

google.com 입력 후

OSI Model, LAN, WAN 관점에서

목차

요약

OSI Model

LAN

WAN

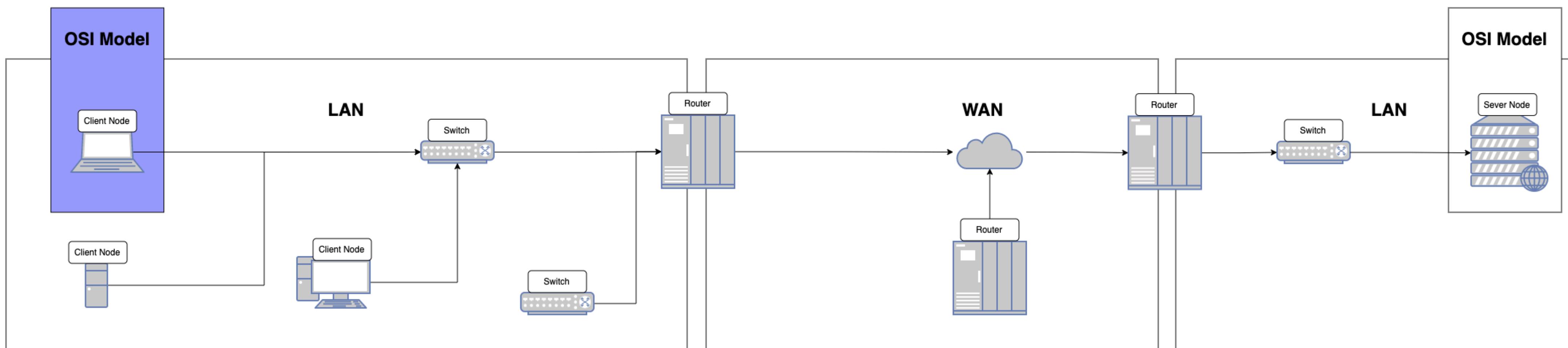
질의 응답

용어 정리

- Node: 네트워크 통신 단말
- LAN(Local Area Network): 소규모 네트워크
- WAN(Wide Area Network): LAN을 연결한 대규모 네트워크
- Switch: LAN 통신 장비
- Router: WAN 통신 장비
- OSI Model: Node와 통신 장비가 소통하기 위한 세부 규칙서

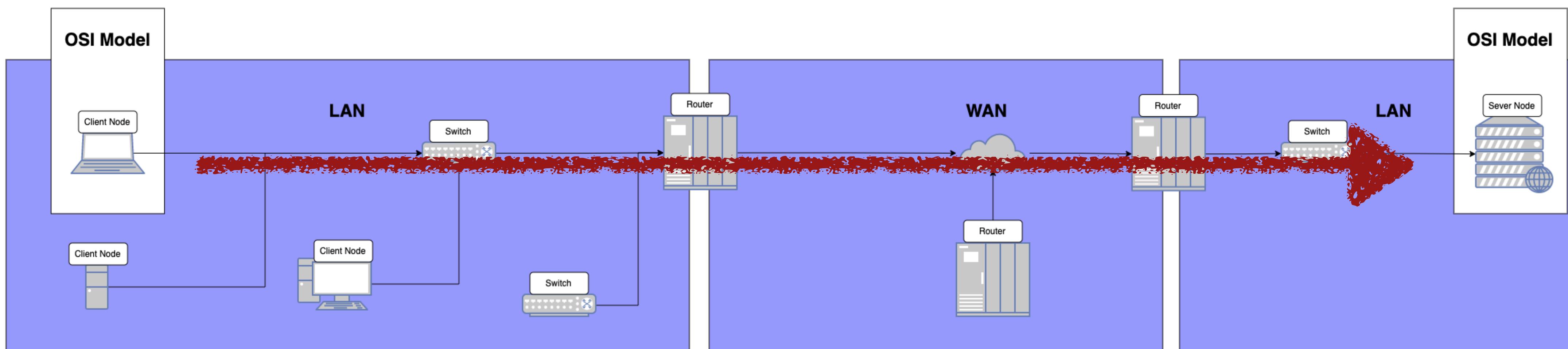
요약

1. google.com 입력 시 Client Node에서 요청 데이터 생성
2. 요청 데이터는 LAN과 WAN을 거쳐 Server Node 도착
3. Server Node는 응답 데이터 생성, Client Node에 역순으로 전달



요약

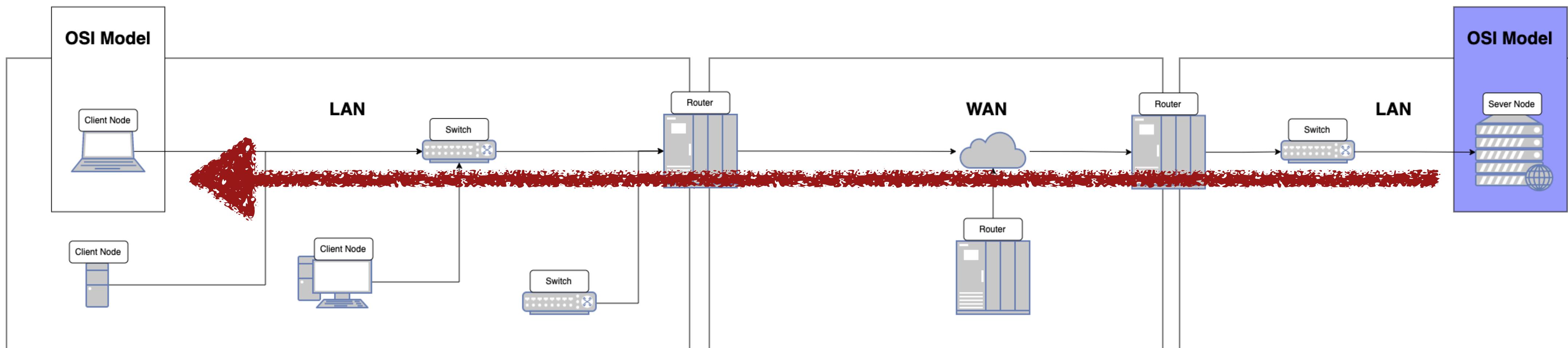
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요약

