



The bridge to possible

# 네트워크야 놀자!

두번째 이야기 중 하나 - IP 주소 체계

박춘택 프로  
System Architect  
CISCO Service Provider

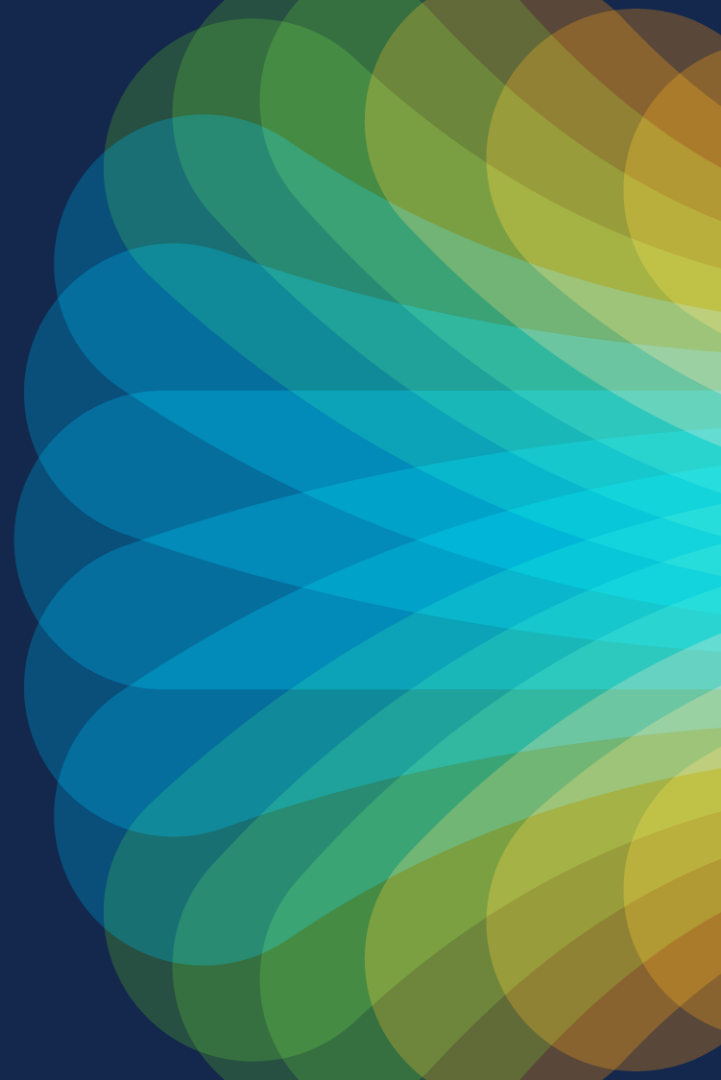


# 목차

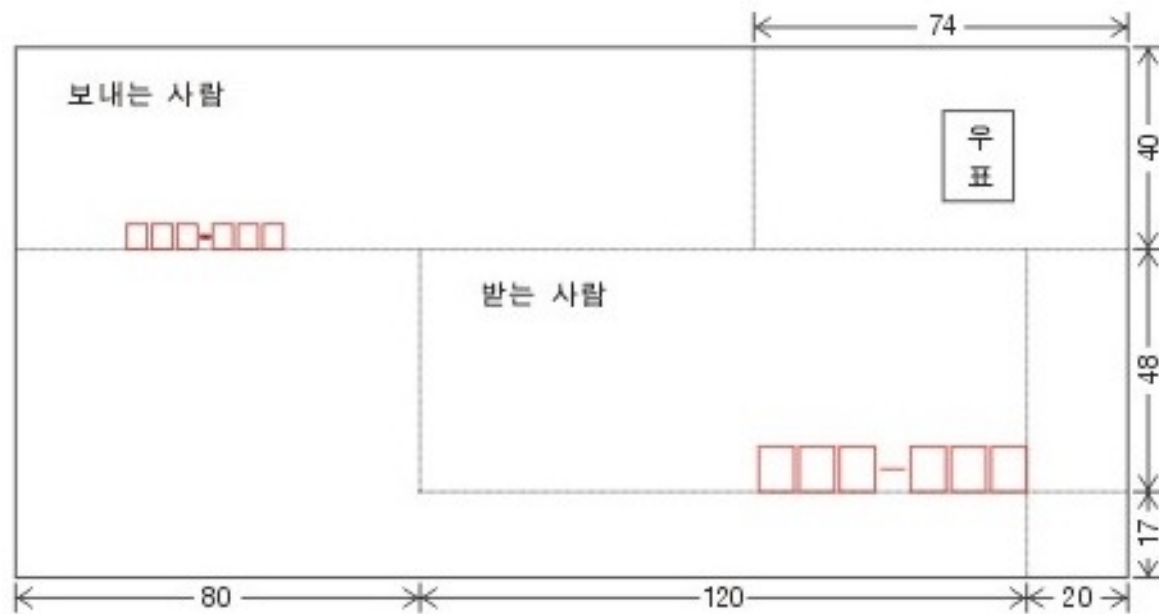
- 대한민국에서 편지 보내기
- 네트워크에서 패킷 보내기
- OSI 7 Layer 와 TCP/IP Layer
- TCP/IP 의 Internet Layer (IPv4와 IPv6)
- TCP/IP 의 Transport Layer (TCP와 UDP)

