

WELCOME

NETWORKING

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200-301

(4th Class)



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Basically we have use 2 types of Address:

1. Physical Address (MAC Address)

2. Logical Address (IP Address)

MAC address:-

- ❑ It is the unique physical address of a network device
- ❑ It's used for communication within LAN
- ❑ Example: 00:0C:42:20:97:68

What is TCP/IP?

TCP/IP is the communication protocol for communication between computers connected to the Internet. TCP/IP stands for Transmission Control Protocol / Internet Protocol. The standard defines how electronic devices (like computers) should be connected to the Internet, and how data should be transmitted between them.

Regional Internet Registry

An **IP address (Internet Protocol address)** is a unique number that devices use in order to identify and communicate with each other on a computer network utilizing the Internet Protocol standard (IP). Any participating network device — including routers, computers, time-servers, printers, Internet fax machines, and some telephones — must have its own unique address.

IP addresses are managed by the Internet Assigned Numbers Authority. IANA generally assigns super-blocks to Regional Internet Registries, who in turn allocate smaller blocks to Internet Service Providers and enterprises

Regional Internet Registry

1. African Network Information Center
2. American Registry for Internet Numbers
3. RIPE Network Coordination Centre
4. Asia-Pacific Network Information Centre
5. Latin American and Caribbean Internet Addresses Registry

AfriNIC is the Regional Internet Registry (RIR) for Africa.

AfriNIC, headquartered in Ebene City, Mauritius, was provisionally recognised by ICANN on October 11, 2004 and became functionally operational on February 22, 2005. It was recognised by ICANN in April 2005.

Previously, IP addresses for Africa were distributed by APNIC, ARIN, and the RIPE NCC. [1]

The American Registry for Internet Numbers (ARIN) is the Regional Internet Registry (RIR) for Canada, the United States, and some islands in the Caribbean and North Atlantic ocean. Established in December 1997, ARIN is incorporated as a nonprofit in the Commonwealth of Virginia, USA.

The Réseaux IP Européens Network Coordination Centre (RIPE NCC) is the Regional Internet Registry (RIR) for Europe, the Middle East and Central Asia. An RIR oversees the allocation and registration of Internet number resources (IPv4 addresses, IPv6 addresses and Autonomous System (AS) Numbers in a specific region.

It is a not-for-profit membership organisation with over 4,300 (as of May 2006) members located in 65 countries in its service region.

The Asia-Pacific Network Information Centre (APNIC) is the Regional Internet Registry for the Asia-Pacific region.

