

Constructing a Network Address using IP Addressing

by:

Joseph Ronald Cañedo

Overview

- Layer 3 Address Structure
- Private and Public IP Addresses
- Subnets
- Subnet and Subnet Mask Calculation
- Summary

Parts of the IP Address

Each IP address consists of:

- Network Field
 - Identifies the network to which the host belongs
 - Assigned by registry authority or the network admin and usually should be changed
- Host Field
 - Identifies the individual host
 - Assigned by the network admin to individual devices



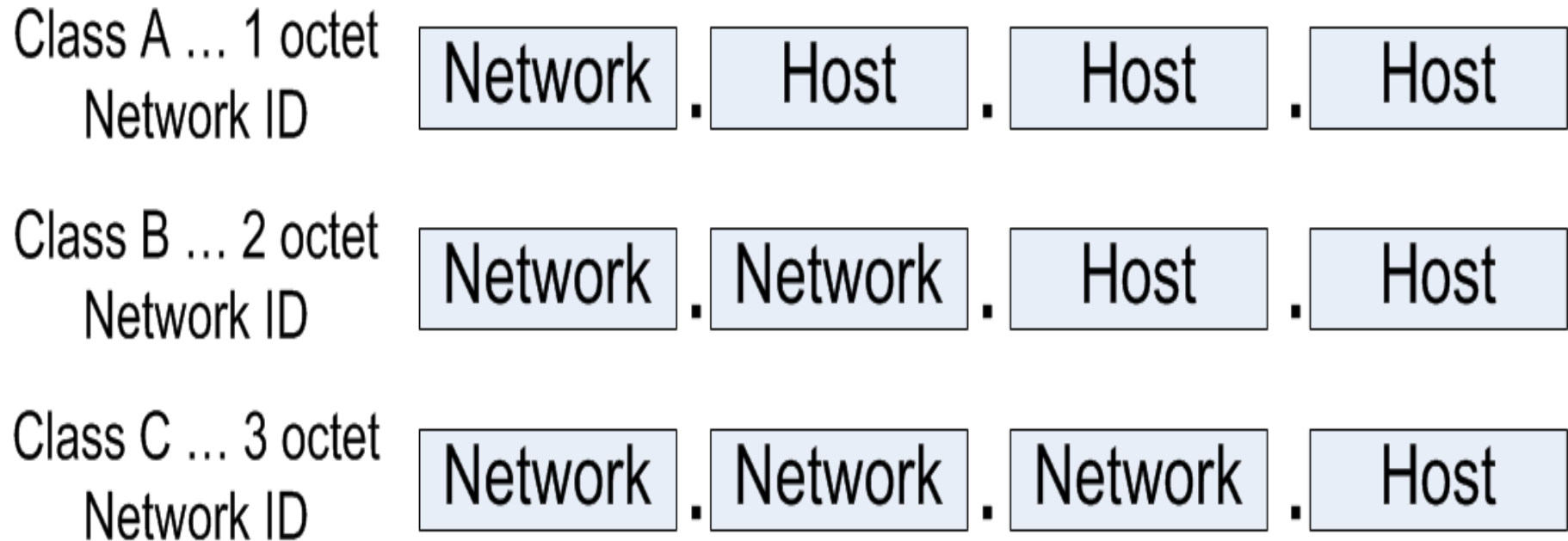
Public IP Address Classes

IP Address Class	IP Address Range (First Octet Decimal Value)
Class A	1 – 126 (00000001 to 01111110)*
Class B	128 – 191 (10000000 to 10111111)
Class C	192 – 223 (11000000 to 11011111)
Class D	224 – 239 (11100000 to 11101111)
Class E	240 – 255 (11110000 to 11111111)