대한민국에서

편지 보내기



# 편지 보내기



출처 : 우정사업본부



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# 편지 보내기

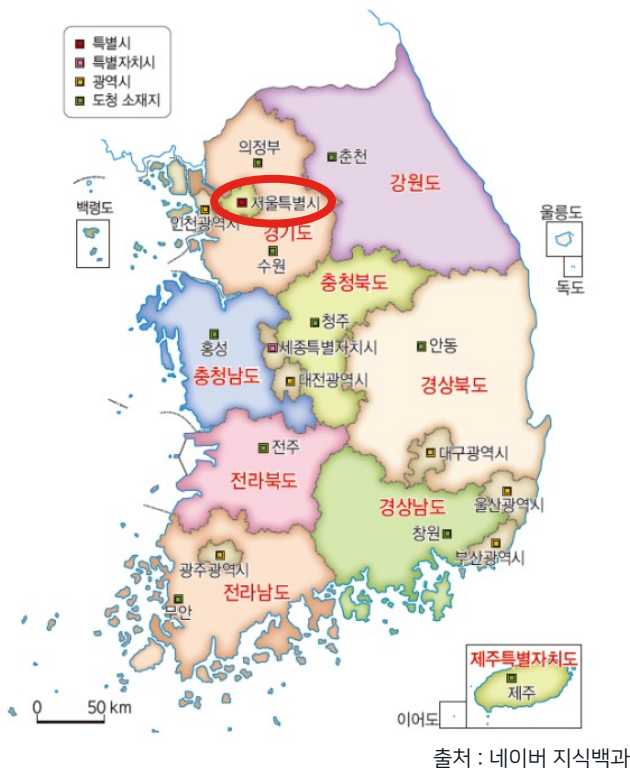
## 시스코 코리아 사무실 주소

우편번호

주소

06164

서울특별시 강남구 영동대로 517 (삼성동, ASEM및한국종합무역센터단지)  
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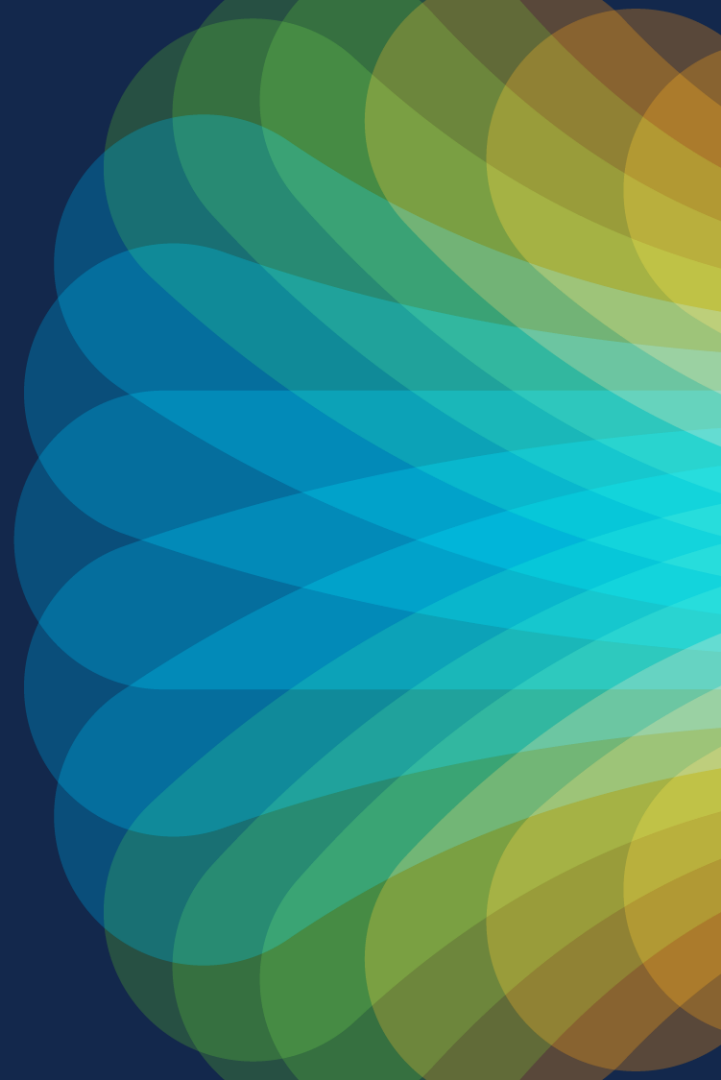


