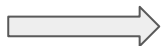www.github.com 입력하면
어떤일이 발생할까??

전체 프로세스 흐름

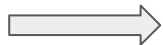1. URL 입력 ⟹ 2. DNS 조회 ⟹ 3. TCP 연결
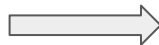   - 사용자

⟹ 4. HTTP 요청 / 응답 ⟹ 5. 렌더링
   - 데이터 교환

1. 사용자 입력 및 URL 분석

https://github.com/

2. DNS 조회

- 1. 브라우저 캐시 확인

- 2. hosts 파일 확인

- 3. OS DNS 캐시 확인

- 4. ISP DNS 캐시

2.1 브라우저 캐시 확인

chrome://net-internals/#dns 에 접속

Events
Proxy
DNS
Sockets
Domain Security Policy
Shared Dictionaries

DNS lookup

Input a domain name to look up:

Domain: example.com   Lookup

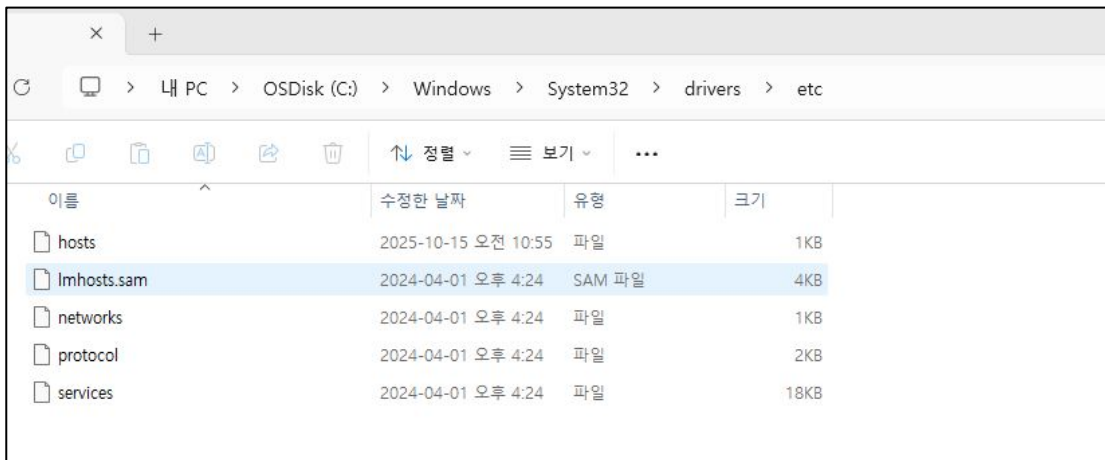**Resolved IP addresses of "www.github.com": ["20.200.245.247"].
No alternative endpoints.**

Host resolver cache   Clear host cache

2.2 hosts 파일 확인

Windows: C:\Windows\System32\drivers\etc\hosts
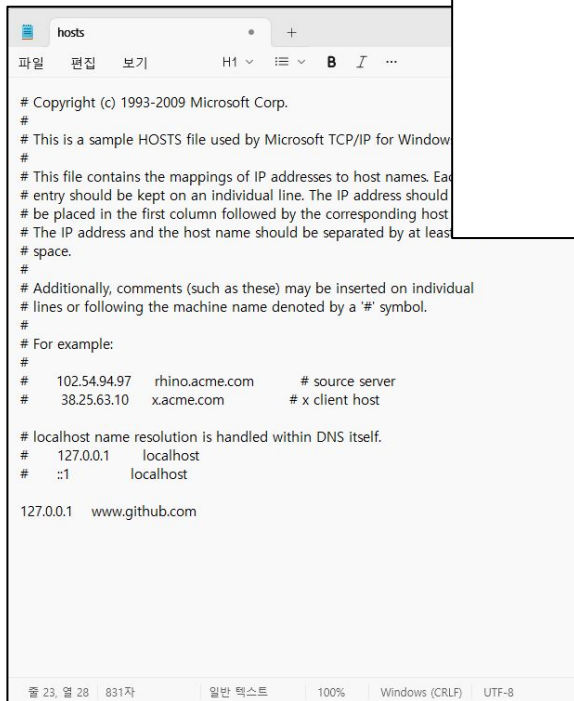
macOS/Linux: /etc/hosts