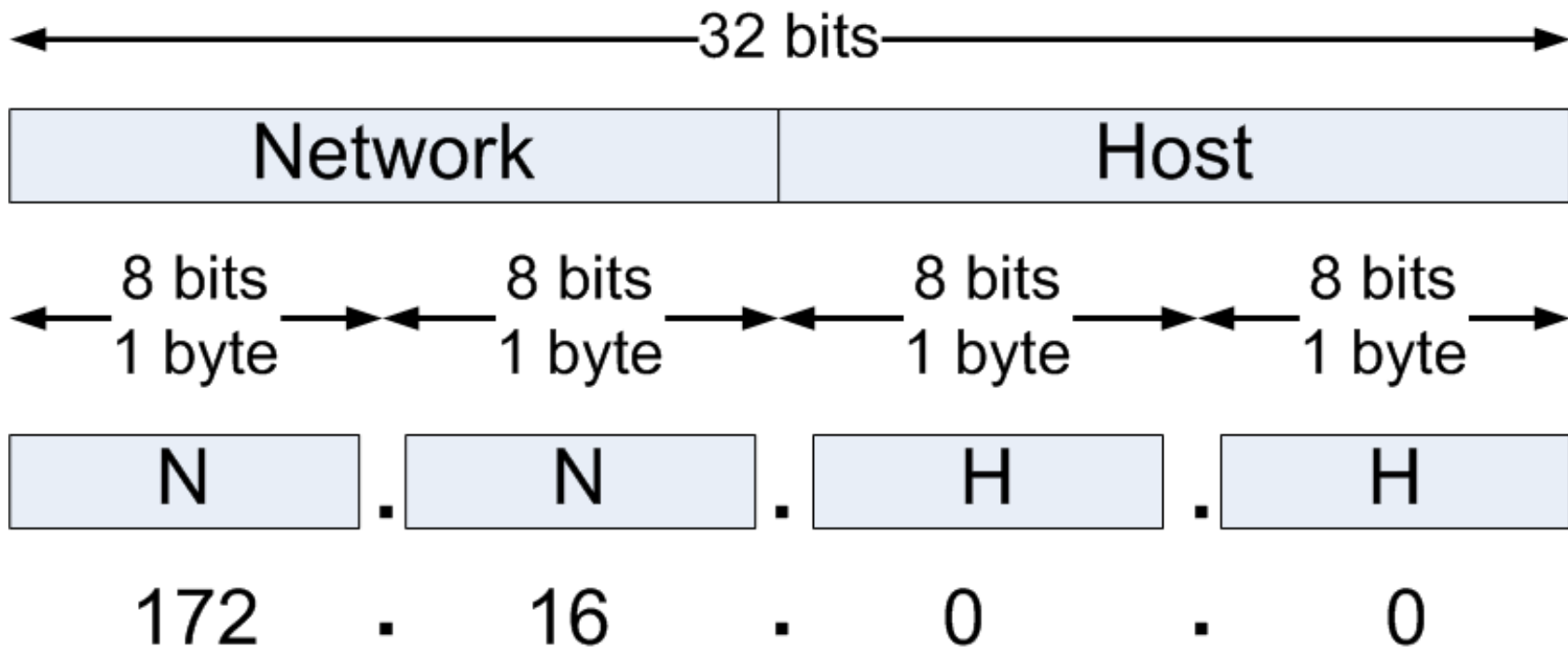
*127 (01111111) is a Class A address reserved for loopback testing and cannot be assigned to a network.