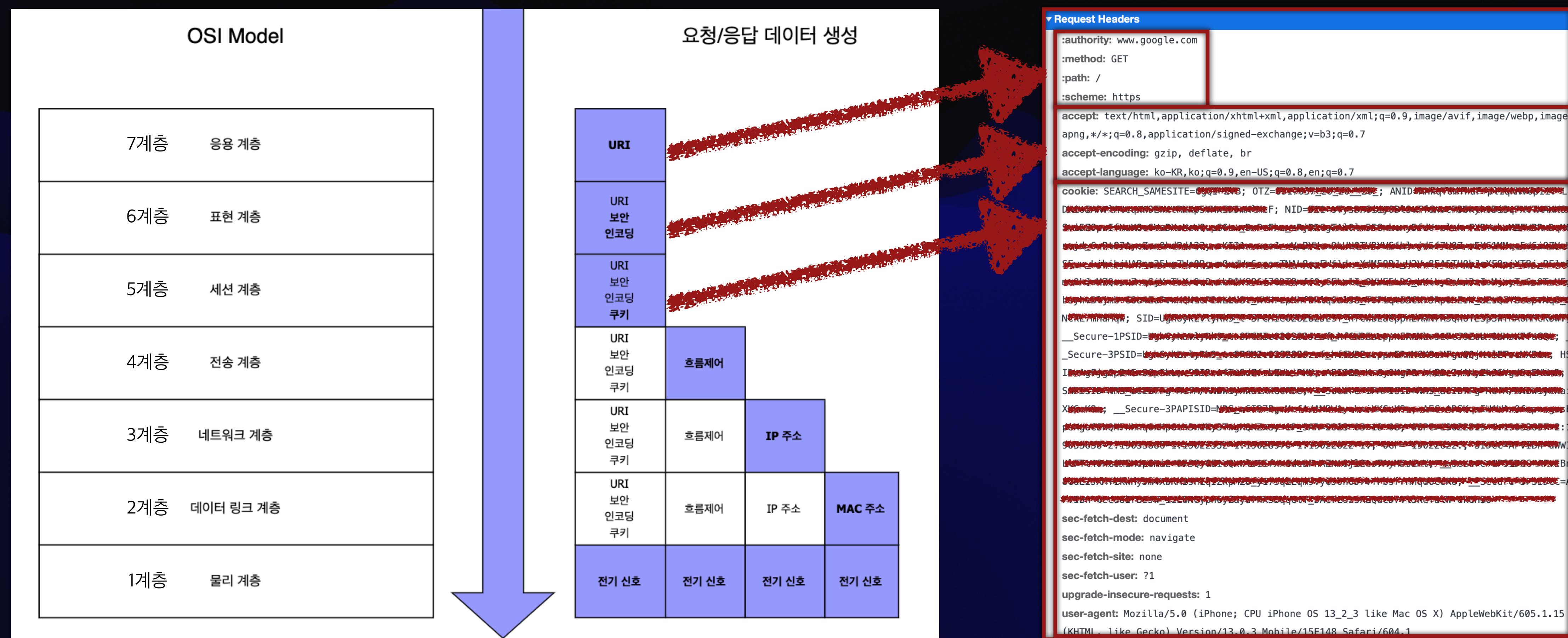
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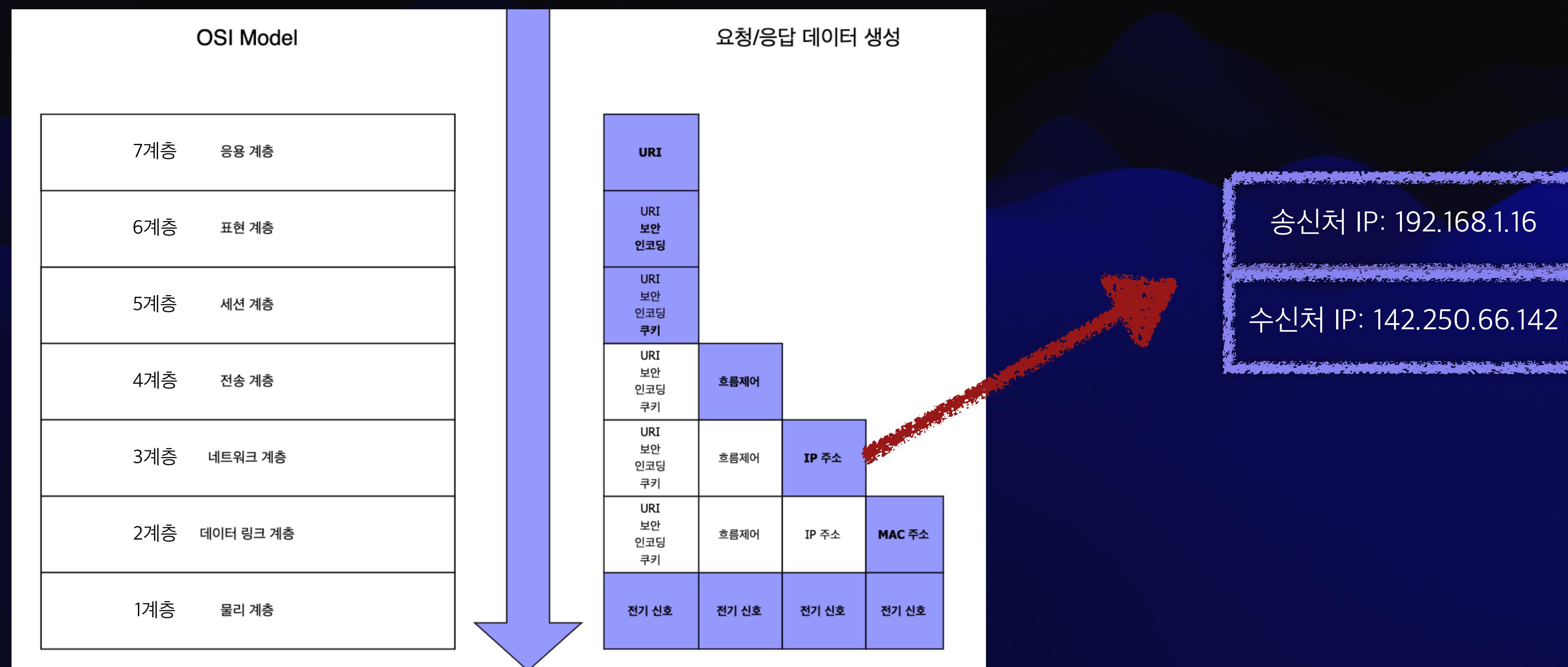
OSI Model

