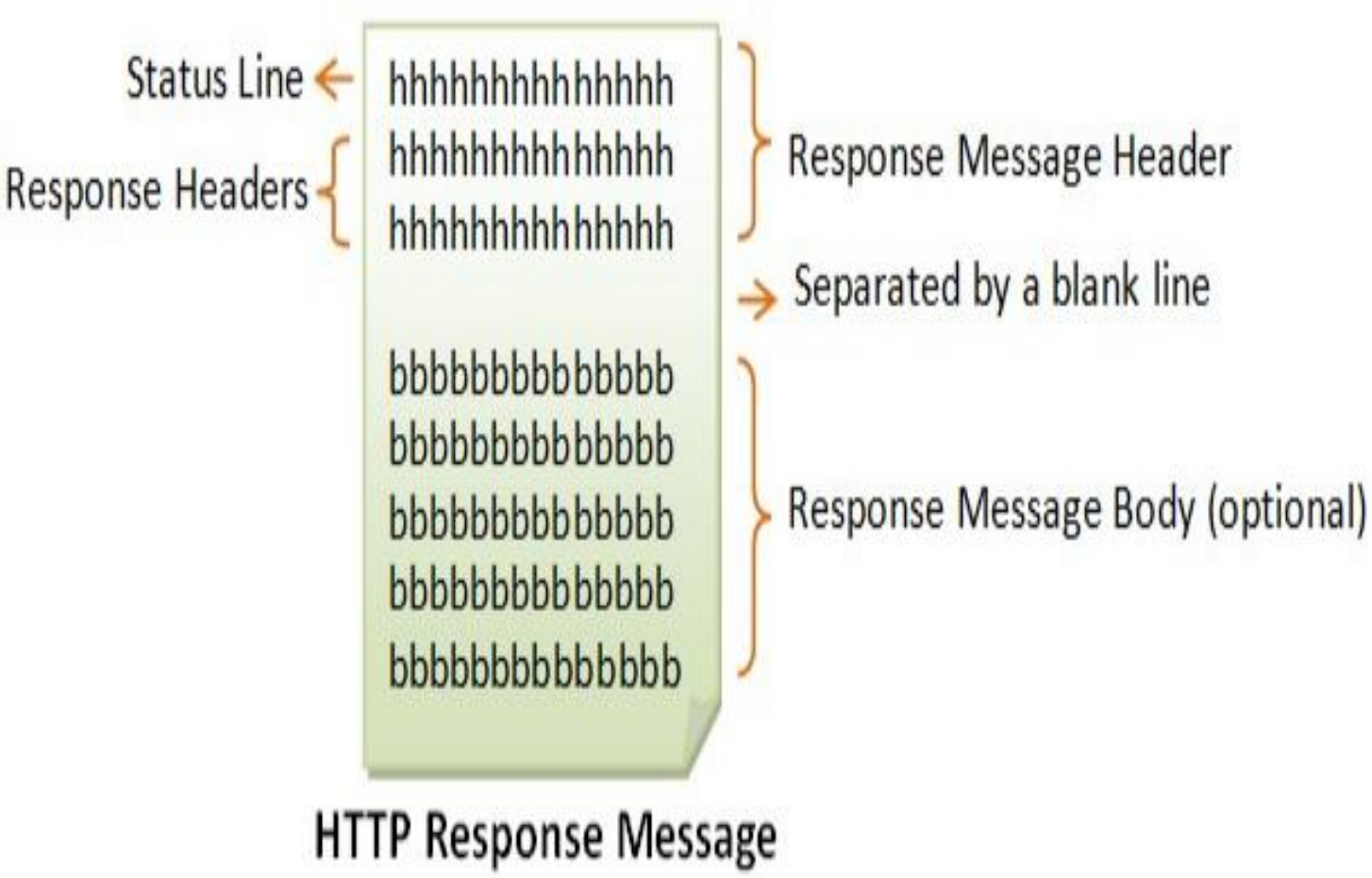
- HTTP defines a set of **request methods.**

1. GET : -The GET method requests is used to retrieve data on resource. GET_Request URI HTTP version Eg:- GET Test.html HTTP 1.1
2. HEAD : - It is used to access header section only.
3. POST : - The POST method is used to submit or post a resource. POST_Request URI HTTP Version

Eg: POST image.jpeg HTTP 1.1

4. PUT : - The PUT method replaces or stores a resource .
5. DELETE : - The DELETE method deletes the specified resource.
6. CONNECT : - The CONNECT method establishes a tunnel to the server.
7. OPTIONS : - The OPTIONS provide the list of method names.
8. TRACE : - The TRACE method is used to trace the actions of the server.

**HTTP Response Message



- HTTP response message consists of:

1. **A Response message headers**
2. **Blank Line**
3. **Body of the Messages**

The first line of the Response Message Header is known as **status line.**

Status-Line consists of the **HTTP protocol version** followed by a **numeric status code** and its associated **textual phrase**. The elements are separated by space SP characters.

HTTP-Version Status-Code Reason-Phrase

- **HTTP Version-** A server supporting HTTP version 1.1/1.0
- **Status Code-** The Status-Code element is a 3-digit integer which generate automatically by the server to reflect the outcome of the request.
- **Reason Phrase** – Is the short explanation of the status code.

Eg:- HTTP 1.1 200 Not found

HTTP 1.0 123 ok

Network Security

- **Network security** is a set of rules and configurations designed to protect the integrity, confidentiality and accessibility of computer networks.
- **Data encryption:** Is the process of converting data from a readable, plaintext format into an unreadable, encoded format.
- **Data Decryption** :Is the conversion of encrypted **data** into its original form is called **Decryption**.