LAB 2:

Introduction to IP addressing

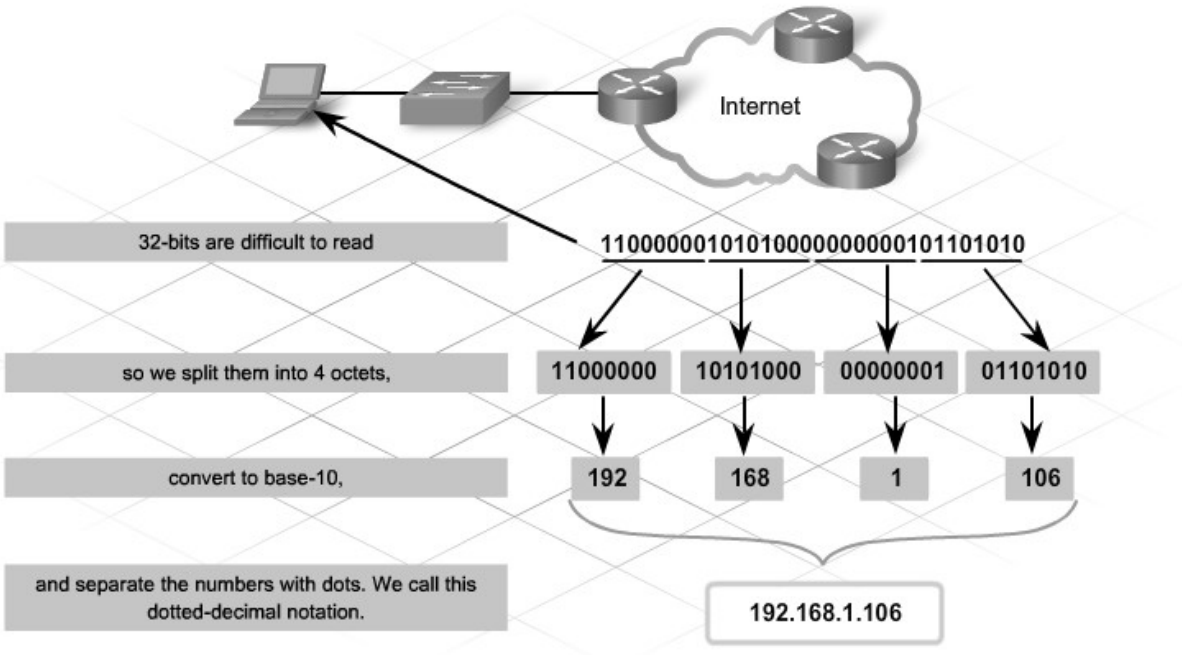
Introduction:

IP (internet protocol)

One of the most important aspects of communications on an internetwork is the IP addressing scheme. IP addressing is the method used to identify hosts and network devices. While IP addressing schemes have had to adapt, the basic IP address structure for IPv4 remains the same. To send and receive messages on an IP network, every network host must be assigned a unique 32-bit IP address. Because large binary numbers are difficult for people to read and understand, IP addresses are usually displayed in dotted-decimal notation. In dotted-decimal notation, each of the four octets is converted to a decimal number separated by a decimal point. For example, the IP address:

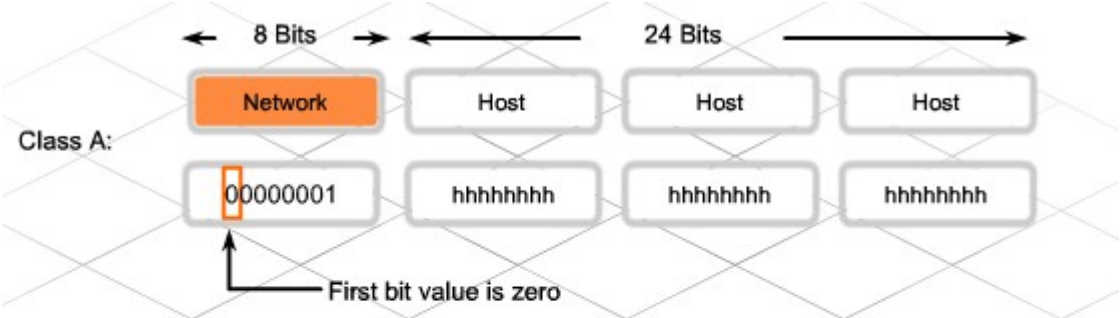
11000000.10101000.00000001.01101010

is represented as 192.168.1.106 in dotted-decimal notation.