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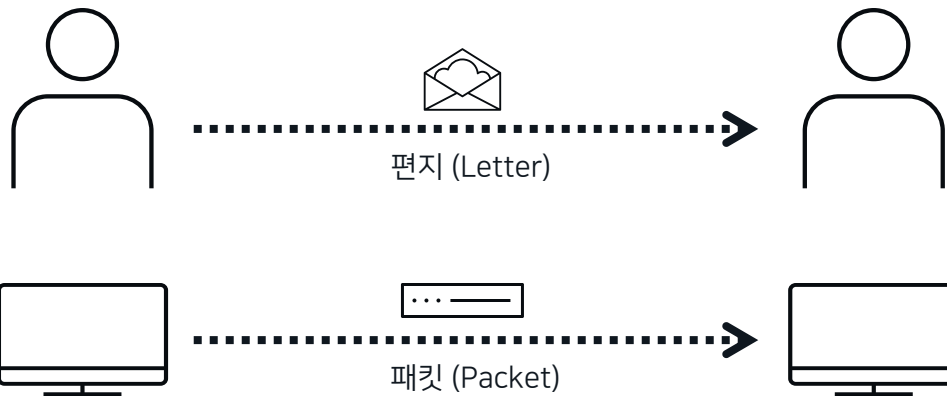
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네트워크에서의

패킷 보내기



# 호스트 간 통신을 위해

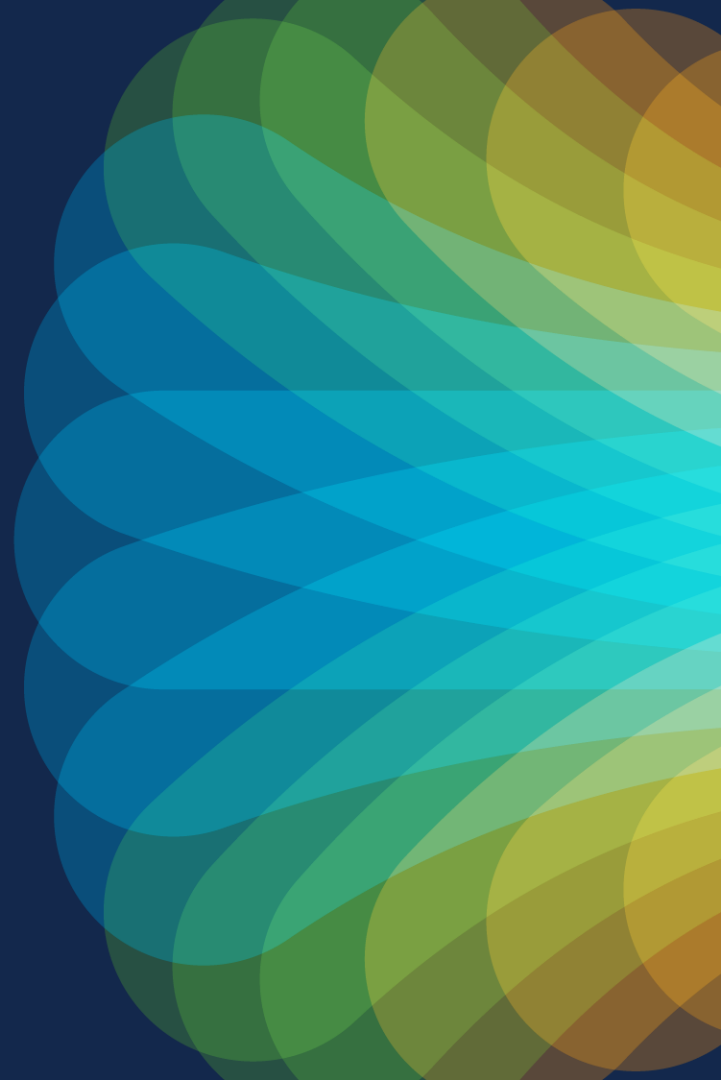


- 호스트 (Host) : 네트워크를 통해 패킷을 주고 받는 장비
  - PC, 랩탑, 태블릿, 스마트폰, IoT 센서, 결제 단말 등
- 물리적으로 떨어져 있는 목적지(받는 사람의) 호스트에게
  - 받은 패킷을 이해하기 위한 상호간 동일한 표준 언어 필요
  - 패킷을 전달하기 위한 주소 체계 필요