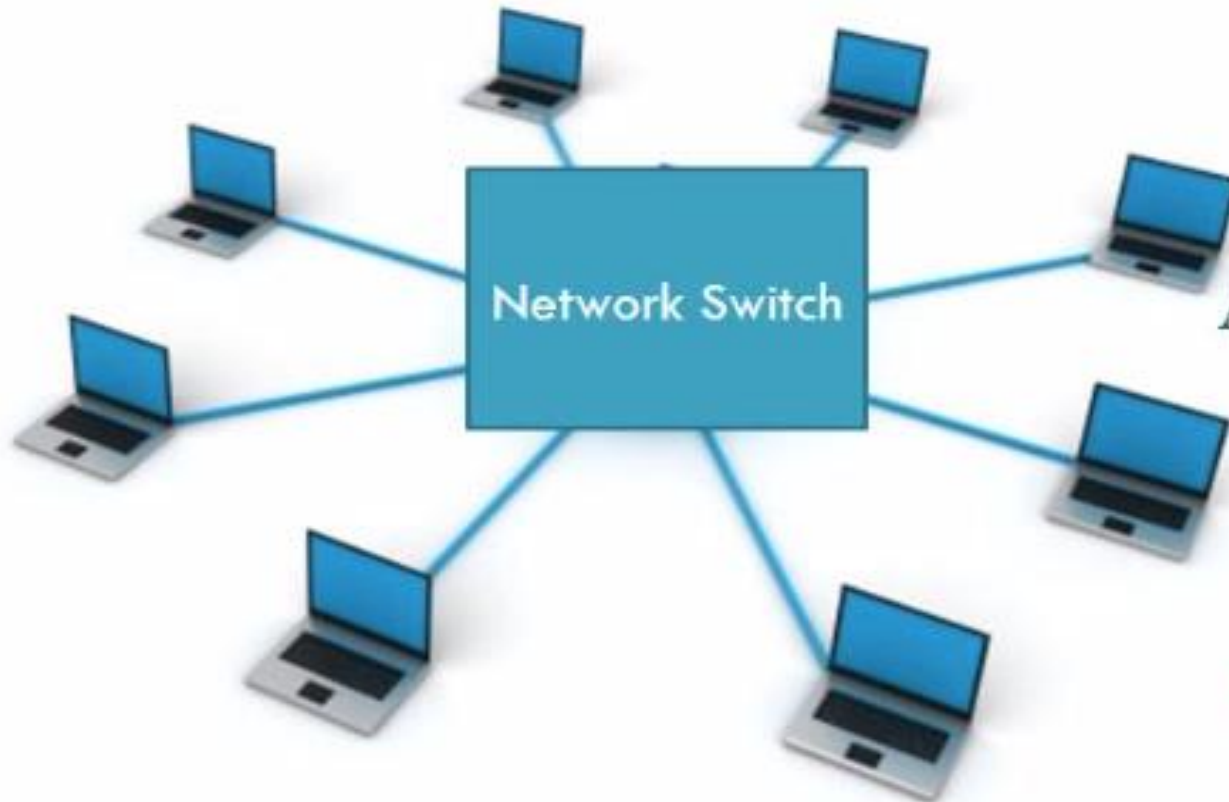
IP address registration information can be queried with the whois database at whois.apnic.net, which may contain records originating from APNIC itself, or from National Internet Registries such as TWNIC (Taiwan), KRNIC (Korea), or JPNIC (Japan). However the APNIC WHOIS database cannot be considered reliable; the data rarely identifies resources with a finer resolution than a regional monopoly ISP.

The previous registry for Australia, known as AUNIC, is now disbanded, and its responsibilities undertaken by APNIC.

The Latin American and Caribbean Internet Addresses Registry (LACNIC) is the Regional Internet Registry for Latin America and the Caribbean. It administers IP addresses, autonomous system numbers, reverse DNS, and other network resources for that region.

