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04-17-2025

## MAC vs IP : How the internet works.

MAC - permanent, 48 Bit address, Hexadecimal  
IP - not permanent

- What's IP address and MAC address?

### Subnet mask

Class A . 255.0.0.0

II B 255.255.0.0

II C 255.255.255.0

II D Unknown

II E Unknown

Network #  
1.0.0.0 → X.0.0.1  
X.0.0.2  
X.0.0.3  
X.255.255.254

A =  $\begin{array}{c} \text{network} \\ \text{host} \\ 1. \text{X.X.X.X} \end{array}$   
B.  $\begin{array}{c} \text{network} \\ \text{host} \\ 2.2.X.X \end{array}$

120.6.128.2

1111111.111111.111111.111111  
120 0111  
128 0432168421

A	1.X.X.X	126.X.X.X	255.0.0.0	/8
B	128.X.X.X	191.X.X.X	255.255.0.0	/16
C	192.X.X.X	223.X.X.X	255.255.255.0	/24

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Class	IP Range	Default Subnet Mask	CIDR Notation
A	0.0.0.0 to 127.255.255.255	255.0.0.0	/8
B	128.0.0.0 to 191.11.11.11	255.255.0.0	/16
C	192.0.0.0 to 223.11.11.11	255.255.255.0	/24
D	224.0.0.0 to 239.11.11.11	N/A	N/A
E	240.0.0.0 to 255.11.11.11	N/A	N/A

video

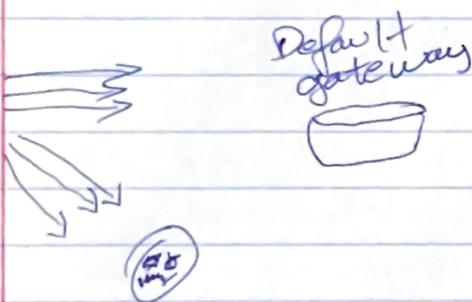
## ARP explained

ARP - address resolution Protocol  
checking arp

Dynamic - automatically, not permanent.

Static - manually entered

> arp -a



video

## IPv4 - IP address lesson

Binary digits - 1s & 0s.

8 bit binary to decimal conversion

"Octet" is a group of 8 binary digits

Ex: 128 64 32 16 8 4 2 1  
0 0 0 0 0 0 1

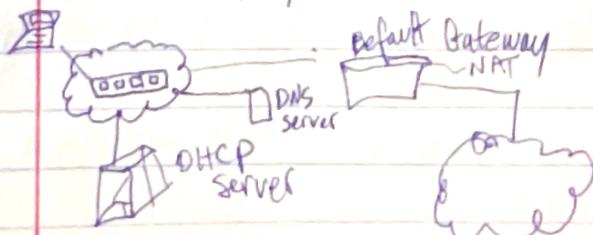
Ex: 128 64 32 16 8 4 2 1  
1 1 1 1 1 1 1  
255.

Ex: 128 64 32 16 8 4 2 1

192.168.1.5  
11000000.10101000.00000001.00000100

video

## Public vs private IP addresses.



DHCP process.

1. Discovering
2. on & off
3. request
4. Ack

can't use 255 or 0.

Ex: 192.168.1.0  
✓ 192.168.1.254

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128 Broadcast

128 64 32 16 8 4 2 1  
7

11111111111111111111.10000000  
00001010.00001010.00001010.10000000  
10.10.10.128/25

Class A

10.10.10.200

00001010.00001010.00001010.00001010.11001000

Public class A

115. X. X. X. /18

115. 0. 0. 1

115. 0. 0. 2

115. 0. 0. 3

:

115. 255. 255. 254 Last # that we can assign.

115. 255. 255. 255 Broadcast

Class

B Public

154. 90. X. X /16

154. 90. 0. 0

.1

.2

.3

154. 90. 255. 254 Last

11 11 11 . 255 Broadcast

address in the address

Broadcast the last range is the broadcast address.

Address Class	Range	# Networks	# Host per Network
A	1 to 126	126	16,777,214
B	128 to 191	16,384	65,534
C	192 to 223	2,097,152	254

Note: 169. 254. 0. 1 - 169. 254. 255. 254

Automatic Private IP Addressing (APIPA) range

Icann - [microsoft]

Did not get IP address from DHCP server

DHCP assigns IP addresses.

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Given an IP address & subnet mask, you can determine the Network #, 1, 2, 3, last and the broadcast #.