2.2 hosts 파일 확인

if)

hosts 내부 파일에

127.0.0.1 www.github.com 를 작성하면?
-> 브라우저에

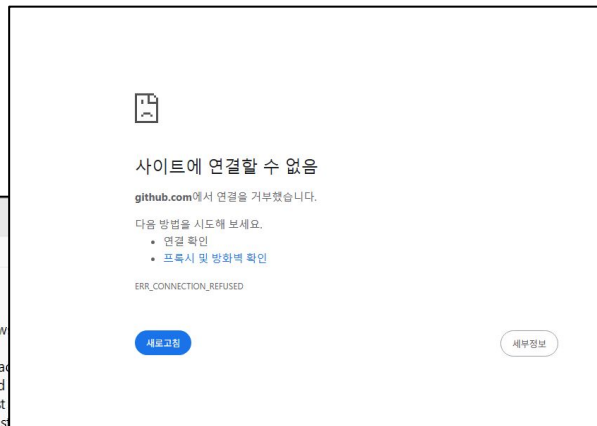Q. 왜 빈 파일일까요?


```
# Copyright (c) 1993-2009 Microsoft Corp.
#
# This is a sample HOSTS file used by Microsoft TCP/IP for Window
#
# This file contains the mappings of IP addresses to host names. Eac
# entry should be kept on an individual line. The IP address should
# be placed in the first column followed by the corresponding host
# The IP address and the host name should be separated by at leas
# space.
#
# Additionally, comments (such as these) may be inserted on individual
# lines or following the machine name denoted by a '#' symbol.
#
# For example:
#
#      102.54.94.97     rhino.acme.com        # source server
#       38.25.63.10     x.acme.com            # x client host

# localhost name resolution is handled within DNS itself.
#      127.0.0.1       localhost
#      ::1             localhost

127.0.0.1    www.github.com
```

사이트에 연결할 수 없음

github.com에서 연결을 거부했습니다.

다음 방법을 시도해 보세요.
• 연결 확인
• 프록시 및 방화벽 확인

ERR_CONNECTION_REFUSED

2.3 OS DNS 캐시 확인

Windows 캐시 확인 `ipconfig /displaydns`

Windows 캐시 초기화 `ipconfig /flushdns`

2.3 OS DNS 캐시 확인

Windows 캐시 확인 `ipconfig /displaydns`

별칭(CNAME) 체인

2.4 IPS DNS 검색

nslookup 관련

```
C:\Users\SSAFY>nslookup www.netflix.com
서버:    kns.kornet.net
Address:  168.126.63.1

권한 없는 응답:
이름:    www.prod.ftl.netflix.com
Addresses:  2a00:86c0:2043::1
            2a00:86c0:2042::1
            44.240.158.19
            52.38.7.83
            44.242.13.161
Aliases:  www.netflix.com
```

2.4 IPS DNS 검색

nslookup 관련

```
C:\Users\SSAFY>nslookup github.com
서버:    kns.kornet.net
Address:  168.126.63.1

권한 없는 응답:
이름:    github.com
Address:  20.200.245.247
```

```
C:\Users\SSAFY>nslookup -type=ns github.com
서버:    kns.kornet.net
Address:  168.126.63.1

권한 없는 응답:
github.com        nameserver = dns3.p08.nsone.net
github.com        nameserver = dns1.p08.nsone.net
github.com        nameserver = ns-421.awsdns-52.com
github.com        nameserver = dns4.p08.nsone.net
github.com        nameserver = ns-1283.awsdns-32.org
github.com        nameserver = ns-1707.awsdns-21.co.uk
github.com        nameserver = dns2.p08.nsone.net
github.com        nameserver = ns-520.awsdns-01.net

dns1.p08.nsone.net        internet address = 198.51.44.8
dns2.p08.nsone.net        internet address = 198.51.45.8
dns3.p08.nsone.net        internet address = 198.51.44.72
dns4.p08.nsone.net        internet address = 198.51.45.72
ns-421.awsdns-52.com      internet address = 205.251.193.165
ns-520.awsdns-01.net      internet address = 205.251.194.8
ns-1283.awsdns-32.org     internet address = 205.251.197.3
ns-1707.awsdns-21.co.uk   internet address = 205.251.198.171
dns1.p08.nsone.net        AAAA IPv6 address = 2620:4d:4000:6259:7:8:0:1
dns2.p08.nsone.net        AAAA IPv6 address = 2a00:edc0:6259:7:8::2
dns3.p08.nsone.net        AAAA IPv6 address = 2620:4d:4000:6259:7:8:0:3
dns4.p08.nsone.net        AAAA IPv6 address = 2a00:edc0:6259:7:8::4
```