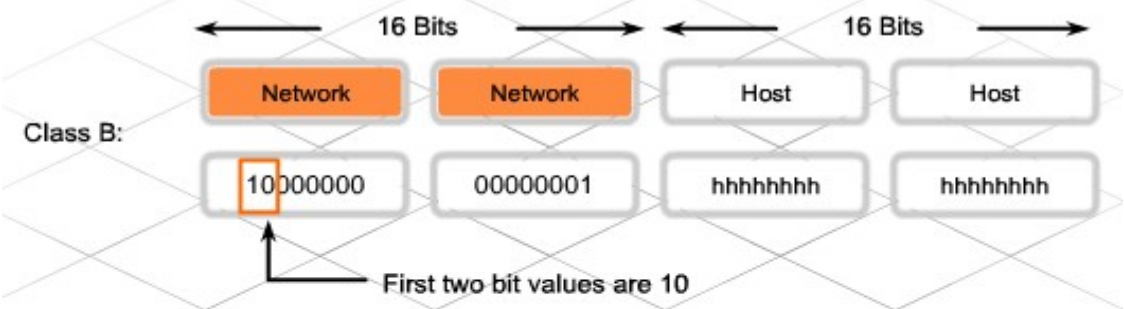


Classes of IP address

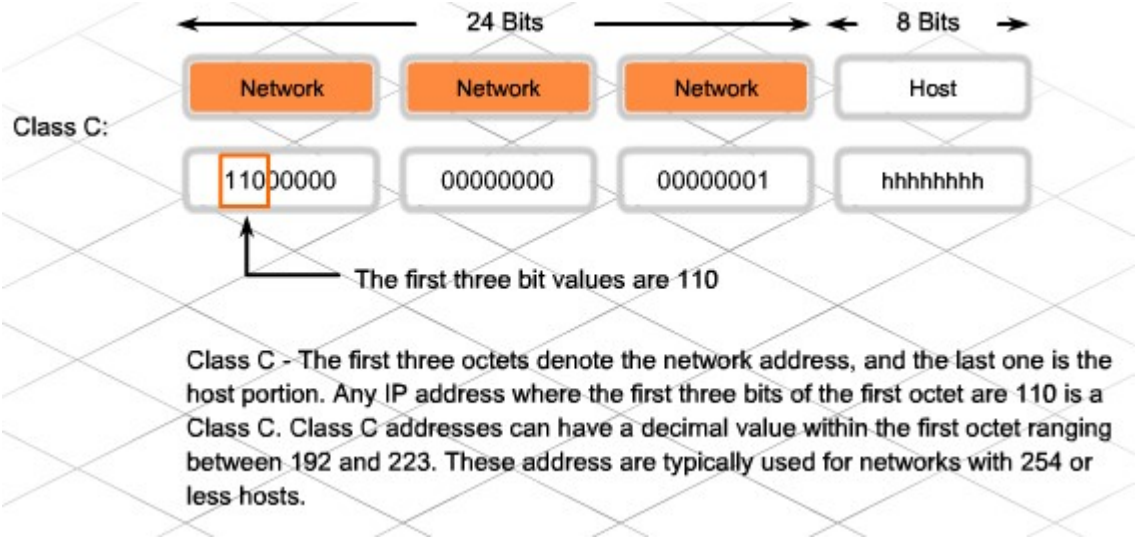
To create more possible network designations, the 32-bit address space was organized into five classes. Three of these classes, A, B, and C, provide addresses that can be assigned to individual hosts or networks. The other two classes, D and E, are reserved for multicast and experimental use.



