ASSIGNMENT-2

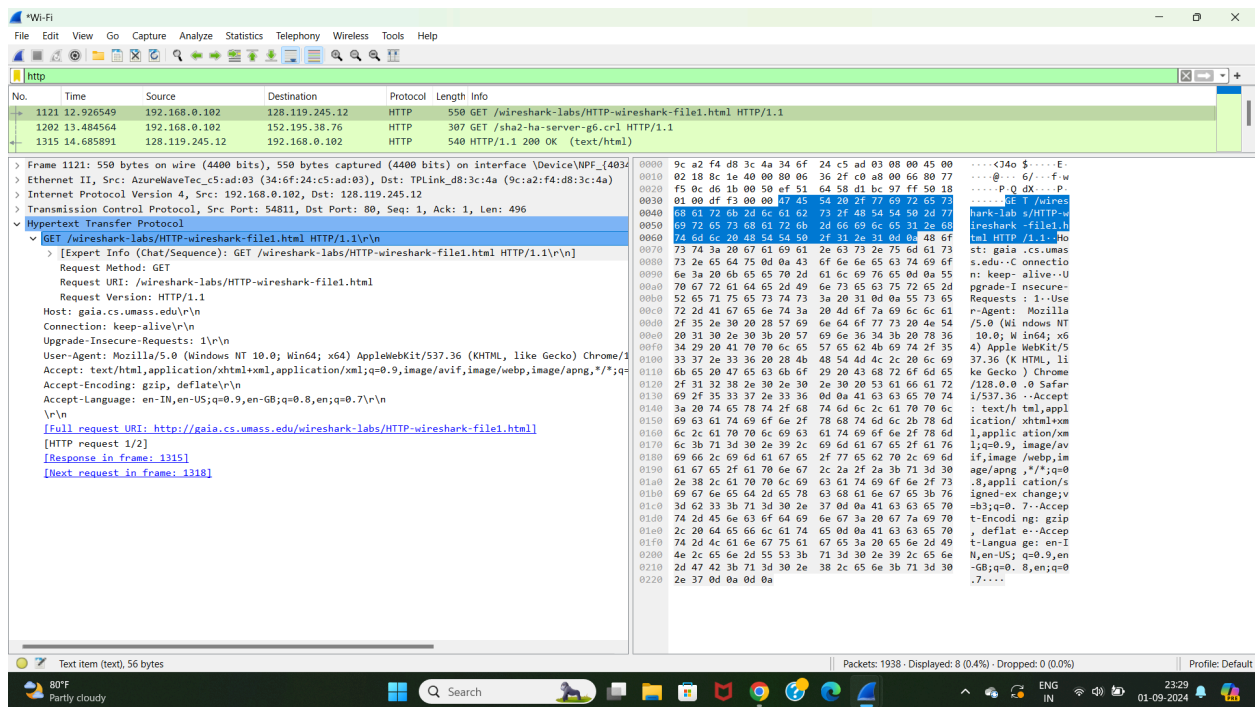## CS342:COMPUTER NETWORKS LABORATORY

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Drive link: 🖻 Group15_computernetworks

TASK-1:

a)**Request Method:** GET

- **URL of the Requested Resource:**
  http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file1.html.
- **Request URI:** Request URI: /wireshark-labs/HTTP-wireshark-file1.html
- **Full request URI:**
  http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file1.html
- **Resource Description:** This URL represents the resource requested by the client.
- **HTTP Version:** HTTP/1.1

b)HTTP Response Analysis:

