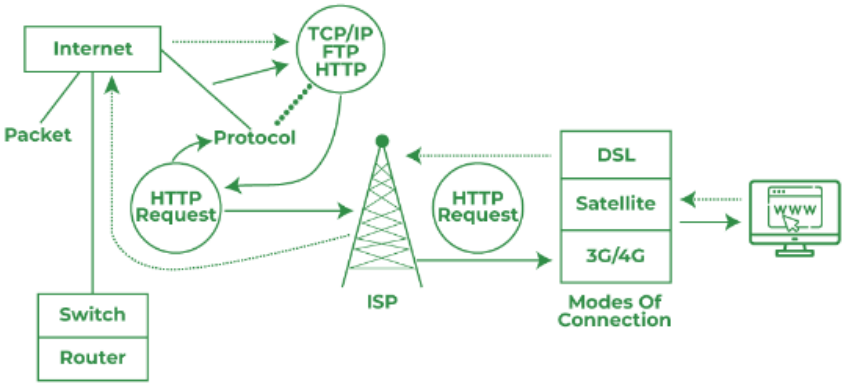
WEB ASSIGNMENT

1) How Internet works

The internet is a global network of networks that allows computers and other devices to communicate and share information worldwide. It consists of a vast number of private, public, academic, business, and government networks interconnected through a wide array of electronic, wireless, and optical networking technologies. The internet enables various services such as email, web browsing, file sharing, online gaming, and social networking.

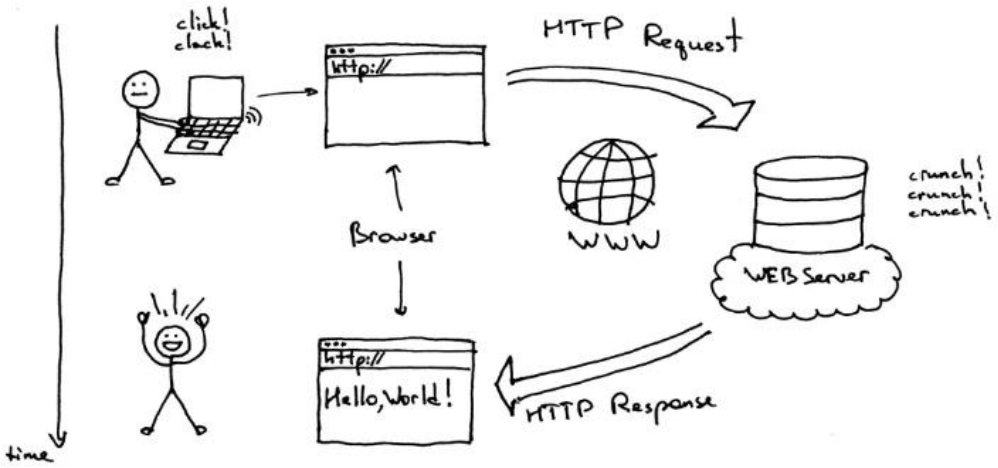


Internet Working Metrics

1. Firstly, you'll be required to connect your system or PC with any router or modem to establish a connection. This connection is the base of the internet connection.
2. When you open the browser and start typing something like "www.google.com", your system will push a query command to your ISP (Internet Service Provider) that is connected with other servers that store and process data.
3. Now, the web browser will start indexing the URL that you've entered and will fetch the details in numeric format (in their language to identify the address (unique) that you're trying to reach.
4. Next, now your browser will start sending the HTTP request where you're trying to reach and send a copy of the website on the user's system. **Note:** The server will send data in the form of small packets (from the website to the browser)
5. Once all the data (of small packets) is received at the user's end (PC/Laptop), the browser will start arranging all those small packets and later will form a collective file (here, the browser will gather all the small packets and rearrange them just like a puzzle) and then you'll be able to see the contents of that website

2) How web Browser works?

Browsers are responsible for retrieving and displaying web content to users. When a user enters a URL or clicks on a link, the browser initiates a complex series of actions to retrieve the web content from a server and display it on the user's device.

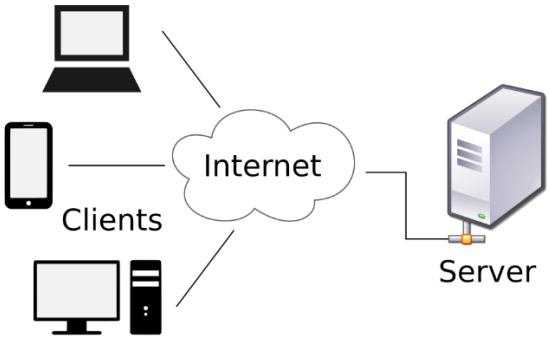


The process begins with Domain Name System (DNS) resolution, where the browser translates the domain name into an IP address to locate the server where the web page is stored.

