Review of IPv4

Networks Administration

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Remember this?

- An IPv4 address is 32 bits long - 4 bytes
- Each byte has 256 possible values (0 - 255)
- We usually respresent them in dotted decimal notation
  - 10.50.1.80
  - 74.125.237.207
  - 224.0.0.118

Network and host bits

- Any IP address can be divided into two parts:
  1. network
  2. host

Network masks

- We can identify the network and host bits by examinng the network mask.
- Example: 255.255.192.0
  In binary: 11111111.11111111.11000000.00000000
  The 1's indicate network bits and the 0's indicate host bits
- We can indicate the same thing by writing /18 - indicating 18 network bits.

Address classes

In the absense of a network mask, we can infer it from the address class

Class	Leading Octet	Mask	Networks	Hosts
A	1 - 127	/8	127	16,777,216
B	128 - 192	/16	16,384	65,536
C	192 - 223	/24	2,097,152	256

Subnetting

- Given an IPv4 network, we can divide it into smaller subnetworks, or subnets.
- We do this by "borrowing" host bits and adding them to the network portion of the address.

Subnetting example

- Given 192.168.1.0/24
- We "borrow" 2 host bits to create 4 subnets:
  192.168.1.0/26
  192.168.1.64/26
  192.168.1.128/26
  192.168.1.192/26

Private networks

Some address ranges can be used for private networks. These addresses are not publically routable.

- 10.0.0.0/8
- 172.16.0.0/16 - 172.31.0.0/16
- 192.168.0.0/24 - 192.168.255.0/24

Network address translation (NAT) can be used to allow privately addressed hosts to connect to the internet.

Network addresses

- An address like 192.168.10.0/24 is usually a *network address*.
- Network addresses do not refer to any one host. They refer to entire networks in aggregate.

Broadcast addresses

- An address like 192.168.10.255 is usually a *broadcast address*.
- Broadcast addresses do not refer to any one host.
- A packet sent to a broadcast address is intended to be received by **every** host on a network.

Gateway addresses

- Hosts on a network are usually configured with a *gateway address* or *default gateway*. These are the addresses of local router interfaces.
- These are ordinary host addresses on the network. Unlike network or broadcast addresses, you can't recognise a gateway address just by looking at it.
- Packets whose destinations are off the local network must be forwarded through the gateway address.

Ports

- IP adresses can only identify hosts on a network.
- One host may be running many processes that receive network packets.
- Transport layer segments use *port numbers* to identify the process that should receive the data.
- Common network services use standard port numbers, like 80 for web, 22 for ssh, and 53 for DNS.