- **Status Code Returned:** `200 OK`
  Explanation:
  - **Meaning:** The status code `200 OK` indicates that the server successfully processed the request. The response contains the requested resource.
  - **Implication:** The `200 OK` status signifies that the request was handled without errors, and the server was able to fulfill it. The response body typically includes the requested content, such as an HTML page, image, or other data.
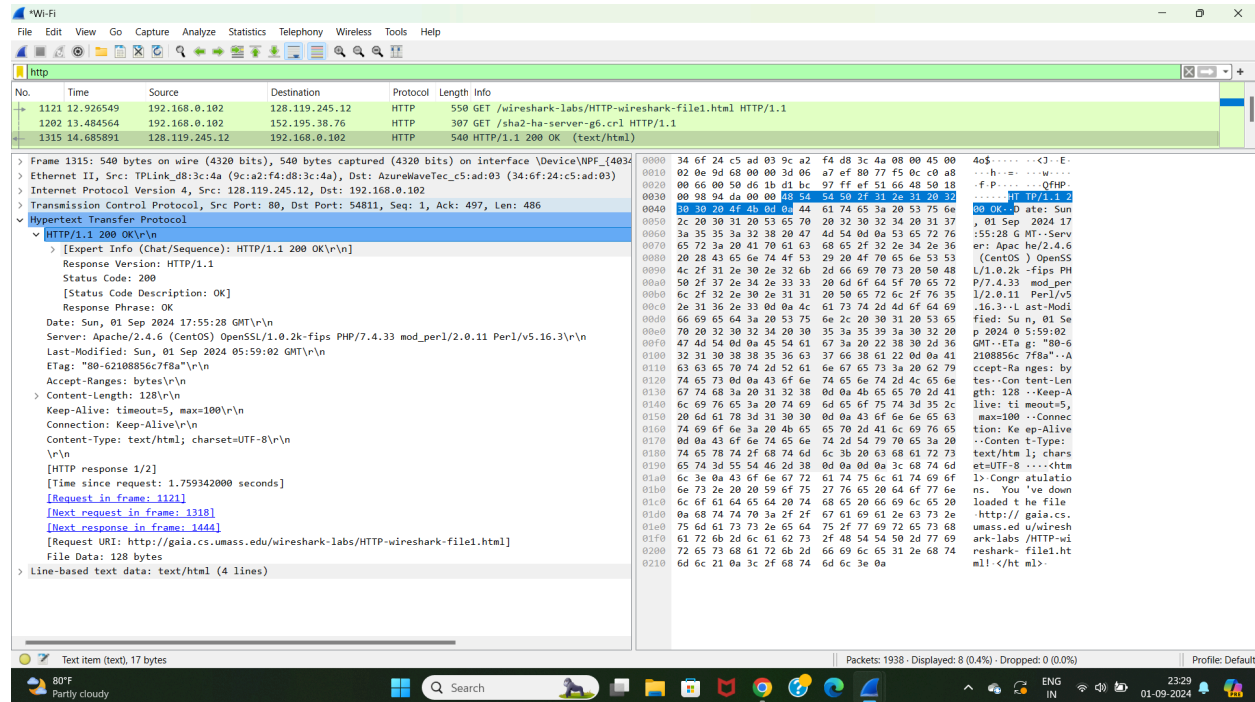
c) Analyzing HTTP Data from Frame 1121

Frame Details:

Frame Number: 1121

Frame Length: 550 bytes (4400 bits)

Capture Length: 550 bytes (4400 bits)

Arrival Time: Sep 1, 2024, 23:25:27.710667000 India Standard Time

Epoch Arrival Time: 1725213327.710667000

Protocols in Frame: Ethernet II, IP, TCP, HTTP

Source MAC Address: AzurellaveTec_c5:ad:03 (34:6F:24:05:AD:03)

Destination MAC Address: TPLink d8:3:40 (9c:ta:21:f4:48:30:48)

Source IP: 192.168.0.102

Destination IP: 128.119.245.12

Source Port: 54811

Destination Port: 80

Sequence Number: 1

Acknowledgment Number: 1

TCP Length: 496

HTTP Request Details:

Request Method: GET

Request URI: /wireshark-labs/HTTP-wireshark-file1.html

Request Version: HTTP/1.1

Host: gaia.cs.umass.edu

Connection: keep-alive

User-Agent: Mozilla/5.0 (Windows NT 18.8; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/128.0.0.0 Safari/537.36

Upgrade-Insecure-Requests: 1

Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7

Accept-Language: en-IN, en-US;q=0.9,en-GB;q=0.8,en;q=0.7

Accept-Encoding: gzip, deflate

Key Observations:

HTTP Request: The request is for the file HTTP-wireshark-file1.html located on the server gaia.cs.umass.edu. The GET method is used, indicating that the client is retrieving data from the server.