HTTP 요청 데이터 생성



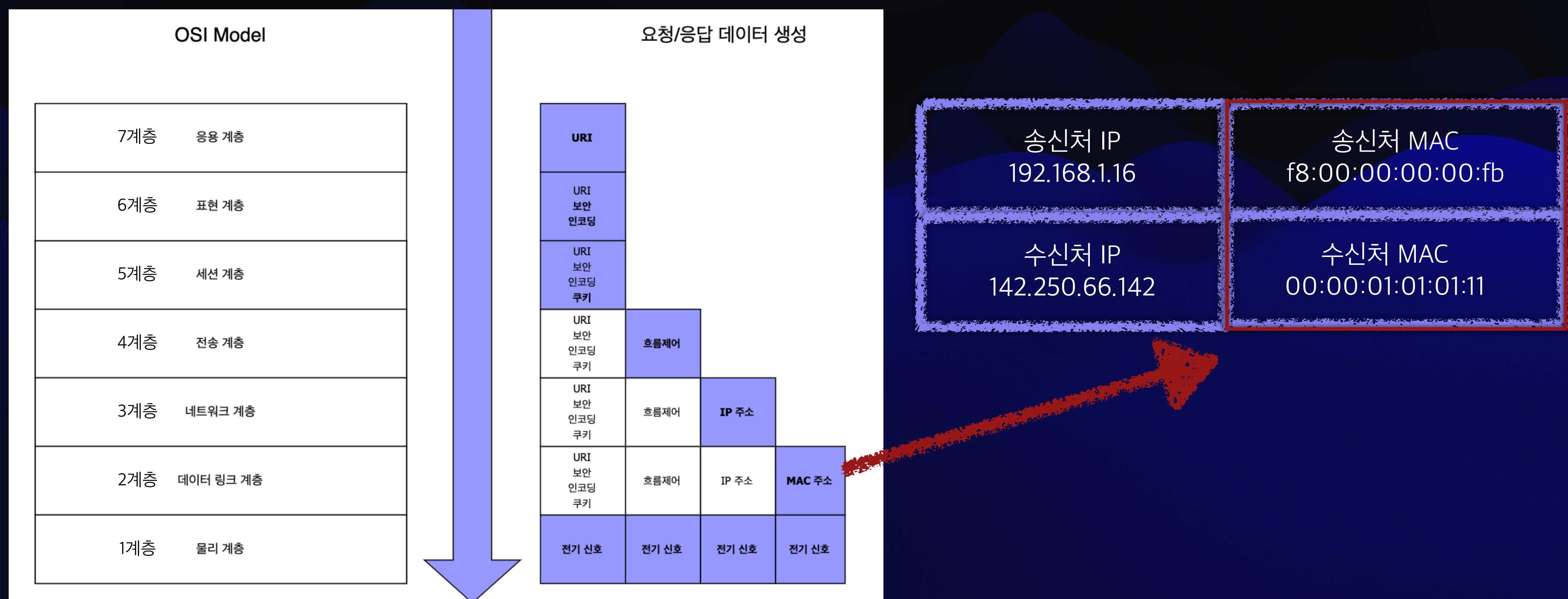
OSI Model

WAN 통신 데이터 생성



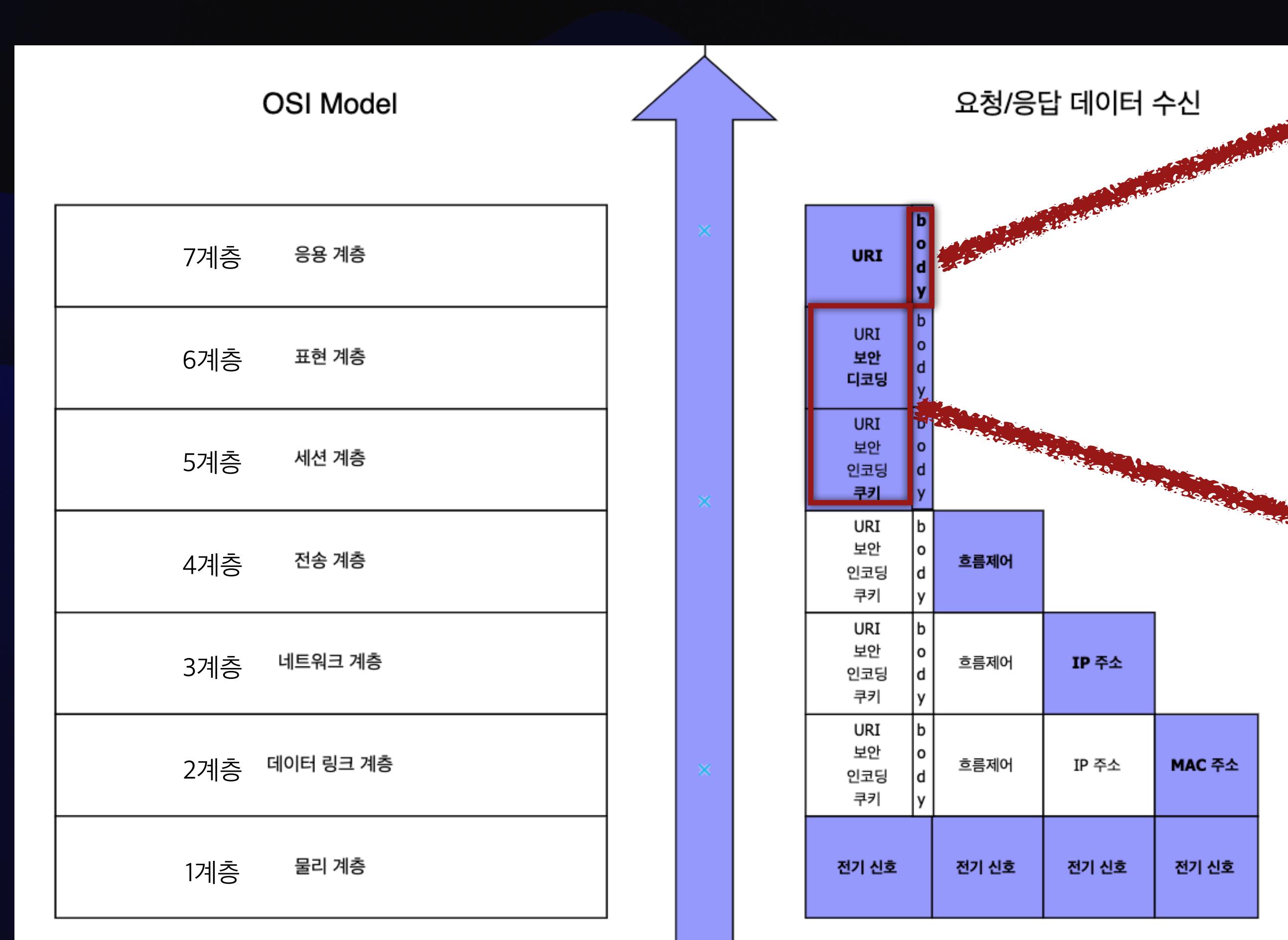
OSI Model

LAN 통신 데이터 생성



OSI Model

응답 데이터 수신



× Headers Preview Response Initiator Timing Cookies

```
1 <!doctype html>
- <html lang="ko">
-   <head>
-     <meta charset="UTF-8">
-     <meta content="width=device-width,initial-scale=1.0" name="viewport">
-     <meta content="telephone=no" name="format-detection">
-     <meta content="address=no" name="format-detection">
-     <meta content="origin" name="referrer">
-     <link href="/images/branding/product_ios/3x/gsa_ios_60dp.png" rel="apple-touch-icon-precomposed">
-     <link href="/images/branding/product_ios/2x/gsa_ios_60dp.png" rel="apple-touch-icon-precomposed">
-     <link href="/images/branding/product_ios/2x/gsa_ios_57dp.png" rel="apple-touch-icon-precomposed">
-     <link href="/images/branding/product_ios/1x/gsa_ios_57dp.png" rel="apple-touch-icon-precomposed">
-     <meta content="/images/branding/googleg/1x/googleg_standard_color_128dp.png" i...
-     <link href="/manifest?pwa=webhp" crossorigin="use-credentials" rel="manifest">
-   <style>
-     @font-face {
-       font-family: 'Google Sans';
-       font-style: normal;
-       font-weight: 400;
-       font-display: optional;
-       src: url("//fonts.gstatic.com/s/googlesans/v14/4UaGrENHsxJlGDuGo10I1L3K...
-       unicode-range: U+0301,U+0400-045F,U+0490-0491,U+04B0-04B1,U+2116;
-     }
-
-     @font-face {
-       font-family: 'Google Sans';
-       font-style: normal;
-       font-weight: 400;
-       font-display: optional;
-       src: url("//fonts.gstatic.com/s/googlesans/v14/4UaGrENHsxJlGDuGo10I1L3N...
-       unicode-range: U+0370-03FF;
-     }
-
-     @font-face {
-       font-family: 'Google Sans';
-       font-style: normal;
-       font-weight: 400;
-       font-display: optional;
-       src: url("//fonts.gstatic.com/s/googlesans/v14/4UaGrENHsxJlGDuGo10I1L3B...
-       unicode-range: U+0102 0103 U+0110 0111 U+0128 0129 U+0168-0169, U+01A0-01A1;
-     }
-
```

response Headers

Alt-Svc: h3=":443"; ma=2592000, h3-29=":443"; ma=2592000

Cache-Control: private

Content-Encoding: gzip

Content-Length: 50191

Content-Type: text/html; charset=UTF-8

Date: Sat, 18 Mar 2023 02:39:46 GMT

Expires: Sat, 18 Mar 2023 02:39:46 GMT

Server: gws

Set-Cookie: 1P_JAR=2023-03-18-02; expires=Mon, 17-Apr-2023 02:39:46 GMT; path=/; domain=.google.com; secure; SameSite=None

Set-Cookie: OTZ=; expires=Mon, 01-Jan-1990 00:00:00 GMT; path=/; domain=www.google.com

Set-Cookie: OTZ=; expires=Mon, 01-Jan-1990 00:00:00 GMT; path=/; domain=.www.google.com

Set-Cookie: OTZ=; expires=Mon, 01-Jan-1990 00:00:00 GMT; path=/; domain=google.com

Set-Cookie: OTZ=; expires=Mon, 01-Jan-1990 00:00:00 GMT; path=/; domain=.google.com

Set-Cookie: SIDCC=AFvIBn9CN0wyZOXZisGRmym8hv870A0rr11mdllg9Mifaf5PXS2vyw7chfshkBtciezc1 33L5gg; expires=Sun, 17-Mar-2024 02:39:46 GMT; path=/; domain=.google.com; priority=high