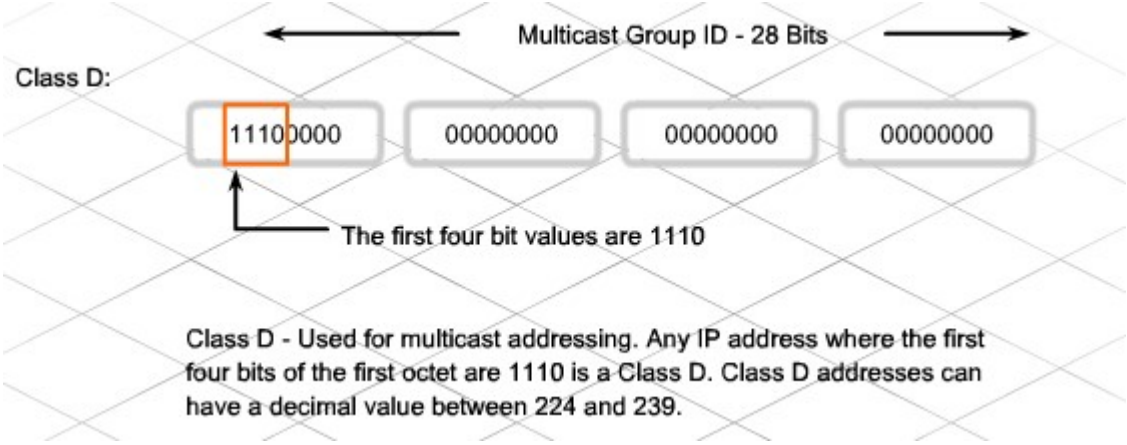
Class A - The first octet denotes the network address, and the last three are the host portion. Any IP address where the first bit of the first octet is 0 is a Class A. Class A addresses can have a decimal value within the first octet ranging between 1 and 126. These address are typically used for networks with more than 65,534 hosts. The Class A address 127 is reserved for loopback testing.



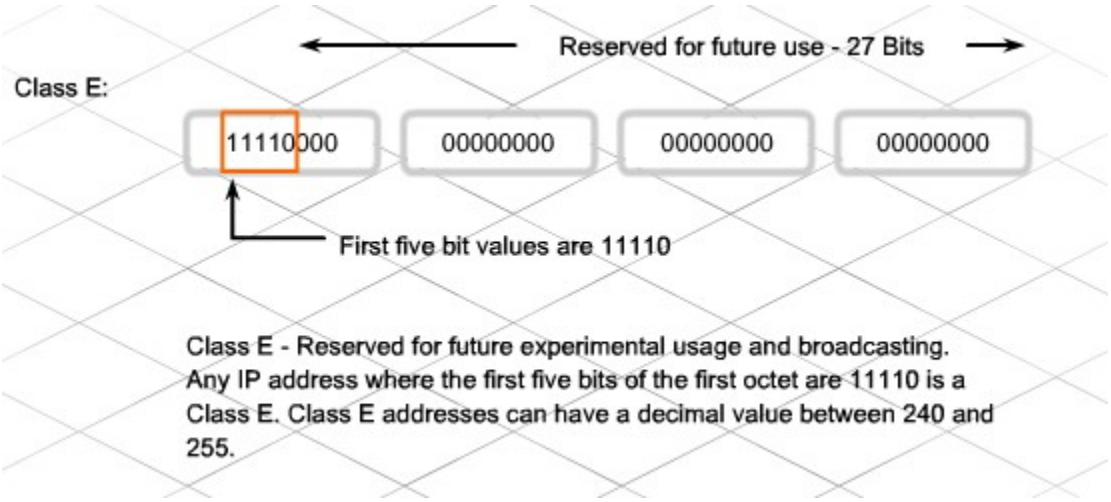
Class B - The first two octets denote the network address, and the last two are the host portion. Any IP address where the first two bits of the first octet are 10 is a Class B. Class B addresses can have a decimal value within the first octet ranging between 128 and 191. These addresses are typically used for networks that have between 255 and 65534 hosts.



Class C - The first three octets denote the network address, and the last one is the host portion. Any IP address where the first three bits of the first octet are 110 is a Class C. Class C addresses can have a decimal value within the first octet ranging between 192 and 223. These address are typically used for networks with 254 or less hosts.



Class D - Used for multicast addressing. Any IP address where the first four bits of the first octet are 1110 is a Class D. Class D addresses can have a decimal value between 224 and 239.



