1.IP address (Internet Protocol address) is a unique numerical identifier assigned to each device connected to a network. It is important because it identifies devices uniquely and enables communication between devices over a network.

2.

|  |  |
| --- | --- |
| Ipv4 | Ipv6 |
| 32 bits (4byte) | 128 bits (16 bytes) |
| Decimal dotted | Hexa decimal doted |
| ~4.3 billion | ~340 undecillion |

3.192%2=0,96%2=0,48%2=0,24%2=0,12%2=0,6%2=0,3%2=1,1%2=1=11000000. 168%2=0,84%2=0,42%2=0,21%2=1,10%2=0,5%2=1,2%2=0, 2%1=1....10101000. 10%2=0,5%2=1,2%2=0,1%2=0........00001010 1%2=1,0%2=0.......00000001. 192.168.10.1=11000000.10101000.00001010.0000000

4. 2^7+2^6=192, 2^7+2^5+2^3=168, 2^0=1,2^1=2........192.168.1.2

5.1-126 class a, class b 128-191 class c 192-223

6.class B

7.Public-Routable over the internet; unique globally.

Private-Used within local networks; not routable on the internet

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

8. is used for testing and troubleshooting network software without using physical network interfaces. It allows a device to communicate with itself.

9.static:Manually assigned, fixed address example Server IP: 192.168.1.100,it's uses are for Servers, printers, network devices

Dynamic:Assigned automatically by DHCP,Laptop IP via WiFi: 192.168.1.5 (changes),it's uses Personal computers, smartphones, etc

10.Class-> A 255.0.0.0

Class B -> 255.255.0.0

Class C -> 255.255.255.0

11.Subnetting is the process of dividing a large IP network into smaller, more manageable subnetworks (subnets). it's used

To improve network performance.

To enhance security and organization.

To reduce broadcast traffic.

To efficiently utilize IP address space.

12. /24 means there are 32 - 24 = 8 bits available for hosts.

Total IPs = 2⁸ = 256 IP addresses

13.Usable IPs = Total IPs - 2 (1 for network, 1 for broadcast)

= 256 - 2 = 254 usable IPs

14.2² = 4 subnets

15.Original subnet: /24, 3 is borrowed

New subnet: 24 + 3 = /27

32-27=5

New subnet mask = 255.255.255.224

16. 32 - 26 = 6 bits for host

Hosts = 2⁶ - 2 = 62 hosts

Assuming it is class c /24 will be the default , Bits borrowed: 26 - 24 = 2 bits

Subnets = 2² = 4 subnets

17./26 = block size of 64( 2^(32-26))

So subnet range is: 192.168.10.64 – 192.168.10.127

Network address: 192.168.10.64

Broadcast address: 192.168.10.127

First usable IP: 192.168.10.65

Last usable IP: 192.168.10.126

18./22 means block size = 2^(32-22) = 1024 addresses

IPs span over 4 subnets of 256 addresses:

10.0.0.0 – 10.0.0.255

10.0.1.0 – 10.0.1.255

10.0.2.0 – 10.0.2.255

10.0.3.0 – 10.0.3.255

Range: 10.0.0.0 – 10.0.3.255

19.2

20.For 510 hosts,at least 9 bits (2⁹ = 512).

= 32 - 9 = 23

Borrowed bits: 23 - 20 = 3 bits

Subnets = 2³ = 8 subnets

23 =11111111.11111111.11111110.00000000=

255.255.254.0