OSI 7 Layer 와

TCP/IP 4 Layer





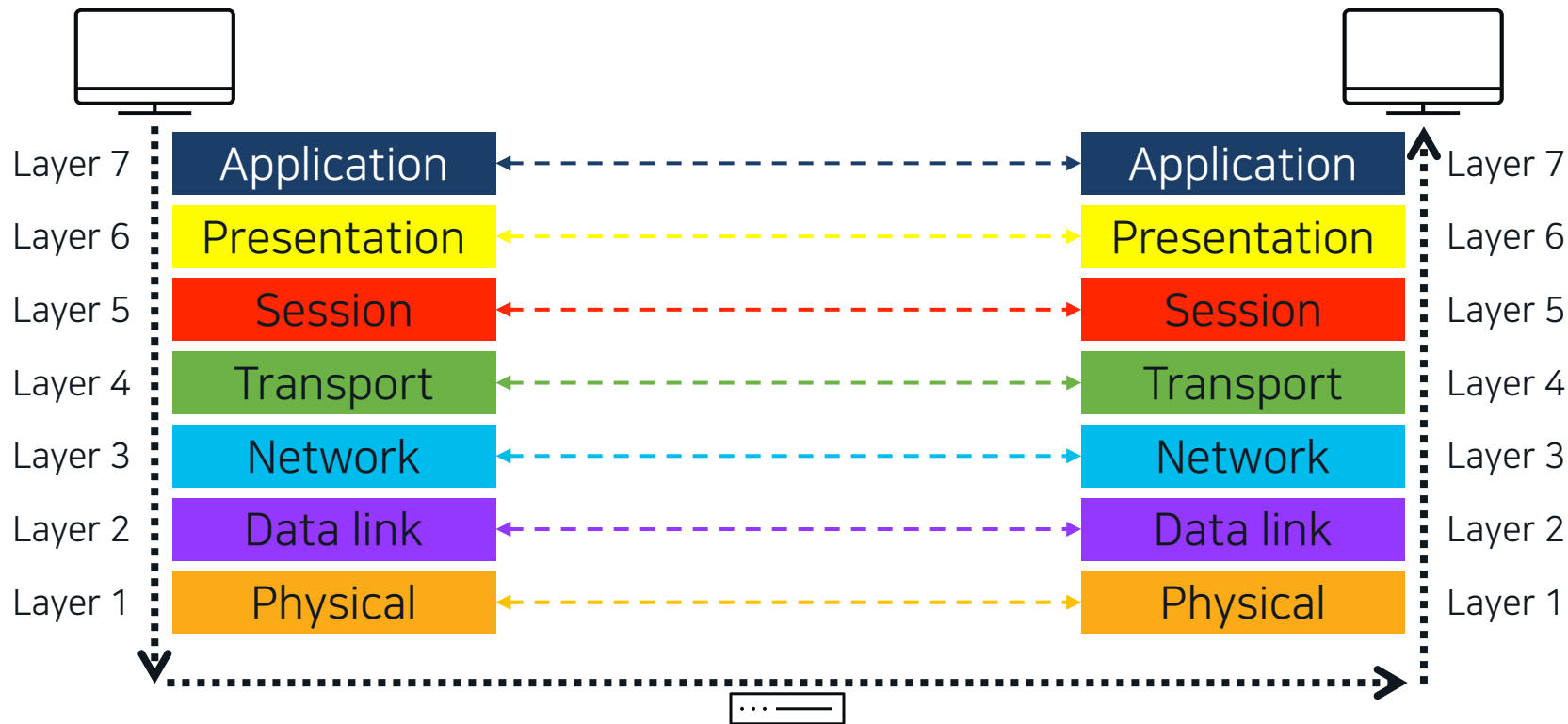
# OSI 7 Layer

Layer 7	Application
Layer 6	Presentation
Layer 5	Session
Layer 4	Transport
Layer 3	Network
Layer 2	Data link
Layer 1	Physical

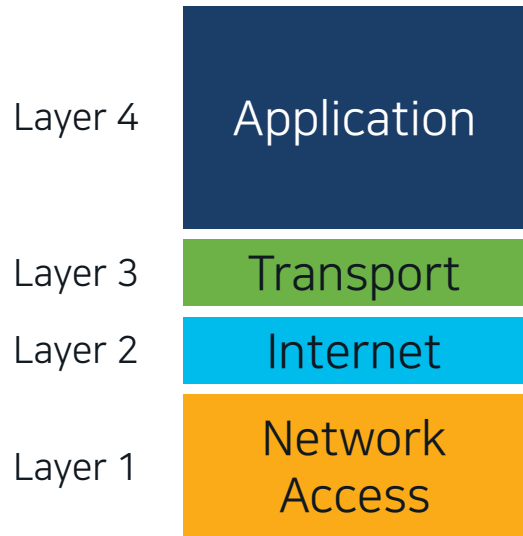
- OSI – ‘Open Systems Interconnection’ Model
- ISO (International Standards Organization)에서 정의
- 원활한 통신을 위한 표준 계위 정의 모델



# OSI 7 Layer 기반 호스트간 통신



# TCP/IP Layer



- Layer 4 - TCP – Transmission Control Protocol
- Layer 3 - IP – Internet Protocol
- IP, TCP/UDP가 좀더 널리 쓰이면서 OSI 모델을 좀더 간편화한 모델



