

IP (Internet Protocol) is the main protocol of internet layer and provides communication between hosts on different kind of networks. It is a connectionless, unreliable, packet delivery service. That means, there is no guarantee that a packet gets delivered.

IP defines an addressing scheme that is independent of the physical address or MAC address. It has two classifications like:

- a. Internet Protocol Version 4 (IPv4)
- b. Internet Protocol Version 6 (IPv6)

Internet Protocol Version 4 (IPv4)

IPv4 is 32-bit addressing scheme used as TCP/IP host addressing mechanism. IP addressing enables every host on the TCP/IP network to be uniquely identifiable. Though IP is not reliable one; it provides '**Best-Effort-Delivery**' mechanism.

IPv4 provides hierarchical addressing scheme which enables it to divide the network into sub-networks, each with well-defined number of hosts. IP Address divided into two parts:

- Prefix (network ID) identifies network to which host attaches
- Suffix (host ID) identifies host on that network

IP addresses are divided into many categories:

Class A- It uses first octet for network addresses and last three octets for host addresses, mean Network ID is 8 bits and Host ID is 24 bits.

Number of IP address= 2^{31} , Number of network= 2^7

IP address possible per network/ no of host = $2^{24}-2$

Range= 0 to 127 but valid is 1-126 (we don't use 0 & 127 as a valid network).

So even though we have 128 networks, but practically we have 126 networks.

NID 8 bits	HID 24 bits
------------	-------------

Class B - it uses first two octets for network addresses and last two for host addresses, means that means Network ID is 16 bits and Host ID is 16 bits

Number of IP address= 2^{30} , Number of network= 2^{14}

IP address possible per network/ no of host = $2^{16}-2$

Range= 128 to 191.

NID 16 bits	HID 16 bits
-------------	-------------

Class C - it uses first three octets for network addresses and last one for host addressing, means that means Network ID is 24 bits and Host ID is 8 bits

Number of IP address= 2^{29} , Number of network= 2^{21}
IP address possible per network/ no of host = 2^8-2
Range= 192 to 223.

NID 24 bits	HID 8 bits
-------------	------------

Class D - it provides flat IP addressing scheme and used for multicasting. Due to this reason it can't categorized into network and host.

Number of IP address= 2^{28}
Range= 224 to 239.

--

Number of IP address= 2^{28}
Range= 240 to 255.

Class E - It is used as experimental and for future use.

So, in the conclusion, we can say that

Class A= number of host= $2^{24}-2$
Class B= number of host= $2^{16}-2$
Class C= number of host= 2^8-2

Internet Protocol Version 6 (IPv6)

IPv6 is a next generation Internet Protocol version 6. IPv6 addresses its nodes with 128-bit wide address providing plenty of address space for future to be used on entire planet or beyond.

IPv6 is 128 bits, can support up to 2^{128} addresses to fulfill future needs with better security and network related features.