HOW BINARY CODE WORKS

- Before understanding the Binary code we need to understand our regular number system works.
  We can use 0,1,2,3,4,5,6,7,8,9
  $512 = (5*10^2)+(1*10^1)+(2*10^0)$
- But in Binary number we can only use 0 and 1.
  9 = 1001
  2^3 2^2 2^1 2^0
  8 4 2 1 (4-bit system and we can write up to 15)
- How much we can write using an 8 bit system?

IP ADDRESS

- In a 8-bit system we can get 256 different values.

  But how!!

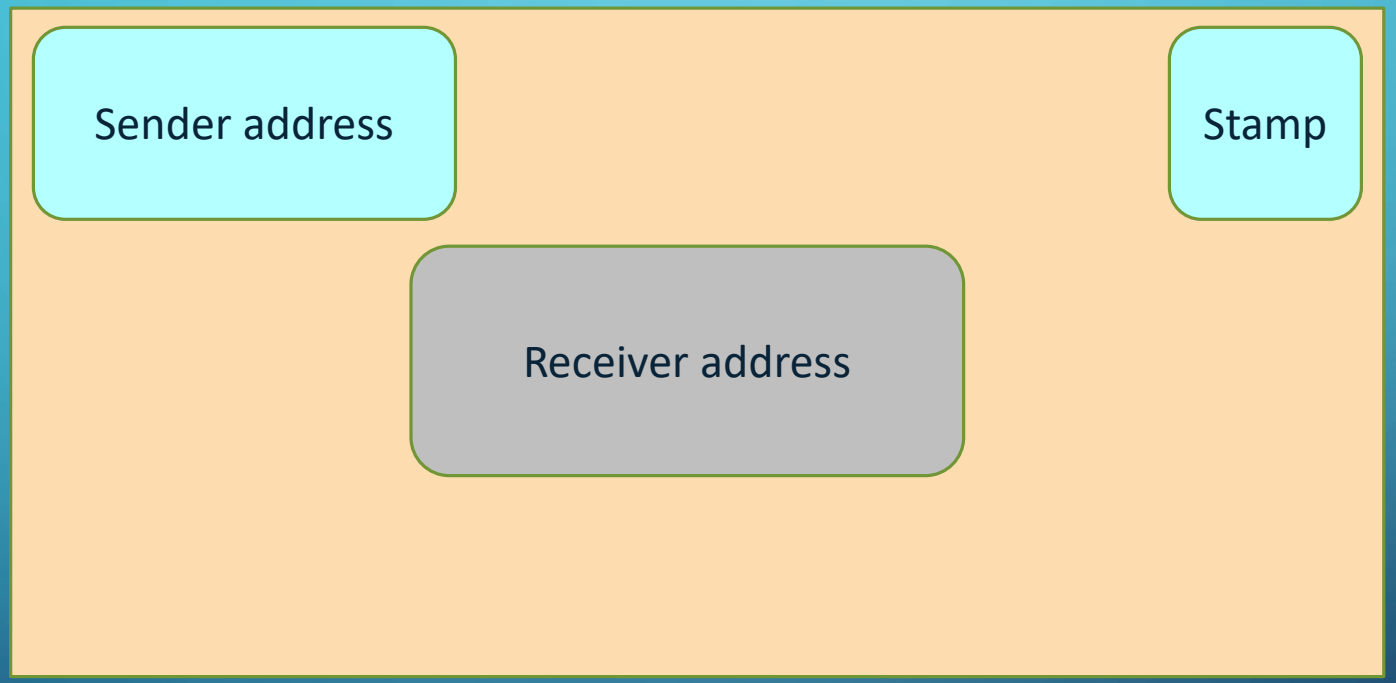
  Simply $2^8 = 256$

- If we have 32 bit system then

  $2^{32} = 4.3$ billion

IP ADDRESS

- Now forget about Bit, network, IP address.
- How we send letter?



IP ADDRESS

- Every device connected to the internet has its own IP address.
  IP address as a regular address
- But we represent IP address this way.