Response Status Code (from earlier analysis): The server returned a status code of 200 OK, meaning the request was successfully processed, and the requested resource was sent back to the client.

Request and Response Time Calculation:

Request Packet Time: 12.926549 sec

Response Packet Time: 14.685891 sec

Response Time: 1.759342 sec

Content Type (from previous analysis): The content type of the response is text/html; charset=UTF-8, indicating that the response contains an HTML document encoded in UTF-8.

 ● This indicates that the server is sending back an HTML document encoded in UTF-8.

● This content might include the HTML tags, structure, and any text or links that make
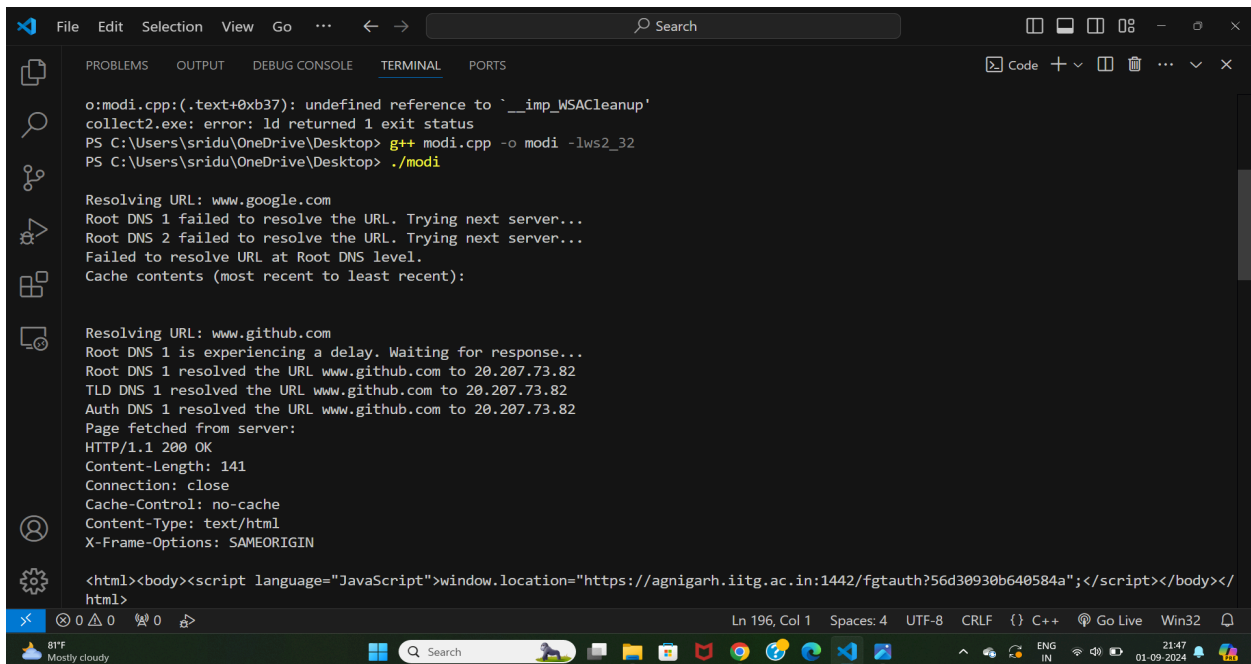
up the webpage.