Set-Cookie: __Secure-1PSIDCC=AFvIBn96Kbe5wnjGoolapt6DwJrTAo...; expires=Sun, 17-Mar-2024 02:39:46 GMT; path=/; domain=.google.com; Secure; HttpOnly; priority=high; SameSite=None

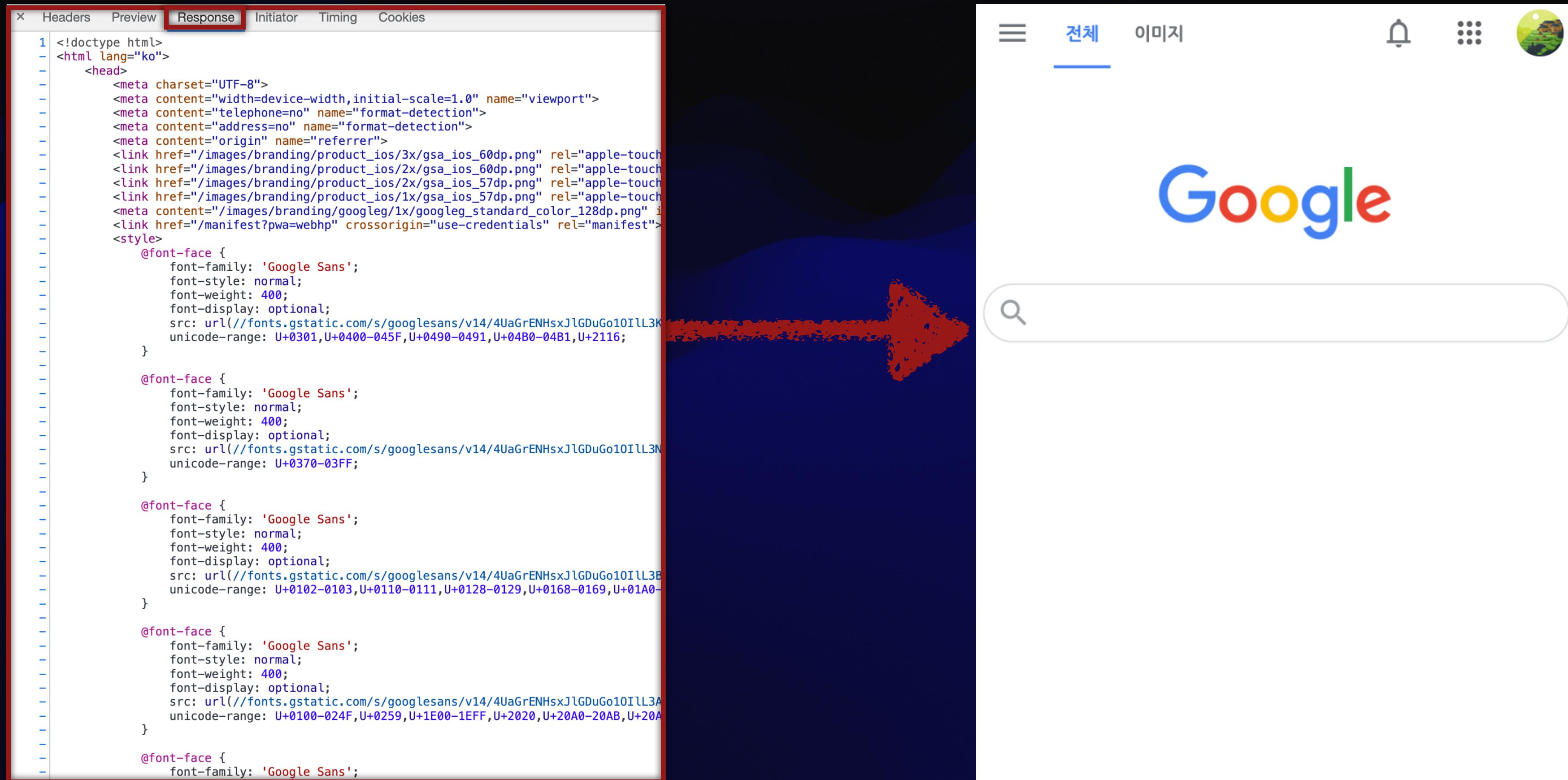
Strict-Transport-Security: max-age=31536000

