

# IP Addresses + Networking

- We (computers + users) communicate through IP addresses

• All IP's are within 0.0.0.0 – 255.255.255.255

They look like  $\frac{1}{1} \cdot \frac{2}{2} \cdot \frac{3}{3} \cdot \frac{4}{4}$

These addresses are split into different classes

On the bit level these classes are:

- A: 00000000
- B: 10000000
- C: 11000000
- D: 11100000
- E: 11110000

These classes then determine their purpose

↳ that's great but IP's are listed in octets

Instead of 8 digits, we have four numbers divided by periods

Classes in Octets (how they are normally displayed)

- A: 0.0.0.0 to 127.255.255.255
- B: 128.0.0.0 to 191.255.255.255
- C: 192.0.0.0 to 223.255.255.255
- D: 224.0.0.0 to 239.255.255.255
- E: 240.0.0.0 to 255.255.255.255

The most important number is the first number – this determines class

example: 0.0.0.0

These numbers are called Octets

## Classes

• They are split into classes to determine their function and make it easily recognizable

A+B+C = networking

D = multicast

E = experimental

## A: Private, Public, loop back

Private networking: 10.0.0.0 to 10.255.255.255

Public Networking: All other address

The most common loopback IP address is 127.0.0.1

Loopback: 127.0.0.0 to 127.255.255.255

↳ Used so computers can communicate with themselves without interrupting the user

## B: public networking, private, APIPA

Private: 172.16.0.0 to 172.31.255.255

APIPA: 169.254.255.255 (last ditch effort to get an IP address)

↳ Automatic Private Internet Protocol Addressing

Public: All other addresses

## C: Public, Private

Private: 192.168.0.0 to 192.168.255.255

Public: all other addresses

This information is used to determine whether you or a device is on the same or a different network.

## Classful Domain Routing = breaking up private networks by class

A: 10.0.0.0 255.0.0.0 /8 → means there are 8 "1"s (turned on)

IP Address/Subnet

(Bit level)

bit level of the IP address

00001010.00000000.00000000.00000000 bit level network

1111111.00000000.00000000.00000000 bit level subnet

NNNNNNNN.NHHHHHHH.HHHHHHHH.HHHHHHHH network v.s. host \*  
→ bits turned on can never change

This is useful because:

if you are on the same network, no worries, otherwise you must use a router to communicate

B: 172.16.0.0 255.255.0.0 /16 → means there are 16 "1"s (turned on)

IP Address/Subnet

(Bit level)

10101100.00010000.00000000.00000000 bit level networks

1111111.1111111.00000000.00000000 bit level subnet

NNNNNNNN.NNNNNNNN.NHHHHHHH.HHHHHHHH network v.s. host

→ bits turned on can never change

Different Networks

172.16.0.0

172.17.0.0

172.17.0.0

...

172.31.0.0

Separate networks

they are private networks that can't be  
routable

If they change you are no longer part of the network

Subnet mask:

tells what bits are network  
and what bits are host

Note: you can't  
subnet a public  
network because you  
don't have the

permissions and  
can't control it

### Practice Example

172.24.1.10 and 172.28.4.12 with subnet mask 255.255.0.0

1

2

bit level view of 1: 10101000.00011000.00000001.00001010  
\* \*

2: 1010100.00011000.00000100.00001100  
\* \*

We are in class B:

→ NNNNNNNN.NNNNNNNN.HHHHHHHH.HHHHHHHH (N's can't change)

\* they're not the same, therefore they are not within the same network

C: 192.168.0.0 , 255.255.255.0 /24

IP Address

Subnet mask

(using bit level)

11000000.10101000.00000000.00000000 bit level network

1111111.1111111.1111111.00000000 bit level subnet

NNNNNNNN.NNNNNNNN.NNNNNNNN.HHHHHHHH network v.s. host

### Different Networks

192.168.0.0

192.168.1.0

192.168.2.0

...

192.168.255.0

Separate Networks

Subnetting : Michael was talking about it but then said don't worry about it yet? Only applicable to Private Networks  
—sounds like he's salty to me —

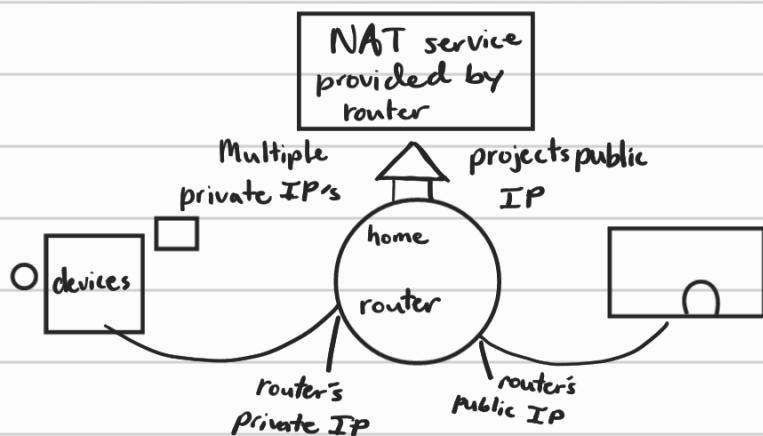
## Extra Notes:

- You can renew + release your public IP if you feel its been compromised
  - go through the router under configuration to change this 10.0.0.1> for xfinity/comcast
- change default of your router (admin.admin)<sup>pw</sup>

## Acronyms:

- NAT=Network Address Translation
- ISP= Internet Service Provider
- DHCP= Dynamic Host Configuration Protocol

## Private networking:



• All they can see is the public IP address, not from where specifically  
(A side benefit is info is hidden)