- The browser then sends an HTTP request to the server, specifying the path and parameters of the requested resource.
- Once the server receives the request, it sends an HTTP response to the browser containing the requested resource in HTML, CSS, and JavaScript code.
- The browser's rendering engine interprets and renders the code to display the web page on the user's device.
- The CSS stylesheets are applied to format the web page's content, including fonts, colors, and layout.
- The browser may also execute JavaScript code on the web page to add interactivity and dynamic behavior.

3) What is server?

A server is a hardware device or software that processes requests sent over a network and replies to them. A client is the device that submits a request and waits for a response from the server. The computer system that accepts requests for online files and transmits those files to the client is referred to as a "server" in the context of the Internet.



4) What are types of servers available?

1. Application Server

These servers host web apps (computer programs that run inside a web browser) allowing users in the network to run and use them preventing the installation of a copy on their own computers. These servers need not be part of the World Wide Web. Their clients are computers with a web browser.

2. Catalog Server

These servers maintain an index or table of contents of information that can be found across a large distributed network. Distributed networks may include computers, users, files shared on file servers, and web apps. Examples of catalog servers are directory servers and name servers. Their clients are any computer program that needs to find something on the network. An example can be a domain member attempting to log in, an email client looking for an email address, or a user looking for a file

3. Communication Server

These servers maintain an environment needed for one communication endpoint to find other endpoints and then communicate with them. These servers may or may not include a directory of communication endpoints and a presence detection service, depending on the openness and security parameters of the network. Their clients are communication endpoints.

4. Computing Server

These servers share vast amounts of computing resources which include CPU and random-access memory over a network. Any computer program that needs more CPU power and RAM than a personal computer can probably afford can use these types of servers. The client must be a networked computer to implement the client–server model which is a necessity.

5. Database Server
These servers maintain and share any form of database over a network. A database is an organized collection of data with predefined properties that may be displayed in a table. Clients of these servers are spreadsheets, accounting software, asset management software, or virtually any computer program that consumes well-organized data, especially in large volumes.

6. Fax Server
These servers share one or more fax machines over a network which eliminates the hassle of physical access. Any fax sender or recipient is the client of these servers.

7. File Server
Shares files and folders, storage space to hold files and folders, or both, over a network. Networked computers are the intended clients, even though local programs can be clients.

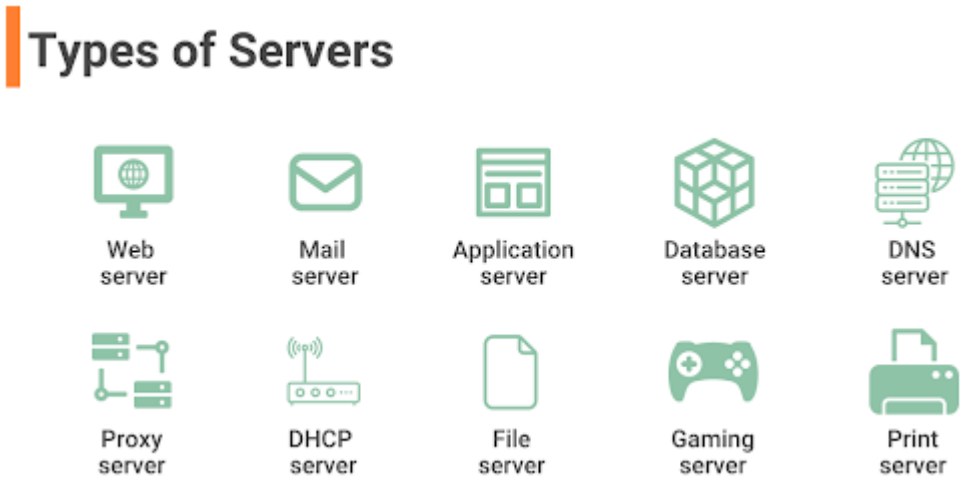
8. Game Server
These servers enable several computers or gaming devices to play multiplayer games. Personal computers or gaming consoles are their clients.

9. Mail Server
These servers make email communication possible in the same way as a post office makes snail mail communication possible. Clients of these servers are senders and recipients of email.

10. Print Server
These servers share one or more printers over a network which eliminates the hassle of physical access. Their clients are computers in need of printing something.

11. Proxy Server
This server acts as an intermediary between a client and a server accepting incoming traffic from the client and sending it to the server. Reasons to use a proxy server include content control and filtering, improving traffic performance, preventing unauthorized network access, simply routing the traffic over a large and complex network. Their clients are any networked computer.

12. Web Server
These servers host web pages. A web server is responsible for making the World Wide Web possible. Each website has one or more web servers. Their clients are computers with a web browser.



5) What is SEO? Importance of SEO?

SEO stands for Search Engine Optimization. It refers to the practice of optimizing your website and its content to rank higher in search engine results pages (SERPs) organically (i.e., without paying for placement through ads). The goal of SEO is to increase the quantity and quality of traffic to your website through organic search engine results.

