

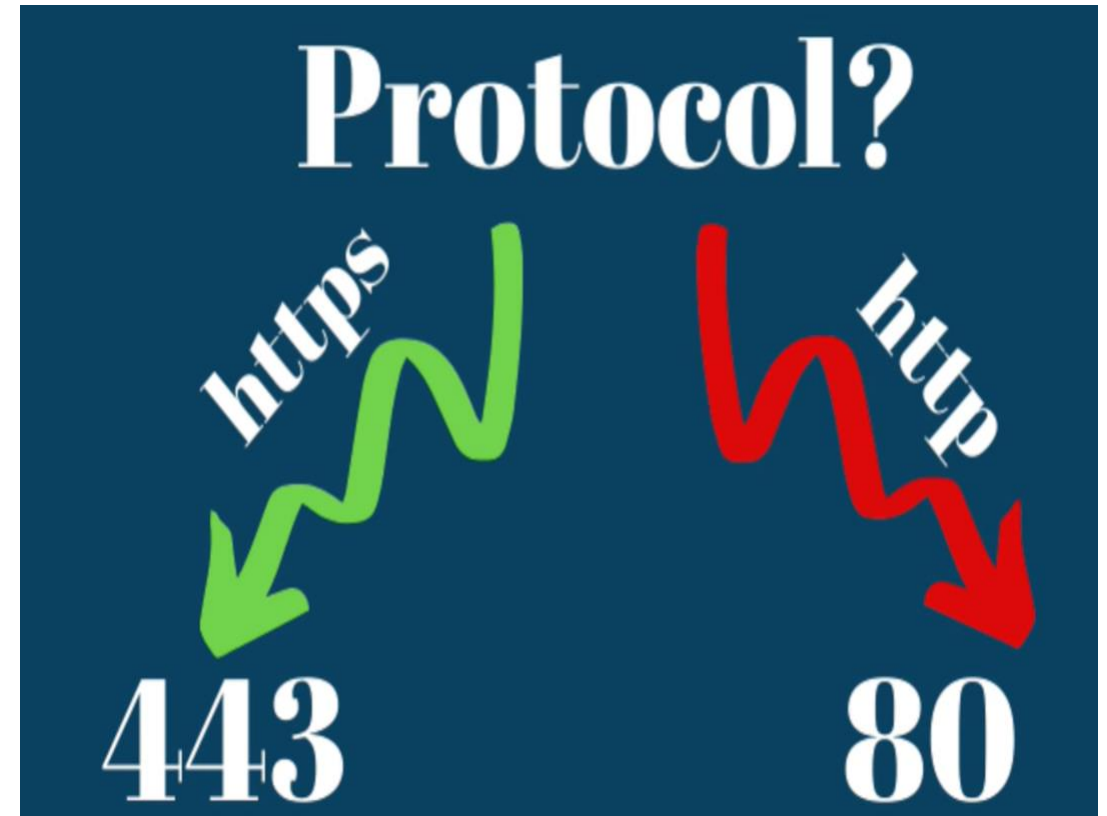
WHAT HAPPENS WHEN YOU
TYPE GOOGLE.COM

DECIDE THE PROTOCOL

Is the protocol HTTPS or HTTP?

Since the url lies on Hsts list the protocol is HTTPS and port will be 443.