IP (Internet Protocol) Address or Logical Address

Understanding about IP



A Unique Identifier

**A Way to Identify machine /
computers on a network**

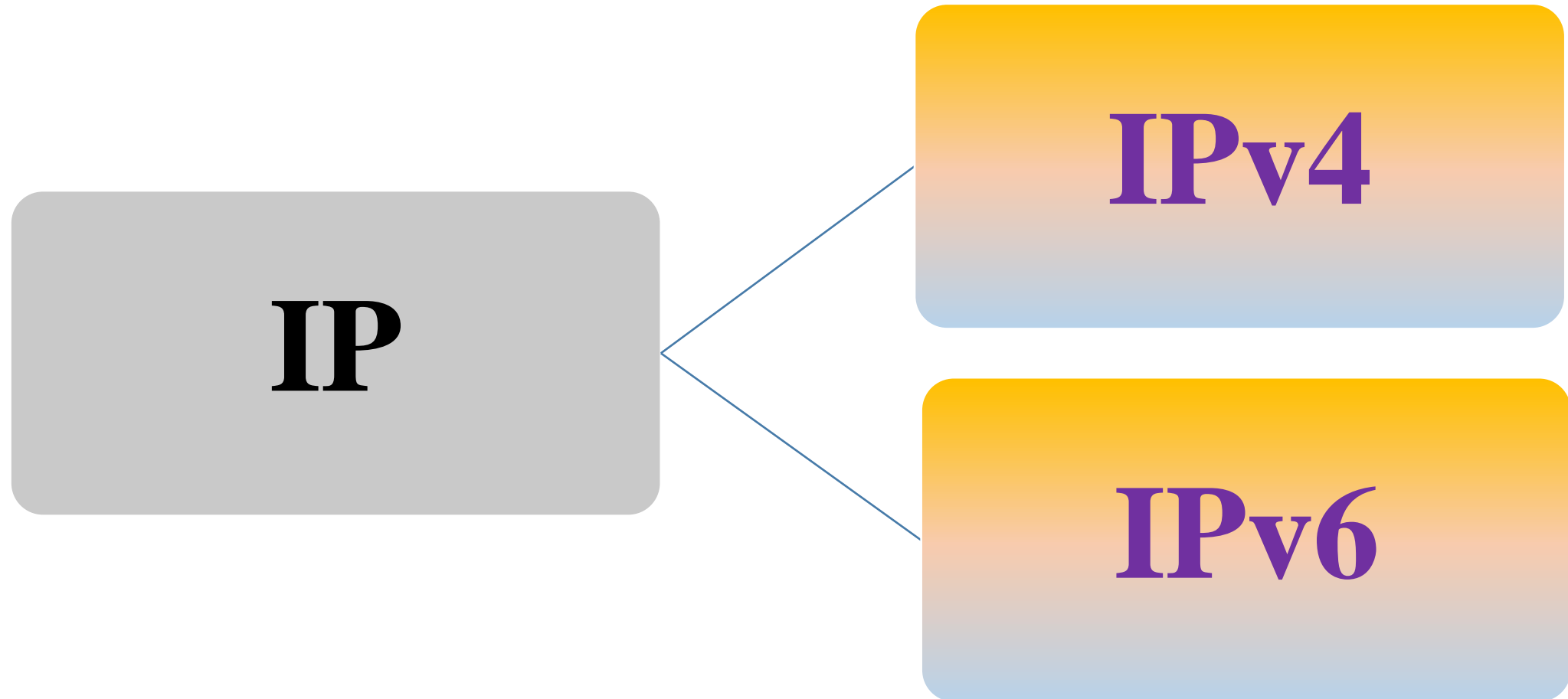
**Use to Connect to another
computer**

Inside TCP/IP

Hiding inside the TCP/IP standard there are a number of protocols for handling data communication:

- ✚ TCP (Transmission Control Protocol) communication between applications
- ✚ UDP (User Datagram Protocol) simple communication between applications
- ✚ IP (Internet Protocol) communication between computers
- ✚ ICMP (Internet Control Message Protocol) for errors and statistics
- ✚ DHCP (Dynamic Host Configuration Protocol) for dynamic addressing

There are two version of IP address



About of IPv4 & IPv6

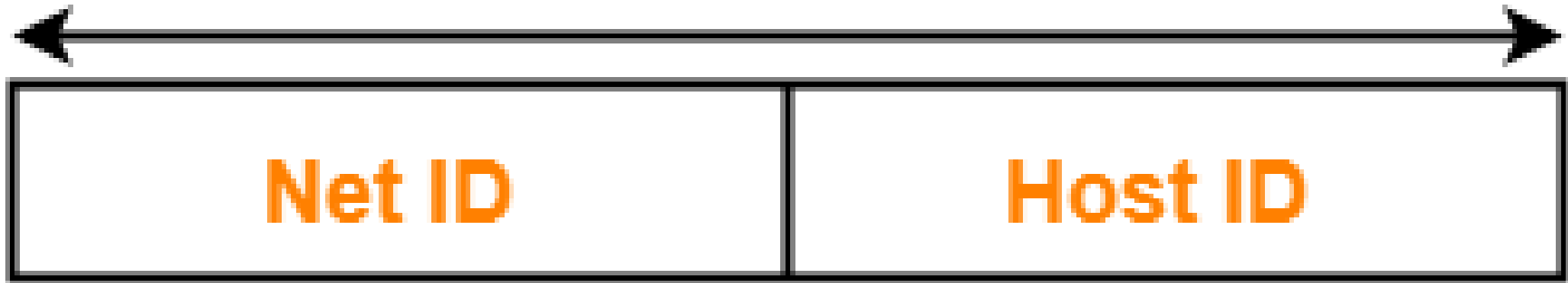
	Internet Protocol version 4 (IPv4)	Internet Protocol version 6 (IPv6)
Deployed	1981	1999
Address Size	32-bit number	128-bit number
Address Format	Dotted Decimal Notation: 192.149.252.76	Hexadecimal Notation: 3FFE:F200:0234:AB00: 0123:4567:8901:ABCD
Prefix Notation	192.149.0.0/24	3FFE:F200:0234::/48
Number of Addresses	$2^{32} = \sim 4,294,967,296$	$2^{128} = \sim 340,282,366,920,938,463,463,374,607,431,768,211,456$