Importance of SEO:

- Increased Visibility and Branding: SEO helps your website rank higher in search engine results, making it more likely that users will click on your link over competitors. This increased visibility can lead to more brand exposure and recognition.

- More Organic Traffic: Organic search is a primary source of website traffic. By optimizing your site's SEO, you can attract more targeted traffic to your website from users who are actively searching for products, services, or information related to your business.

- Cost-Effective Marketing: Compared to paid advertising, SEO can provide a relatively low-cost way to attract traffic to your website over the long term. While it requires an initial investment of time and resources, good SEO practices can continue to pay off in terms of traffic and leads.

- Better User Experience: SEO involves making your website more navigable, faster, and easier to use. This not only helps search engines to index your site easily but also improves the user experience, leading to higher engagement and conversions.

- Long-Term Strategy: SEO is a long-term strategy that, when done effectively, can continue to provide benefits over time. Unlike paid advertising, which stops generating traffic as soon as you stop paying, organic traffic from SEO can persist if your site maintains its ranking.

- Builds Credibility and Authority: Websites that rank higher in search engine results are often perceived as more credible and authoritative by users. By consistently providing valuable content and optimizing your site for SEO, you can build trust with your audience.

- Measurable Results: SEO efforts can be tracked and analyzed using tools like Google Analytics. This allows you to measure the impact of your SEO strategies on metrics such as traffic, conversions, and ROI, and make adjustments as needed to improve performance.

6) What is Accessibility

Web accessibility means that websites, tools, and technologies are designed and developed so that people with disabilities can use them. More specifically, people can:

- perceive, understand, navigate, and interact with the Web
- contribute to the Web

Web accessibility encompasses all disabilities that affect access to the Web, including:

- auditory
- cognitive
- neurological

- physical
- speech
- visual

Web accessibility also benefits people without disabilities, for example:

- people using mobile phones, smart watches, smart TVs, and other devices with small screens, different input modes, etc.
- older people with changing abilities due to ageing
- people with “temporary disabilities” such as a broken arm or lost glasses
- people with “situational limitations” such as in bright sunlight or in an environment where they cannot listen to audio
- people using a slow Internet connection, or who have limited or expensive bandwidth

7) What is Markup Language?

A computer language that consists of easily understood keywords, names, or tags that help format the overall view of a page and the data it contains. Some examples of a markup language are BBC, HTML, SGML (standard generalized markup language), and XML (extensible markup language).

Example segment of HTML (Hypertext Markup Language) code that creates bold text on a web page.

Example of bold in HTML.

8) What is HTML?

- HTML stands for Hyper Text Markup Language
- HTML is the standard markup language for creating Web pages
- HTML describes the structure of a Web page
- HTML consists of a series of elements
- HTML elements tell the browser how to display the content
- HTML elements label pieces of content such as "this is a heading", "this is a paragraph", "this is a link", etc.

  Example

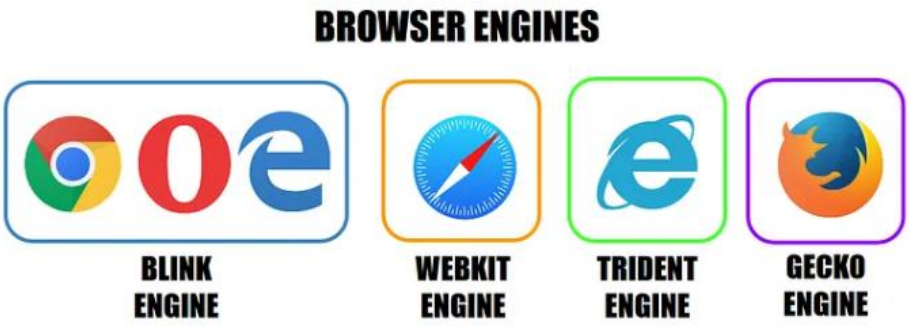
```
<!DOCTYPE html>
<html>
<head>
<title>Page Title</title>
</head>
<body>

<h1>My First Heading</h1>
<p>My first paragraph.</p>

</body>
</html>
```

9) What is browser engine?

A browser engine is a core software component of every major web browser. The primary job of a browser engine is to transform HTML documents and other resources of a web page into an interactive visual representation on a user's device. The engine combines all relevant CSS rules to calculate precise graphical coordinates for the visual representation it will show on the screen. To complete the process, the engine makes the necessary system calls.



10) What is rendering engine? share the available rendering engine?

A rendering engine, also known as a layout engine, is a core component of web browsers responsible for rendering the content of web pages. It interprets HTML, CSS, JavaScript, and other web technologies to display the visual elements of a webpage on your screen. Here are some of the notable rendering engines:

- **Blink:**

Used By: Google Chrome, Microsoft Edge (Chromium-based), Opera.
Description: Blink is a fork of WebKit, created by Google after they originally used WebKit for Chrome. It prioritizes speed, security, and stability.

- **Gecko:**

Used By: Mozilla Firefox.
Description: Gecko is developed by Mozilla and is known for its flexibility, standards compliance, and extensibility. It powers Firefox's rendering and layout capabilities.