Hsts stands for HTTP strict transport security



We have domain: google.com

We have protocol: https

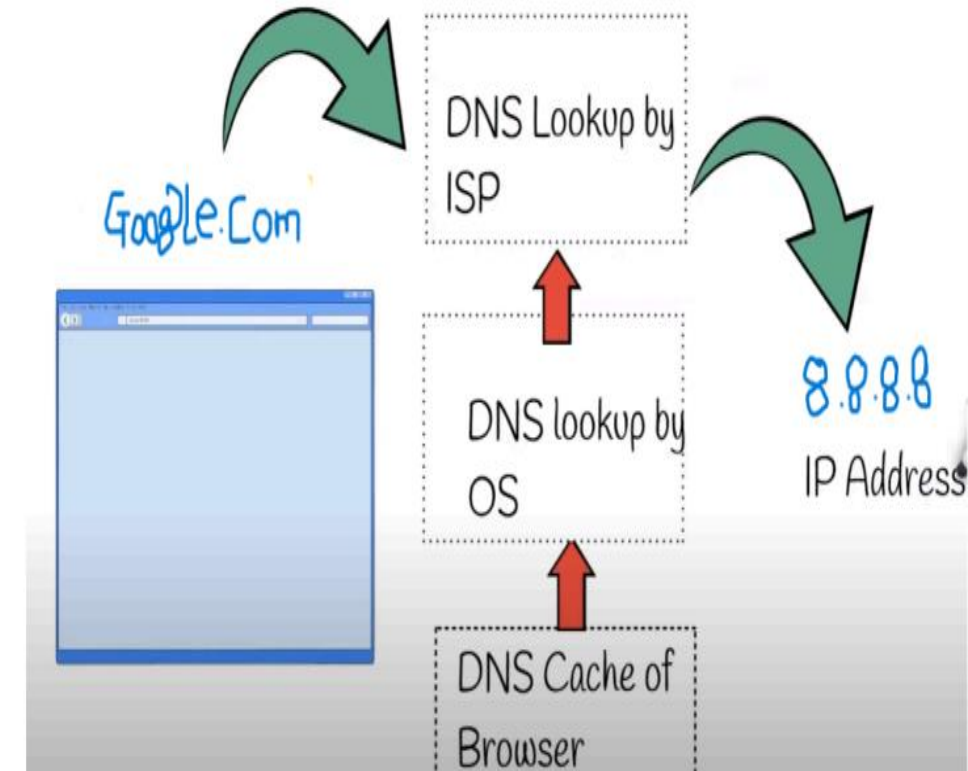
We have port: 443

But what is the IP address?



DNS LOOKUP (DOMAIN NAME SERVICE)

1. **Cache check:** The browser checks its local cache for the IP address of "google.com."
2. **OS check:** If the browser cache doesn't have the information, it asks the operating system's DNS resolver, which might have the address.
3. **Router Cache:** If the OS doesn't have it, the request is sent to your router, which may have cached it.
4. **ISP DNS server:** If the router doesn't have it, the request is forwarded to your Internet Service Provider's (ISP) DNS server.



If no one has the IP address yet, the ISP's DNS server will start looking for it.

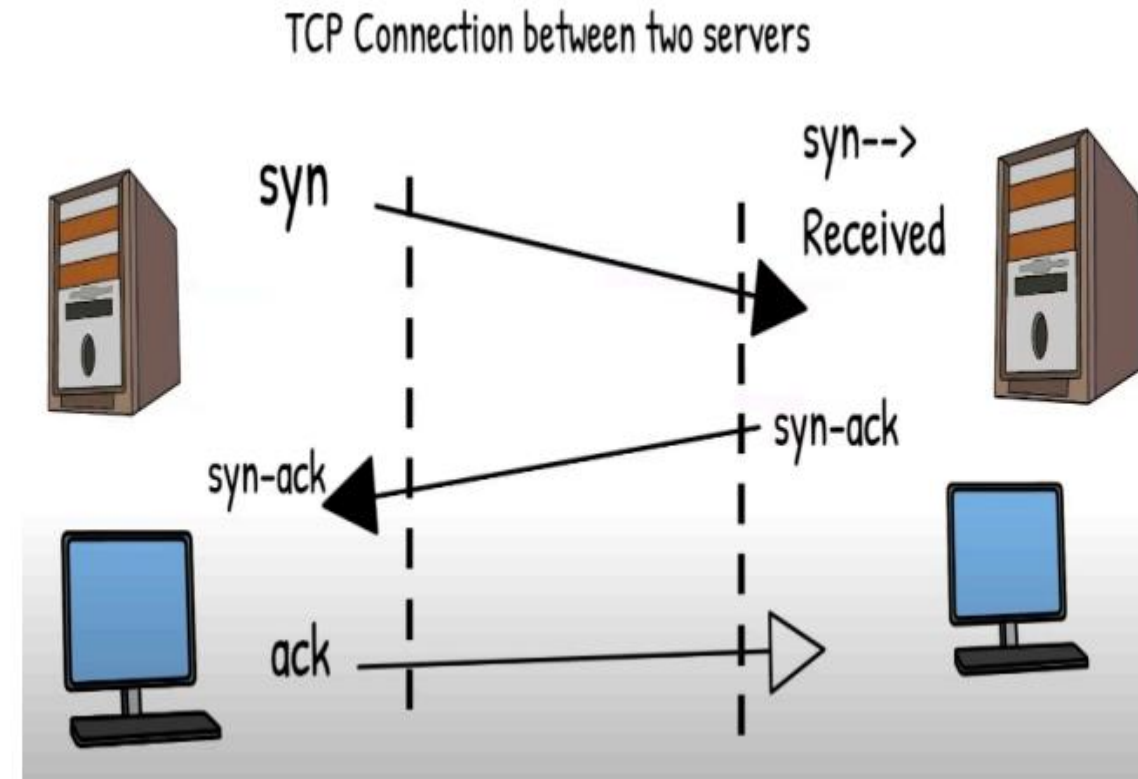
1. **Recursive DNS Query:** If the ISP's DNS server doesn't have the IP address, it queries other DNS servers, potentially across the globe, to find the correct IP address.
2. **Root DNS Server:** If necessary, the query might be sent to a root DNS server, which can direct the query to the correct top-level domain (TLD) server (e.g., for ".com").
3. **Authoritative DNS Server:** The query finally reaches Google's authoritative DNS server, which returns the IP address associated with "google.com."
4. **Response:** The IP address is sent back through the chain to your browser.

