IPv4 Addressing

- 32-bit hierarchical address
- consists of network and host portion
- network bit is 1 and host bit is 0
- subnet mask is required to determine network and host portions

Subnet Mask is compared to IPv4 bit for bit, from left to right

Actual Process : ANDing

Prefix length → alternative method to easily identify subnet mask address

↓

number of bits set to 1 in subnet mask

* written in slash notation

255.0.0.0 = 11111111.00000000.00000000.00000000 = /8
255.255.0.0 = 11111111.11111111.00000000.00000000 = /16
255.255.255.0 = 11111111.11111111.11111111.00000000 = /24
255.255.255.128 = 11111111.11111111.11111111.10000000 = /25
255.255.255.192 = 11111111.11111111.11111111.11000000 = /26
255.255.255.224 = 11111111.11111111.11111111.11100000 = /27
255.255.255.240 = 11111111.11111111.11111111.11110000 = /28
255.255.255.248 = 11111111.11111111.11111111.11111000 = /29
255.255.255.252 = 11111111.11111111.11111111.11111100 = /30

Determining the Network - Logical AND

Net. Add = Host. Add & Sub. Mask

Host IPv4 : 208. 251. 209. 154

Sub. Mask : 255. 255. 255. 248 (/29)

Host IPv4 : 11010000.11111011.11010001.10011010
Sub. Mask : 11111111.11111111.11111111.11111000 AND

Net. IPv4 : 11010000.11111011.11010001.10011000
208 251 209 152

Network Address: has all 0 bits in host portion
cannot be assigned to a device

1st Host Address: 1st available host IP address in network
-always has all 0s and ends with a 1

Last Host Address: last available host IP address in network
-always has all 1s and ends with a 0

Broadcast Address: Special address_communicates with all hosts
-host portion is all 1s

Types of IPv4 addresses

(1) Public IPv4
(2) Private IPv4

-Public IPv4 addresses are globally routed between ISPs.

Private IPv4 address range

10.0.0.0/8 10.0.0.0 - 10.255.255.255
172.16.0.0/12 172.16.0.0 - 172.31.255.255
192.168.0.0/16 192.168.0.0 - 192.168.255.255

-Private IPv4 addresses are not unique, not globally routable and can be used internally within any network

Routing to the Internet (NAT)

Network Address Translation: translates private IPv4 to public

IPv4

Special use of IPv4

Loopback : 127.0.0.0 /8 (127.0.0.1 to 127.255.255.254)
- Commonly identified as only 127.0.0.1
- Used on a host to test if TCP/IP is operational

Link-local : 169.254.0.0/16 (169.254.0.1 to 169.254.255.254)
- Commonly known as Automatic Private IP Addressing (APIPA) addresses or self-assigned addresses
- Used by DHCP clients to self-configure when no DHCP servers are available

Legacy Classful Addressing

Class A (0.0.0.0/8 to 127.0.0.0/8)
Class B (128.0.0.0/16 to 191.255.0.0/16)
Class C (192.0.0.0/24 to 223.255.255.0/24)
Class D (224.0.0.0 to 239.0.0.0)
Class E (240.0.0.0 to 255.0.0.0)

Network Segmentation

Broadcast Domain : link between router and switch
Collision Domain : link between switches and end devices

Problem - Hosts can generate excessive broadcasts and negatively affect the network

Solution - Reduce the size of the network to create smaller broadcast domains

Reasons for segmentation: (1) Reduces overall network traffic
(2) Improves network performance
(3) Implements security policies

Subnets are used for location, group and device type.

Enterprise networks have (1) Intranet (2) DMZ