

MODULE – I Introduction to Internet – The World Wide Web – Web Browsers, Web Servers, Uniform Resource locators, Multipurpose Internet mail extensions. HTTP Request Message – HTTP Response Message.

What is The Internet?

The Internet is a massive network of networks, a networking infrastructure. It connects millions of computers together globally, forming a network in which any computer can communicate with any other computer as long as they are both connected to the Internet. Information that travels over the Internet does so via a variety of languages known as protocols.

Quick Points about The Internet:

- It is a global network connecting millions of computers.
- The Internet is decentralized.
- Each Internet computer is independent.
- There are a variety of ways to access the Internet.
- There are more than 3,700,000,000 Internet Users in the world.

What is The Web (World Wide Web)?

The World Wide Web, or simply Web, is a way of accessing information over the medium of the Internet. It is an information-sharing model that is built on top of the Internet. The Web uses the HTTP protocol, only one of the languages spoken over the Internet, to transmit data. Web services, which use HTTP to allow applications to communicate in order to exchange business logic, use the the Web to share information. The Web also utilizes browsers, such as Internet Explorer or Firefox, to access Web

documents called Web pages that are linked to each other via hyperlinks. Web documents also contain graphics, sounds, text and video.

Quick Points about The Web:

- It is a system of Internet servers that support specially formatted documents.
- Documents are formatted in a markup language that supports links to other documents.
- You can jump from one document to another simply by clicking on hot spots (hyperlinks).
- Applications called Web browsers that make it easy to access the World Wide Web.
- There are more than 1,275,000,000 Websites.

Web Browser

The web browser is an application software to explore www (World Wide Web). It provides an interface between the server and the client and requests to the server for web documents and services. It works as a compiler to render HTML which is used to design a webpage. Whenever we search for anything on the internet, the browser loads a web page written in HTML, including text, links, images, and other items such as style sheets and JavaScript functions. Google Chrome, Microsoft Edge, Mozilla Firefox, and Safari are examples of web browsers.

1. Google Chrome: Developed by Google, Chrome is one of the most widely-used web browsers in the world, known for its speed and simplicity.

2. Mozilla Firefox: Developed by the Mozilla Foundation, Firefox is an open-source browser that is known for its privacy features and customization options.

3. Apple Safari: Developed by Apple, Safari is the default browser on Mac and iOS devices and is known for its speed and integration with other Apple products.

4. Microsoft Edge: Developed by Microsoft, Edge is the default browser on Windows 10 and is known for its integration with other Microsoft products and services.

5. Opera: Developed by Opera Software, Opera is a web browser that is known for its speed and built-in VPN feature.

6. Brave: Developed by Brave Software, Brave is a web browser that is focused on privacy and security and blocks third-party ads and trackers by default.

Web Server

Web server is a program which processes the network requests of the users and serves them with files that create web pages. This exchange takes place using Hypertext Transfer Protocol (HTTP).

Basically, web servers are computers used to store HTTP files which makes a website and when a client requests a certain website, it delivers the requested website to the client. For example, you want to open Facebook on your laptop and enter the URL in the search bar of google. Now, the laptop will send an HTTP request to view the facebook webpage to another computer known as the webserver.

Web Server Architecture follows the following two approaches:

- **Concurrent Approach**
- **Multi-process-Event-Driven Approach.**

Concurrent Approach

Concurrent approach allows the web server to handle multiple client requests at the same time. It can be achieved by following methods:

Multi-process

Multi-threaded

Hybrid method.

Multi-processing

Multi-threaded : Unlike Multi-process, it creates multiple single-threaded process.

Hybrid : It is combination of above two approaches. In this approach multiple process are created and each process initiates multiple threads. Each of the threads handles one connection. Using multiple threads in single process results in less load on system resources.

Multi-processing : In this a single process (parent process) initiates several single-threaded child processes and distribute incoming requests to these child processes. Each of the child processes are responsible for handling single request. It is the responsibility of parent process to monitor the load and decide if processes should be killed or forked.