Establishing a TCP Connection (TCP Handshake)

SYN: The browser sends a TCP packet with a "SYN" (synchronize) flag to the server, asking to establish a connection.

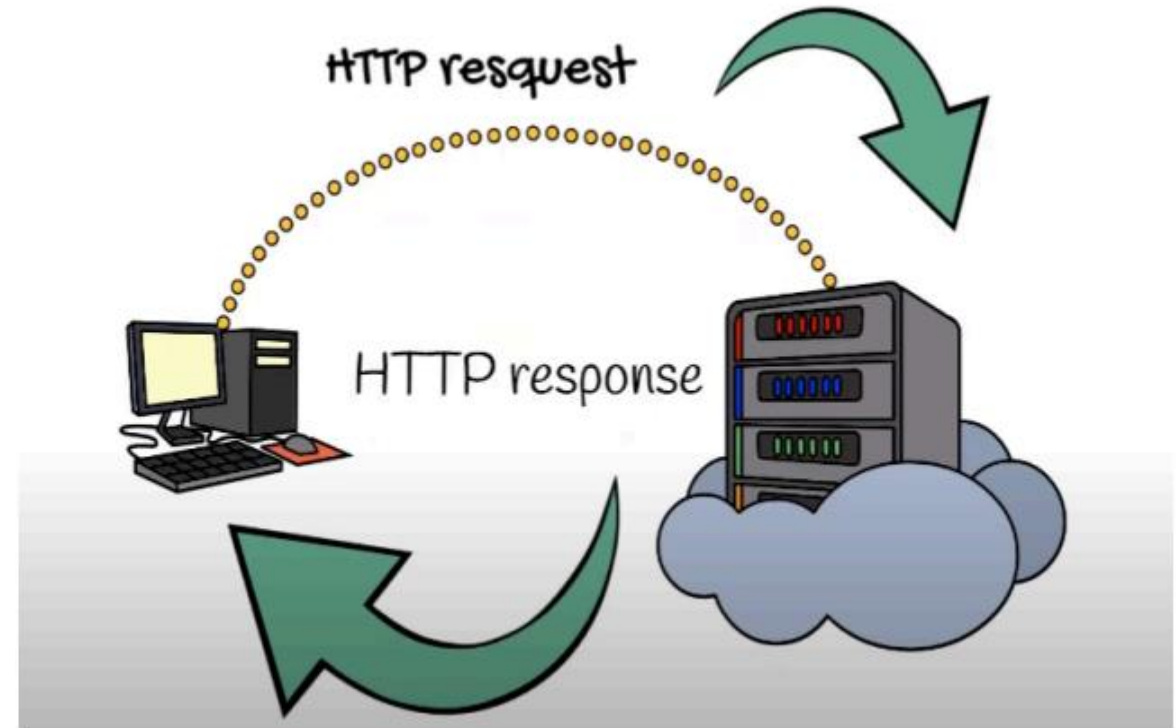
SYN-ACK: The server responds with a packet that has both the "SYN" and "ACK" (acknowledge) flags set, indicating it's ready to establish a connection.

ACK: The browser sends back an "ACK" packet to confirm the connection is established.



