

Topic: Web Pages Retrieval

When a user enters a URL into a web browser to access a web page, a complex, multi-step process unfolds behind the scenes to locate, retrieve, and display the page on the user's device. This process involves the interplay of several key components, including the web browser itself, IP addresses, Domain Name System (DNS), web servers, and HTML. Here's an overview of each step in the process:

Web Browser

The web browser initiates the process when the user types a URL into the address bar. The browser's role is to send a request to retrieve the desired web page and to render the page for the user to view. It acts as the interface through which the user interacts with the web.

Domain Name System (DNS)

- Resolution: The URL entered typically contains a domain name (e.g., `www.example.com`). The browser first needs to translate this human-readable domain name into a machine-readable IP address where the website is hosted. This translation is performed by the Domain Name System (DNS), a global network of servers that function as the internet's phone book.
- Query Process: The browser sends a DNS query to a DNS server to resolve the domain name to its corresponding IP address. If the DNS server doesn't have the record, it forwards the query to other DNS servers until the correct IP address is found.

IP Addresses

An IP address is a unique numerical label assigned to each device connected to the internet. It's used to identify the location of the web server that hosts the website. Once the DNS has translated the domain name into an IP address, the browser knows where to send its request to retrieve the web page.

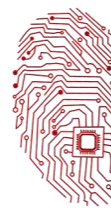
Web Server

- Receiving Request: The web server, identified by the IP address, receives the request from the browser to access a particular web page.
- Processing Request: The server locates the requested page. If the server hosts multiple websites (as is common with shared hosting), it uses the original domain name in the request to determine the correct website.

HTML and Rendering

- Sending HTML Data: The web server responds to the browser's request by sending back the HTML document associated with the requested web page, along with any additional content such as CSS, JavaScript, images, and videos that are part of the page.
- Rendering the Page: The browser receives the HTML document and uses its rendering engine to interpret the HTML, CSS, and JavaScript code. It constructs the Document Object Model (DOM) of





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the page, applies styles, executes JavaScript, and assembles the components into the web page as seen by the user.

Additional Steps

- **Rendering Additional Resources:** As the browser parses the HTML, it may find references to other resources that need to be fetched (like CSS files, JavaScript files, images, etc.). It sends additional requests to the server or other servers if necessary to fetch these resources.
- **Final Display:** After all resources are retrieved and scripts are executed, the final page is displayed to the user. The browser continues to listen for user interactions (like clicks or typing) and updates the display as needed based on user actions or script execution.

This entire process—from entering the URL to displaying the web page—happens in a matter of seconds, showcasing the efficiency and complexity of the technologies that power the web.