Server Configuration and Tuning

- IP addresses and TCP ports that may be used to connect to this server.
- Number of subtasks (called threads in Java) that will be created when the server is initialized. This many TCP connections can be established simultaneously with minimal overhead.
- Maximum number of threads that will be allowed to exist simultaneously. If this is larger than the previous value, then the number of threads maintained by the server may change, either up or down, over time.
- Maximum number of TCP connection requests that will be queued if the server is already running its maximum number of threads. Connection requests received if the queue is full will be refused.

- Length of time the server will wait after serving an HTTP request over a TCP connection before closing the connection if another request is not received

What is a URL?

A URL (Uniform Resource Locator) is a unique identifier used to locate a resource on the Internet. It is also referred to as a web address. 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 or by clicking a hyperlink found on a webpage, bookmark list, in an email or from another application.

Parts of a URL

<https://www.techtarget.com/whatis/search/query?q=URL> as an example, components of a URL can include:

The protocol or scheme. Used to access a resource on the internet. Protocols include http, https, ftps, mailto and file. The resource is reached through the domain name system (DNS) name. In this example, the protocol is https.

Host name or domain name. The unique reference that represents a webpage. For this example, [whatis.techtarget.com](https://www.techtarget.com/whatis/search/query?q=URL).

Port name. Usually not visible in URLs, but necessary. Always following a colon, port 80 is the default port for web servers, but there are other options. For example, [:port80](https://www.techtarget.com/whatis/search/query?q=URL).

Path. A path refers to a file or location on the web server. For this example, [search/query](https://www.techtarget.com/whatis/search/query?q=URL).

Query. Found in the URL of dynamic pages. The query consists of a question mark, followed by parameters. For this example, [?](https://www.techtarget.com/whatis/search/query?q=URL).

Parameters. Pieces of information in a query string of a URL. Multiple parameters can be separated by ampersands (&). For this example, q=URL.

Multipurpose Internet Mail Extension (MIME)

It is a standard that was proposed by Bell Communications in 1991 in order to expand the limited capabilities of email.

MIME is a kind of add-on or a supplementary protocol that allows non-ASCII data to be sent through SMTP. It allows the users to exchange different kinds of data files on the Internet: audio, video, images, application programs as well.

Why do we need MIME?

Limitations of Simple Mail Transfer Protocol (SMTP):

SMTP has a very simple structure

Its simplicity however comes with a price as it only sends messages in NVT 7-bit ASCII format.

It cannot be used for languages that do not support 7-bit ASCII format such as French, German, Russian, Chinese and Japanese, etc. so it cannot be transmitted using SMTP. So, in order to make SMTP more broad, we use MIME.

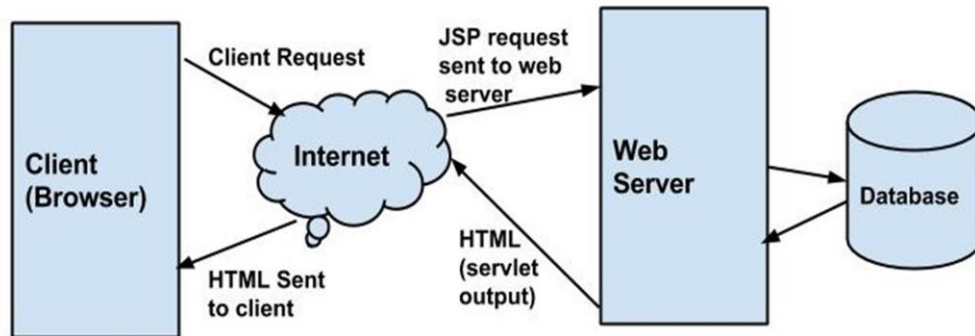
It cannot be used to send binary files or video or audio data.

Purpose and Functionality of MIME – Growing demand for Email Messages as people also want to express themselves in terms of Multimedia. So, MIME another email application is introduced as it is not restricted to textual data.