Sending an HTTP Request

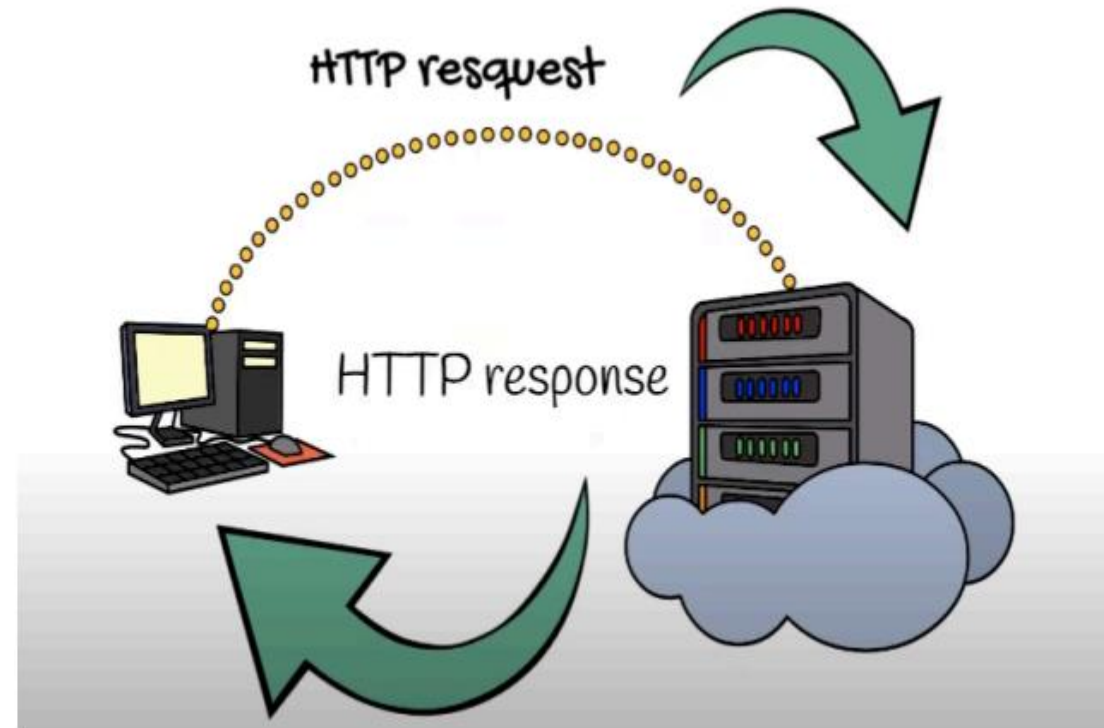
The browser sends an HTTP GET request to the server, asking for the content located at the root path ("/") of "google.com."



Server Processing and Response

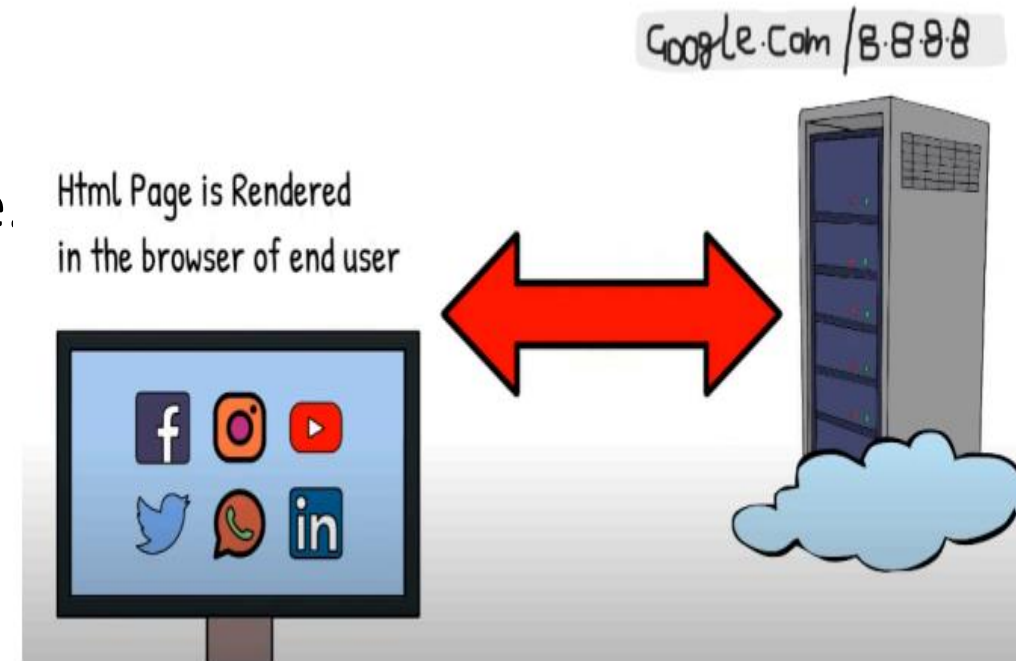
Processing Request: The Google server receives the request, processes it, and determines what resources are needed to fulfill it (HTML, CSS, JavaScript, images, etc.).