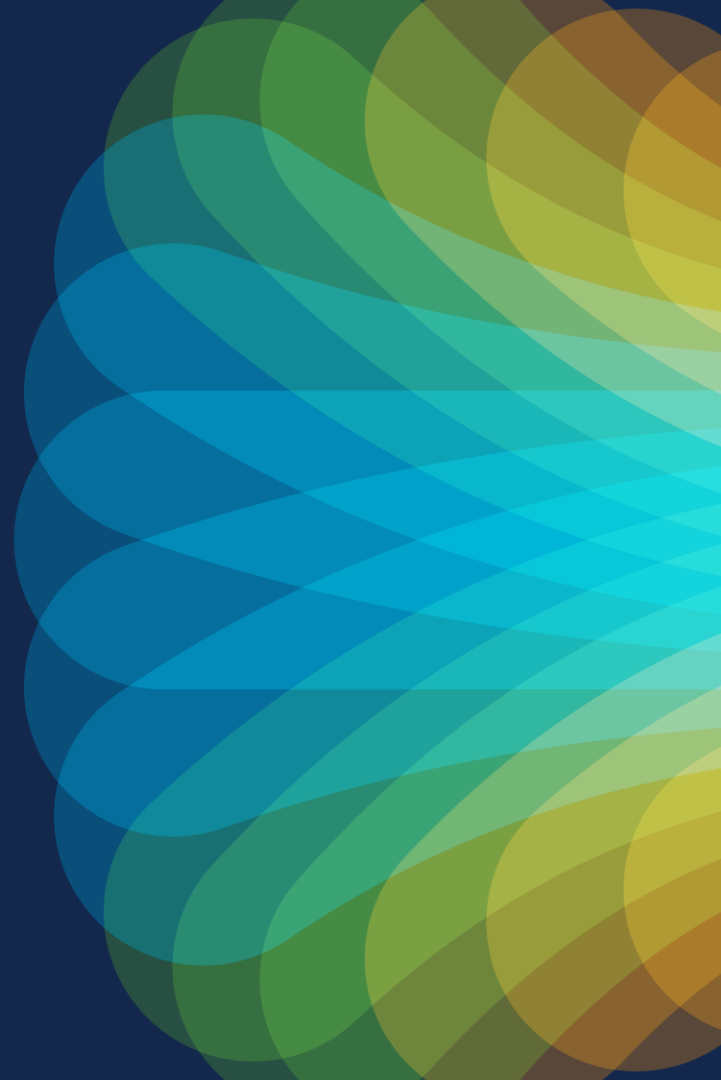
# OSI 7 Layer 와 TCP/IP Layer

Layer 7	Application	HTTP, DNS, DHCP, FTP	Application	Layer 4
Layer 6	Presentation			
Layer 5	Session			
Layer 4	Transport	TCP, UDP	Transport	Layer 3
Layer 3	Network	IP(v4, v6), ICMP(v4, v6)	Internet	Layer 2
Layer 2	Data link	Ethernet, Frame-Relay, PPP	Network Access	Layer 1
Layer 1	Physical			



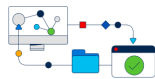
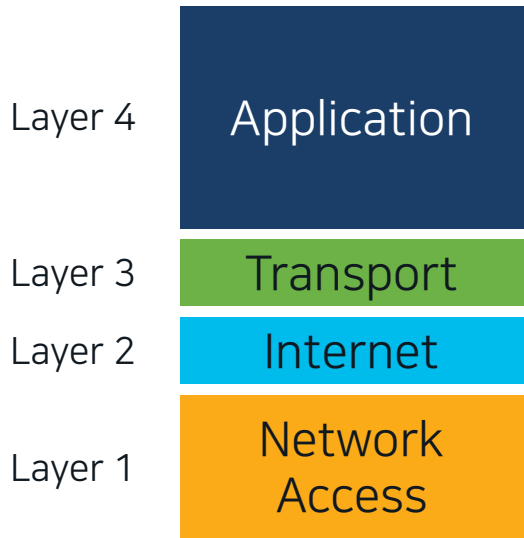
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# TCP/IP 의 Internet Layer (IPv4)



# Internet Protocol 특징

- OSI의 네트워크 계층에서 동작
- Connectionless protocol
- 각 패킷 (Packet)은 독립적으로 처리
- 계층적 주소 체계
- Best-effort 전송
- 데이터 복구 기능 부재



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# 왜 IP Addresses 인가 ?

- IP를 사용하는 네트워크에서 각 호스트들을 고유하게 식별
- 모든 호스트는(computer, networking device, peripheral) 고유한 주소를 가지고 있어야 함
- Host ID:
  - 개별 호스트를 식별
  - 조직에서 각 호스트(장비)들에 할당

192.168.1.1 255.255.255.0



# IPv4 와 IPv6 소개

IPv4 32-bits

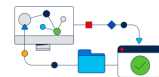
IPv6 128-bits

$$2^{32} = 4,294,967,296$$

$$2^{128} = 340,282,366,920,938,463,463,374,607,431,768,211,456$$

$$2^{128} = 2^{32} * 2^{96}$$

$$2^{96} = 79,228,162,514,264,337,593,543,950,336 \text{ times the number of possible IPv4 Addresses (79 trillion trillion)}$$





# IPv4 와 IPv6 소개

IPv4:	4 octets
11000000.10101000.11001001.0111000	
192.168.201.113	
4,294,467,295 IP addresses	

IPv6:	16 octets
11010001.11011100.11001001.01110001.11010001.11011100. 11001100.01110001.11010001.11011100.11001001.01110001. 11010001.11011100.11001001.01110001	
A524:72D3:2C80:DD02:0029:EC7A:002B:EA73	
$3.4 \times 10^{38}$ IP addresses	

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# IPv4 와 IPv6 소개

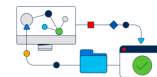
## IPv4 Header

Version	IHL	Type of Service	Total Length			
Identification			Flags	Fragment Offset		
Time to Live	Protocol		Header Checksum			
Source Address						
Destination Address						
Options				Padding		