- **WebKit:**

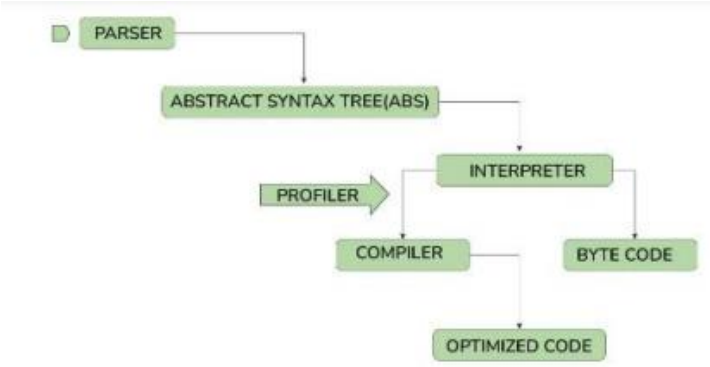
Used By: Apple Safari (on macOS and iOS), formerly used by Google Chrome before it switched to Blink.
Description: WebKit is an open-source engine primarily developed by Apple. It focuses on providing a fast, stable, and secure browsing experience.

- **Trident:**

Used By: Older versions of Microsoft Internet Explorer (up to IE11).
Description: Trident was developed by Microsoft and was used in Internet Explorer for rendering web content. It has been largely superseded by Microsoft Edge (which uses Blink) as the default browser on Windows.

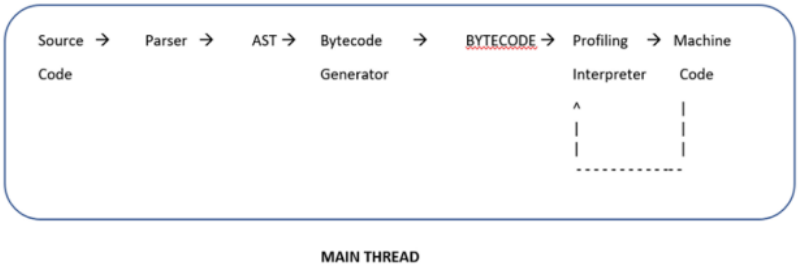
11) What is JavaScript Engine? share the available JS engine? Purpose of JS Engine?

JavaScript is a scripting language and is not directly understood by computer but the browsers have inbuilt JavaScript engine which help them to understand and interpret JavaScript codes. These engines help to convert our JavaScript program into computerunderstandable language. A JavaScript engine is a computer program that executes JavaScript code and converts it into computer understandable language.

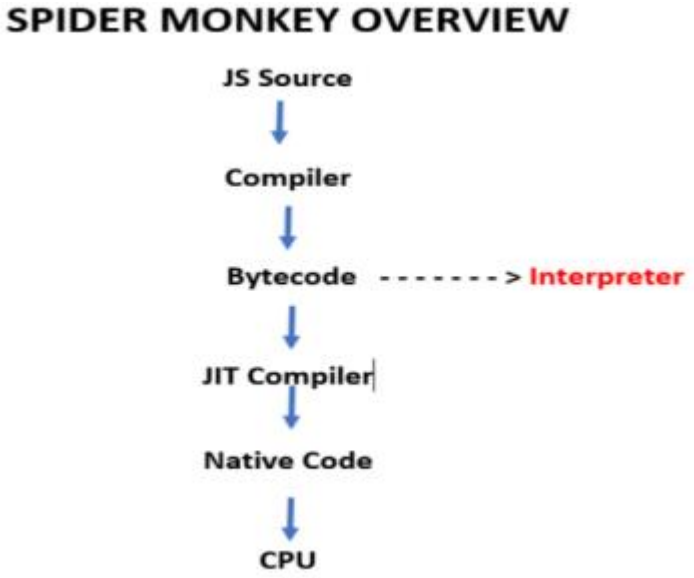


Browser	Name of Javascript Engine
Google Chrome	V8
Edge (Internet Explorer)	Chakra
Mozilla Firefox	Spider Monkey
Safari	Javascript Core Webkit

- **V8:**
  V8 is a JavaScript engine developed by the Chromium Project for Google Chrome and Chromium web browsers. It is a JavaScript engine that can run standalone, or be embedded into any C++ application. Using its own parser, it generates an abstract syntax tree. Then, Ignition generates bytecode from this syntax tree using the internal V8 bytecode format. Bytecode is compiled into machine code by TurboFan. It also handles memory allocation for objects, and garbage collects objects it no longer needs. Optimization techniques such as elision of expensive runtime properties, and inline caching. The garbage collector is a generational incremental collector. V8 provides an edge as it allows JavaScript to run much faster, which improves users' experience of the web, paves the way for the development of web applications, and spurs rapid growth of server-side JavaScript through projects like Node.js.
- **Chakra:**
  Chakra is a JScript engine developed by Microsoft. It is proprietary software. It is used in the Internet Explorer web browser. A distinctive feature of the engine is that it JIT compiles scripts on a separate CPU core, parallel to the web browser.