IP Address Structure and Class

- A B C....Easy as 1 2 3

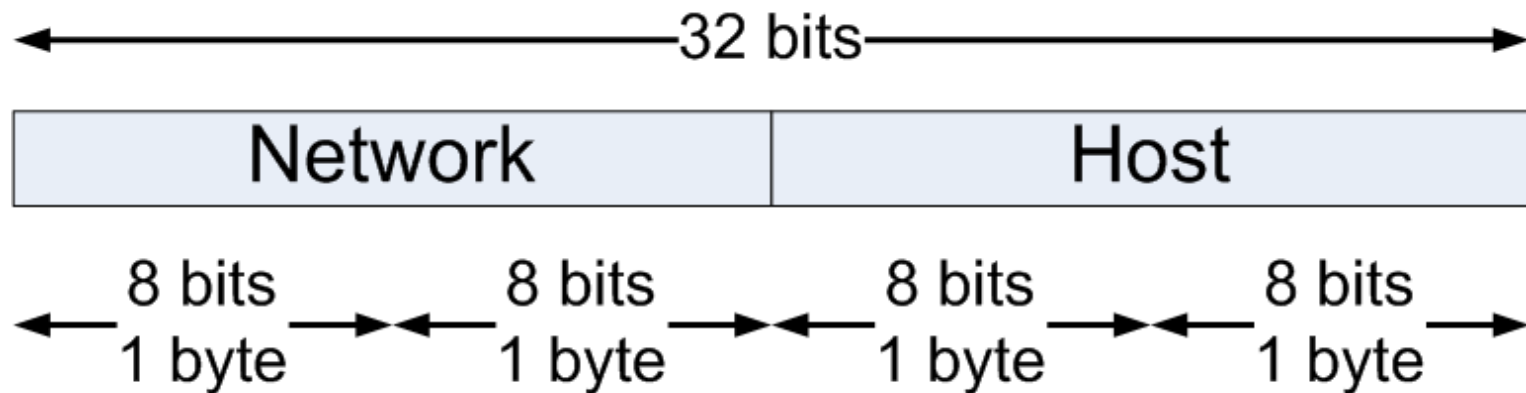


IP Address and Octets



Network Address (host bits = all zeros)

Reserved IP Address



Network Address Host bits = all 0s

Network	Network	Host	Host
172	16	0	0

Broadcast Address Host bits = all 1s

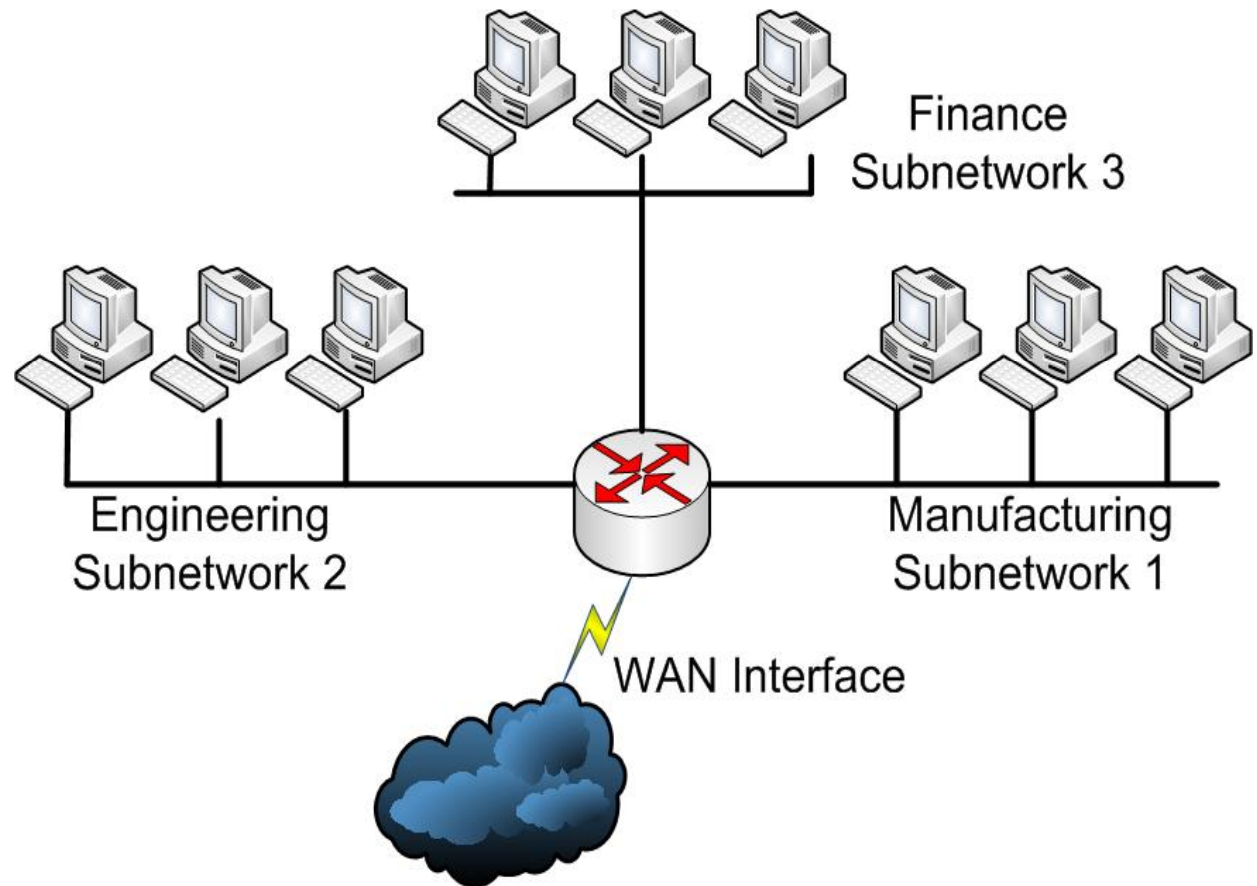
Network	Network	Host	Host
172	16	255	255

