Introduction to IPv4 Addressing

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Today's Goals

- `IPv4` Addresses Breakdown.
- `Subnet` Addresses and Masks.

IP Addresses

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  - Translating this into binary:

0000 1010 0000 1010 0000 0000 0000 1010

Anatomy of an address

- An `IPv4` address consists of two parts:
  - A *network* prefix, used to identify the network to which the host belongs to.
  - A *host* ID used to identify the host on that network.
- Originally, networks had fixed sizes:
  1. `Class A`: 8 bits network prefix.
  2. `Class B`: 16 bits network prefix, starting with `10`.
  3. `Class C`: 24 bits network prefix, starting with `110`.
  4. `Class D`: 4 bits network prefix `1110`, used only for multicast, starting with `1110`.
  5. `Class E`: 4 bits network prefix `1111`, experimental not in use, starting with `1111`
- Free bits represent different hosts on the same network.

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- For class C, we have 256 addresses.
- Any issues with this approach?

CIDR

- This is clearly limiting in the sizes of the network, often wasteful.
- We then introduced *Class Inter-Domain Routing* (CIDR) addresses.
- We write a suffix for each address, representing length of the network prefix.
- So we can create various sub-network (subnets) in every network.

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- The /24 represents the network prefix, that being `10.10.8`!
- How many hosts can be on the network `192.168.3.100/22`?
- 22 bits are the network prefix, leaving us with 10 bits for hosts, which means $2^{10} = 1024$ hosts.

Subnet masks

- Sometime, we write the subnet prefix as a mask over the `IPv4` address.
- To obtain the network prefix, perform a *bitwise* AND on the address and the mask.

Example:

- Consider this `IPv4` address `172.139.55.197` with subnet mask `255.255.255.192`.
- Which subnet does this belong to?

Subnet Example Continued

- The subnet mask is:

$$1111\ 1111\ 1111\ 1111\ 1111\ 1111\ 1100\ 0000$$

- So the top 26 bits of the IPv4 address constitute the network prefix.
- So the network prefix is 172.139.55.192

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- So the top 26 bits of the IPv4 address constitute the network prefix.
- So the network prefix is `172.139.55.192`
- Can the address `172.139.55.3` belong to his subnet?
- What is the range of addresses on this subnet?