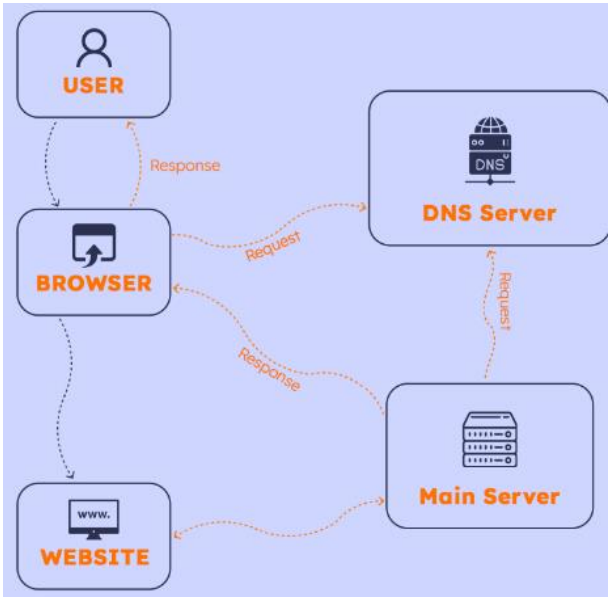


- **Spider Monkey:**
  SpiderMonkey is the first JavaScript engine, written by Brendan Eich at Netscape Communications, later released as open-source and currently maintained by the Mozilla Foundation. It is still used in the Firefox web browser.



- **Webkit:**
  WebKit is developed by Apple and used in its Safari web browser, as well as all iOS web browsers. It is used by the BlackBerry Browser, PlayStation consoles beginning from the PS3, the Tizen mobile operating systems, and a browser included with the Amazon Kindle e-book reader. WebKit's C++ Application Programming Interface (API) provides a set of classes to display Web content in windows and implements browser features such as following links when clicked by the user, managing a back-forward list, and managing a history of pages recently visited.
  Key tasks of a JS engine include:
- Parsing: The engine reads and parses the JavaScript code to understand its syntax and structure.
- Compilation: The engine may compile the parsed code into an intermediate representation or directly into machine code for faster execution.
- Optimization: Modern JS engines often employ various optimization techniques to improve the performance of JavaScript code. This can include inline caching, just-intime (JIT) compilation, and other optimizations based on runtime profiling.
- Execution: Once optimized, the engine executes the JavaScript code, performing calculations, manipulating data, interacting with the browser's Document Object Model (DOM), handling events, and more.
- Memory Management: JS engines manage memory allocation and deallocation to ensure efficient use of resources.
  Popular JS engines include V8 (used in Chrome and Node.js), SpiderMonkey (used in Firefox), JavaScriptCore (used in Safari), and Chakra (used in older versions of Microsoft Edge).
  Overall, JS engines play a crucial role in making JavaScript a powerful and versatile language for developing both client-side and server-side applications on the web.

12) How website works?

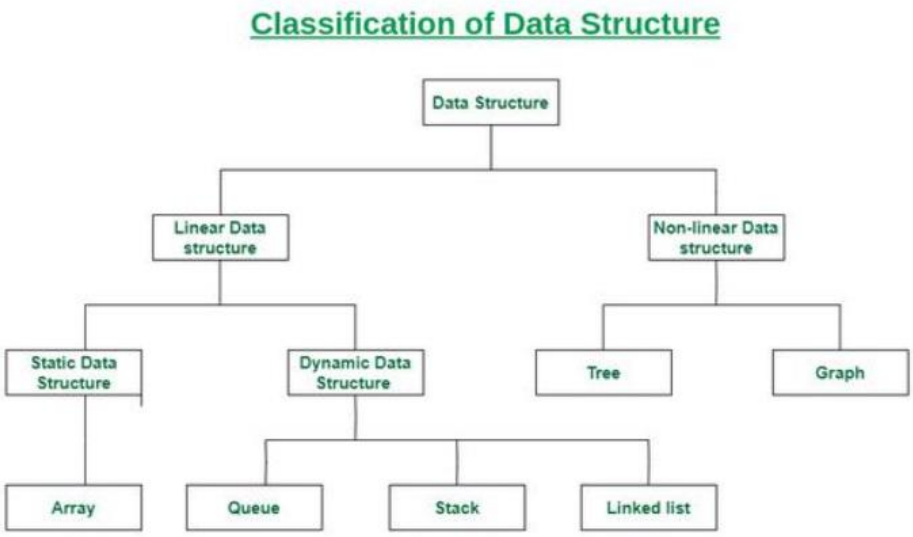


The process is quite simple. Firstly, you enter a domain name or a website address in the search bar. Then the browser passes the request to DNS Server. DNS server acts as an address directory. It converts the human-readable address to a machine-readable address i.e. the IP address of the Website address to a machine-readable address i.e. the IP address of the website.
Then it passes the request to the main server or the server where your site is stored. Then the server provides the response to the browser and now you are able to access the website. The whole process takes hardly 1 or 2 seconds.
A website is a collection of web pages which store information in form of text, pictures, videos, animation, or any other form. A website needs a hosting server to host it or store its data. The domain name is basically the name of the website which helps a user to find the address of the website. And below is the whole process for the functioning of a site –

