What Happens When You Type in a URL In The Browser?

The browser will check cache for DNS entry to find the corresponding ip address of the domain, If not found in cache the dns server initiates a DNS query to find the ip address of server that hosts the domain name. Upon finding an IP Address the browser establishes the tcp connection with the server and sends the http request and the server sends back the response to the browser.

Here are the steps that undergo when you type a url in the browser and press enter.

1. The browser checks the cache for DNS records to find the corresponding ip address (browser cache, OS cache, router cache, ISP cache)
2. If the requested url is not found in the cache, the ISP DNS server initiates a DNS query to find the IP address of the server that hosts it.
3. Browser initiates TCP connection with the server
4. Browser sends the HTTP request to the server
5. Server processes requests and sends back a response to the browser with the response code.
6. Browser renders the content.

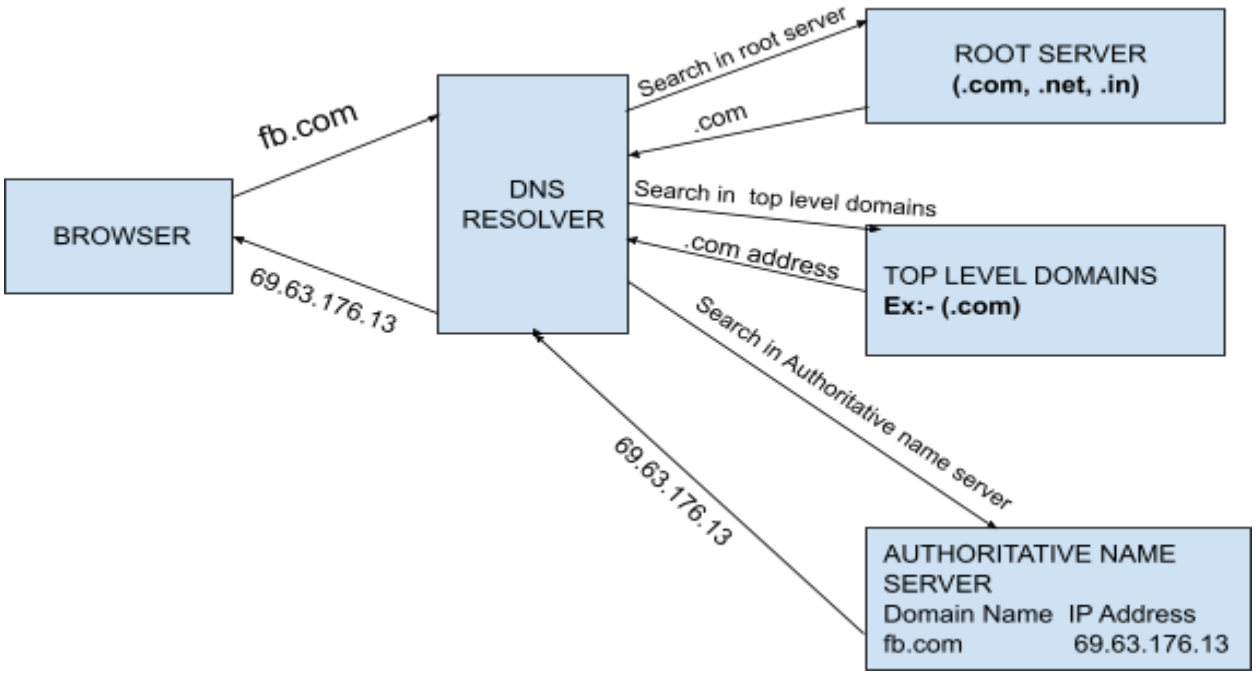


FIG 1 : DNS Server

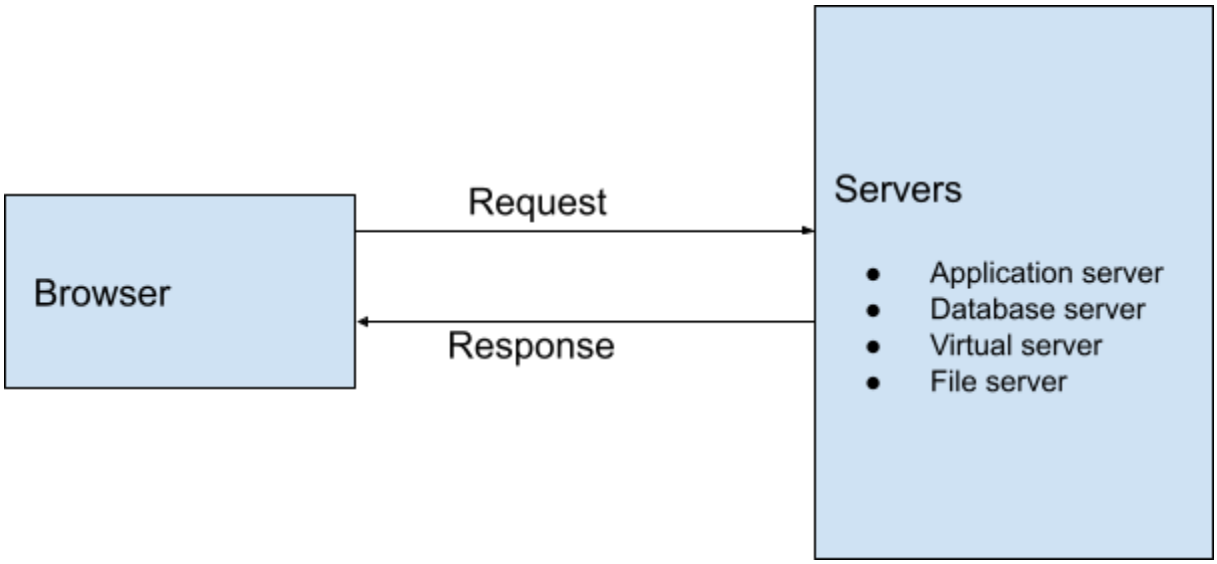


FIG 2 : Client Server Communication

1] TCP connection initiates with the server by Browser

Once the IP address of the computer is found where your website information is stored, it initiates connection with it. To communicate over the network, internet protocol is followed. TCP/IP is the most common protocol.

2] Communication Starts (Request Response Process)

- The connection is built between client and server. Now, they both can communicate with each other and share information.
- After successful connection, browser (client) sends a request to a server that I want this content.
- The server knows everything of what response it should send for every request. Hence, the server responds back. This response contains every information that you requested like web page, status-code, cache-control, etc.
- The browser renders the content that has been requested.

Sample GET request (Headers are highlighted):

```
GET http://facebook.com/ HTTP/1.1
Accept: application/x-ms-application, image/jpeg, application/xaml+xml, [...]
User-Agent: Mozilla/4.0 (compatible; MSIE 8.0; Windows NT 6.1; WOW64; [...]
Accept-Encoding: gzip, deflate
Connection: Keep-Alive
Host: facebook.com
Cookie: datr=1265876274-[...]; locale=en_US; lsd=WW[...]; c_user=2101[...]
```

