

# Detailed Report on the Application Layer

## Overview

When we type "www.google.com" in your browser, several processes occur at the application layer.

### 1. URL Parsing

### 2. DNS Resolution

- Cache Check : The browser first checks its DNS cache to see if it already has the IP address for "www.google.com".
- Operating System Cache : If the browser cache does not have the information, it checks the OS's DNS cache.
- DNS Query : If not found in the cache, the browser sends a DNS query to the local DNS resolver, typically provided by the ISP.
  - DNS Query Example :  
plaintext  
Query: A record for www.google.com
- Recursive Query : If the local DNS resolver doesn't have the IP address, it performs a recursive query:
  - Root Servers : The resolver queries root DNS servers for the .com TLD server.
  - TLD Servers : The root server responds with the address of the .com TLD server.
  - Authoritative Server : The resolver queries the .com TLD server, which responds with the address (e.g., `142.250.190.78`).
- Response : The IP address is sent back to the browser.
  - plaintext  
DNS Response: 142.250.190.78

### 3. HTTPS Request Construction

- Request Method : The browser constructs an HTTPS GET request to retrieve the web page.
- Request Headers : Additional information is included in the request headers.
  - Host Header : Specifies the domain name.
  - User-Agent Header : Identifies the browser and operating system.
  - Accept Header : Lists acceptable content types.
  - Connection Header : Indicates if the connection should be kept alive.
- Example HTTP GET Request :

plaintext  
GET / HTTP/1.1  
Host: www.google.com  
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:89.0) Gecko/20100101  
Firefox/89.0  
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,\*/\*;q=0.8  
Accept-Language: en-US,en;q=0.5  
Accept-Encoding: gzip, deflate, br  
Connection: keep-alive

#### **4. Session Management**

- Cookies : The browser may include cookies stored from previous interactions with "google.com".
- Authentication : If the user is logged in, authentication tokens may be included.
- Session Headers : Other session-related headers might be added.

#### **5. Interaction with the Transport Layer**

- TCP Connection Request : The browser initiates a TCP connection to the IP address 142.250.190.78 on port 80 (or 443 for HTTPS).
- Request Transmission : The constructed HTTPS GET request is passed down to the transport layer, where it will be segmented and transmitted over the network.