**Introduction to IP Address**

* In 1974, the Transmission Control Protocol (**TCP**) was specified in detail. TCP replaced NCP and provided enhanced reliable communication services.
* In 1981, the Internet Protocol (**IP**) (also known as IP version 4 [IPv4]) was specified in detail. IP provides addressing and routing functions for end-to-end delivery.
* In 1982, the Defense Communications Agency (DCA) and ARPA established the Transmission Control Protocol (TCP) and Internet Protocol (IP) as the TCP/IP protocol suite.
* In 1984, the Domain Name System (**DNS**) was introduced. DNS resolves domain names (such as www.example.com) to IP addresses (such as 192.168.5.18).
* In 1995, Internet service providers (**ISPs**) began to offer Internet access to businesses and individuals.
* In 1996, the Hypertext Transfer Protocol (**HTTP**) was introduced. The World Wide Web uses HTTP.
* IPv4 is the Internet layer of the TCP/IP protocol suite originally defined for use on the Internet

**Elements of IP network:**

* **Node**  Any device, including routers and hosts, which runs an implementation of IP.
* **Router**  A node that can forward IP packets not explicitly addressed to itself.
* **Host**  A node that cannot forward IP packets not explicitly addressed to itself (a non-router).
* **LAN segment**  A portion of a subnet consisting of a single medium that is bounded by bridges or Layer 2 switches.
* **Subnet** One or more LAN segments that are bounded by routers and use the same IP address prefix. Other term for subnet are network segment .
* **Network**  Two or more subnets connected by routers. Another term for network is internetwork.
* **Neighbor**  A node connected to the same subnet as another node.
* **Address**  An identifier that can be used as the source or destination of IP packets and that is assigned at the Internet layer to an interface or set of interfaces.
* **Packet**  The protocol data unit (PDU) that exists at the Internet layer and comprises an IP header and payload.

**2) Why IP when there is MAC ?**

**Ans:** becauseIP Address can be routable that is the main reason why MAC address can’t be done because MAC address is giving by the Manufactures & it is hardcoded In to NIC card & there is no rules for defining MAC address & Mac was not maintained as hierarchically as IANA doing for IP addresses.

With out hierarchy if you try to maintain all other **MAC Addresses** you will need more than **1 GB** for each router to maintain all other **MAC addresses**.

How IP is routable ?

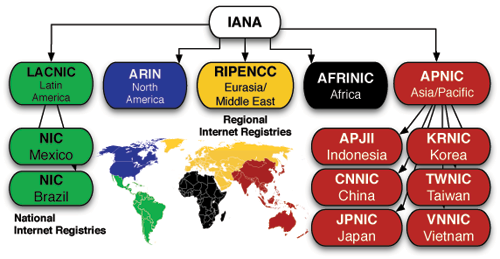
Because ISP is allocating IP addresses based on the region & connecting one region with another region.

**ICAAN**- The Internet Corporation for Names & Numbers - They’re the top level and they govern over IP - the internet protocol, and run the policies behind it.

From there it flows down to IANA - Internet Assigned Numbers Authority. **IANA**is a department of ICAAN that co-ordinates and maintains the number systems that keep the internet running like IP addresses & DNS.

Next step is region specific organizations that hold onto the IP addresses that provide registration and management of them, North America for example is **ARIN**.

Once at ARIN, ISPs (Internet Service Providers) or organizations can contact them to register an IP address or a block of IP addresses which is where you come in.



You then purchase a connection from an ISP and connect to the internet.

IPv4 addresses were distributed from ICANN through IANA and then through to your regional internet registry where your ISP or company can coordinate from there and you connect to it!

**3) Why MAC Address even we have IP Address?**

Because while we are connecting to the outside world Destination IP should not be changed destination MAC will be used for routing through the path.

Ethernet uses MAC Addresses to send the frame to the computer.

**4) Why Private IP even we have MAC address ?**

The answer is your software applications and operating system are *designed to communicate using* ***IP Address***, not directly with **Ethernet MAC addressing**.

So regardless of whether the **remote computer**/**node you wish to communicate with is in your local network or in some other network halfway round the globe**, that logical link is established with TCP/IP. That way **applications** just define the **destination IP address** in the IP packet, fill it with data.

It is the operating system's networking stack that determines if the IP address is local or remote:

1. If local network, look for **MAC address** corresponding to that **IP address** and send the IP packet direct, which is in an Ethernet frame.
2. If **remote network**, look for MAC address of default gateway router to send the IP packet, also within an Ethernet frame(Destination MAC will be Router MAC Address). The router retrieves the IP packet from the frame, looks at the address and determines the next node (and its MAC address) to pass it along, and sends it that direction in another Ethernet frame.

**5) Why Destination MAC address is first in Ethernet frame ?**

Because ethernet frame will be broadcasted to all the devices in the ethernet, on receiving signal device will start reading data(destination MAC in the frame), if it is it’s own MAC then it will start receiving remaining data from the frame otherwise it will simply ignore that packet.