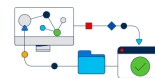
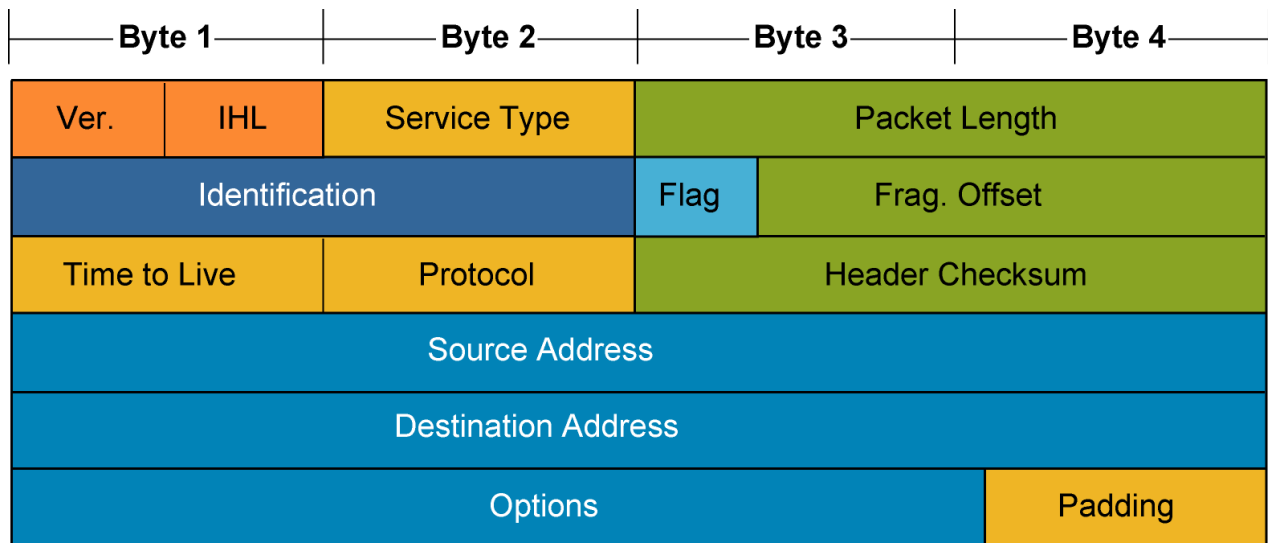
- IPv4와 IPv6 동일
- IPv6에서는 미사용
- IPv6에서는 변경
- IPv6에 신규

## IPv6 Header

Version	Traffic Class	Flow Label		
Payload Length			Next Header	Hop Limit
Source Address				
Destination Address				



# IPv4 헤더



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# IPv4 주소 형식 : 점 (소수점) 표기

	Example			
	10101100	00010000	10000000	00010001
An IP address is a 32-bit binary number	10101100	00010000	10000000	00010001
For readability, the 32-bit binary number can be divided into four 8-bit octets	10101100	00010000	10000000	00010001
Each octet (or byte) can be converted to decimal	172	16	128	17
The address can be written in dotted decimal notation	172.	16.	128.	17

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# IPv4 Address Classes: 첫번째 Octet

A B C ... Easy as 1 2 3

Class A ... First 1 bit fixed	<u>0</u> x x x x x x x	.	Host	.	Host	.	Host
Class B ... First 2 bits fixed	<u>10</u> x x x x x x	.	Network	.	Host	.	Host
Class C ... First 3 bits fixed	<u>110</u> x x x x x	.	Network	.	Network	.	Host



# IPv4 Address 범위

IP Address Class	First Octet Binary Value	First Octet Decimal Value	Possible Number of Hosts
Class A	1-126	<u>0</u> 0000001 to 0 <u>1</u> 111110*	16,777,214
Class B	128-191	<u>10</u> 000000 to <u>10</u> 111111	65,534
Class C	192-223	<u>110</u> 00000 to <u>110</u> 11111	254

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\*127(01111111)은 루프백 테스트를 위해 예약된 클래스 A 주소 중 일부이며  
호스트 등의 네트워크에 할당할 수 없음

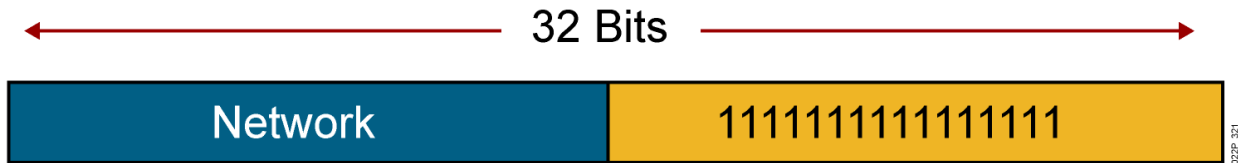


# 예약된 IPv4 Address 들

- Network Addresses



- Broadcast Addresses



# 공인/사설 IPv4 Address 들

Class	공인 Address 범위	사설 Address 범위
A	1.0.0.0 ~ 9.255.255.255	10.0.0.0 to 10.255.255.255
	11.0.0.0 ~ 126.255.255.255	
B	128.0.0.0 ~ 172.15.255.255	172.16.0.0 to 172.31.255.255
	173.32.0.0 ~ 191.255.255.255	
C	192.0.0.0 ~ 192.167.255.255	192.168.0.0 to 192.168.255.255
	192.169.0.0 ~ 223.255.255.255	

