

Unit - I

1.1 Introduction to the web

The Web is an Internet-Based distributed information system. Anyone with a device which has an internet connection can easily retrieve information from the web. Internet connection is important for utilizing the web.

Understanding the Internet and World Wide Web

The Internet refers to a global network of interconnected computers and devices that communicate with each other using a common set of protocols. It is a vast network infrastructure that spans the globe, connecting millions of computers and other devices together.

History of Internet

The internet evolved from the ARPANET (Advanced Research Projects Agency Network), a US Defence Advanced Research Projects Agency. The concept of the internet emerged during the year 1960 by ARPANET. The first node to node connection was established during 1969 between UCLA and Stanford Research Institute. First message sent was “Login” but at the receiving node only “Lo” was received. In the year 1970 Robert Kahn and Vinton Cerf developed the Transmission Control Protocol and Internet Protocol, which were a major technology development in the Internet. In January 1, 1983 ARPANET adopted TCP/IP which is said to the beginning of “Network of Networks”. In

1990 Tim Berners-Lee developed the concept of World Wide Web by inventing HTTP, URIs and HTML.

World Wide Web

The World Wide Web is an information system that operates over the Internet. It is a collection of interconnected documents and other resources, linked together by hyperlinks and accessible via web browsers.

History of World Wide Web

Foundation for WWW was laid by Sir Tim Berners-Lee during the year 1980, he was a scientist working at CERN. Basic idea behind the development of WWW is to allow scientists to share and access information more easily. In 1989 HyperText Transfer Protocol (HTTP) was used for the retrieval of documents over the internet and HyperText Markup Language (HTML) was used to format the content of the documents. In 1990 Sir Tim Berners-Lee and his colleague Robert Cailliau developed the first browser called WorldWideWeb which was later renamed Nexus. It helped users to browse web pages and navigate through hypertext links. In 1991 first publicly available web pages were created. In 1993 Mosaic web browser was developed which was the first multimedia web browser. It introduced features like inline images, which made web pages more visually appealing. In 2000's search engines like Yahoo and Google emerged, which provided the user the ability to search for specific information on the web.

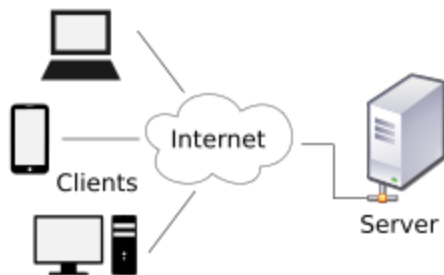
Web Architecture

Web architecture is the conceptual structure of the World Wide Web. It involves the use of technologies and protocols such as HTML, CSS, JavaScript, and HTTP to build and deliver web pages and applications to users. There major types of web architecture are given below

- Client Server Model
- Three-tier Model

Client-Server Model

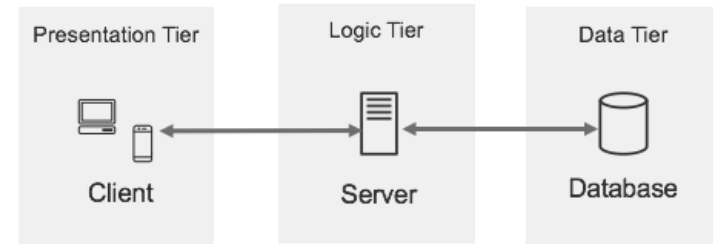
This is the initial model of the web, it is called as two-tier architecture. In this model servers provide the network service to the clients. A server is the computer that is designed to serve the requests that are made by a client. A client can be any device that requests something from the server.



Client-Server Model

Three-Tier Model

In a three tier model there are three layers: data, logic and presentation.



