Networking

IPv4 Addressing

IPv4 Addressing

- Guiding Question: How does the Network Layer ensure data is efficiently and accurately delivered between devices on different networks?

- Students will:
  - Define the purpose and structure of an IP address.
  - Recognize the classes of IP addresses.
  - Define the purpose of a subnet mask.
  - Recognize the public IP ranges and the private IP ranges.
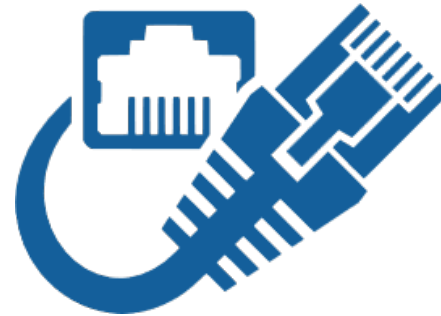 - Identify methods of acquiring an IP address.

Finding Devices on a Network

- **RULE #1** – Your device must be unique.

- **Media Access Control** (MAC) Address - Globally unique identifier for each networking device.
  - MAC address is like a SS # - not changeable, unique to you.
  - Also known as the physical address of a device.
  - Represented as 12 hexadecimal digits.

- **Examples:**
  - 00:24:E8:83:68:96
  - 00-C0-CA-52-38-8C
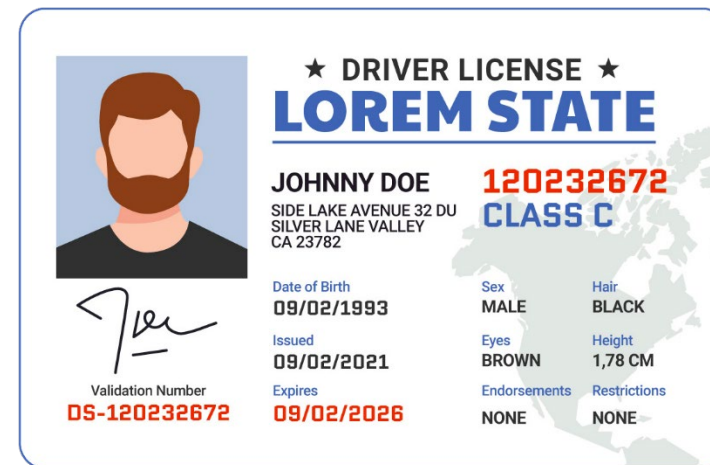
Finding Devices on a Network

- **RULE #2** – You must "belong" to a network.

- Joining a network gives the device access to shared resources like files, printers, Internet access, etc.

- Your device joins a network when it plugs into an ethernet port or when it connects to Wi-Fi.

- As the network connection is made, an IP address is assigned to the device.

IP Address

Internet Protocol Address – A temporary identifier for each network interface. If you have an ethernet port and a Wi-Fi card, each will get their own IP address assigned.

- Must be unique among the connected devices on that network.

- Also known as the logical address of a device.

- An IP address is like an ID card.
  - Changeable.
  - Can belong to many organizations.
  - Unique within that organization.

Types Of IP Address

IPv4 - The original type and it is still the most commonly used.

- Address format:
    - Dotted decimal notation - 32 bits represented in 4 sections separated by dots.
    - Each section is called an octet and can hold a decimal number from 0 to 255.
    - **Example:** 192.168.55.32

IPv6 - The new type but the world is slowly making the conversion.

IPv4 Address Classes

- **Class A**: Typically given to organizations that are part of the Internet infrastructure.

- **Class B:** Assigned to large organizations like multi-national corporations or governments.

- **Class C:** Assigned to medium and small organizations but there is limited availability.

- **Class D:** Reserved for multicast.

- **Class E:** Reserved for research.

Class	Range for 1st Octet
A	1 – 126
B	128 - 191
C	192 – 223
D	224 – 239
E	240 - 255

IP Addresses Has 2 Parts

- Every IP address has 2 parts:
  - Network ID – Identifies LAN.
  - Host ID – Identifies device.

- The subnet mask is used to determine which part is network and which part is host.

- Any octet that is "covered" by **255** will be part of the network identifier.

- Any octet that is not covered will have addresses available to assign to hosts.