Frame-Options: SAMEORIGIN

X-XSS-Protection: 0

OSI Model

응답 데이터 처리



The image shows a screenshot of a browser developer tools Network tab. A specific response is selected, and its content is displayed in the Response panel. The content is the HTML code for the Google homepage. A large red arrow points from the bottom right of the response body towards the search bar of a separate Google search results page.

```
<!doctype html>
<html lang="ko">
  <head>
    <meta charset="UTF-8">
    <meta content="width=device-width,initial-scale=1.0" name="viewport">
    <meta content="telephone=no" name="format-detection">
    <meta content="address=no" name="format-detection">
    <meta content="origin" name="referrer">
    <link href="/images/branding/product_ios/3x/gsa_ios_60dp.png" rel="apple-touch-icon-precomposed">
    <link href="/images/branding/product_ios/2x/gsa_ios_60dp.png" rel="apple-touch-icon-precomposed">
    <link href="/images/branding/product_ios/2x/gsa_ios_57dp.png" rel="apple-touch-icon-precomposed">
    <link href="/images/branding/product_ios/1x/gsa_ios_57dp.png" rel="apple-touch-icon-precomposed">
    <meta content="/images/branding/googleg/1x/googleg_standard_color_128dp.png" i...
    <link href="/manifest?pwa=webhp" crossorigin="use-credentials" rel="manifest">
  <style>
    @font-face {
      font-family: 'Google Sans';
      font-style: normal;
      font-weight: 400;
      font-display: optional;
      src: url("//fonts.gstatic.com/s/googlesans/v14/4UaGrENHsxJlGDuGo10ILL3K...
      unicode-range: U+0301,U+0400-045F,U+0490-0491,U+04B0-04B1,U+2116;
    }

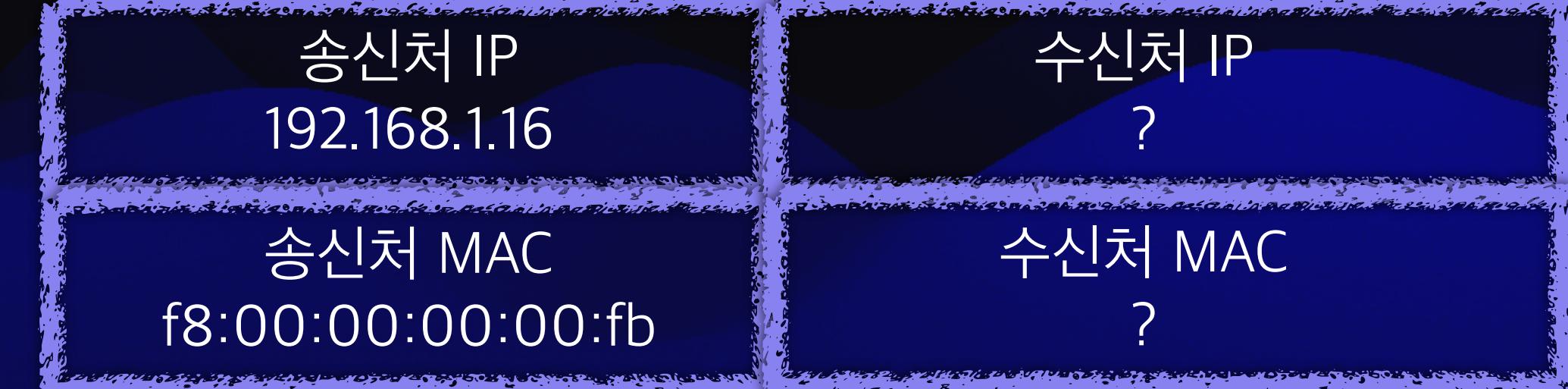
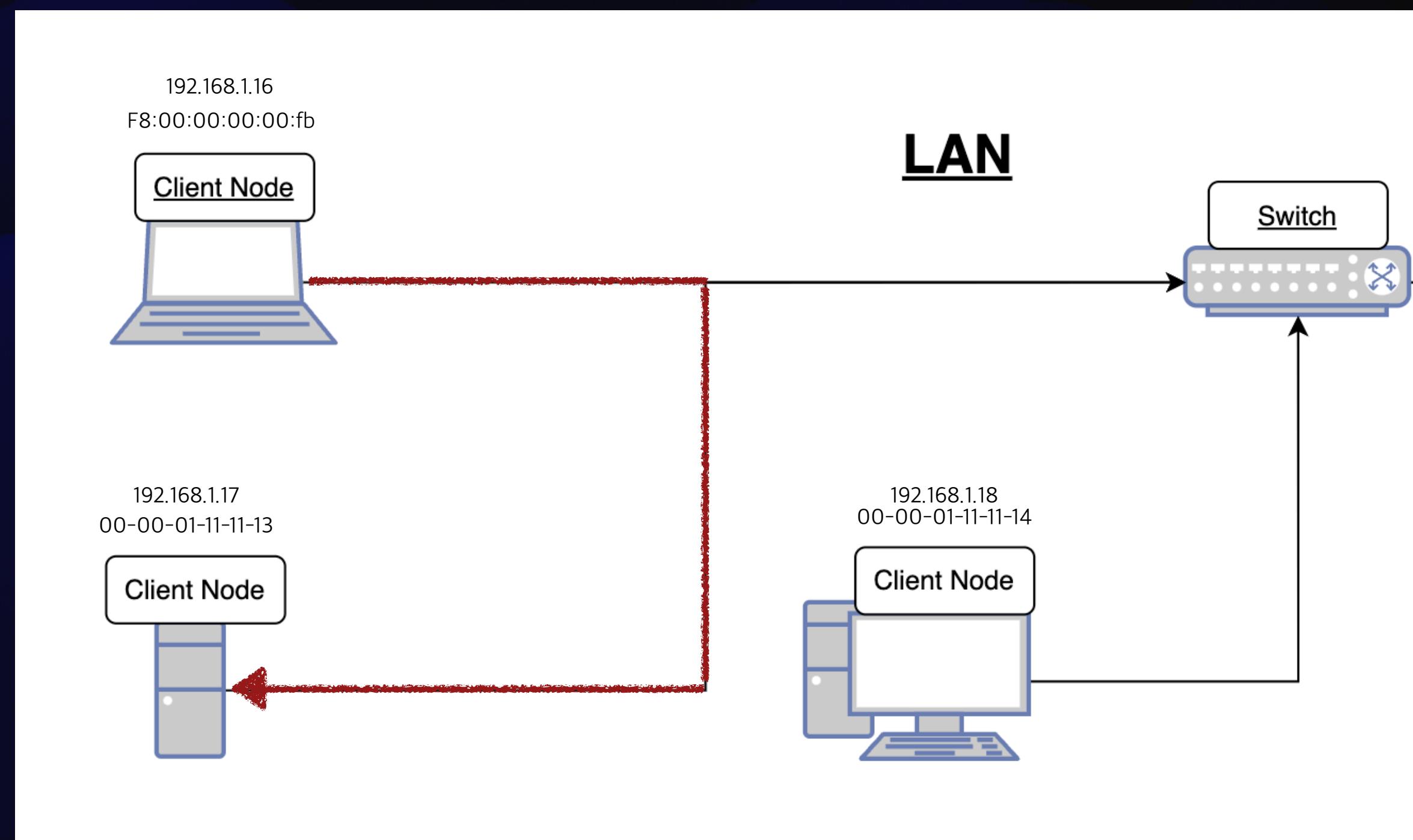
    @font-face {
      font-family: 'Google Sans';
      font-style: normal;
      font-weight: 400;
      font-display: optional;
      src: url("//fonts.gstatic.com/s/googlesans/v14/4UaGrENHsxJlGDuGo10ILL3N...
      unicode-range: U+0370-03FF;
    }

    @font-face {
      font-family: 'Google Sans';
      font-style: normal;
      font-weight: 400;
      font-display: optional;
      src: url("//fonts.gstatic.com/s/googlesans/v14/4UaGrENHsxJlGDuGo10ILL3B...
      unicode-range: U+0102-0103,U+0110-0111,U+0128-0129,U+0168-0169,U+01A0-...
    }

    @font-face {
      font-family: 'Google Sans';
      font-style: normal;
      font-weight: 400;
      font-display: optional;
      src: url("//fonts.gstatic.com/s/googlesans/v14/4UaGrENHsxJlGDuGo10ILL3A...
      unicode-range: U+0100-024F,U+0259,U+1E00-1EFF,U+2020,U+20A0-20AB,U+20A...
```