110 . 165 . 222 . 70

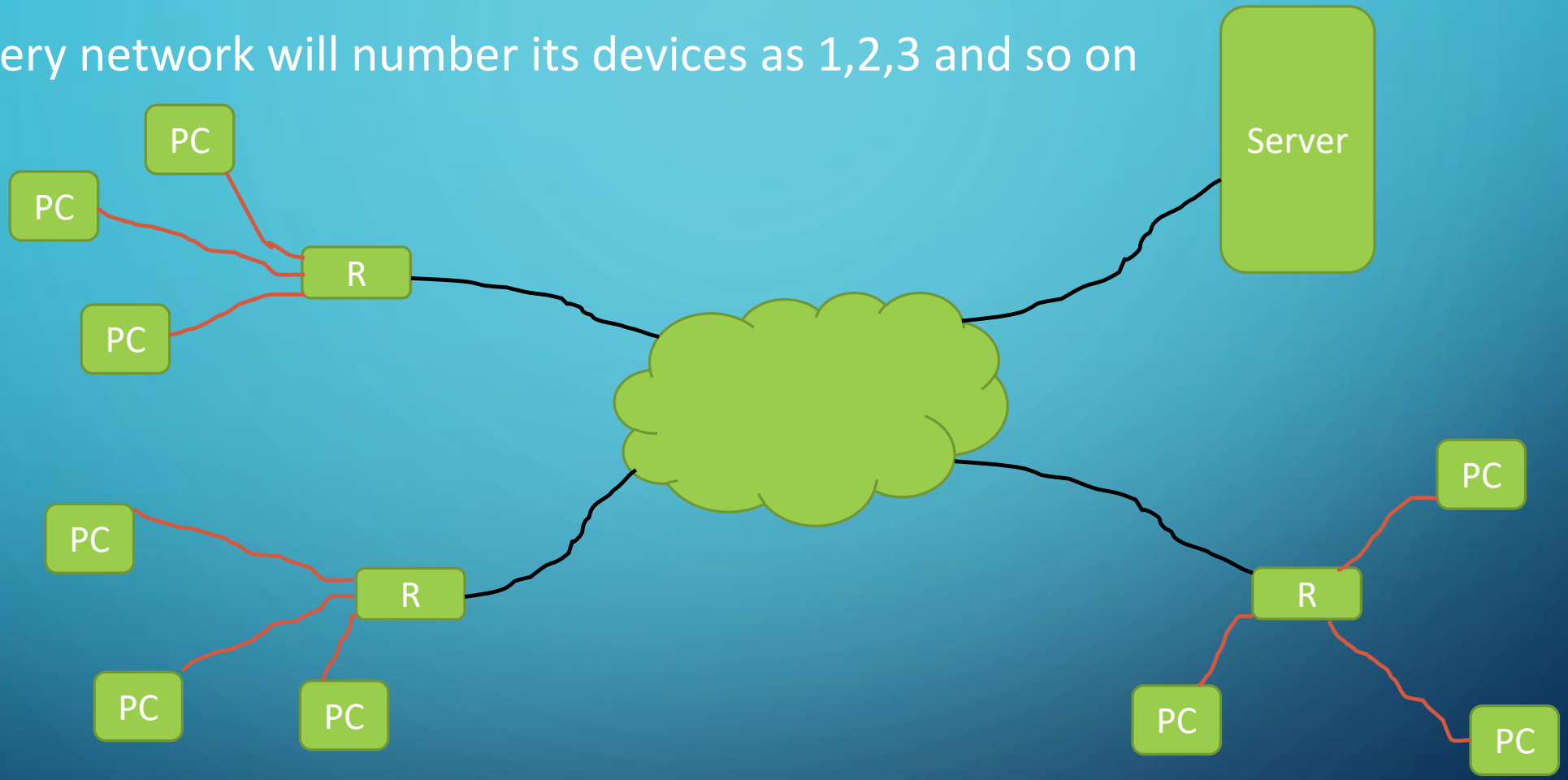
01101110 10100101 11011110 01000110

Each part of the IP address is called octet.