Data sent by server : The response includes HTML content indicating that the resource has

been moved. It may contain a message like "200 OK" along with a hyperlink to the new

location.

Summary:

The provided data corresponds to an HTTP GET request made to http://gaia.cs.umass.edu/wireshark-labs/HTTP-wireshark-file1.html. The server returned the requested HTML resource with a status code of 200 OK, signifying a successful response. The

response time was approximately 655 milliseconds, which is within a reasonable range for such requests. The frame encapsulates this data over Ethernet, IP, TCP, and HTTP protocols, detailing both the request and the response transaction between the client and server.

TASK-2 :

Terminal output for www.github.com

Terminal output for www.youtube.com

Terminal Output for www.wikipedia.com

Terminal Output for www.cnn.com

The terminal shows:

```
Root DNS 1 resolved the URL www.cnn.com to 151.101.159.5
TLD DNS 1 failed to resolve the URL. Trying next server...
TLD DNS 2 resolved the URL www.cnn.com to 151.101.159.5
Auth DNS 1 is experiencing a delay. Waiting for response...
Auth DNS 1 resolved the URL www.cnn.com to 151.101.159.5
Page fetched from server:
HTTP/1.1 200 OK
Content-Length: 141
Connection: close
Cache-Control: no-cache
Content-Type: text/html
X-Frame-Options: SAMEORIGIN

<html><body><script language="JavaScript">window.location="https://agnigarh.iitg.ac.in:1442/fgtauth?57d6063cbe5627e3";</script></body></html>
Cache contents (most recent to least recent):
www.cnn.com
www.wikipedia.org
www.youtube.com
www.github.com

PS C:\Users\sridu\OneDrive\Desktop>
```

1. The series of DNS lookups impacts web page retrieval time by adding cumulative delays from each server involved in the resolution process. Sequential querying of multiple servers introduces latency at each stage, and potential retries due to server failures or delays further extend the total resolution time. This accumulation of delays can result in slower page load times and a reduced user experience. Efficient DNS resolution practices, such as caching and optimized failure handling, are essential to minimize these delays and enhance overall performance.

2. Impact of cache size on proxy server performance

- **Larger Cache**: Enhances performance by increasing cache hit rates, reducing the frequency of DNS lookups or HTTP requests, and thereby speeding up response times. However, it requires more memory, which can be a limitation in environments with constrained resources.
- **Smaller Cache**: Reduces memory usage, which is beneficial for resource-limited systems. However, it may result in a higher number of cache misses, leading to more frequent lookups or requests to the origin server. This can cause slower response times and decreased overall performance.

Trade-offs:

- **Performance vs. Memory**: While a larger cache improves performance by storing more data and minimizing lookups, it also demands more memory. Conversely, a smaller cache conserves memory but can lead to reduced performance due to increased cache misses.

3. Challenges of Integrating DNS Lookups with HTTP Communication

Integration Challenges:

- **Asynchronous Operations**: DNS lookups and HTTP requests are both asynchronous operations that need to be managed to avoid blocking the system. Ensuring smooth coordination between these processes is essential for efficient operation.
- **Error Handling**: DNS failures or delays can affect HTTP communication. The system needs to handle these errors gracefully, retrying lookups or switching to backup servers as needed.

Handling Coordination:

- **Timeouts and Retries**: Implementing timeouts and retry mechanisms for DNS lookups ensures that the system can handle delays and failures effectively.
- **Caching:** Caching DNS results reduces the frequency of lookups, improving overall efficiency and reducing the load on DNS servers.

4. Performance Implications of Cache Misses

Impact of Cache Misses:

- **Increased Latency**: When a page is not found in the cache (cache miss), the system must perform a DNS lookup and an HTTP request, which increases the overall page load time.
- **User Experience**: Frequent cache misses can lead to slower page loads and a poor user experience, as users have to wait longer for pages to be retrieved from the server.