Private IP Addresses

Class	Private Address Range
A	10.0.0.0 to 10.255.255.255
B	172.16.0.0 to 172.255.255.255
C	192.168.0.0 to 192.168.255.255

Subnetworks

- Smaller networks are easier to manage.
- Overall traffic is reduced
- You can more easily apply network security policies



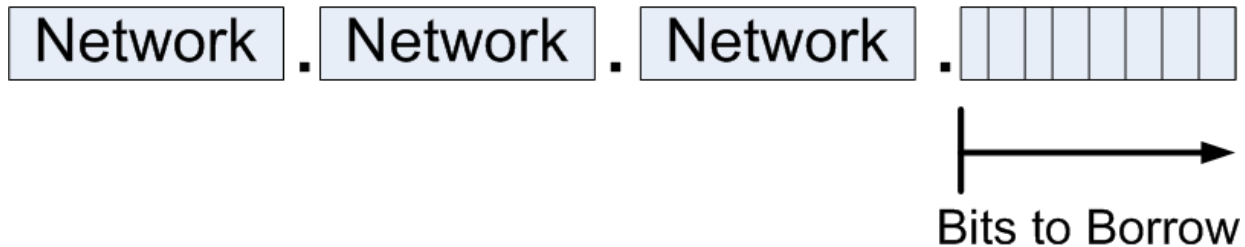
Number of Subnets Available

To identify subnets, you will “borrow” bits from the host ID portion to the IP address

- Number of subnets available depends on the number of bits borrowed.
- One address is still reserved as the network address.
- One address is still reserved as broadcast address.
- Available number of subnets = 2^N where N is the number of bits borrowed.

Number of Bits Borrowed	Number of Subnets (2^N)
2 bits	$2^2 = 4$
3 bits	$2^3 = 8$
4 bits	$2^4 = 16$
5 bits	$2^5 = 32$
6 bits	$2^6 = 64$

Possible Subnets and Hosts for a Class C Network



Number of Bits Borrowed (N)	Number of Subnets Possible (2^N)	Number of Bits Remaining in Host ID ($8 - N = h$)	Number of Hosts Possible Per Subnet ($2^h - 2$)
1	2	7	126
2	4	6	62
3	8	5	30
4	16	4	14
5	32	3	6
6	64	2	2
7	128	1	2

What a Subnet Mask Does?

- Tells the router the number of bits to look at when routing
- Defines the number of bits that are significant
- Used as a measuring tool, not to hide anything

