

## Convert Decimal to Binary

128 64 32 16 8 4 2 1

26 = 11010

49 = 110001

39 = 1100011

177 = 10110001

247 = 11110111

128 64 32 16 8 4 2 1

1 1 1 1 0 1 1 1

## Binary to Decimal

128 64 32 16 8 4 2 1

1 0 0 1 0 0 0 1

10010001 = ?

= 145

128 64 32 16 8 4 2 1

0 0 0 0 0 0 0 0

= 0

128 64 32 16 8 4 2 1

1 1 1 1 1 1 1 1

= 255 (IPv4 address is basically 4 8bit numbers)

## Structure of an IP address

IPv4  $x = 8 \text{ bits} \rightarrow$  (between 0 to 255)

$x.x.x.x = 32 \text{ bits}$

1.2.3.4  $\rightarrow$  is it valid IP address  $\checkmark$

10.2.40.60  $\rightarrow \checkmark$

100.2.3.20  $\rightarrow \checkmark$

300.4.6.7  $\rightarrow \times$   
 $\rightarrow$  because  $300 > 255$

10.4.3.7(8)  $\rightarrow \times$   
 $\rightarrow$  additional octet, so not valid

## Classes of IP Address

Internet Assigned Numbers Authority (IANA)  $\rightarrow$  they allocate IP addresses

### Classful Networking

Class	1st Octet	Number of Hosts	Subnet Mask
Class A	1-126	16.7 million	255.0.0.0
Class B	128-191	65 thousand	255.255.0.0
Class C	192-223	254	255.255.255.0

(1-223) 1st octet

21 6.10.4  
class A

96.4.10.254  
class A

160.10.4.100  
class B

200.100.200.1  
class C

A  $\rightarrow$  255.0.0.0  
B  $\rightarrow$  255.255.0.0  
C  $\rightarrow$  255.255.255.0

Non-routable  
IPv4 addresses

(Private/NAT addresses)

Class	First Address	Last address
class A	10.0.0.0	10.255.255.255
class B	172.16.0.0	172.31.255.255
class C	192.168.0.0	192.168.255.255

$\rightarrow$  10 is class A

120.10.40.60 120.100.60.100  
255.0.0.0 255.0.0.0  
120.0.0.0 120.0.0.0  
 $\rightarrow$  (YES)  $\leftarrow$  same.

180.16.32.100 180.17.19.100  
255.255.0.0 255.255.0.0  
180.0.0.0 180.0.0.0  
 $\rightarrow$  NOT same  
So, NO, they can't talk  
No, same (NID)

## How many computers are in each network?

IP 192.168.30.10  
Subnet mask 255.255.255.0

192.168.30.0  $\rightarrow$  Network ID (NID)

(If two computers have same network ID (NID) they can talk to each other without a router)

192.168.40.20

255.255.255.0

192.168.40.0  $\rightarrow$  (NID)

192.168.40.32  
255.255.255.0

192.168.40.220  
255.255.255.0

can these two machines talk to each other? YES

cause same network ID (NID)

192.168.40.32

255.255.255.0

192.168.40.0

192.168.40.220

255.255.255.0

192.168.40.0

$\rightarrow$  same NID

What are private IP addresses

Non-routable

IPv4 addresses

(Private/NAT addresses)

Class	First Address	Last address
class A	10.0.0.0	10.255.255.255
class B	172.16.0.0	172.31.255.255
class C	192.168.0.0	192.168.255.255

(Private IPs are not routable on the Internet)

192.168.30.10  
255.255.255.0

192.168.40.200  
255.255.255.0

192.168.30.0

192.168.40.0

NOT SAME  
So, NO

Assigning IP Address Practices: (DHCP - Dynamic Host Configuration Protocol)  
(Virtual Machines)  
ping the IP addresses TTL = Time to Live

## CIDR (Classless Inter Domain Routing)

192.168.30.4/24

255.255.255.0

that's /24

bits bits  
255.255.0.0 = /16

255.0.0.0 = /8

$\rightarrow$  CIDR notation  
basically represent subnet mask  
means 24 bit is on in the subnet mask.

(A Router is a device that basically connects dissimilar networks)  
(Default-Gateway)?

IP address of the Router

IP 192.168.31.200

Subnet mask 255.255.255.0

Default gateway 192.168.31.1

Correct answer = 192.168.31.1

Default gateway has to be same network

172.30.4.3 /16 (class B)

255.255.0.0 = /16 (class A)

$\rightarrow$  (class full)

$\rightarrow$  fixed-length subnet mask

classless

$\rightarrow$  variable length