MIME transforms non-ASCII data at the sender side to NVT 7-bit data and delivers it to the client SMTP. The message on the receiver side is

transferred back to the original data. As well as we can send video and audio data using MIME as it transfers them also in 7-bit ASCII data.

HTTP Request Message - HTTP Response Message

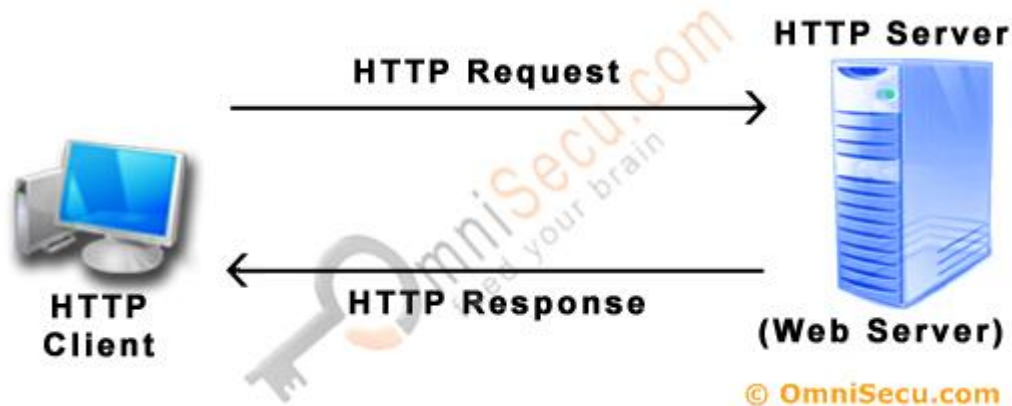


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What is HTTP?

HTTP stands for **H**yper**T**ext **T**ransfer **P**rotocol. This is a basis for data communication in the internet. The data communication starts with a request sent from a client and ends with the response received from a web server.

- A website URL starting with “http://” is entered in a web browser from a computer (client). The browser can be a Chrome, Firefox, Edge, Safari, Opera or anything else.
- Browser sends a request sent to the web server that hosts the website.
- The web server then returns a response as a HTML page or any other document format to the browser.
- Browser displays the response from the server to the user.



1) HTTP Client Request: Hypertext Transfer Protocol (HTTP) client sends an Hypertext Transfer Protocol (HTTP) Request to the Hypertext Transfer Protocol (HTTP) Server

according to the HTTP standard, specifying the information the client like to retrieve from the Hypertext Transfer Protocol (HTTP) Server.

2) HTTP Server Response: Once the Hypertext Transfer Protocol (HTTP) Request arrived at the Hypertext Transfer Protocol (HTTP) server, it will process the request and creates an Hypertext Transfer Protocol (HTTP) Response message. The Hypertext Transfer Protocol (HTTP) response message may contain the resource the Hypertext Transfer Protocol (HTTP) Client requested or information why the Hypertext Transfer Protocol (HTTP) request failed.

Web server

Web server is a computer where the web content is stored. Basically web server is used to host the web sites but there exists other web servers also such as gaming, storage, FTP, email etc.

Server Features

The primary feature of every web server is to accept HTTP requests from web clients and return an appropriate resource (if available) in the HTTP response. Even this basic functionality involves a number of steps (the quoted terms used in this list are defined in subsequent paragraphs):

1. The server calls on TCP software and waits for connection requests to one or more ports.
2. When a connection request is received, the server dedicates a “subtask” to handling this connection.
3. The subtask establishes the TCP connection and receives an HTTP request.
4. The subtask examines the Host header field of the request to determine which “virtual host” should receive this request and invokes software for this host.
5. The virtual host software maps the Request-URI field of the HTTP request start line to a resource on the server.
6. If the resource is a file, the host software determines the MIME type of the file (usually by a mapping from the file-name extension portion of the Request-URI), and creates an HTTP response that contains the file in the body of the response message.
7. If the resource is a program, the host software runs the program, providing it with information from the request and returning the output from the program as the body of an HTTP response message.