2.4 IPS DNS 검색

nslookup -type=ns (주소) -> 실제 (주소)의 권한있는 서버를 알 수 있다.

```
C:\Users\SSAFY>nslookup -type=ns github.com
서버:    kns.kornet.net
Address:  168.126.63.1

권한 없는 응답:
github.com       nameserver = dns3.p08.nsone.net
github.com       nameserver = dns1.p08.nsone.net
github.com       nameserver = ns-421.awsdns-52.com
github.com       nameserver = dns4.p08.nsone.net
github.com       nameserver = ns-1283.awsdns-32.org
github.com       nameserver = ns-1707.awsdns-21.co.uk
github.com       nameserver = dns2.p08.nsone.net
github.com       nameserver = ns-520.awsdns-01.net

dns1.p08.nsone.net        internet address = 198.51.44.8
dns2.p08.nsone.net        internet address = 198.51.45.8
dns3.p08.nsone.net        internet address = 198.51.44.72
dns4.p08.nsone.net        internet address = 198.51.45.72
ns-421.awsdns-52.com      internet address = 205.251.193.165
ns-520.awsdns-01.net      internet address = 205.251.194.8
ns-1283.awsdns-32.org     internet address = 205.251.197.3
ns-1707.awsdns-21.co.uk   internet address = 205.251.198.171
dns1.p08.nsone.net        AAAA IPv6 address = 2620:4d:4000:6259:7:8:0:1
dns2.p08.nsone.net        AAAA IPv6 address = 2a00:edc0:6259:7:8::2
dns3.p08.nsone.net        AAAA IPv6 address = 2620:4d:4000:6259:7:8:0:3
dns4.p08.nsone.net        AAAA IPv6 address = 2a00:edc0:6259:7:8::4
```

```
C:\Users\SSAFY>nslookup github.com dns1.p08.nsone.net
서버:    dns1.p08.nsone.net
Address:  198.51.44.8

이름:    github.com
Address:  20.200.245.247
```
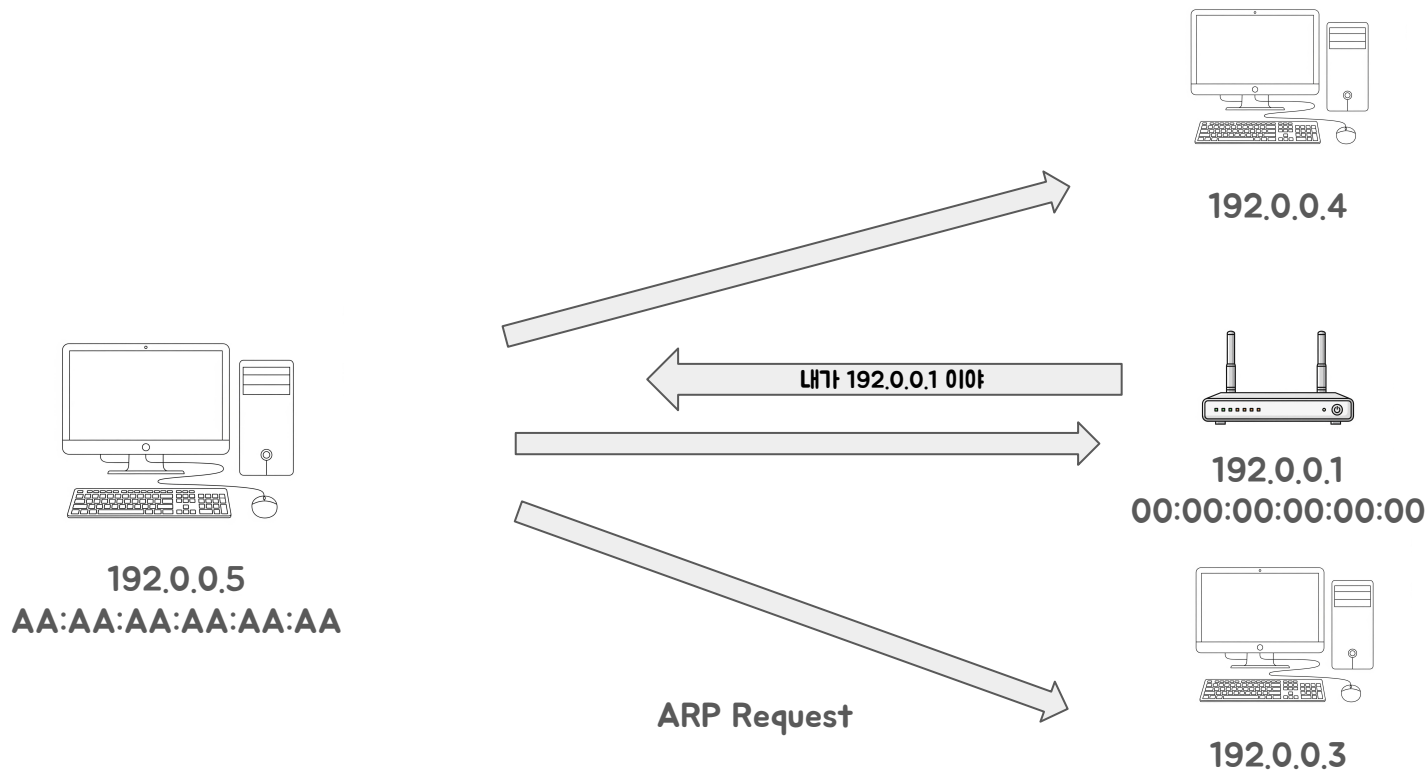
권한이 있는 서버 dns1.p08.nsone.net