Here we will discuss about IPv4 Address scheme.

- ❑ IP Address is a 32 bit binary address written as 4 numbers separated by dots.
- ❑ The 4 numbers are called as octets where each octet has 8 bits.
- ❑ The octets are divided into 2 components- Network ID and Host ID.

1 st Octet	2 nd Octet	3 rd Octet	4 th Octet
8 bit	8 bit	8 bit	8 bit
8*4= 32 bit			

32 bits



Format of an IP Address

1. Network ID represents the IP Address of the network and is used to identify the network.

2. Host ID represents the IP Address of the host and is used to identify the host within the network.

IP Address Classes and Their Formats

Since networks vary in size, there are four different address formats or classes to consider when applying to NIC for a network number:

- ✚ Class A addresses are for large networks with many devices.
- ✚ Class B addresses are for medium-sized networks.
- ✚ Class C addresses are for small networks (fewer than 256 devices).
- ✚ Class D addresses are multicast addresses.
- ✚ Class E Not use

Range of IPv4 address

Classes of IPv4 Address

- A = 0-127 (0 reserved for default routing, 127 reserved for loopback)
- B= 128-191
- C= 192-223
- D= 224-239 (reserved for multicasting)
- E= 240-255 (reserved for broadcasting, research, weather forecasting and scientific purpose)

Class A (0-127)

Octat	1st	2nd	3rd	4th
N/H	Network id	Host ID	Host	Host
bit	8 bit	8 bit	8 bit	8 bit
N/H bit	8 bit	24 bit		
Number of network	126			
Number of Host	16777214			

Class B (128-191)

Octat	1st	2nd	3rd	4th
N/H	Network id	Network id	Host	Host
bit	8 bit	8 bit	8 bit	8 bit
N/H bit	16 bit		16 bit	
Number of network	16384			
Number of Host	65534			

Class C (192-223)

Octat	1st	2nd	3rd	4th
N/H	Network id	Network id	Network id	Host
bit	8 bit	8 bit	8 bit	8 bit
N/H bit	24 bit			8 bit
Number of network	2097152			
Number of Host	254			

SHORT THEORY

Network Classes with their respective Default Subnet Masks

<u>CLASS TYPE</u>	<u>NETWORK RANGE</u>	<u>DEFAULT SUBNET MASK</u>
Class A	1.0.0.0 to 127.255.255.255	255.0.0.0
Class B	128.0.0.0 to 191.255.255.255	255.255.0.0
Class C	192.0.0.0 to 223.255.255.255	255.255.255.0

Here you can see each Network Class with its range of IP Addresses followed by the default subnet mask for the particular Class. Remember that we can modify the default subnet mask to meet our needs

How can identify IP Address Class ?

- ❑ To identify class, we will look onto only 1st Octet of my IP address.

EXAMPLE

Example of an IPv4 address: 63.171.234.171

Here, as 63 resided in 1st Octet & it is in 0 - 127, so this IP is a Class-A IP.

