MAC, IPv4 and IPv6, APIPA

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MAC:

- MAC address stands for Media Access Control.
- It is a **48-bit address**.
- MAC address are also called as Physical address, Hardware address.
- MAC address are separated by the colon.

  For example: 1a:2b:3c:4d:5e:6f

- Every physical machine has a unique MAC address.
- The first 24 bits of the address will be OUI bits (Organization unique Identifier) which is given by vendor.

  For example: vendor → Cisco

  Then : OUI → 004096
- MAC addresses are very important for communication.

IPv4:

- IPv4 stands for Internet Protocol version 4.
- IPv4 was the first version deployed for production in the **ARPANET in 1983**.
- IPv4 is a connectionless protocol used in packet-switched layer networks, such as Ethernet.
- IPv4 uses a **32-bit address** space, which limits the number of unique hosts to 4,294,967,296 (2^{32}), but large blocks are reserved for special networking methods.
- Representation of IPv4 is **A.B.C.D**. For example: 192.168.10.0/24.
- IPv4 is a connectionless protocol, and operates on a best effort delivery model, in that it does not guarantee delivery, nor does it assure proper sequencing or avoidance of duplicate delivery.
- These aspects, including data integrity, are addressed by an upper layer transport protocol, such as the Transmission Control Protocol (TCP).
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IPv6:

- IPv6 stands for Internet Protocol version 6.
- IPv6 is the most recent version of the Internet Protocol.
- IPv6 was developed by the **Internet Engineering Task Force (IETF)** to deal with the long-anticipated problem of IPv4 address exhaustion.
- IPv6 uses a 128-bit address, theoretically allowing 2^{128}, or approximately 3.4×10^{38} addresses.
- IPv6 addresses are represented as eight groups, separated by colons, of four hexadecimal digits.
- The full representation may be simplified by several methods of notation; for example, ***2001:0db8:0000:0000:0000:8a2e:0370:7334*** becomes ***2001:db8::8a2e:370:7334***.
- The network portion of the IPv6 is given by the router or the DHCP server.
- The next 64 bit is generated by the hosts machine itself.

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- For this the hosts machine selects its MAC address which is of 48 bits. It divides that MAC address into 24 bits each and inserts a 26 bit value of **"FFFE".**
- Now we have a 64 bit address, in that we have to flipped or invert the starting 7th bit then result will be our remaining 64 bit address which is known as **"EUI-64".**
- **"link local",** it is only use for communication inside the network. In IPv6 the link-local address starts with **"FE80"** and the 64 bit of the network id are all zeros. The 64 bit of the link local address are generated via EUI-64 mechanism only.
- IPv6 is an Internet Layer protocol for packet-switched internetworking and provides end-to-end datagram transmission across multiple IP networks, closely adhering to the design principles developed in the previous version of the protocol, Internet Protocol Version 4 (IPv4).

Loop Back IP:

- Loop back IP address is which sends the outgoing signal to itself.
- A loopback address is a type of IP address that is used to test the communication or transportation medium on a local network card and/or for testing network applications.
- Data packets sent on a loopback address are re-routed back to the originating node without any alteration or modification.
- A loopback address is primarily used as a means to validate that the locally connected physical network card is working properly and the TCP/IP stack installed.
- The range of loop back address is **127.0.0.0 to 127.255.255.255**.

APIPA:

- APIPA is feature mostly supported by windows OS.
- Computer assigns the IP address to itself when there is no DHCP server is available the range is **169.254.0.0 to 169.254.255.255**.