Influence on User Experience:

- **Loading Times**: Longer loading times due to cache misses can frustrate users and lead to decreased satisfaction.
- **Server Load**: Increased server requests from cache misses can also lead to higher load on the server, potentially affecting performance f**or all users.**

Problems faced:

Error 301 moved permanently: Error 301 Moved Permanently signals that the requested resource has been permanently relocated to a new URL. The server provides the new URL in the `Location` header, and clients should update their links and bookmarks accordingly. This status code helps search engines and browsers recognize the new address and adjust their records to ensure users are directed to the correct location in the future.

3) <u>DEVELOP AN HTTP PROXY SERVER:</u>

Cookies that are stored.

1)Cookie Data:

 Value: AEC=AVYB7crWeHAzKB0CrN951L4fUtu3QM59R4KrWZ9kb6mvGeNBxfIjKqrq8w

 SameSite: lax

 domain: .google.com

 expires: Fri, 28-Feb-2025 17:49:05 GMT

 path: /

 Set-Cookie: AEC: AVYB7crWeHAzKB0CrN951L4fUtu3QM59R4KrWZ9kb6mvGeNBxfIjKqrq8w

Cookie Data:

 Value:
NID=517=ZY2wtd83NBIZ4M8KOiFZb_dQrK039LFAnD_dfWjAJ0oJvx9PnlPfiplbLZrHNX9rpy2j_
xBnYmJ8HWQ739SPDmBKVTJVvqFZdvt-cc3O-wjQ-3MO7NQTD7qJjKHWaIIITitw6wzV3Lo2z3
hxMVT6-UjutVcTSf7YHnFj8xf5qqumohMFD9_H5bHHA

 domain: .google.com

 expires: Mon, 03-Mar-2025 17:49:05 GMT

 path: / Set-Cookie: NID:
517=ZY2wtd83NBIZ4M8KOiFZb_dQrK039LFAnD_dfWjAJ0oJvx9PnlPfiplbLZrHNX9rpy2j_xBnY
mJ8HWQ739SPDmBKVTJVvqFZdvt-cc3O-wjQ-3MO7NQTD7qJjKHWaIIITitw6wzV3Lo2z3hxM
VT6-UjutVcTSf7YHnFj8xf5qqumohMFD9_H5bHHA

1. First Cookie (AEC):

- **Value**: `AVYB7crWeHAzKB0CrN951L4fUtu3QM59R4KrWZ9kb6mvGeNBxfIjKqrq8w`
- **SameSite**: `lax`
  - **Explanation**: The `SameSite` attribute helps prevent Cross-Site Request Forgery (CSRF) attacks. `lax` means that the cookie is sent with top-level navigations and will be sent with GET requests initiated by third-party websites.
- **Domain**: `.google.com`
  - **Explanation**: The cookie is associated with the domain `.google.com`, which means it will be sent with requests to this domain.
- **Expires**: `Fri, 28-Feb-2025 17:49:05 GMT`
  - **Explanation**: This cookie will expire on the specified date and time.
- **Path**: /
  - **Explanation**: The cookie is valid for all paths on the `.google.com` domain.

2. Second Cookie (NID):

- **Value**:
  517=ZY2wtd83NBIZ4M8KOiFZb_dQrK039LFAnD_dfWjAJ0oJvx9PnlPfiplbLZrHN
  X9rpy2j_xBnYmJ8HWQ739SPDmBKVTJVvqFZdvt-cc3O-wjQ-3MO7NQTD7qJjKHWaI
  lIITitw6wzV3Lo2z3hxMVT6-UjutVcTSf7YHnFj8xf5qqumohMFD9_H5bHHA
- **Domain**: .google.com
  - **Explanation**: This cookie is also associated with the domain .google.com.
- **Expires**: Mon, 03-Mar-2025 17:49:05 GMT
  - **Explanation**: The cookie will expire on the specified date and time.
- **Path**: /
  - **Explanation**: The cookie is valid for all paths on the .google.com domain.