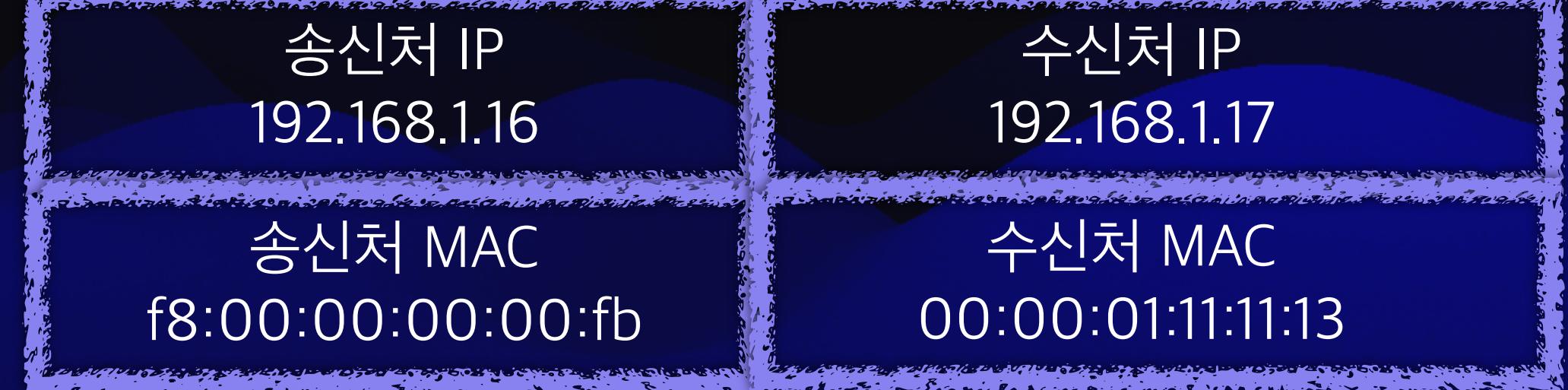
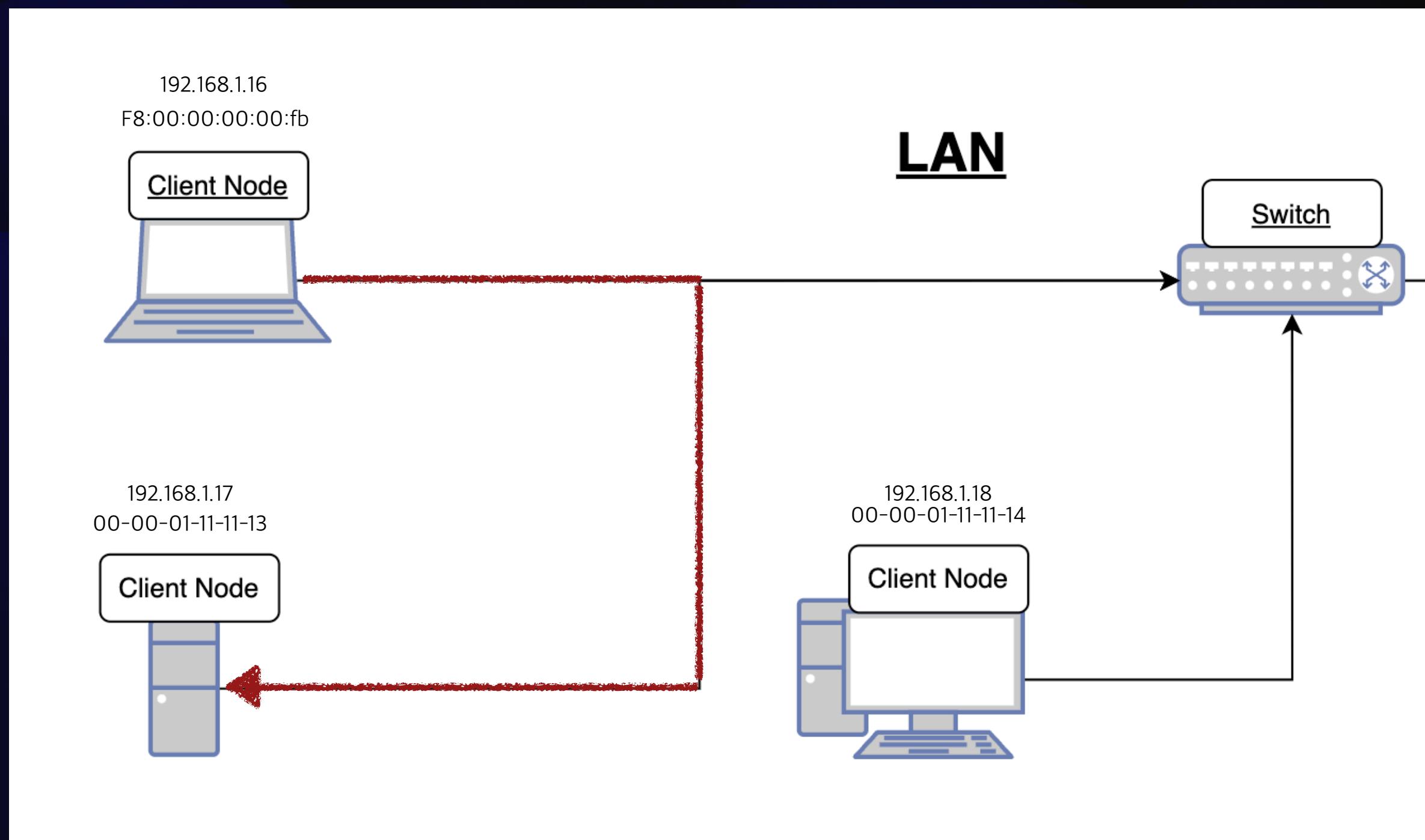
LAN

DHCP → 송신처 IP / NIC → 송신처 MAC



LAN

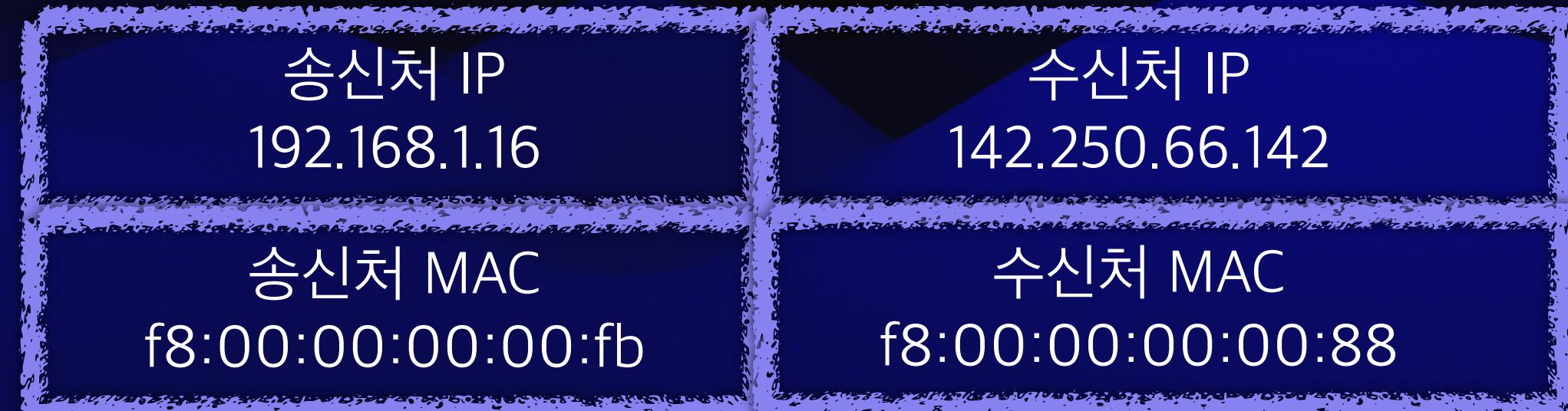
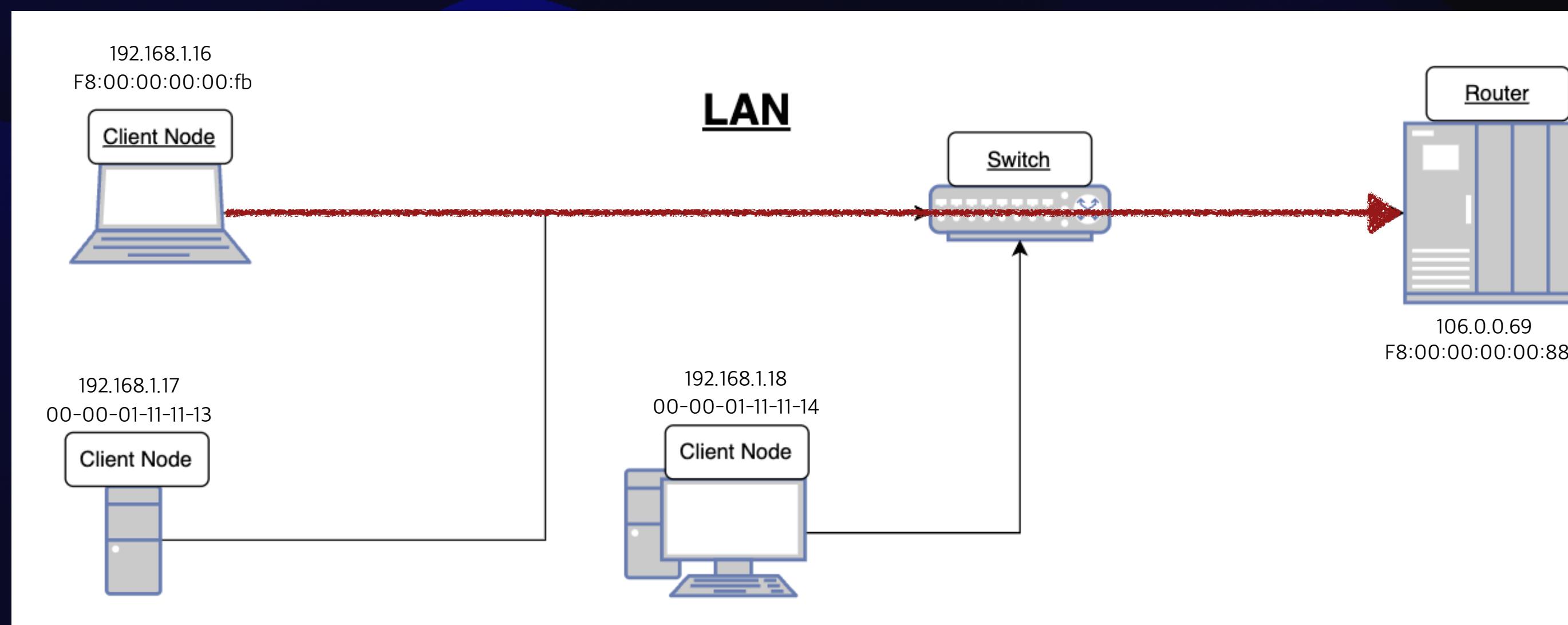
DHCP → 송신처 IP / NIC → 송신처 MAC
ARP → 수신처 IP / ARP → 수신처 MAC



```
→ ~ arp -a
? (169.254.110.206) at d8:f3:bc:75:b5:e3 on en0 [ethernet]
? (169.254.135.161) at fc:b3:bc:2c:50:42 on en0 [ethernet]
? (169.254.152.233) at ba:3a:eb:e:18:6d on en0 [ethernet]
? (192.168.0.1) at 88:36:6c:af:71:9a on en0 ifscope [ethernet]
? (192.168.0.10) at ba:4f:77:b7:29:68 on en0 ifscope [ethernet]
? (192.168.0.12) at 3c:21:9c:3e:61:38 on en0 ifscope [ethernet]
? (192.168.0.19) at aa:df:89:da:ba:d5 on en0 ifscope [ethernet]
? (192.168.0.21) at 8a:93:e3:5c:c:98 on en0 ifscope [ethernet]
```