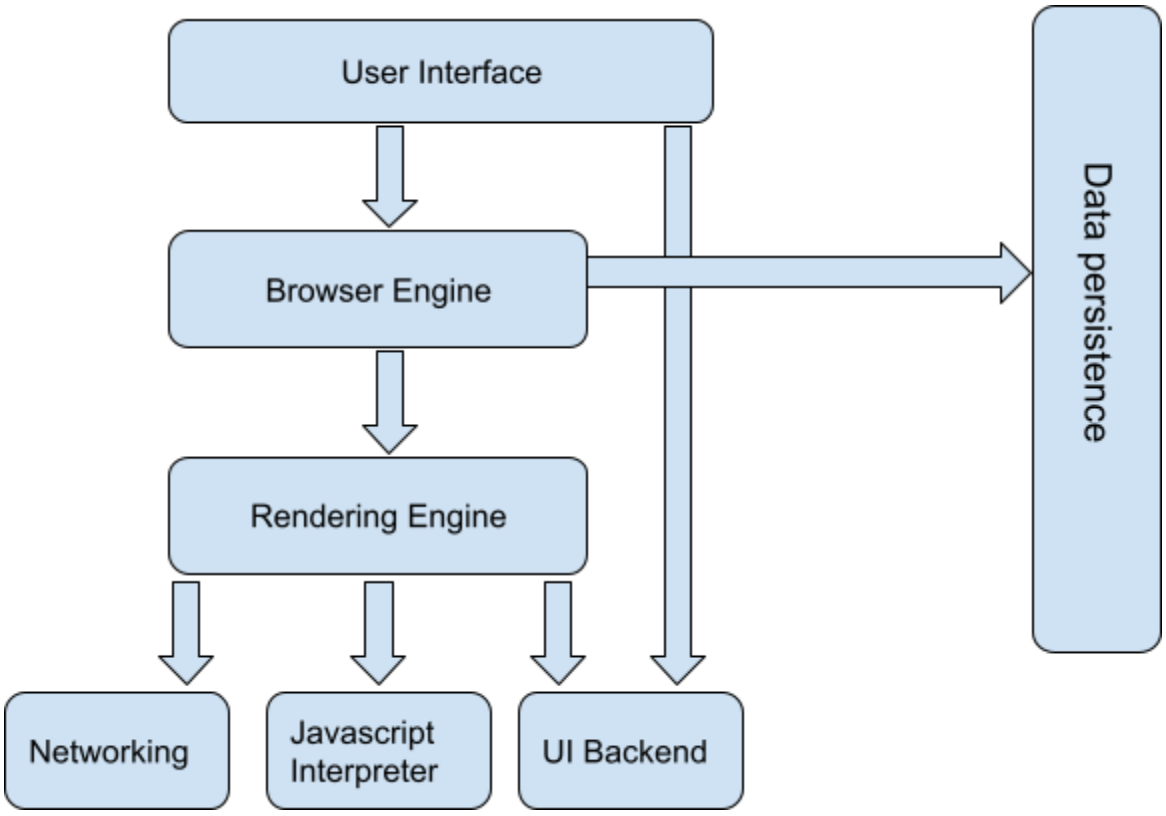
Example HTTP server response:

```
HTTP/1.1 200 OK
Cache-Control: private, no-store, no-cache, must-revalidate, post-check=0,
    pre-check=0
Expires: Sat, 01 Jan 2000 00:00:00 GMT
P3P: CP="DSP LAW"
Pragma: no-cache
Content-Encoding: gzip
Content-Type: text/html; charset=utf-8
X-Cnection: close
Transfer-Encoding: chunked
Date: Fri, 12 Feb 2010 09:05:55 GMT
```

What is the Main Functionality of the browser?

- The main functionality of the browser is to retrieve the information from the world wide web to the users.
- Web browser allows users to interact with dynamic contents and allows users to upload and download data from the internet.
- Web browsers also allow users to access the Application, database and file servers.
- Web browsers render the html into interactive pages.

High Level components of a browser



Rendering engine and its use

The Rendering engine is software that transforms html,css,javascript documents and other resources of a web page into an interactive visual representation on a user device.

Parsers (HTML,CSS,etc)