- A user enters a domain name into the search bar of the browser.
- The browser passes the request to the DNS Server which converts the domain name into the IP address of the site.
- Then DNS Server passes the request to the main server where the website is stored.
- And the main server now sends the response to the web browser or to the user.
- The user is now able to view the site.

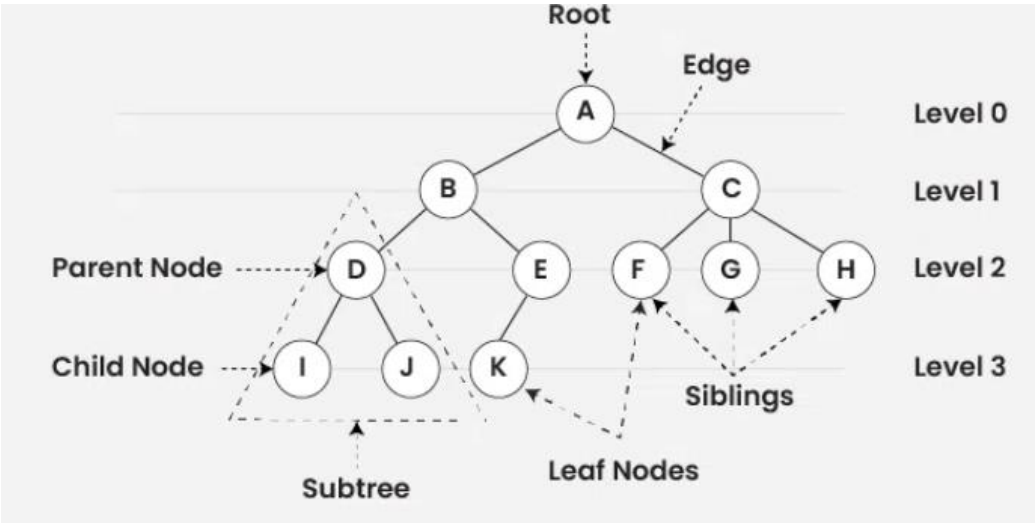
13) What is Data Structure?

A data structure is a way of organizing, managing, and storing data in a computer so that it can be accessed and used efficiently. In simpler terms, it's a way to organize and store data in a computer's memory or disk to facilitate efficient operations on that data.



14) Explain Tree Data Structure?

Tree data structure is a specialized data structure to store data in hierarchical manner. It is used to organize and store data in the computer to be used more effectively. It consists of a central node, structural nodes, and sub-nodes, which are connected via edges. We can also say that tree data structure has roots, branches, and leaves connected.



15) What is user agent? share the list and its purpose?

A user agent is a string of text transmitted by a web browser or other client application to identify itself to a web server. This string includes various details about the software and hardware that the client is using to access the web. The user agent string allows websites and servers to deliver content and services tailored to the specific capabilities and characteristics of the client device.

Purpose of User Agent:

- Content Adaptation: Websites can use the user agent string to adapt their content and layout based on the capabilities and limitations of the client device (e.g., screen size, supported technologies).

- Feature Detection: Web developers can use the user agent to detect specific features and capabilities supported by the client browser, enabling them to provide alternative content or functionality when necessary.

- Analytics and Statistics: User agent strings can be used for analytics purposes to track the types of devices and browsers accessing a website, which helps in understanding user demographics and optimizing user experience.

- Browser Compatibility: User agents help in determining browser compatibility and support for various web standards and technologies, allowing developers to ensure their websites work correctly across different browsers.

Examples of User Agent Strings:

- Google Chrome:
  Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/91.0.4472.124 Safari/537.36
- Mozilla Firefox:
  Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:89.0) Gecko/20100101 Firefox/89.0
- Apple Safari:
  Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/15.0 Safari/605.1.15
- Microsoft Edge:
  Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/91.0.4472.124 Safari/537.36 Edg/91.0.864.59

16) What is Hypertext?

Hypertext is a kind of specially-formatted text that provides a link to other content. Hypertext allows system designers to organize information in a branching structure instead of a linear one. Clicking a hypertext link (called a hyperlink) will send the user to another part of the current document or a separate document entirely. Hypertext links are a fundamental building block of the Internet, allowing users to navigate in a web browser from page to page and from site to site.

17) What is HTML Tags?

HTML tags are composed of an opening tag, content, and a closing tag. The opening tag marks the beginning of an element, and the closing tag marks the end. The content is the information or structure that falls between the opening and closing tags.