ARP (Address Resolution Protocol) 단계

192.0.0.4

내가 192.0.0.1 이야

192.0.0.1
00:00:00:00:00:00

192.0.0.5
AA:AA:AA:AA:AA:AA

ARP Request

192.0.0.3

```
C:\Windows\System32>arp -a

Interface: 70.12.103.165 --- 0xd
  Internet Address      Physical Address      Type
  70.12.103.1           00-00-5e-00-01-71     dynamic
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static

C:\Windows\System32>
```

arp - a
내가 가지고 있는 local mac
주소들을 찾아본다.

```
C:\Windows\System32>route print
===========================================================================
Interface List
 13...8c b0 e9 94 da e2 ......Realtek PCIe GbE Family Controller
  1...........................Software Loopback Interface 1
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0      70.12.103.1   70.12.103.165     26
     70.12.103.0    255.255.255.0         On-link    70.12.103.165    281
   70.12.103.165  255.255.255.255         On-link    70.12.103.165    281
   70.12.103.255  255.255.255.255         On-link    70.12.103.165    281
       127.0.0.0        255.0.0.0         On-link         127.0.0.1    331
       127.0.0.1  255.255.255.255         On-link         127.0.0.1    331
 127.255.255.255  255.255.255.255         On-link         127.0.0.1    331
       224.0.0.0        240.0.0.0         On-link         127.0.0.1    331
       224.0.0.0        240.0.0.0         On-link    70.12.103.165    281
 255.255.255.255  255.255.255.255         On-link         127.0.0.1    331
 255.255.255.255  255.255.255.255         On-link    70.12.103.165    281
===========================================================================
Persistent Routes:
  Network Address          Netmask  Gateway Address  Metric
          0.0.0.0          0.0.0.0      70.12.103.1       1
===========================================================================

IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
  1    331 ::1/128                  On-link
 13    281 fe80::/64                On-link
 13    281 fe80::4ece:757:90f3:35b3/128
                                    On-link
  1    331 ff00::/8                 On-link
 13    281 ff00::/8                 On-link
===========================================================================
Persistent Routes:
  None
```
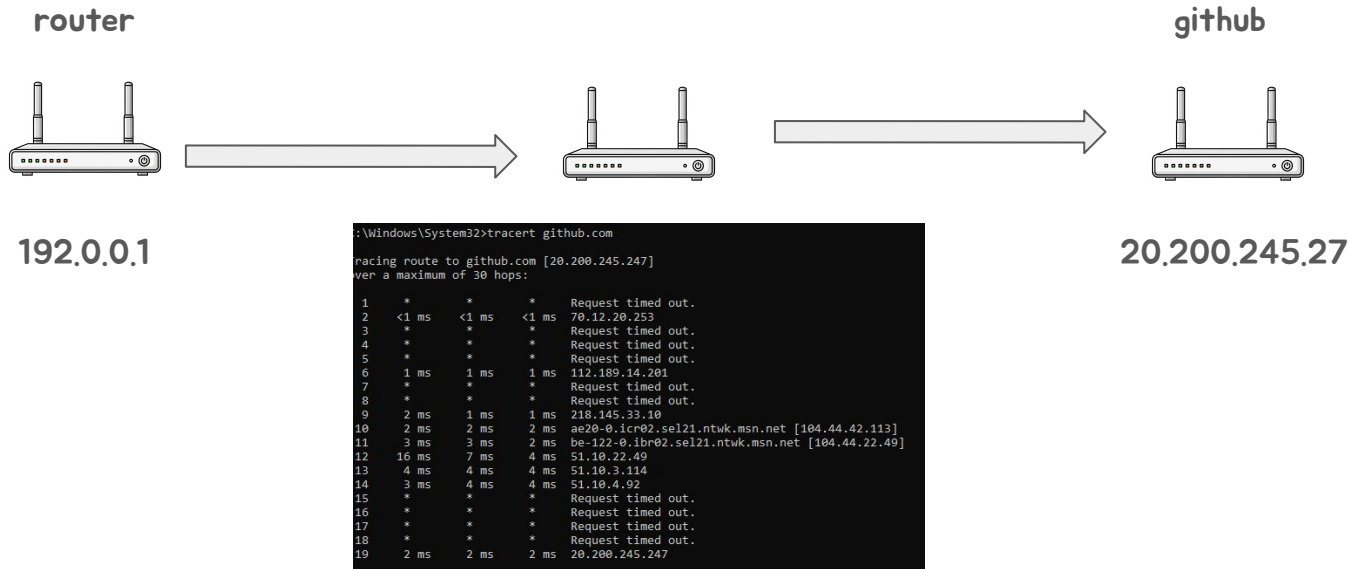
windows : route print
mac : netstat -rn