Summary of Class full Addressing

Class	Range	MSB	Number of bit in Network ID	Number of bit in Host ID	Number of Network	Number of Host for every network
A	1 - 127	0	8	24	126	16777214
B	128 - 191	10	16	16	16384	65534
C	192 - 223	110	24	8	2097152	254
D	224 - 239	1110	<i>Reserved for multicast addressing</i>		Not Applicable	
E	240 - 255	1111	<i>Reserved for experimental use</i>		Not Applicable	

Classification of IP Address

1. Private / Fake / Dummy IP Address

IP Class	IP From	IP To	CIDR Notation	Subnet Mask
Class A	10.0.0.0	10.255.255.255	10.0.0.0/8	255.0.0.0
Class B	172.16.0.0	172.31.255.255	172.16.0.0/16	255.255.0.0
Class C	192.168.0.0	192.168.255.255	192.168.0.0/24	255.255.255.0

2. Public /Real Address

Rest of the IP Address Called Public Address except Look back address.

3. Loopback Address : Diagnostic test that returns the transmitted signal to the sending device after it has passed through a device or across a link. Address is 127.0.0.1 to 127.255.255.255

The first few bits of each IP address indicate which of the address class formats it is

Class	Network Bit		Host Bit
	MSB	Bit	
Class A	1 Bit	Network (7 bits)	Local address (24 bits)
Class B	2 Bits	Network (14 bits)	Local address (16 bits)
Class C	3 Bits	Network (21 bits)	Local address (8 bits)

SUBNETTING

Why use subnets?

- ✚ Reduce network congestion
- ✚ Mix different technology network components
- ✚ Decentralize and ease administration
- ✚ Geographical reasons
- ✚ Network Management

You can expand a network by using physical devices, such as routers and bridges, to add network segments. Network segments separated in a TCP/IP environment by routers are called subnet. Subnets define the logical divisions of a network.

Subnet Masks : IP numbers are hierarchical in nature. A number called a subnet mask is used in conjunction with the IP address to enable the segmentation of a large network into smaller networks. Applying a subnet mask to an IP address allows you to identify the network and node parts of the address. The network bits are represented by the 1s in the mask, and the node bits are represented by the 0s

Default Subnet Mask

By default, all type of Classes (A, B and C) have a subnet mask, we call it the "Default Subnet mask".

Class A - 255.0.0.0

Class B - 255.255.0.0 192.168.10.0/25 192.168.10.1-128-rabby 129-256-imran

Class C - 255.255.255.0

Binary Count	/25	/26	/27	/28	/29	/30	/31	/32
Number of Subnet	2	4	8	16	32	64	128	256
Binary position form Left Right	2^1	2^2	2^3	2^4	2^5	2^6	2^7	2^8
Bit								
Binary position form Right to Left	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
Position Value	128	64	32	16	8	4	2	1
Subnet Mask	128	192	224	240	248	252	254	255

Subnet mask

For 1 bit	: 128	= 128
For 2 bit	: 128+64	= 192
For 3 bit	: 128+64+32	= 224
For 4 bit	: 128+64+32+16	= 240
For 5 bit	: 128+64+32+16+8	= 248
For 6 bit	: 128+64+32+16+8+4	= 252
For 7 bit	: 128+64+32+16+8+4+2	= 254
For 8 bit	: 128+64+32+16+8+4+2+1	= 255

/32 (1)

index

/31 (2)

/30 (4)