Class E - Reserved for future experimental usage and broadcasting. Any IP address where the first five bits of the first octet are 11110 is a Class E. Class E addresses can have a decimal value between 240 and 255.

Default subnet mask:

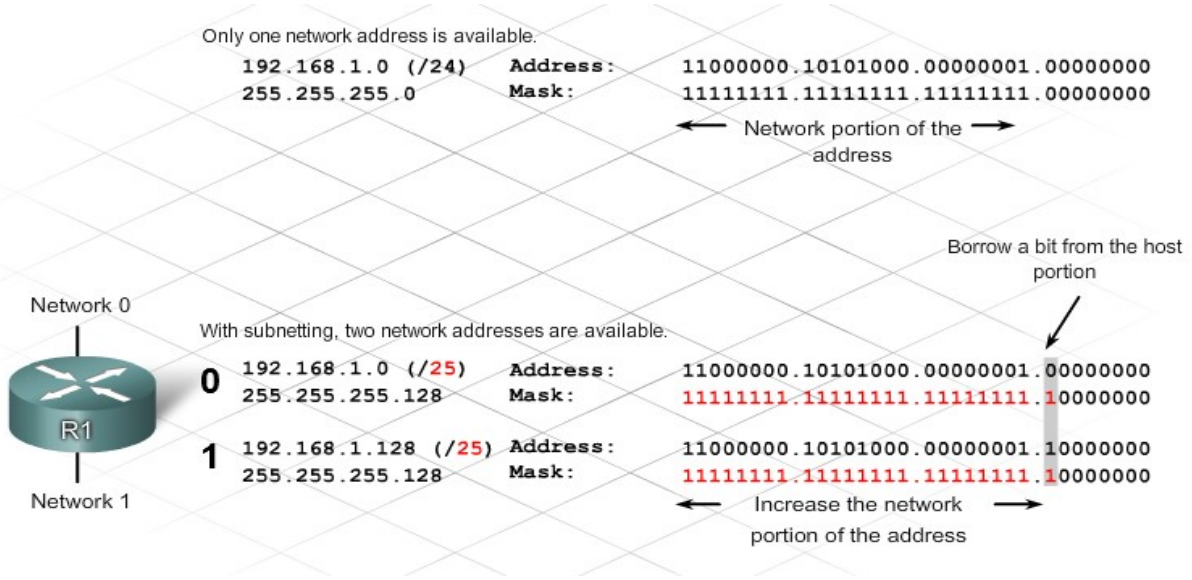
Class A 255.0.0.0

Class B 255.255.0.0

Class C 255.255.255.0

Subnetting:

A single Class A, B, or C network address space can be divided into multiple subnetworks by using bits from the host address space to designate the subnet ID. As an example, an organization using a Class C address space has two offices in different buildings. To make the network easier to manage, the network administrators want each location to have a logically separate network. Taking one bits from the host address increases the subnet mask length from the default 24 bits to 25 bits, or 255.255.255.128.



Addressing Scheme: Example of 2 networks

Subnet	Network Address	Host range	Broadcast Address
0	192.168.1.0/25	192.168.1.1 - 192.168.1.126	192.168.1.127
1	192.168.1.128/25	192.168.1.129 - 192.168.1.254	192.168.1.255

Private addresses:

In addition to creating separate classes, the Internet Engineering Task Force (IETF) decided to reserve some of the Internet address space for use by private networks. Private networks have no connection to public networks. Private network addresses are not to be routed across the Internet. This allows multiple networks in various locations to use the same private addressing scheme without creating addressing conflicts. The use of private address space reduced the number of unique registered IP addresses that were assigned to organizations.

Class	Private IP Addresses (RFC 1918)	Default Subnet Mask	Number of Networks	Hosts per Network	Total Hosts
A	10.0.0.0 to 10.255.255.255	**255.0.0.0**	**1**	**16,777,214**	**16,777,214**
B	172.16.0.0 to 172.31.255.255	**255.255.0.0**	**16**	**65,534**	**1,048,544**
C	192.168.0.0 to 192.168.255.255	**255.255.255.0**	**256**	**254**	**65,024**