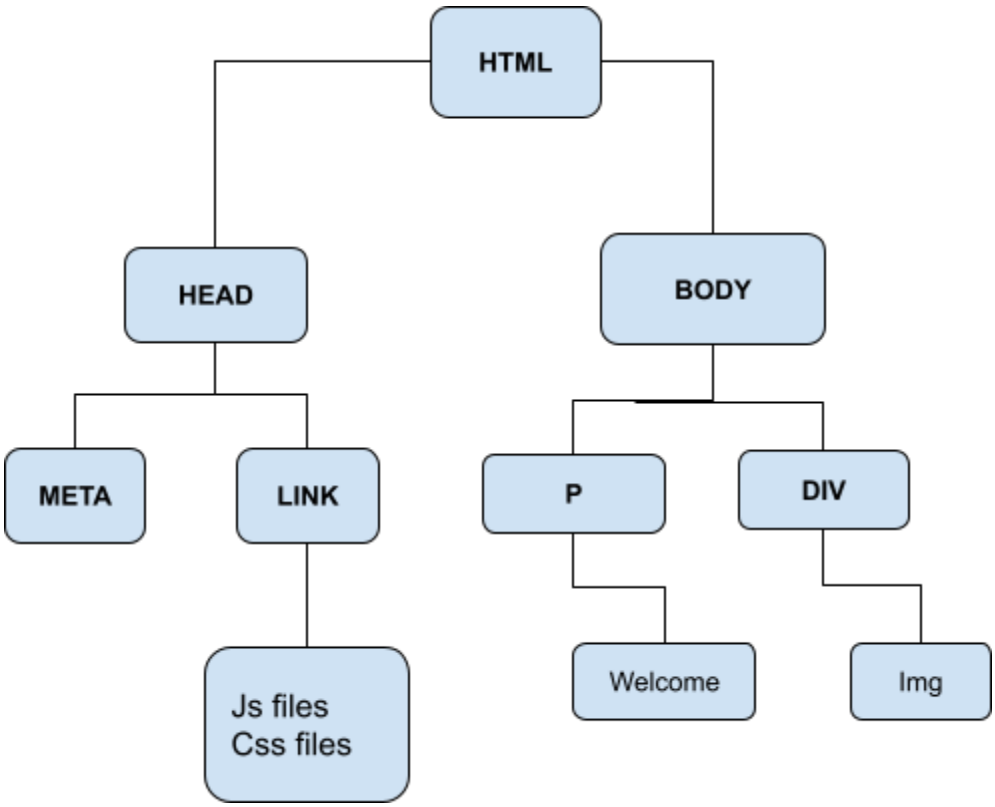
Parsing means analyzing and converting a program into an internal format that a runtime environment can actually run, for example the JavaScript engine inside browsers.
The browser parses HTML into a DOM tree. HTML parsing involves tokenization and tree construction

Script Processors

The Script processor allows you to specify your own processor logic for a simple processor using JavaScript

Tree construction

The **Document Object Model** defines a standard for accessing documents: "The W3C Document Object Model (DOM) is a platform and language-neutral interface that allows programs and scripts to dynamically access and update the content, structure, and style of a document."



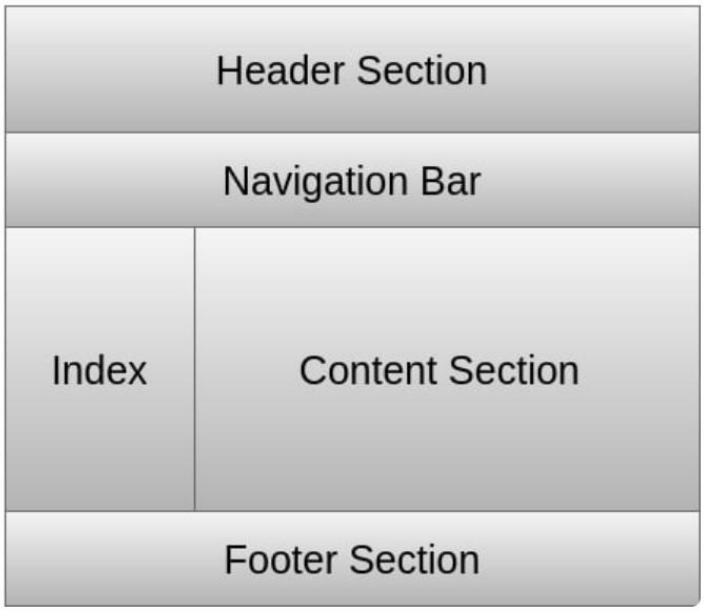
- Browser receives an HTML document from the server in thebinary stream format, which is basically a text file with a response header Content-Type = text/html; charset=UTF-8.
- When the browser reads the HTML document, whenever it encounters an HTML element, it creates a JS object called a Node. Eventually, all html elements will be converted to a Node.
- After the browser has created nodes from the HTML document, it has to create a "tree-like" structure of these node objects.

Order of script processing

Layout and Painting

Layout Phase :

- This phase can be said as a geometry phase, where we calculate the geometry of the nodes.
- In the layout phase, the exact position of the nodes and their size respective to the view-port of the browser is computed. In this way, a box model is generated which knows the exact positions and size. This process is also known as layout or reflow.
- Box model generated in the layout phase.



Painting phase:

- As we know the visible nodes, their styling, & their geometry, now all this information is used to render the nodes from the render tree to actual pixels on the screen.
- This process is referred to as Painting. It uses the UI backend layer.