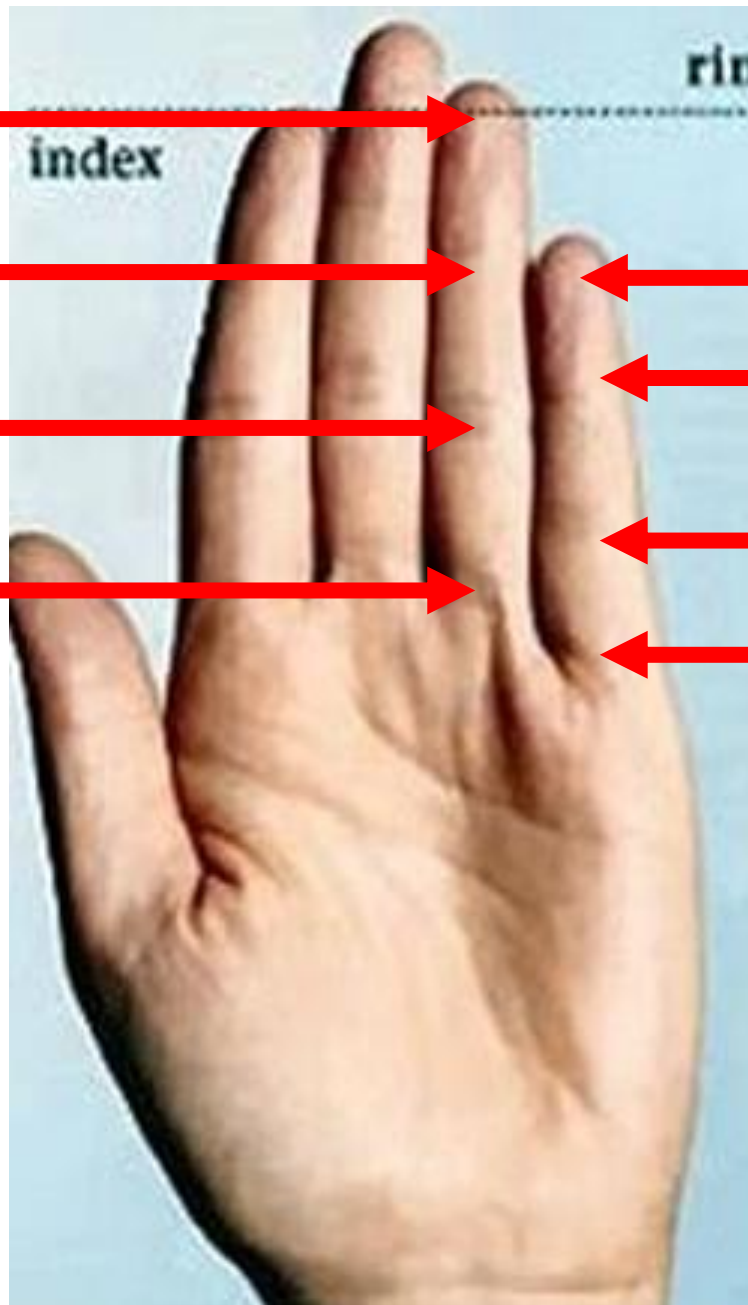
/29 (8)

/28 (16)

/27 (32)

/26 (64)

/25 (128)



192.168.10.12/26

Total IP :- 64

Subnet Mask :- 255.255.255.192

Number of Subnet:- 4

Network Id:- 192.168.10.0

192.168.10.12/26

Total IP :- 64

(Total IP বের করার জন্য আমাদের IP এর Subnet Mask টি আগুলের যে কড়ে পড়ে ঐ কড়ের মানই হলো Total IP)

(যেমন:- 26 পড়ে ২ নাম্বার কড়ে, ঐ কড়ের মান 64, তাহলে Total IP= 64)

192.168.10.12/26

Total IP :- 64

Subnet Mask :-255.255.255.192

(Subnet Mask বের করার জন্য আমাদের IP এর Subnet Mask টি আঙ্গুলের যে কড়ে পড়ে ঐ কড় থেকে নিচের সকল কড়ের মানের যোগফল হলো SM)

(যেমন:- 26 পড়ে ২ নাম্বার কড়ে,

তাহলে $SM = 128 + 64 = 192$)

192.168.10.12/26

Total IP :- 64

Subnet Mask :-255.255.255.192

Number of Subnet:- 4

(Number of Subnet এর জন্য আমাদের কড়ের মান ধরতে হবে ভিন্ন। শুরু হবে (2,4,8,16,32,64,128,256) বের করার জন্য আমাদের IP এর Subnet Mask টি আগুলের যে কড়ে পড়ে ঐ কড়ের নতুন মানই হলো Number of Subnet.)