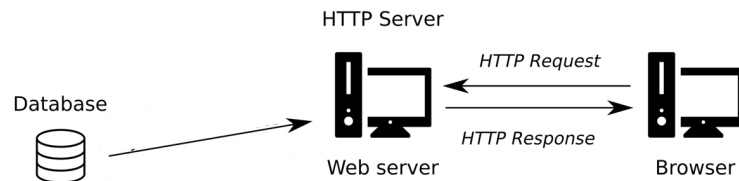
Three-Tier Model

The Presentation Tier occupies the top level of the application. Users interact directly with this tier using a browser or any other interface. It uses web development frameworks such as HTML, CSS and JavaScript. The Logic Ties also called as the middle tier is used to process the business logic of the application. It works as a bridge between the presentation tier and data tier. It is usually coded in PHP, Python, C#, JSP, etc. Data tier is composed of persistent storage. This is where the information is stored and retrieved. Data in this tier is kept independent of application server or business logic and is managed and accessed by programs, such as MySQL, Microsoft SQL server, Oracle, etc.

Web Servers

A web server is a computer or a software application that delivers web content, such as web pages, images, documents, and other resources, to clients upon receiving requests. It is a key component of the client-server model in web architecture. The primary function of a web

server is to handle incoming HTTP requests from clients, process those requests, and respond with the requested content.



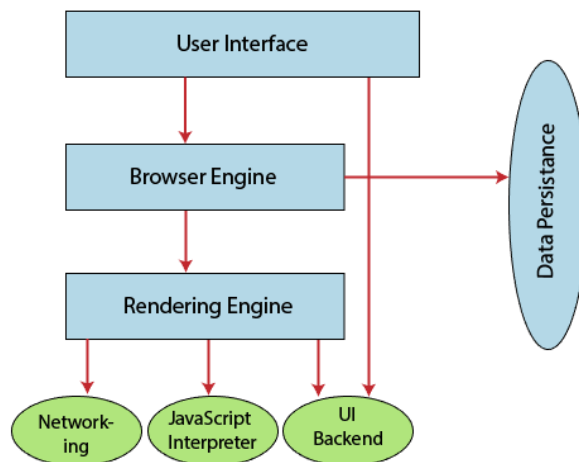
Web Server Architecture

Functions of Web Server

- Storing and Delivering Content
- Handling HTTP request
- Generating Response to HTTP request
- Managing web Applications
- Handle Multiple Clients

Web Browsers

A web browser is a software application that allows users to access, view, and interact with websites and web content on the internet.



Web Browser Architecture

It acts as a client in the client-server model of web architecture, where it sends requests to web servers and displays the received content to users. It consists of User Interface, Browser Engine, Rendering Engine and Data persistence.

- User Interface: Web browsers provide a user interface (UI) through which users can navigate the web. It has an address bar, bookmarks, tabs and other facilities.
- Browser Engine: This acts as an intermediate between UI and the Rendering engine. This handles Data Persistence.
- Rendering Engine: This is used to interpret and display HTML, CSS and JavaScript code, which make up the structure, styling and interactivity of web pages.
- Data Persistence: This manages the storage of information regarding a website on the user's computer.

Types of Web Browsers

- Mainstream Browsers
- Mobile Browsers
- Privacy Focused Browsers.

Web Applications

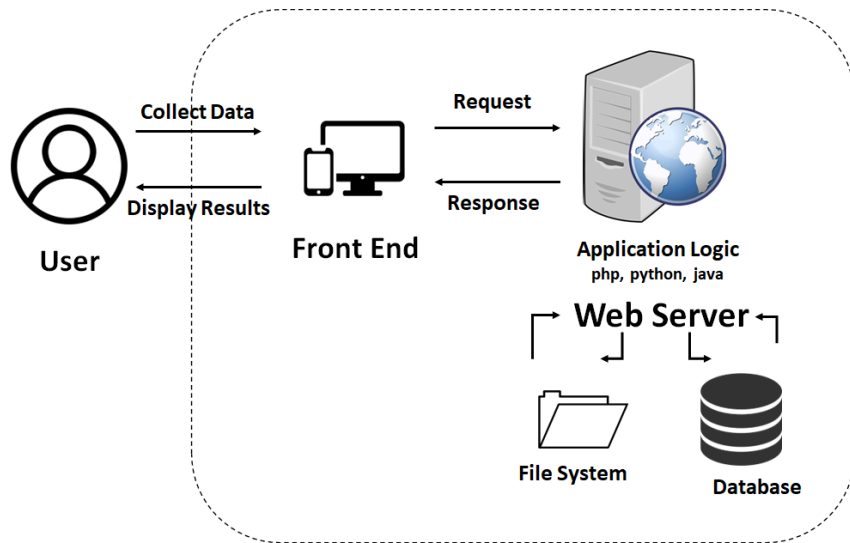
A website is a collection of files accessed through a web address, covering a particular subject, and managed by a particular person or organization. Its opening page is called a home page. There are two types of website

1. Static Website
2. Dynamic Website

Static website: The content of a static website is fixed. It can be changed only by the developer

Dynamic website: The content of the website changes based on different factors at realtime.