gateway - 70.12.103.1

라우팅 - 실제 주소를 찾아가는 과정 (홉 엔 홉) 과정

```
:\Windows\System32>tracert github.com

racing route to github.com [20.200.245.247]
ver a maximum of 30 hops:

  1     *        *        *     Request timed out.
  2    <1 ms    <1 ms    <1 ms  70.12.20.253
  3     *        *        *     Request timed out.
  4     *        *        *     Request timed out.
  5     *        *        *     Request timed out.
  6     1 ms     1 ms     1 ms  112.189.14.201
  7     *        *        *     Request timed out.
  8     *        *        *     Request timed out.
  9     2 ms     1 ms     1 ms  218.145.33.10
 10     2 ms     2 ms     2 ms  ae20-0.icr02.sel21.ntwk.msn.net [104.44.42.113]
 11     3 ms     3 ms     2 ms  be-122-0.ibr02.sel21.ntwk.msn.net [104.44.22.49]
 12    16 ms     7 ms     4 ms  51.10.22.49
 13     4 ms     4 ms     4 ms  51.10.3.114
 14     3 ms     4 ms     4 ms  51.10.4.92
 15     *        *        *     Request timed out.
 16     *        *        *     Request timed out.
 17     *        *        *     Request timed out.
 18     *        *        *     Request timed out.
 19     2 ms     2 ms     2 ms  20.200.245.247
```
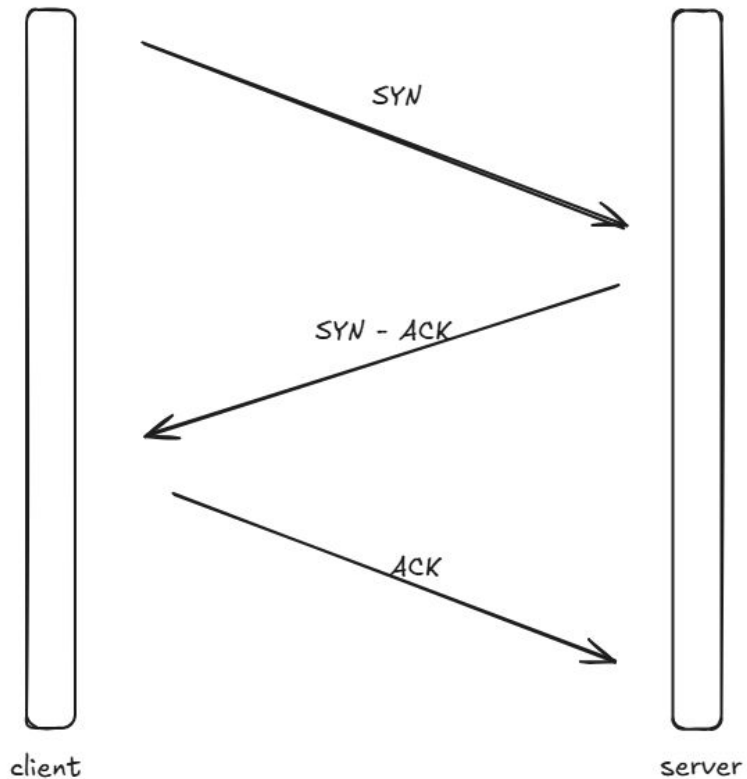
windows: tracert -d -w 100 github.com
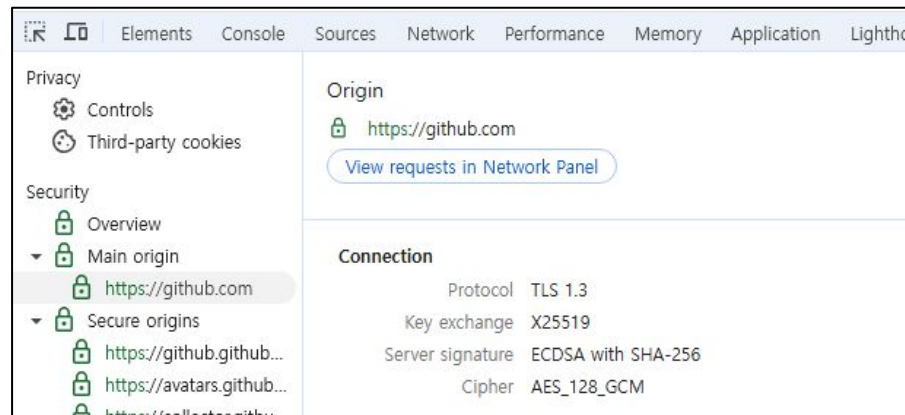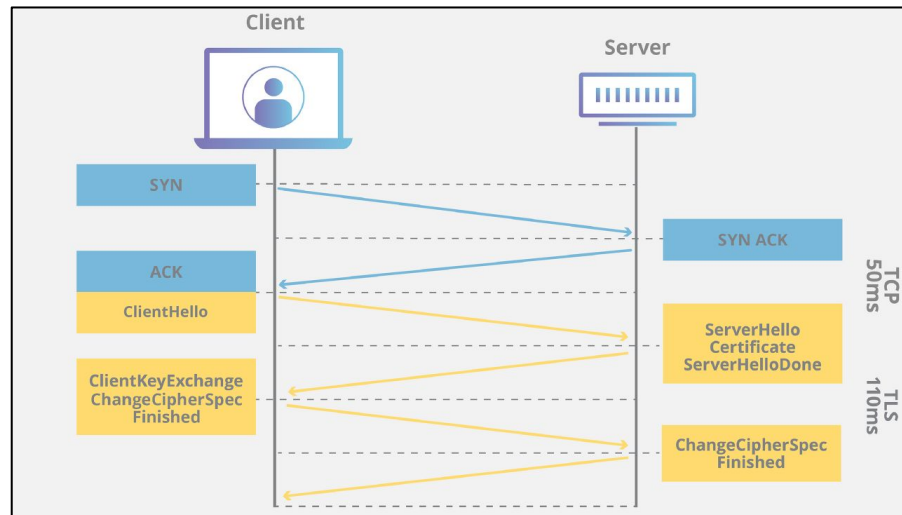MAC : traceroute -l -n -q 1 -w 1 github.com

대문자(l)
라우팅 되는 곳들

3. 서버와의 연결 (TCP 3-Way Handshake) (TCP)

TLS Handshake (HTTPS)

4. 데이터 요청 및 수신 HTTP

5. 브라우저 렌더링

발표 마치겠습니다.