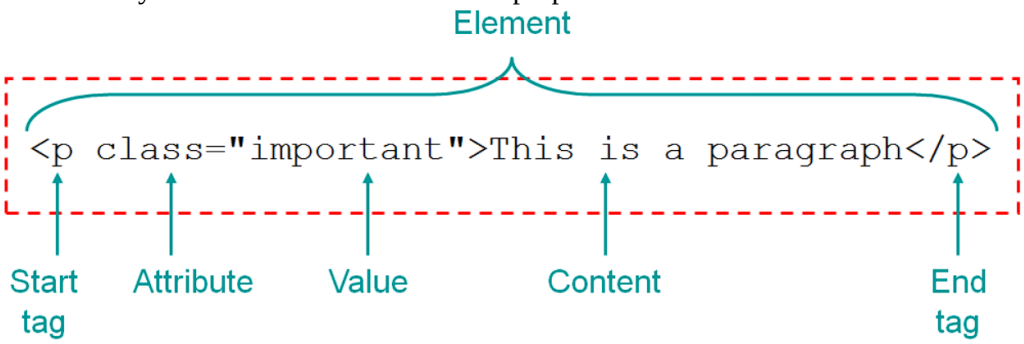
Tag Name	Description
<html> Tag	The <html> tag is the root element of an HTML document. It encapsulates the entire content of the page.
<head> Tag	The <head> tag contains meta-information about the HTML document, such as the title, links to stylesheets, and character set declaration.
<body> Tag	The <body> tag encloses the main content of the HTML document, including text, images, links, and other elements.
Heading Tags <h1> to <h6>	Heading tags are used to define headings in HTML, ranging from <h1> as the largest to <h6> as the smallest.
Paragraph Tag <p>	The <p> tag is used to define paragraphs of text.
Anchor Tag <a>	The <a> tag creates hyperlinks. The href attribute specifies the URL of the linked page.
Image Tag <img>	The <img> tag is used to embed images. The src attribute specifies the image file.
List Tags , ,	HTML supports both unordered lists ( ) and ordered lists ( ), with list items ( ) defining each list item.
bold Tag <b>	The bold tag in HTML is used to specify the bold text without any extra importance.

18) What is HTML Attributes?

HTML attributes provide additional information about elements within an HTML document. Every HTML element can have attributes. Attributes are always defined in the start tag. They are specified using a name/value pair format, where the attribute name defines the property, and its value provides specific details, like name=”value”. These attributes impact content display and interaction on web pages.

Attribute Name

- **Id**
  A unique identifier for an HTML element, used for styling or JavaScript interaction.
- **class**
  Defines one or more class names for an element, used for styling and applying CSS rules.
- **src**
  Specifies the source URL for external resources like images, audio, or video.
- **href**
  Specifies the URL of the linked resource, typically used in anchor (a) elements for hyperlinks.
- **Alt**
  Provides alternative text for images, displayed if the image cannot be loaded or is unavailable.
- **any_custom_attr**
  Describes any custom attribute name and its purpose in the HTML document.



19) What is HTML Elements?

An HTML Element is a collection of start and end tags with the content inserted between them. HTML elements are building blocks of web pages, representing different types of content such as headings, paragraphs, links, and images.

```
<tagname > Contents... </tagname>
```

HTML Element	Descriptions
Opening tag(<tagname >)	It is used to tell the browser where the content material starts.
Closing tag(</tagname>)	It is used to tell the browser where the content material ends.
Content	It is the actual content material inside the opening and closing tags.

20) How do convert elements to tree?

Elements in an HTML document are converted to a tree-like structure known as the Document Object Model (DOM) during parsing. Each HTML element becomes a node, and their relationships form a hierarchical tree.

Converting elements into a tree typically involves organizing them in a hierarchical structure where each element (or node) has a parent-child relationship.

Here's a general approach to convert elements into a tree:

- **Define the Tree Structure:**
  Decide on the structure of your tree (e.g., binary tree, n-ary tree). o Understand the relationship between nodes (parent-child relationship).
- **Represent Nodes:**
  Each element you want to convert to a tree will become a node in the tree.
  Nodes typically have properties such as a value (data) and pointers (references) to child nodes.
- **Identify Root Node (if applicable):**
  Determine which element will be the root of the tree. The root is the topmost node that doesn't have a parent.
- **Establish Relationships:**
  For each element/node, establish its parent-child relationships based on the hierarchical structure.
  Depending on the type of tree (e.g., binary tree, n-ary tree), nodes can have specific limits on the number of children they can have.
- **Create the Tree Data Structure:**
  Implement the tree data structure in your chosen programming language. This might involve defining classes (in object-oriented programming) or structs (in languages like C).
  Ensure that each node has fields or properties to hold its value and references to its child nodes.
- **Build the Tree:**
  Iteratively or recursively build the tree structure by linking nodes together according to the parent-child relationships you've established.

21) What is DOCTYPE?