Class D : 224.0.0.0 ~ 239.255.255.255

Class E : 240.0.0.0 ~ 255.255.255.255

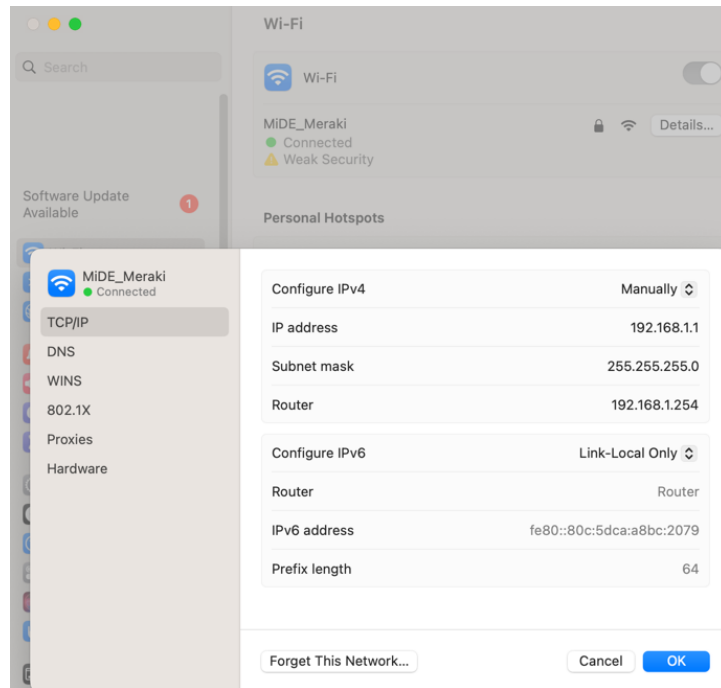
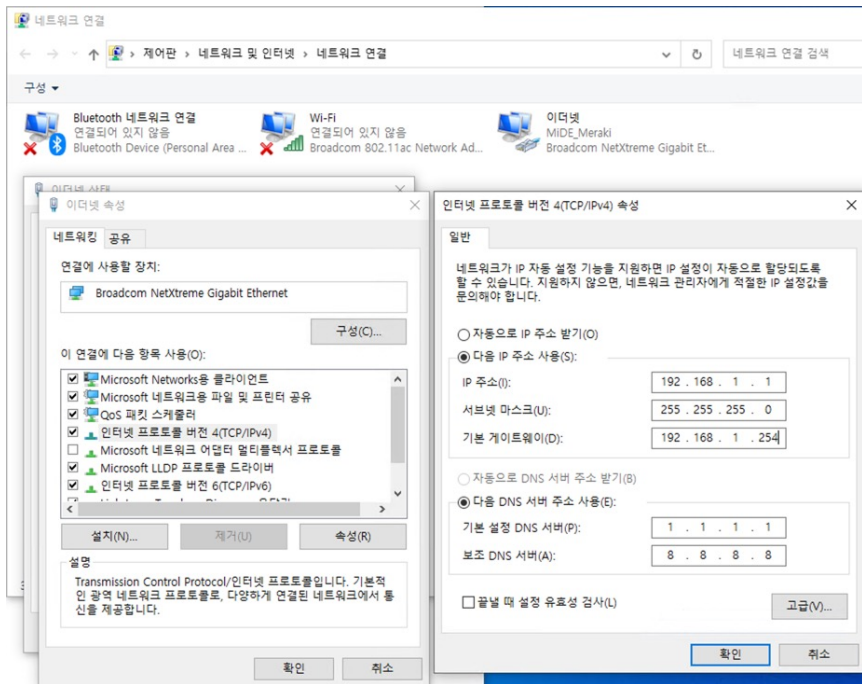


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# Windows PC, MAC에서의 IP 설정



# ipconfig / ifconfig

```
C:\WINDOWS\system32\cmd.exe
C:\Documents and Settings>ipconfig /all

Windows IP Configuration

Host Name . . . . . : PCUSER
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled . . . . . : No
WINS Proxy Enabled . . . . . : No
DNS Suffix Search List . . . . . :

Ethernet adapter Local Area Connection:

Connection-specific DNS Suffix . . : Intel(R) PRO/1000 PL Network Connection
Description . . . . . :
Physical Address. . . . . : 00-15-58-2F-21-E6
Dhcp Enabled . . . . . : Yes
Autoconfiguration Enabled . . . . . : Yes
IP Address . . . . . : 192.168.1.102
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 192.168.1.1
DHCP Server . . . . . : 192.168.1.1
DNS Servers . . . . . : 127.107.241.185
                        127.135.250.69
Lease Obtained . . . . . : Wednesday, April 25, 2007 12:27:51 AM
Lease Expires . . . . . : Thursday, April 26, 2007 12:27:51 AM
```

```
cisco@FindITProbe:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:0C:29:6F:2E:DD
          inet addr:192.168.1.102  Bcast:192.168.1.255  Mask:
          inet6 addr: fe80::20c:29ff:fe6f:2edd/64 Scope:Link
          inet6 addr: fec0::20c:29ff:fe6f:2edd/64 Scope:Site
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:149596 errors:0 dropped:0 overruns:0 fra
          TX packets:205206 errors:0 dropped:0 overruns:0 car
          collisions:0 txqueuelen:1000
          RX bytes:26494354 (25.2 MiB)  TX bytes:183876308 (1

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:73994 errors:0 dropped:0 overruns:0 fram
          TX packets:73994 errors:0 dropped:0 overruns:0 carr
          collisions:0 txqueuelen:0
          RX bytes:33273411 (31.7 MiB)  TX bytes:33273411 (31
```