A web application, also known as a web app, is a software application that runs on web browsers over the Internet or an intranet. It is designed to provide interactive functionality and deliver services to users through a web interface.



Web Application Architecture

Frontend: This consists of UI/UX elements that the end user sees and interacts with. The visual features of the frontend include layouts, notifications, activity tracking, etc.

Backend: This handles the business logic that is required to run the application. It manages the application by reacting properly to HTTP requests and sending proper responses.

Advantages of Web Applications

- Cross-platform compatibility
- Easy Deployment
- Centralized data management
- Accessibility and Convenience
- Collaboration
- Cost effective

Disadvantages of Web Applications

- Internet Connectivity is required
- Not all Browser support a web application
- Only Limited Device Functionality can be used
- Has limited Performance

1.2 HTML Basics

HTML stands for Hyper Text Markup Language. It was created by Tim Berners-Lee in 1991 and officially released for the public in 1995. It is a markup language that uses tags.

History of HTML

HTML is the standard markup language used to create web pages and web applications. It allows developers to structure content on the internet by using a system of tags and elements. HTML history can be explained based on the HTML versions available.

HTML Versions

- **HTML1.0 (1991)**: It was the initial version of HTML created by Tim Berners-Lee. It is used as a simple language for structuring and linking documents. It consists of basic elements such as heading, paragraphs, lists and links.
- **HTML2.0 (1995)**: This version introduced elements like tables, image embedding, and form controls.
- **HTML3.0 (1996)**: During this version release each browser's developers created their own tags and structure specific for their browsers. This resulted in inconsistency in viewing the webpage in all the browsers.
- **HTML3.2 (1997)**: This version included features like frames, applets, and text flow around images. This version also introduced text formatting and web page designing using CSS.
- **HTML4.01 (1999)**: This version introduced the concept of standardization of HTML. It introduced features like style sheets and scripting.
- **HTML5 (2014)**: This version introduced semantic elements and responsive designing of HTML.

World Wide Web Consortium

The World Wide Web Consortium (W3C) is an international community that develops and promotes standards and guidelines for the World Wide Web. W3C enables collaboration between organizations such as Apple Inc, Google LLC, Microsoft Corporation, Mozilla Corporation, etc.

Functions of W3C

Important functions of W3C are listed below

- Standardization of HTML versions
- Specification Development for each version of HTML
- Guidelines for HTML usage
- Research and Development of HTML
- Testing and Validation of HTML New Version
- Collaboration

HTML Editors

HTML editors are software tools designed to assist in the creation, editing, and management of HTML (Hypertext Markup Language) documents. Some common types of editors are

- **Text Editors**: These are basic editors that allow you to write and edit HTML code. They often lack advanced features like syntax highlighting and auto-completion. Example Notepad
- **IDE(Integrated Development Environments)**: IDE has various tools for web development, that includes HTML code editing, debugging, version control, and more. They include code completion, syntax highlighting, and etc. Example VSCode
- **WYSIWYG (What You See Is What You Get) Editors**: They provide a visual interface for creating web pages without directly writing HTML code. Users can design pages by dragging and dropping elements and visually adjusting their properties. WYSIWYG editors generate HTML code in the background. Example BlueGriffon

- **Online HTML Editors:** These editors run in web browsers and allow you to edit HTML code directly within the browser window. They are useful for quick edits or when you don't have access to a dedicated software tool. Example: JSFiddle

HTML Basics

An HTML document consists of tags. Each tag represents an HTML element. HTML Elements may have attributes or not. Attributes are properties that are specific to an HTML element.

