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1) Total number of bits available and why it is limited:

There are about 65,535 ports per IP address: this is the highest number that can be represented by a 16-bit, or 2-byte it wasn't conceivable that computers would ever be able to spare more than that for something as trivial as ports, or something like that.

2) Ipv4 and Ipv6

Ipv4 and ipv6 are the versions to provide the proper information and identification for each ip addresses as there are large number of ip addresses in current period.

Ipv4 addresses:

- The first version of an ip address that was in format of 2^{32} bits of total ip address in ipv4 form .it was sufficient at initial phase .but in current advancement the addresses in ip ranges from 0 to 225 with 4 octets each is separated by a period. In a ip address first 3 parts are network id and last part is host id . using ipv4 addresses as reference we can identify ipv4 addresses from ipv6 addresses
- Ip classes are designed to provide easier management of large number of ip address .there are 5 classes depending on class size named a,b,c,d,e.
- First part a accommodates network with large number of networks first part ranging from 0 to 127
- Next part can fulfil the requirement for a moderated number of network host ranges from 128 to 191
- Part c can allocate ip address for low number of network id .the first 3 bits of network id is 1 1 0. Ranging from 192 to 223. So for above 3 part we can easily assign and identify network host.
- Part d is used for multicasting to send multiple signals at same time from a single host.for example in a video streaming the lead bit is 1 1 1 0 with network id ranges from 224 to 239
- Class e has ip bits reserved for research purpose only where ip address ranges from 240 to 255
- For Ipv4 the memory required for storing ipv4 version addresses in a system is very low they apply connection less protocol for sharing data and providing best effort in delivery

Ipv6 addresses:

- It was designed to overcome the address demand which to apply 128- bit binary type format.
- Approximately 320 civilian ip address were satisfied under ipv6
- This type of ip addresses were designed of 4 hexadecimal digit and 8 sets with each block contains 16 bits
- Ipv 6 addresses provides integrated security for network that is internet security protocol(ipsec).

- It allows its application to extend in various services according to the need of the network
- It also allows address config that uses dhcp network for setting and stateless that applies auto config settings.
- It also allows some methods to convert ipv4 address to ipv6 addresses.

3) **Ip addressing schemes :**

- IP address stands for internet protocol address; it is an identifying number that is associated with a specific computer or computer network. When connected to the internet, the IP address allows the computers to send and receive information.
- Ip addressing is a requirement for communication in a computer network with an addressing scheme ,packets are forwarded from one location to another.
- The scheme consist of two special cases of ip address addresses and loopback addresses and three layer address are used for routing , switching, creating of path.

Class A:

- In this class out of 32 bits only first 8 bits are assigned to the network part, hence it has default subnet mask of 255.0.0.0. In this class the first bit is reserved and is always kept off.
- Lower range can be found out by keeping all the bits off (means the corresponding numerical value is not added)
- the IP range of this class should be 0-127 but 0.0.0.0 doesn't represent a valid network and 127.0.0.0 to 127.255.255.255 is reserved for local host loop back to verify TCP/IP services. Eg: Some examples are 10.x.x.x, 125.x.x.x, 79.x.x.x, 98.x.x.x etc.

class B:

- in this class first 16 bits are assigned to network part & so it has default subnet mask of 255.255.0.0. For range assignment first two bits are reserved, first bit always on and second bit always off.
- Its lower range is 128 as last six bits and Its higher range is 191 as last six bits So the range of class B is 128-191. Some examples are 130.x.x.x, 156.x.x.x, 178.x.x.x, 190.x.x.x.

Class C:

- This class has 24 bits for network part and so its default subnet mask is 255.255.255.0. To assign the range first 3 bits are reserved, 1 & 2 bits are always on and 3 bit is always off.
- Its lower range is 192 as last five bits are off.
- So the class C range is **192-223**. Some examples are 200.x.x.x, 215.x.x.x, 221.x.x.x, 195.x.x.x.

Class D:

- The range of this class is from 224-239 and can't be allocated to hosts. This class is used for multicasting by various routing protocols. Some common examples are
- 224.0.0.5-Used by all OSPF routers
- 224.0.0.6-Used by OSPF DRs (Designated Routers)
- 224.0.0.9-Used by RIP-2
- 224.0.0.10-Used by EIGRP
- 224.0.0.12-Used by DHCP Server/Relay Agent
- 224.0.0.14-Used by RSVP encapsulation
- 224.0.0.18-Used by VRRP
- 224.0.0.22-Used by IGMP

Class E:

- The range of this class is from 240-255 and is not meant for general use. These are typically used for experiments.

4) Reserved ports:

- Port numbers range from 0 to 65535, but only port numbers 0 to 1023 are reserved for privileged services and designated as well-known ports. The following list of well-known port numbers specifies the port used by the server process as its contact port.
 1. 1- tcp port service multiplexer
 2. 5- remote job entry
 3. 7- echo
 4. 18- message send protocol
 5. 20- ftp data
 6. 21- ftp control
 7. 22- ssh remote login protocol
 8. 23- telnet
 9. 25- Simple mail transfer protocol
 10. 29- Msg icp
 11. 37- time
 12. 42- host name server

- 13. 43- whols**
- 14. 49- login host protocol**
- 15. 53- domain name system**
- 16. 69- tvft**
- 17. 70- gopher server**
- 18. 79- finger**
- 19. 80- http**
- 20. 103- x.400 standard**
- 21. 108- sna gateway**
- 22. 109- pop2**
- 23. 110- pop3**
- 24. 115- simple file transfer protocol**
- 25. 118- sql service**
- 26. 119- news group**
- 27. 137- netbios name service**
- 28. 139- netbios datagram service**
- 29. 143- interim mail access protocol**
- 30. 150- netbios session service**
- 31. 156- sql server**
- 32. 161- snmp**
- 33. 179- border gatewap protocol**
- 34. 190- gateway access control protocol**
- 35. 194- internet rely chat**
- 36. 197- dls**
- 37. 389- lightweight direct access protocol**
- 38. 396- novel netware ip**
- 39. 443- https**
- 40. 444- snpp**
- 41. 445- Microsoft ds**
- 42. 458- apple quick time**
- 43. 546- dhcp client**
- 44. 547- dhcp server**
- 45. 563- snews**
- 46. 1080- socks**