2)

Cookie Data:

 Value: AEC=AVYB7coo2DJaOUTIZRcKFGwdrpWsjDqwgzQuqo4pvcbmWJkJBtrS12id4I8

 SameSite: lax

 domain: .google.com

 expires: Fri, 28-Feb-2025 17:50:01 GMT

 path: /

 Set-Cookie: AEC: AVYB7coo2DJaOUTIZRcKFGwdrpWsjDqwgzQuqo4pvcbmWJkJBtrS12id4I8

Cookie Data:

 Value:
NID=517=jeCKo_bKdSclzDndtcRNyoAakNnVBgJko1Masaz8oaIBXtEkV8KpyaTlPzAC9XJgPym
ESamUTdMzq8BJAEOfu51T0Ka1JmwiJ0J2dhRrQKn4nvkvBvI0l495Ynmr0xyMMssEHQXVDeR
XqBFPpE0jLuIjhrigx3xxa6Gl1NIIiLZYh1kh38CAW9m1nA

 domain: .google.com

 expires: Mon, 03-Mar-2025 17:50:01 GMT

 path: /

 Set-Cookie: NID:
517=jeCKo_bKdSclzDndtcRNyoAakNnVBgJko1Masaz8oaIBXtEkV8KpyaTlPzAC9XJgPymESa

mUTdMzq8BJAEOfu51T0Ka1JmwiJ0J2dhRrQKn4nvkvBvI0l495Ynmr0xyMMssEHQXVDeRXqB
FPpE0jLuIjhrigx3xxa6Gl1NIIiLZYh1kh38CAW9m1nA

1. First Cookie (AEC):

- **Value**: AVYB7coo2DJaOUTIZRcKFGwdrpWsjDqwgzQuqo4pvcbmWJkJBtrS12id4I8
- **SameSite**: lax
  - **Explanation**: The SameSite attribute set to lax means that the cookie is sent with top-level navigations and with GET requests initiated by third-party websites, but not with other cross-site requests (like a POST request from another site).
- **Domain**: .google.com
  - **Explanation**: The cookie is associated with the domain .google.com, meaning it will be sent with requests made to this domain.
- **Expires**: Fri, 28-Feb-2025 17:50:01 GMT
  - **Explanation**: The cookie will expire on this date and time. It is a persistent cookie, meaning it will stay on the user's device until this date, unless manually deleted by the user or replaced by a new cookie with the same name.
- **Path**: /
  - **Explanation**: The cookie is valid for all paths on the .google.com domain.

2. Second Cookie (NID):

- **Value**:
  517=jeCKo_bKdSclzDndtcRNyoAakNnVBgJko1Masaz8oaIBXtEkV8KpyaTlPzAC9
  XJgPymESamUTdMzq8BJAEOfu51T0Ka1JmwiJ0J2dhRrQKn4nvkvBvI0l495Ynmr0x
  yMMssEHQXVDeRXqBFPpE0jLuIjhrigx3xxa6Gl1NIIiLZYh1kh38CAW9m1nA
- **Domain**: .google.com
  - **Explanation**: This cookie is associated with the domain .google.com, and will be sent with requests to this domain.
- **Expires**: Mon, 03-Mar-2025 17:50:01 GMT
  - **Explanation**: This cookie will expire on the specified date and time.
- **Path**: /
  - **Explanation**: The cookie is valid for all paths on the .google.com domain.