Elements

Elements are the building blocks of HTML documents. Each element defines individual components of the web page. Elements are defined using tags. Most of the elements have a starting and ending tag. There are two types of elements

- **Block Element** - These types of elements are displayed for the full width of the page and always start in a new line.
- **Inline Element** - These types of elements do not start in a new line and take only the width that is necessary.

Tags

Tags define where an element starts and ends in a HTML document. Most of the HTML elements have a start and end tag. Start tag has the element name enclosed within < >. End tag is enclosed within < /> and has a '/' before the element name.

Example

```
<html> </html>
```

Attributes

Attributes are additional properties that are used to modify the property of an HTML element. It has two parts “attribute_name” that defines the property and “value” that provides the value for the property.

There are three types of attributes

1. **Required attribute:** These attributes are necessary for an element
2. **Optional attribute:** These attributes are not compulsory for an element
3. **Event attribute:** These attributes are defined for the event that occur on an element

Example

```
<element attribute="value">
    Element Content
</element>
```

Basic Structure: Basic HTML Page

An HTML page is created using HTML tags. Most of the HTML tags have an opening and closing tag. An example for the basic HTML page is given below

```
<!DOCTYPE html>
<html>
  <head>
    <title>First Web Page</title>
  </head>
  <body>
    <h1>Welcome</h1>
```

```
<p>This is My First web page</p>
</body>
</html>
```

Basic HTML page consists of the following elements

1. DOCTYPE
2. html
 - a. head
 - b. body

<!DOCTYPE>

It is the first element on a webpage. This informs the browser about the version of the HTML used and how the HTML document should be processed. It must be given in all the HTML documents.

<html>

It is the root element of the HTML document. It acts as a container that wraps all the elements of the HTML document. HTML tag contains two important tags <head> and <body>.

```
<html>
...
...
</html>
```

<head>

Head tag contains information about the page. The contents given in the head tag is not visible on the webpage. The elements that can be given within the head tag are

- Title

- Meta
- Script
- Style

Title element is the only element that is required within the head tag. Meta element gives information about the webpage. Script element provides scripting code which is used for implementing interactions. Style element is used to provide CSS styling rules for the elements in the page.

<body>

In a HTML page there must be only one body element. This contains the content that is visible to the user on a browser.

Basic Tags: Comments

Comments are used to provide information about the webpage. It is used for documentation purposes. The content given within the comment tags are not displayed on the browser. It is also used to disable or hide a particular content on the webpage.

Syntax

```
<!-- Comments -->
```

Example

```
<!DOCTYPE html>
<html>
  <head>
    <!-- This is the title of the Web Page-->
    <title>Comments Example</title>
  </head>
  <body>
    <!-- This page Explains the use
    of Comments-->
    <!--
```

```

    <h1>Sample Heading</h1>
    -->
    This Page contains comments.
</body>
</html>

```

Formatting of Text

Heading

HTML header tag is used to display heading text in a web page. It has 6 levels of heading starting from 1-6. h1 is largest heading and h6 is smallest heading

Syntax

```
<h1> Text </h1>
```

Bold

HTML Bold tag is used to display the text given within the tag as bold text.

Syntax

```
<b> Text </b>
```

Italics

Italics tag is used to display text given within the tag as italicized text.

Syntax

```
<i> Text </i>
```

Underline

Underline tag is used to display text given in the tag with an underline.

Syntax

```
<u> Text </u>
```

Strikethrough

Strikethrough tag is used to display text given in the tag with a strikethrough

Syntax

```
<strike> Text </strike>
```

BR tag

HTML BR tag is used to provide line break in HTML page.

Syntax

```
<br>
```

Example

```

<!DOCTYPE html>
<html>
  <head>
    <title>Formatting Tags</title>
  </head>
  <body>
    <h1><u>Formatting tags</u></h1>
    <p>In this <b>text</b> <i>various</i> <u>Text</u>
    <strike>formatting</strike> tags are <br> explained</p>
  </body>
</html>

```

Font

Font tag is used to set font for the text given within the tag. It can be used multiple times in a webpage.