The HTML document type declaration or Doctype is an instruction used by web browsers to fetch what version of HTML the website is written in. It helps browsers in understanding how the document should be interpreted thus eases the rendering process. It is neither an element nor a tag. The doctype should be placed on the top of the document. It must not contain any content and does not need a closing tag.

Syntax:

```
<!DOCTYPE html>
```

Example : In this example, we will use Doctype.

```
<!-- This resembles doctype for HTML5 file  -->
<!DOCTYPE html>
<html>
<head>
   <title>Page Title</title>
</head>
<body>
   <h2>Welcome To JNC</h2>
   <p>Default code has been loaded into the Editor.</p>
</body>
</html>
```

22) What are the ways we can save html file?

HTML files can be saved locally on a computer using various methods:

- Save directly from a text editor (e.g., Notepad, VS Code). Export from a web browser (e.g., right-click and "Save Page As...").
- Download from a web server via FTP or other file transfer protocols. The extension used for saving HTML documents is . html or . htm. HTML stands for Hypertext Markup Language, which is the standard language used for creating web pages

23) What is charset? why we need to use this?

Charset (character encoding) specifies how characters are represented in a document. It ensures that text displays correctly across different platforms and languages. Common charsets include UTF-8, ISO-8859-1, etc.
When used by the <meta> element, the charset attribute specifies the character encoding for the HTML document.
When used by the <script> element, the charset attribute specifies the character encoding used in an external script file.
The HTML5 specification encourages web developers to use the UTF-8 character set, which covers almost all of the characters and symbols in the world!

Applies to The charset attribute can be used on the following elements:

Elements	Attribute
<meta>	charset
<script>	charset

Examples
Meta Example
Specify the character encoding for the HTML document:

```
<head>
<meta charset="UTF-8">
</head>
```

24) What is meta data? what is the purpose of it?

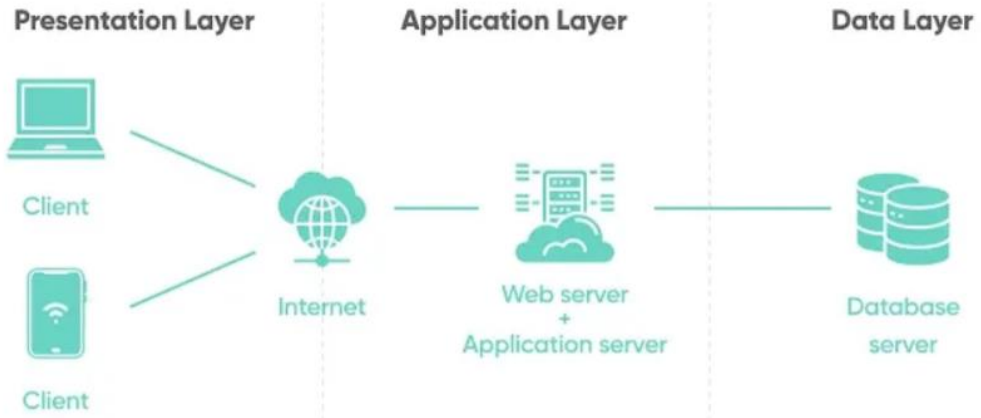
Metadata is simply called as data about the data, it is used to organize the information, manage the information and understand the information. Metadata was found in different contexts, including digital files, libraries, websites and databases. It plays a major role in management the data, retrieving the information, organization of the content with different domains.

Purposes of Metadata:

- **Organization**: Helps to classify and categorize data, making it easier to find and retrieve.
- **Identification**: Provides essential details to identify and distinguish between different data sets.
- **Discovery**: Enhances searchability, making it easier for users to locate specific data.
- **Interoperability**: Facilitates the exchange and integration of data between different systems and formats.
- **Management**: Assists in the management of data throughout its lifecycle, including storage, maintenance, and archiving.

- **Preservation**: Ensures that data remains accessible and usable over time, even as technologies evolve.
- **Usage**: Informs users about how data can be used, including any restrictions or permissions.
- **Context**: Provides context to understand the data's meaning, relevance, and relationships to other data.

25) Explain Web Application Architecture?



Modern web application architecture is typically implemented with a 3-tier structure:

- **Presentation layer:** This is the user interface of the web application. It is responsible for the visual aspects of the web application, such as the design of the user interface, the layout of the screens, and the navigation.
- **Application layer:** This is the business logic layer. It is responsible for the logic and processes that the web application needs to perform. This includes the processing of user input, data manipulation, and the execution of business rules. One or multiple web servers live within the application layer.
- **Data layer:** This layer is responsible for the persistent data storage and the retrieval of data when needed. It is typically composed of a database and other data stores such as files and web services. It’s worth noting that the data layer could have one or multiple databases, depending on the exact architecture.

The 3-tier structure is important because it helps to separate the different elements of a software application. By separating these components, the application can be designed to be more efficient and secure. It also makes it easier to maintain and extend over time.