WAN

DHCP → 송신처 IP / NIC → 송신처 MAC
DNS → 수신처 IP / ARP → 수신처 MAC

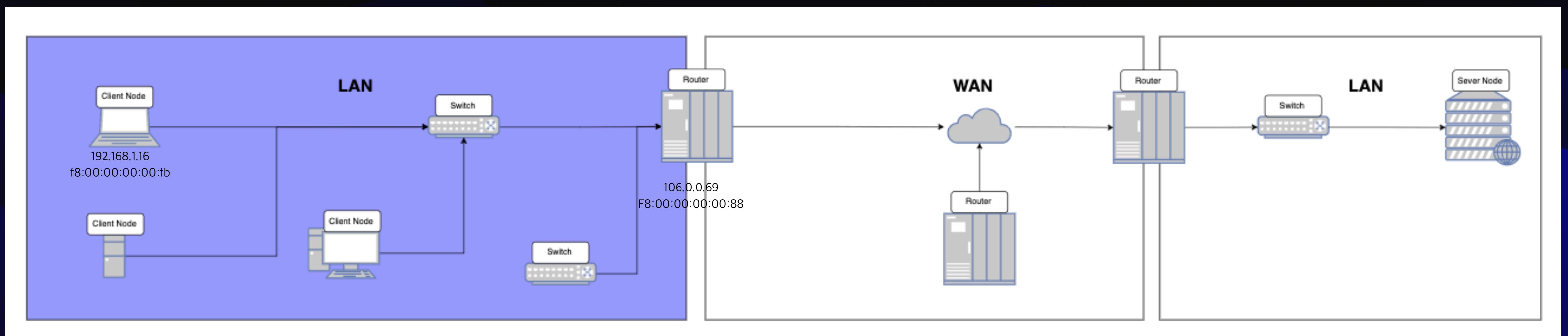


```
→ ~ nslookup google.com
Server: 192.168.1.1
Address: 192.168.1.1#53

Non-authoritative answer:
Name: google.com
Address: 142.250.66.142
```

WAN

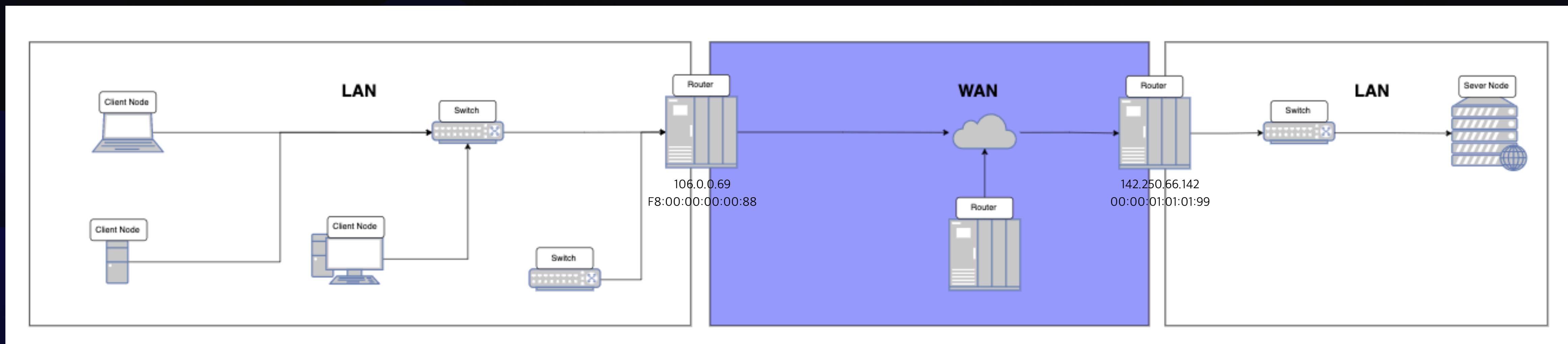
송수신처 주소 획득



송신처 IP 192.168.1.16	수신처 IP 142.250.66.142
송신처 MAC f8:00:00:00:00:fb	수신처 MAC f8:00:00:00:00:88

WAN

송수신처 주소 변경



송신처 IP
106.0.0.69

송신처 MAC
f8:00:00:00:00:88

수신처 IP
142.250.66.142

수신처 MAC
00:00:01:01:01:99

WAN

라우터 -> 라우터 이동

```
traceroute to google.com      (142.250.66.142)
1  192.168.1.1  2.066 ms
2  *
3  *
4  1.213.9.129  3.464 ms
5  1.213.9.129  3.291 ms
6  1.208.147.5  4.559 ms
7  *
8  1.208.149.1  9.066 ms
9  61.40.251.154  35.942 ms
10 203.248.129.114  34.946 ms
11 142.250.173.138  61.444 ms
12  *
13 216.239.43.50  67.046 ms
14 108.170.242.176  67.839 ms
15 72.14.234.67  67.407 ms
16 142.250.213.6  63.686 ms
17 142.251.49.204  62.114 ms
18 209.85.142.202  61.846 ms
19 108.170.241.33  64.999 ms
20 142.251.245.17  61.994 ms
21          142.250.66.142  61.567 ms
```