Server Response: The server sends back an HTTP response containing status Code (for example, "200 OK" if the request was successful, HTML Document which contains the structure of the webpage and additional Resources like JavaScript files, images



Rendering the Webpage

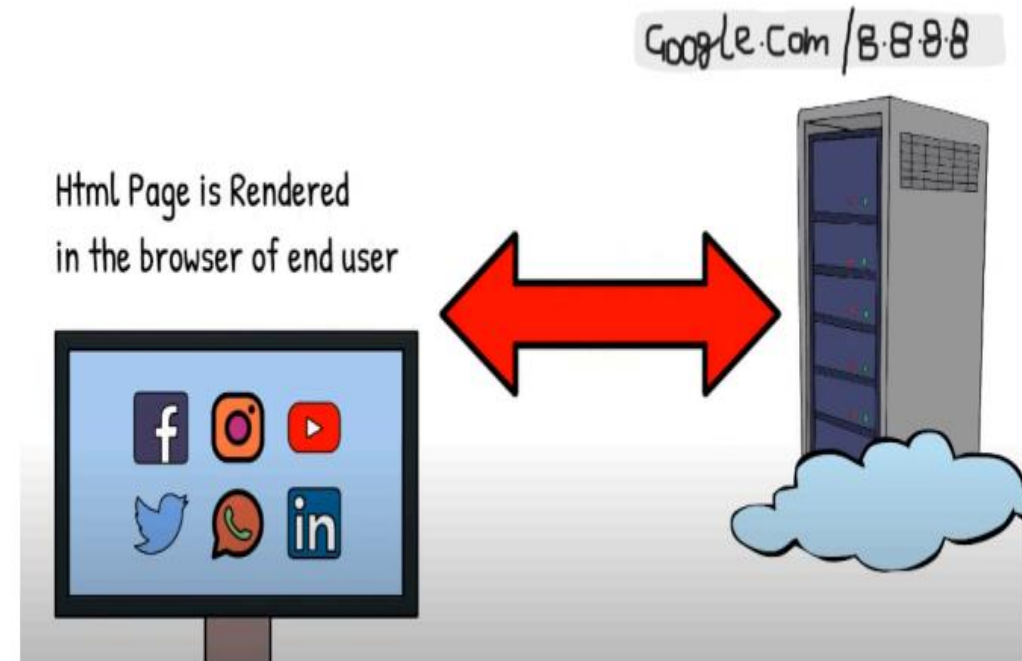
1. **HTML Parsing:** The browser begins parsing the HTML document to construct the Document Object Model (DOM), which is a hierarchical representation of the webpage.
2. **CSS Parsing:** CSS files are downloaded and parsed to apply styling to the DOM elements.
3. **JavaScript Execution:** JavaScript files are downloaded and executed, enabling dynamic and interactive elements on the page.



Rendering the Webpage

5. Resource Requests: As the browser parses the HTML, it might discover additional resources it needs (like images or fonts) and request them from the server.

6. Progressive Rendering: The browser progressively renders the webpage as it receives and processes the content. This is why you might see parts of the webpage load while other parts are still being fetched.



Displaying the Webpage

Reflow and Repaint

As the browser processes the CSS and JavaScript, it may need to recalculate the layout (reflow) and redraw (repaint) parts of the webpage.



SUMMARY

- When you type "google.com," your browser translates the domain into an IP address using DNS lookup. It then establishes a secure connection with Google's server through a TCP handshake and SSL/TLS encryption. The browser sends an HTTP request for the webpage, and the server responds with the necessary files. These files are then processed and rendered by the browser, resulting in the fully displayed Google homepage on your screen, all within a fraction of a second.