So every single IP address is 32-bit

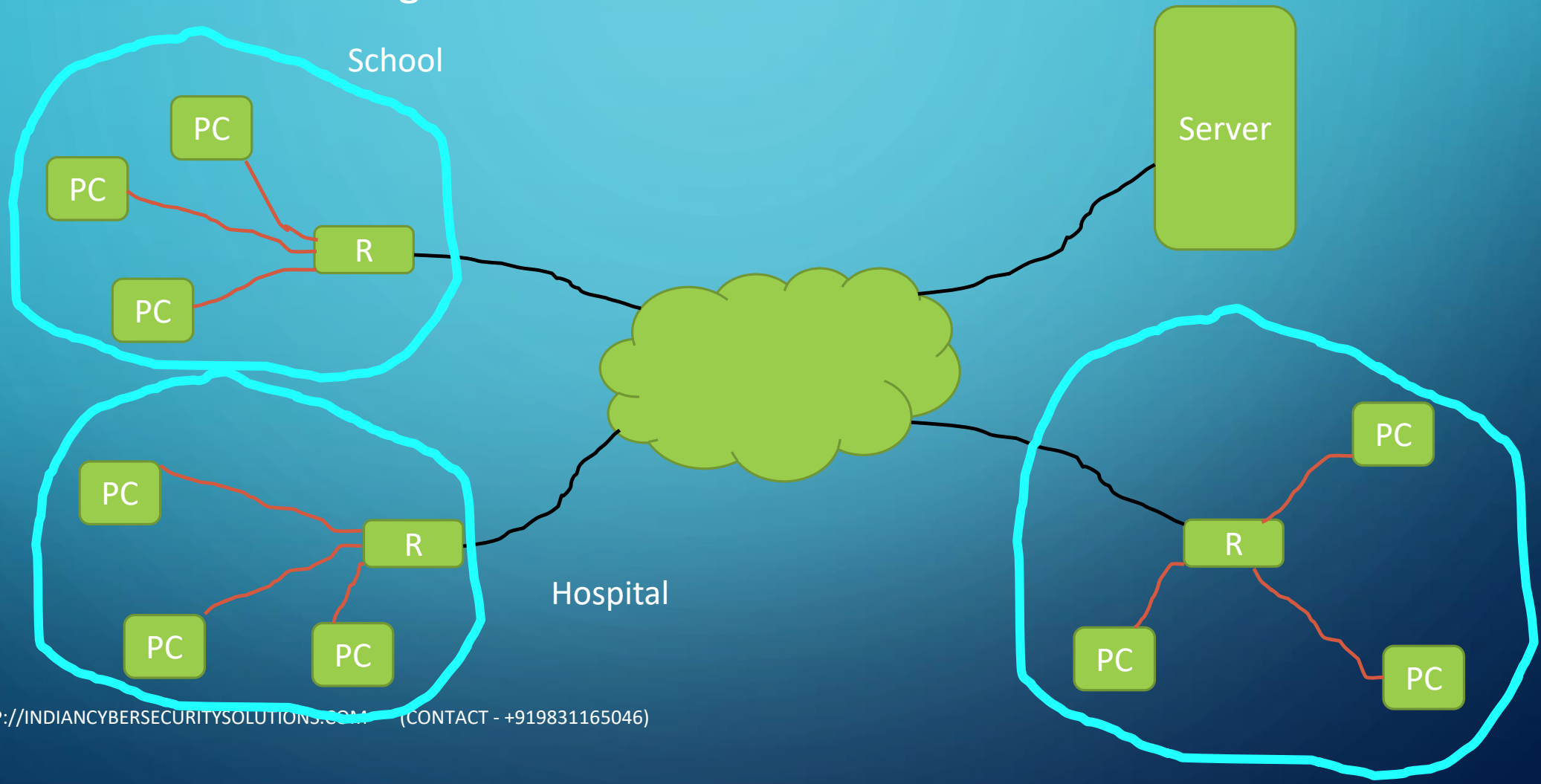
IP ADDRESS

- Every network will number its devices as 1,2,3 and so on



IP ADDRESS

- Internet is not one big network. Internet is a network of networks.