Network Portion **Host Portion**

IP Address 192.168.100.10

Subnet Mask 255.255.255.0

Default Subnet Masks

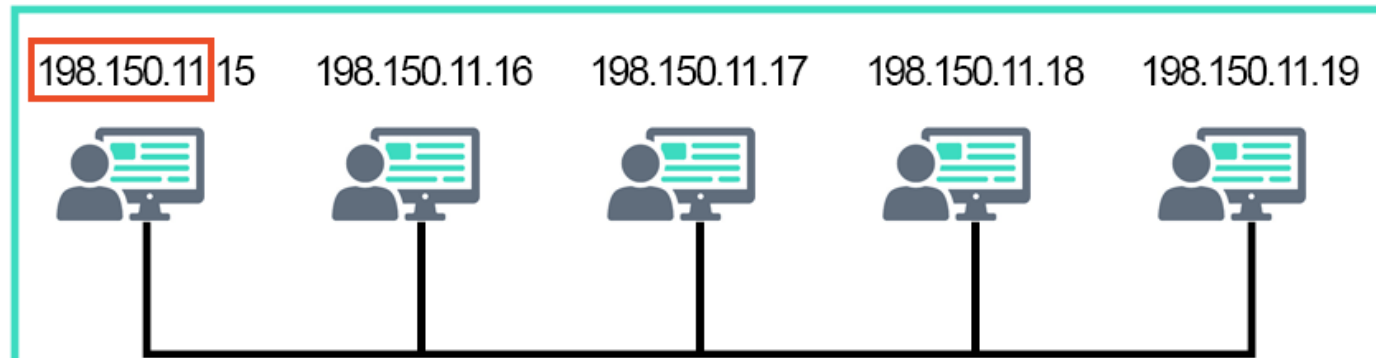|	
Class A	255.0.0.0
Class B	255.255.0.0
Class C	255.255.255.0

Reserved Addresses

Certain host addresses are reserved and cannot be assigned to devices on a network:

- **Network Identifier Address** – Used to identify the network itself .
  - This address has 0 in the host sections.
  - Examples: 89.**0.0.0** OR 156.30.**0.0** OR 205.168.13.**0**
- **Broadcast Address** – Used for broadcasting packets to all the devices on a network.
  - This address has 255 in the host sections
  - Examples: 64.255.255.255 OR 182.112.255.255
- **Loopback Address** – Used to test the device network interface.
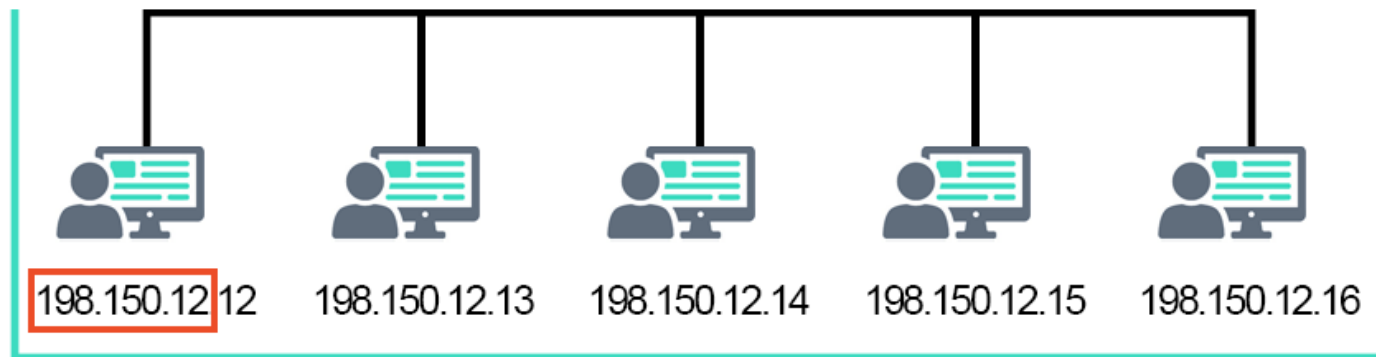 - 127.0.0.1

Network ID

Devices can only communicate with devices that have the same network ID.

198.150.11.15   198.150.11.16   198.150.11.17   198.150.11.18   198.150.11.19

Subnet Mask 255.255.255.0 -- NO TALKING!!

198.150.12.12   198.150.12.13   198.150.12.14   198.150.12.15   198.150.12.16

Public or Private

Private

- Addresses that can be used by multiple organizations at the same time.

- Network IDs can be **10** or **172.16 – 172.31** or **192.168.**

- To access the Internet, devices with a Private IP address must 'piggyback' on a public address.
    - This is called **Network Address Translation** (NAT).

Public

- The addresses are unique in the entire world.

- Must use a public IP address to access the Internet.

Private IPv4 addresses

- Used as a solution to the problem of the exhaustion of public IP addresses.
- Addresses that fall within these ranges are not routed on the Internet backbone.
  - Routers immediately discard private addresses.
- Used behind a gateway on LAN, makes it possible to expand the available number of IP addresses.

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