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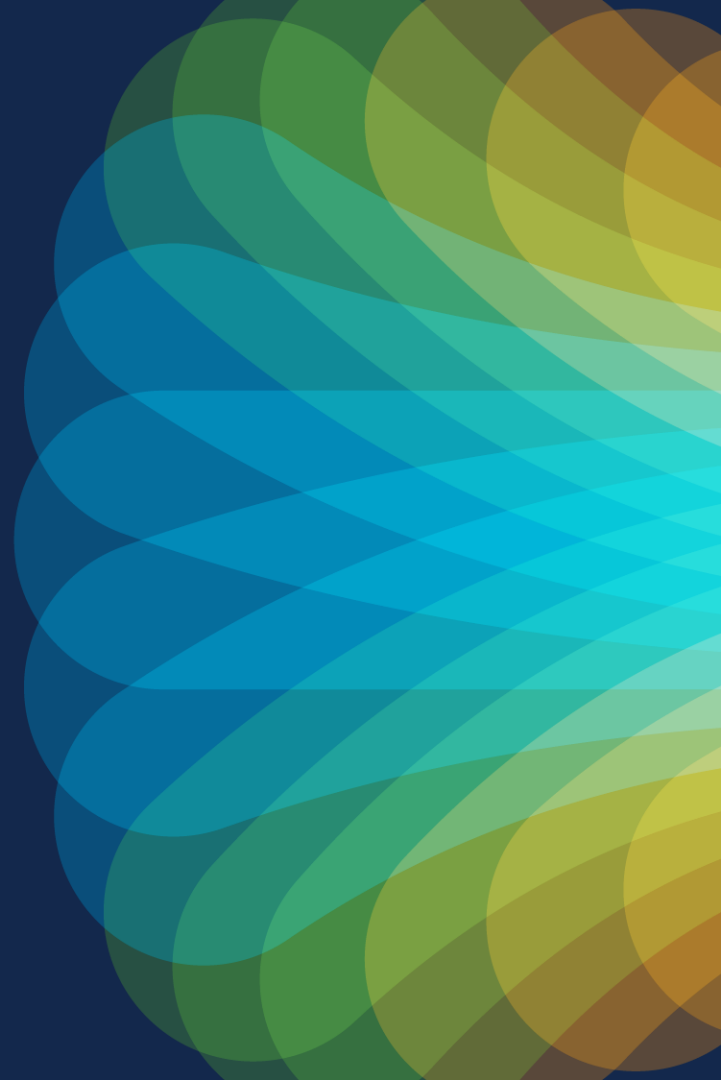
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# Summary

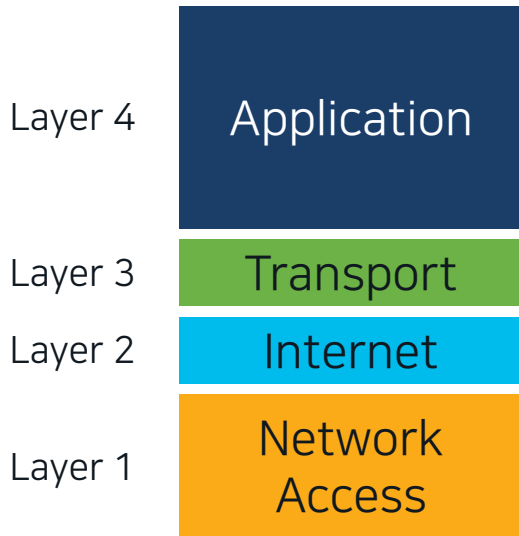
- IP 네트워크 주소는 Netowork ID와 Host ID의 두 부분으로 구성
- IPv4 주소는 32비트로 일반적으로 점으로 구분된 십진수 형식(예: 192.168.54.18)으로 표시
- 이진수 형식으로 표기 할 때
  - Class A 주소의 첫 번째 비트는 항상 0
  - Class B 주소의 첫 두 비트는 항상 10
  - Class C 주소의 첫 세 비트는 항상 110
- 특정 IP 주소(Network 및 Broadcast)는 예약되어 있으며 개별 네트워크 디바이스에 할당할 수 없음
- 인터넷 호스트에는 고유한 공인 IP 주소가 필요하지만, 사설 호스트는 사설 네트워크 내에서 고유하면서 유효한 사설 주소를 가질 수 있음



# TCP/IP 의 Transport Layer (TCP와 UDP)



# TCP/IP Layer



- Layer 4
  - TCP – Transmission Control Protocol
  - UDP – User Datagram Protocol



# Reliable 과 Best-Effort 비교

	Reliable	Best-Effort
Connection Type	Connection-oriented	Connectionless
Protocol	TCP	UDP
Sequencing	Yes	No
Uses	<ul style="list-style-type: none"><li>▪ E-mail</li><li>▪ File sharing</li><li>▪ Downloading</li></ul>	<ul style="list-style-type: none"><li>▪ Voice streaming</li><li>▪ Video streaming</li></ul>

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감사합니다.