IP ADDRESS

- Here comes “Network ID” and the “Host ID”
  So we need these two information to send or receive any data.
- Now we have only 32-bits to use for both Network and Host ID.
- 110 . 165 . 222 . 70

  01101110 10100101 11011110 01000110
- Now we have

  2^{16} =65,530 for network 2^{16} =65,530 for Host

IP ADDRESS

- Now what we have only 500/600 hosts in a network?
- Then 65,000 will be wasted.

110	.	165	.	222	.	70
01101110		10100101		11011110		01000110

- Now we have

2^{24} for network

2^{8} for Host

IP ADDRESS

- So now, we need a way to dynamically change the size or the size of networks that connects to the internet.
- So this is not the way to work with IP address.
- Now we need a solution.

IP ADDRESS

- Welcome to subnetting.

- Subnet mask: 11111111 11111111 11110000 00000000

IP ADDRESS

	110	. 165	. 222	. 70
IP address :	01101110	10100101	11011110	01000110
Subnet mask:	11111111	11111111	11110000	00000000
	11111111	11111111	11111111	00000000

- If we see ‘1’ in subnet mask means that portion is for the “Network” and the ‘0’s for the “Host”
- Here first 20-bits are designated as Network address.
  And last 12-bit for host

IP ADDRESS

	110	. 165	. 222	. 70
IP address :	01101110	10100101	11011110	01000110
Subnet mask:	11111111	11111111	11110000	00000000
NW IP address	01101110	10100101	1101xxxx	xxxxxxxx
Host IPaddress	xxxxxxxx	xxxxxxxx	xxxx1110	01000110

IP ADDRESS

- Types of IPv4 address according to the decimal value of the first octet.

First Octet	Class
1-126	A
128-191	B
192-223	C
224-239	D
240-255	E

- 127 is reserved as loopback address. Class A,B and C are for unicast address, Class E for Research.

IP ADDRESS

- CIDR notation : -

  Subnet mask can be represented using “/” just after the ip address like,

  110.165.222.70/20

- This means there are 20 bits for network and other 12 bits for host out of 32.

IP ADDRESS

- Subnetting of class C network : -

  Let, 192.168.1.0 is subnetted with a subnet mask 255.255.255.192 so the subnet mask is /26. It means here are 26 NW bits and 6 host bits.

- Maximum number of subnets : -

  $= 2^{(\text{number of used NW bits} - \text{number of classful of NW bits})}$

  $= 2^{(26-24)}$

  $= 2^2$

  $=4$

IP ADDRESS

- Maximum Hosts per subnet : -

  $= 2^{(\text{number of host bits})} - 2$

  $= 2^6 - 2$

  $= 64 - 2$

  $= 62$

IP ADDRESS

- Subnet Block Size : -

  = 256 – 192

  = 64

- How 192 came here!

  This is the last non 0 value of subnet mask and it also called as interesting octet.

IP ADDRESS

- So the subnets are : -

  192.168.1.0

  192.168.1.64 (0+64)

  192.168.1.128 (0+64+64)

  192.168.1.192 (0+64+64+64)

- Finally the subnets are : -

  192.168.1.0 - 192.168.1.63

  192.168.1.64 - 192.168.1.127

  192.168.1.128 - 192.168.1.191

  192.168.1.192 - 192.168.1.255

[First number of any subnet is subnet number and the last one is the Broadcast number. IP addresses in between these two of each subnet are used as valid Host IP address.

IP ADDRESS

- Subnet Mask Chart : -

Bit Split	Subnet Mask	Block Size	Max Useable Subnets	# C IP's/Subnet	# B IP's/Subnet	# A IP's/Subnet
2/6	192	64	2	62	16382	4,194,302
3/5	224	32	6	30	8190	2,097,152
4/4	240	16	14	14	4094	1,048,576
5/3	248	8	30	6	2046	524,286
6/2	252	4	62	2	1022	262,142
7/1	254	2	126	0	510	131,070
8/0	255	1	254	0	254	65,534

END OF DAY 5

NETWORKING (CCNA TRAINING)

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