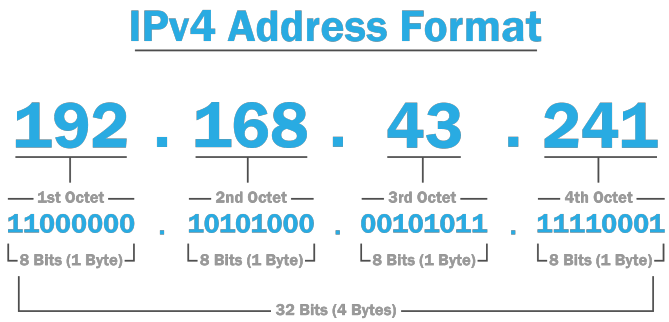
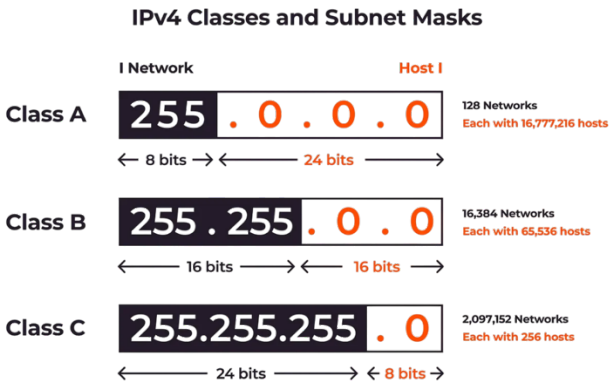
AWS Solutions Architect Foundational Network Knowledge

IP

- 111.111.111.111: An IP address in decimal.
- 01101111.01101111.01101111.01101111: The same IP in binary. Each 8-bit group (an octet) ranges from 0 to 255 in decimal ($2^8 - 1$).



- An IP address is 32-bit, giving us about 4.3 billion addresses.
- It is composed of network ID + host ID.
    - For example, 192.168.10.10 is 11000000.10101000.00001010.00001010. Blue is the network ID and red is the host ID.
    - IP addresses that share the same network ID belong to the same network.
- IP addresses are divided into different classes: A, B, and C.
    - Why? To chop IP addresses for efficient allocation (IP addresses are running out).



- Class A
  - Left-most 8 bits are network ID and the rest are used for hosts
  - The left-most digit starts with 0
  - IP range: 1.0.0.0 to 126.0.0.0
    - 127.255.255.255 is the largest IP, but
    - 0.0.0.0 and 127.0.0.0 are reserved.
  - Subnet Mask: 255.0.0.0
  - Number of hosts available: $2^{24} - 2 = 16{,}777{,}214$
- Class B
  - Left-most 16 digits are network ID and the rest are used for hosts
  - Starts with 10
  - IP range: 128.0.0.0 to 191.255.0.0
  - Number of hosts available: 65,534
- Class C
  - Left-most 24 digits are network ID and the rest for hosts
  - Starts with 110
  - IP range: 192.0.0.0 to 223.255.255.0
  - Number of hosts available: 254
- For each class, 0 and 255 are not used for hosts; they're used as identity and broadcast.
  - 192.168.1.0
  - 0 identifies the entire network
  - 255 is for broadcasting

Subnet

- Subnet: A smaller network inside a network.
- Subnetting: A process of dividing a larger network into smaller ones (subnets).
  - For example, if a company needs only 100 IPs, we can create 100 subnets from class C.
- Subnet Mask
  - A 32-bit number that separates an IP address into the network ID and the host ID.
  - 255.0.0.0 for class A, 255.255.0.0 for class B, and 255.255.255.0 for class C.
- Prefix
  - A concise way to represent subnet mask.
  - For example, /24 means:

        - It's class C.
        - Subnet mask is 255.255.255.0
- More on subnetting
    - Suppose a company needs 50 IP addresses.
    - It gets 192.168.10.0/24, which allows 254 available hosts.
    - Subnetting further divides this network into subnets.
        - 254 → 127 → 64
        - The company can just take 64 and the rest can be used elsewhere for efficiency.
    - Consider the last octet, which is used for hosts:
        - The first bit is used as subnet bit.
        - .00000000 to .01111111 (0 to 127)
        - .10000000 to .11111111 (128 to 255)