(যেমন:- 26 পড়ে ২ নাম্বার কড়ে, ঐ কড়ের মান 4, তাহলে Number of Subnet = 4)

Number of Subnet:- 4

(Number of Subnet বলতে বোঝায় মূলত আমাদের যে IP

(192.168.10.12/26) টি রয়েছে তাকে আমরা 4টি ভাগে ভাগ করতে পারবো।

এবং প্রতিটি ভাগে থাকবে 64টি করে IP।

192.168.10.12/26 (Number of Subnet)				
No.	Network	Hosts		Broadcast Address
		From	To	
1.	192.168.10.0	192.168.10.1	192.168.10.62	192.168.10.63
2.	192.168.10.64	192.168.10.65	192.168.10.126	192.168.10.127
3.	192.168.10.128	192.168.10.129	192.168.10.190	192.168.10.191
4.	192.168.10.192	192.168.10.193	192.168.10.254	192.168.10.255

192.168.10.12/26

Total IP :- 64

Subnet Mask :-255.255.255.192

Number of Subnet:- 4

Network Id:-192.168.10.0

(Network ID বের করার জন্য আমাদের Number of subnet এর
যে ঘরে পরে ঐ ঘরের প্রথম IP হলো Network ID ।

(যেমন:- 192.168.10.12 পড়ে ১ নাম্বার ভাগে,
তাহলে Network ID = 192.168.10.0)

Subnetting Tables

For the 203.191.32.0 network with the subnet mask 255.255.255.128/25

Network	Hosts		Broadcast Address
	from	to	
203.191.32.0	203.191.32.1	203.191.32.126	203.191.32.127
203.191.32.128	203.191.32.129	203.191.32.254	203.191.32.255

For the 203.191.32.0 network with the subnet mask 255.255.255.192/26

Network	Hosts	Broadcast Address	
	from	to	
203.191.32.0	203.191.32.1	203.191.32.62	203.191.32.63
203.191.32.64	203.191.32.65	203.191.32.126	203.191.32.127
203.191.32.128	203.191.32.129	203.191.32.190	203.191.32.191
203.191.32.192	203.191.32.193	203.191.32.254	203.191.32.255

For the 203.191.32.0 network with the subnet mask 255.255.255.224/27

Network	Hosts		Broadcast Address
	from	to	
203.191.32.0	203.191.32.1	203.191.32.30	203.191.32.31
203.191.32.32	203.191.32.33	203.191.32.62	203.191.32.63
203.191.32.64	203.191.32.65	203.191.32.94	203.191.32.95
203.191.32.96	203.191.32.97	203.191.32.126	203.191.32.127
203.191.32.128	203.191.32.129	203.191.32.158	203.191.32.159
203.191.32.160	203.191.32.161	203.191.32.190	203.191.32.191
203.191.32.192	203.191.32.193	203.191.32.222	203.191.32.223
203.191.32.224	203.191.32.225	203.191.32.254	203.191.32.255

For the 203.191.32.0 network with the subnet mask 255.255.255.240/28

Network	Hosts		Broadcast Address
	from	to	
203.191.32.0	203.191.32.1	203.191.32.14	203.191.32.15
203.191.32.16	203.191.32.17	203.191.32.30	203.191.32.31
203.191.32.32	203.191.32.33	203.191.32.46	203.191.32.47
203.191.32.48	203.191.32.49	203.191.32.62	203.191.32.63
203.191.32.64	203.191.32.65	203.191.32.78	203.191.32.89
203.191.32.80	203.191.32.81	203.191.32.94	203.191.32.95
203.191.32.96	203.191.32.97	203.191.32.110	203.191.32.111
203.191.32.112	203.191.32.113	203.191.32.126	203.191.32.127
203.191.32.128	203.191.32.129	203.191.32.142	203.191.32.143
203.191.32.144	203.191.32.145	203.191.32.158	203.191.32.159
203.191.32.160	203.191.32.161	203.191.32.174	203.191.32.175
203.191.32.176	203.191.32.177	203.191.32.190	203.191.32.191
203.191.32.192	203.191.32.193	203.191.32.206	203.191.32.207
203.191.32.208	203.191.32.209	203.191.32.222	203.191.32.223
203.191.32.224	203.191.32.225	203.191.32.238	203.191.32.239
203.191.32.240	203.191.32.241	203.191.32.254	203.191.32.255