Info	
IP:	1.213.9.129
RDNS:	None
ASN:	AS3786
CIDR:	1.208.0.0/12
NetName:	BORANET

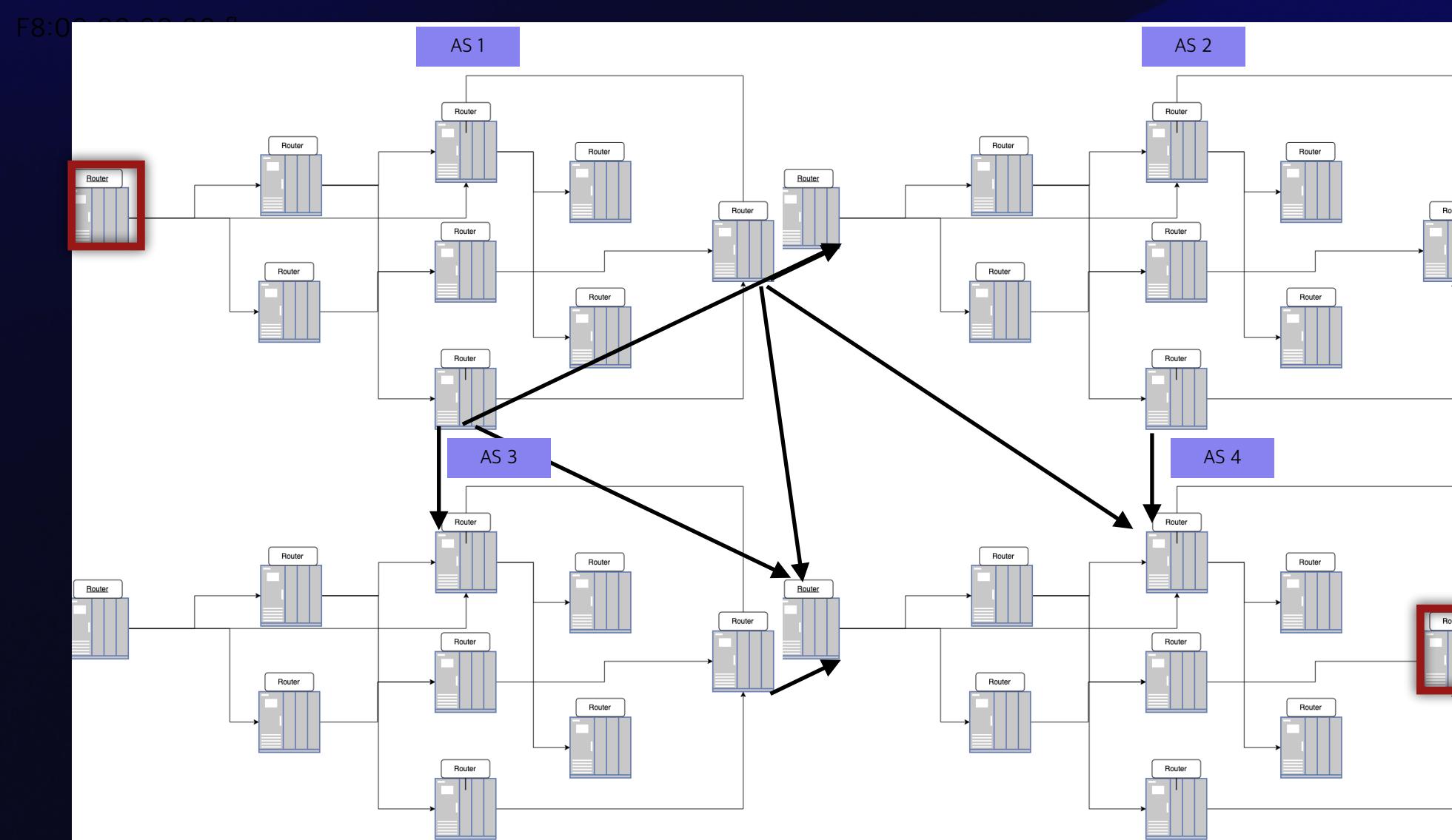
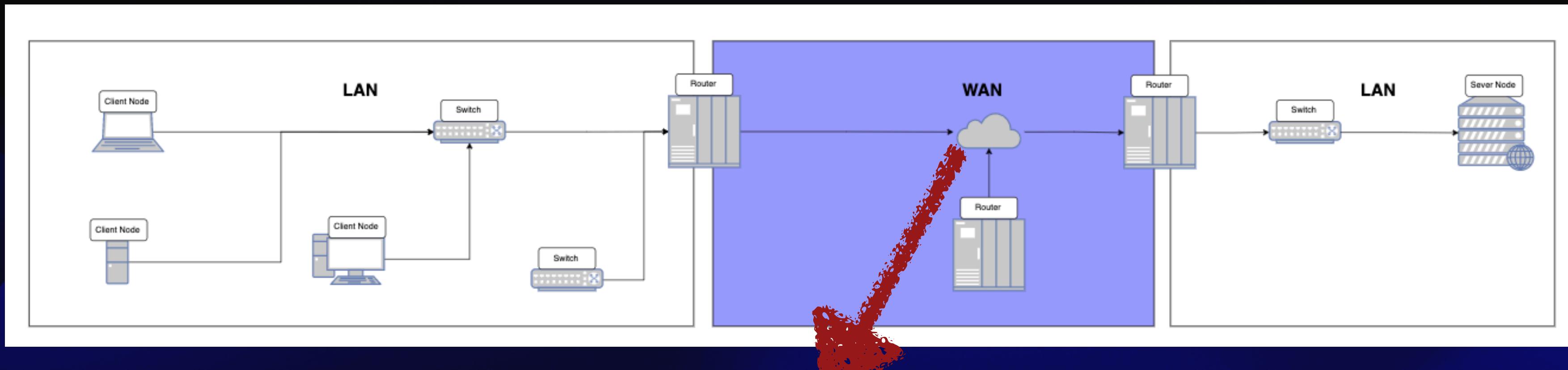
Owner	
Name:	IP Manager
Address:	Seoul Yongsan-gu Hangang-daero 32
Phone:	+82-2-1-01
Email:	ipadm@lguplus.co.kr

Owner	
Name:	Google LLC
Address:	1600 Amphitheatre Parkway 94043 Mountain View US
Phone:	Unknown
Email:	Unknown

Location	
Continent:	North America
Country:	United States
City:	Unknown
Latitude:	37.751
Longitude:	-97.822

WAN

IGP: AS 내부 라우팅 / BGP: AS 간 라우팅



IGP 프로토콜에 의해 생성된 라우팅 테이블 예시

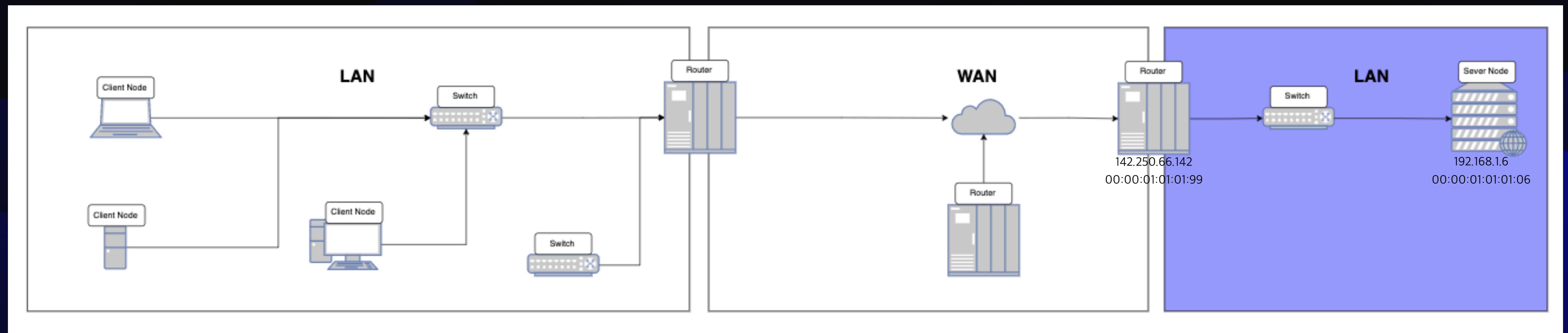
대상 네트워크	다음 흡 라우터
203.0.113.0/24	192.168.1.1
192.0.2.0/24	192.168.1.2
198.51.100.0/24	192.168.1.3

BGP에 의해 생성된 라우팅 테이블 예시

대상 네트워크	다음 흡 AS	다음 흡 라우터
203.0.113.0/24	AS65534	192.0.2.1
198.51.100.0/24	AS65533	203.0.113.1
192.0.2.0/24	AS65532	198.51.100.1

WAN

송수신처 주소 변경



송신처 IP
106.0.0.69

송신처 MAC
00:00:01:01:01:99

수신처 IP
192.168.1.6

수신처 MAC
00:00:01:01:01:06



질의 응답

감사합니다