Ex:

192.168.1.5 /24

11 11 11.0 1st

11 11 11.1 2nd

11 11 11.2 3rd

11 11 11.254 last

255.255 Broadcast

128 192 224 240 248 252 254 255

128 64 32 16 8 4 2 1

private C

192.168.1.5 /25

192.168.1.0 /24

Submask to determine what subfamily you live in.

255.255.255.0

Note: 128 192 224 240 248 252 254 255

128 64 32 16 8 4 2 1 # of addresses

2 4 8 16 32 64 128 \* # of subnets

Network #

125 126 127 128 129 130 131 132 # of networks

## CIDR - Classless Inter-Domain Routing

192.168.8.111

Sub Family 1st

192.168.8.0

127 Broadcast  
128  
255

Net 192.168.8.128

Broadcast 192.168.8.255.

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Starting Network ID 192.168.8.111

Starting Subnet mask 255.255.255.0 /24

192.168.8.0

- 1
- 2
- 111
- 254
- 255

128 192 224 240 248 252 254 255  
128 64 32 16 8 4 2 1  
2 4 8 16 32 64 128 \*  
125 126 127 128 129 130 131 132

192.168.8.111

255.255.255.0.0

/13

192.168.1.112 /126

Network = .64

.1

.63 Network

.64 Broadcast

127

128 B

Broadcast = .127

.2

.112

.254

.255

Gateway

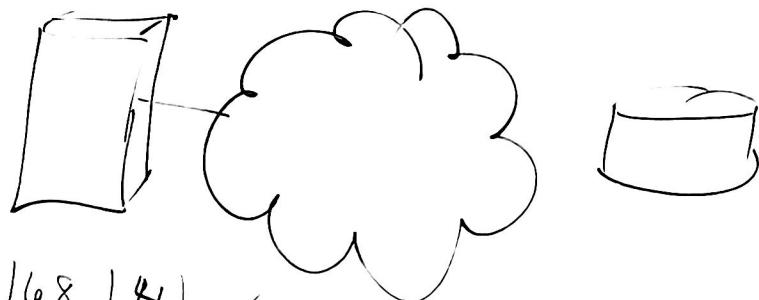
192.168.1.41 /127

31  
32  
63 Network  
64 Broadcast

Network = 192.168.1.32

Broadcast = 192.168.1.63

125	126	27	128	129	130	131	132
128	192	224	240	248	252	254	255
120	47	32	16	8	4	2	1
2	4	8	16	32	64	128	*



192.168.1.41 127

Net D

192.168.1.3

Base

$$\begin{array}{r}
 0 \\
 .63 \\
 \hline
 .64 \\
 - \\
 .127 \\
 \hline
 .128
 \end{array}$$

$$\begin{array}{r}
 1.0 \\
 - 0.3 \\
 \hline
 0.3 \\
 - 0.3 \\
 \hline
 0.0
 \end{array}$$

IP Address Classes  
Default Subnet mask

Network ID

10.10.10.200

127

ARP

MAC addresses

Public -vs- Priv.	25	26	127	128 129 130 131 132
	128	192	224	240 248 252 254 255
	128	192	224	6 8 4 2 1
Subnet →	255	255	255	16 32 64 128 256
	255	255	255	255 255 255 255 255

10.10.10.0 Network # or IP  
10.10.10.127 Broadcast

(6)  
32/200

10.10.10.127 - Broadcast

63  
64

192

10.10.10.128 - IP address  
128

128  
108

132

191  
192

155

Mac vs Ip address | How the internet works?  
<https://www.youtube.com/watch?v=BPZaeVqJtW8>

what is IP address and MAC address?  
<https://www.youtube.com/watch?v=HKM7qwPSUj0>

ARP Explained - Address Resolution Protocol  
<https://www.youtube.com/watch?v=cn8Zxh9bPio>

IPv4 Addressing Lesson 1: Binary and the IP Address MADE EASY  
<https://www.youtube.com/watch?v=ddM9AcreVqY>

Public vs Private IP Address  
<https://www.youtube.com/watch?v=p08ZFG0Xc4Q>

Subnet Mask - Explained  
[https://www.youtube.com/watch?v=s\\_Ntt6eTn94](https://www.youtube.com/watch?v=s_Ntt6eTn94)

Calculate Network, Broadcast and host addresses  
<https://www.youtube.com/watch?v=hb2yTNT2rBU>

IPv4 Subnetting - Finding the broadcast address of a network  
<https://www.youtube.com/watch?v=mKCX-YcdVuY>