3)

Cookie Data:

Value: AEC=AVYB7coF174Xa24KPFWcQcgfiOHUqYpVxNh_OBGKJ5tDXFULLC-iPrF0bUY

SameSite: lax

domain: .google.com

expires: Fri, 28-Feb-2025 17:49:49 GMT

path: /

Set-Cookie: AEC:
AVYB7coF174Xa24KPFWcQcgfiOHUqYpVxNh_OBGKJ5tDXFULLC-iPrF0bUY

Cookie Data:

Value:
NID=517=nAyyRbYuXtUNf_LatgGoHhMLJx6yNeZ5lb_sUECGeU035Pt-RmbcXNzNnb5e5hk5X
Jsz-z2rHvl-3OKwVuIjF6QX6D7vWyEdtMrHppwY1YGQazLJphBvWs4fdhvLcJLT_c9W_y4tpPkx
0FoxdCP5puImj5cixeRE3o7FUDIOe2_DjzveWeOfuDqWOQ

domain: .google.com

expires: Mon, 03-Mar-2025 17:49:49 GMT

path: /

Set-Cookie: NID:
517=nAyyRbYuXtUNf_LatgGoHhMLJx6yNeZ5lb_sUECGeU035Pt-RmbcXNzNnb5e5hk5XJsz-z
2rHvl-3OKwVuIjF6QX6D7vWyEdtMrHppwY1YGQazLJphBvWs4fdhvLcJLT_c9W_y4tpPkx0Foxd
CP5puImj5cixeRE3o7FUDIOe2_DjzveWeOfuDqWOQ

1. First Cookie (AEC):

- **Value**: AVYB7coF174Xa24KPFWcQcgfiOHUqYpVxNh_OBGKJ5tDXFULLC-iPrF0bUY
- **SameSite**: lax
    - **Explanation**: The SameSite=lax attribute indicates that the cookie is sent with top-level navigation and with GET requests initiated by third-party websites, but not with other cross-site requests (like POST requests).
- **Domain**: .google.com
    - **Explanation**: The cookie is associated with the domain .google.com, meaning it will be sent with any request made to this domain or its subdomains.
- **Expires**: Fri, 28-Feb-2025 17:49:49 GMT
    - **Explanation**: This is when the cookie will expire. Until then, it remains on the user's device unless manually deleted or replaced.
- **Path**: /
    - **Explanation**: The cookie is valid for all paths on the .google.com domain, meaning it will be sent with requests to any path within this domain.

2. Second Cookie (NID):

- **Value**:
  517=nAyyRbYuXtUNf_LatgGoHhMLJx6yNeZ5lb_sUECGeU035Pt-RmbcXNzNnb5e5
  hk5XJsz-z2rHvl-3OKwVuIjF6QX6D7vWyEdtMrHppwY1YGQazLJphBvWs4fdhvLcJ
  LT_c9W_y4tpPkx0FoxdCP5puImj5cixeRE3o7FUDIOe2_DjzveWeOfuDqWOQ
- **Domain**: .google.com
  - **Explanation**: Like the first cookie, this one is also tied to the .google.com domain, making it valid for requests to this domain and its subdomains.
- **Expires**: Mon, 03-Mar-2025 17:49:49 GMT
  - **Explanation**: This cookie will expire on this date and time, remaining on the user's device until then unless manually removed or replaced.
- **Path**: /
  - **Explanation**: The cookie is valid for all paths within the .google.com domain.

For all the cookies:

- **Cookie Name and Value**:
  - The AEC and NID cookies are likely used for managing user sessions, preferences, or authentication by Google services. The Value represents a unique identifier that helps the server recognize the user on subsequent requests.
- **SameSite**:
  - The AEC cookie has SameSite=lax, providing some protection against cross-site request forgery (CSRF) by limiting when the cookie is sent with cross-site requests.
- **Domain and Path**:
  - Both cookies are set for the domain .google.com and apply to all paths (/) within this domain. This means any request made to google.com or its subdomains can include these cookies.
- **Expiration**:
  - Both cookies have a specific expiration date, making them persistent cookies. They will remain on the user's device until the specified date unless they are deleted or replaced by the server.

These cookies are part of the mechanisms that websites use to store user-specific information, manage sessions, and maintain personalized experiences.