Syntax

```
<font face = "" color = "" size = "">
```

Text value

```
</font>
```

This tag has three attributes

1. face

This attribute is used to provide the font name with which the webpage will be displayed.

2. color

This attribute is used to provide color for the text. It can have Color Name, rgb() or HEXCODE.

3. size

This attribute is used to provide font size. Values from 1-7 are used. 1 indicates small size and 7 indicates large size.

HTML Background Colors

In HTML color can be added to the background of an element. In an HTML element “bgcolor” attribute is used to apply background color to that element.

Syntax

```
<tag bgcolor=“color_value”> </tag>
```

“color_value” is specified using one of the following three types.

1. COLOR Name

Color names are text values that specify a color. Color names such as RED, GREEN, BLUE, YELLOW, etc are used to provide color.

2. HEX Code

A hexadecimal Color Code (HEX code) is provided with the form #RRGGBB, where RR (red), GG (green) and BB (blue) specify the color using hexadecimal values. Each component can have values from 00-FF.

Example

Red Color - #FF0000

Green Color - #00FF00

Blue Color - #0000FF

Black Color - #000000

White Color - #FFFFFF

3. RGB Value

Color is generated as a combination of Red, Green and Blue values. In this rgb(r,g,b) function is used with red, green and blue color parameters. Each parameter can have value in the range 0-255.

Example

Red Color - rgb(255,0,0)

Green Color - rgb(0,255,0)

Blue Color - rgb(0,0,255)

Black Color - rgb(0,0,0)

White Color - rgb(255,255,255)

Working with Images

In HTML tag is used to insert an image into a webpage. Image specified in the tag is linked to the page and when a user views the page the image is rendered on the browser.

Syntax

```
<img src= “” alt= “” width= “” height= “”/>
```

Image tag has three attributes

1. src

This attribute is used to provide the source link of the image.

2. alt

This attribute is used to provide a text that will be shown if the image is not available

3. width/height

These attributes are used to provide the size of the image.

Example

```
<!DOCTYPE html>
<html>
  <head>
    <title>Image</title>
  </head>
  <body>
    <h1>Image Tag</h1>
    <p>First Image</p>
    
  </body>
</html>
```




HTML Symbols

In HTML reserved characters and special characters cannot be used directly. Instead “Entity Names” are used to represent the symbols. Some of the symbols and their entity names are given below

Symbol	Description	Entity Name
“	quotation mark	"
‘	apostrophe	'
&	ampersand	&
<	less-than	<
>	greater-than	>
©	Copyright	©
	Blankspace	

HTML Emojis

Emojis are small images that are used to express ideas. Emojis are characters from the UTF-8 character set. Some of the emojis and their entity names are given below

Emoji	Description	Entity Name
	Hour Glass	⌚
	laughing	😀
	Sad	🙁

Common Tags in HTML Head

HTML Head tag acts as a container for data about the HTML page. The following tags are some of the common tags in HTML head

- **<title>**
Title tag is used to define the title of the document. It must be text and it is shown in the browser’s title bar.
- **<meta>**
Meta tag defines the metadata about the HTML document. Metadata is Information about Data. It does not have a closing tag. One or more meta tags can be added to the head tag. Contents of meta tags are not displayed on the page. Meta tags are used by search engines.

Syntax

```
<meta name= “” content= “”/>
```

It has two important attributes

1. name: It can have three values: keywords, description or author.

2. content: It contains the content for each name value.

Example

```
<!DOCTYPE html>
<html>
  <head>
    <title>Meta Tags</title>
    <meta charset="UTF-8" />
    <meta name="keyword" content="html,css" />
    <meta name="description" content="learn HTML Meta Tag"
  />
    <meta name="author" content="Natarajasivan" />
  </head>
  <body>
    <h1>Meta Tags Explained</h1>
    <p>Meta tag helps Search Engines to process page</p>
  </body>
</html>
```

- **<style>**

Style tag is used to define style information for the document.

- **<link>**

Link tag is used to define a relationship between a current document and an external resource. It is mostly used to add external style sheets.

- **<script>**

Script tag is used to add Client-Side script to the HTML Document. Scripts are mostly used for form validation and dynamic changes of the content.