For the 203.191.32.0 network with the subnet mask 255.255.255.248/29

Network	Hosts		Broadcast Address
	From	to	
203.191.32.0	203.191.32.1	203.191.32.6	203.191.32.7
203.191.32.8	203.191.32.9	203.191.32.14	203.191.32.15
203.191.32.16	203.191.32.17	203.191.32.22	203.191.32.23
203.191.32.24	203.191.32.25	203.191.32.30	203.191.32.31
203.191.32.32	203.191.32.33	203.191.32.38	203.191.32.39
203.191.32.40	203.191.32.41	203.191.32.46	203.191.32.47
203.191.32.48	203.191.32.49	203.191.32.54	203.191.32.55
203.191.32.56	203.191.32.57	203.191.32.62	203.191.32.63
203.191.32.64	203.191.32.65	203.191.32.70	203.191.32.71
203.191.32.72	203.191.32.73	203.191.32.78	203.191.32.79
203.191.32.81	203.191.32.82	203.191.32.86	203.191.32.87
203.191.32.88	203.191.32.89	203.191.32.94	203.191.32.95
203.191.32.96	203.191.32.97	203.191.32.102	203.191.32.103
203.191.32.104	203.191.32.105	203.191.32.110	203.191.32.111
203.191.32.112	203.191.32.113	203.191.32.118	203.191.32.119
203.191.32.120	203.191.32.121	203.191.32.126	203.191.32.127
203.191.32.128	203.191.32.129	203.191.32.134	203.191.32.135
203.191.32.136	203.191.32.137	203.191.32.142	203.191.32.143
203.191.32.144	203.191.32.145	203.191.32.150	203.191.32.151
203.191.32.152	203.191.32.153	203.191.32.158	203.191.32.159
203.191.32.160	203.191.32.161	203.191.32.166	203.191.32.167
203.191.32.168	203.191.32.169	203.191.32.174	203.191.32.175
203.191.32.176	203.191.32.177	203.191.32.182	203.191.32.183
203.191.32.184	203.191.32.185	203.191.32.190	203.191.32.191
203.191.32.192	203.191.32.193	203.191.32.198	203.191.32.199
203.191.32.200	203.191.32.201	203.191.32.206	203.191.32.207
203.191.32.208	203.191.32.209	203.191.32.214	203.191.32.215
203.191.32.216	203.191.32.217	203.191.32.222	203.191.32.223
203.191.32.224	203.191.32.225	203.191.32.230	203.191.32.231
203.191.32.216	203.191.32.217	203.191.32.222	203.191.32.223
203.191.32.224	203.191.32.225	203.191.32.230	203.191.32.231
203.191.32.232	203.191.32.233	203.191.32.238	203.191.32.239
203.191.32.240	203.191.32.241	203.191.32.246	203.191.32.247
203.191.32.248	203.191.32.249	203.191.32.254	203.191.32.255

Work

192.168.10.12/25

192.168.10.12/26

192.168.10.12/27

192.168.10.12/28

192.168.10.12/29

192.168.10.12/30

192.168.10.12/31

192.168.10.12/32

192.168.10.12/24

192.168.10.12/26

Demo:-

192.168.10.12/26

Total IP :- 64

Subnet Mask :- 255.255.255.192

Number of Subnet:- 4

Network Id:- 192.168.10.0

Work

192.168.10.12/25

192.168.10.12/26

192.168.10.12/27

192.168.10.12/28

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.

Demo:-

192.168.10.12/26

Total IP :- 64

Subnet Mask :- 255.255.255.192

Number of Subnet:- 4

Network Id:- 192.168.10.0

thank
you