

CS & IT ENGINEERING



Computer Network

IPv4 Addressing

Lecture No. - 01

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Recap of Previous Lecture



Topic

IPv4 Options

Topic

ICMP





Topics to be Covered



Topic

IPv4 Address



ABOUT ME



Hello, I'm **Abhishek**

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Topic : Internet Protocol



Two versions :

1. IPv4

- Variable size IPv4 packet header (due to options)
- Time-to-Live (TTL)
- Header Checksum

2. IPv6

- Fixed size (40 bytes) IPv6 packet main header
- Next Header field
- Hop limit (Time-to-Live)
- No any Checksum



Topic : IP Address



- Unique identifier
- Assigned to a device that uses Internet Protocol for communication
- Logical Address (IP Address)

- MAC Address (Physical Address)
[48-bit size, NIC Card Address]



Topic : IP Address

→ IP address having two sections :

1. Network Identifier (Net ID) : x - bits
2. Host Identifier (Host ID) : y - bits

→ Size of IP address field = (x + y) bits





Topic : Network Identifier

- Unique network identifier (x - bits)
[Range : 0 to $(2^x - 1)$]
- Assigned to each connected network
- Managed by IANA
[Internet Assigned Numbers Authority]
- Total number of networks (worldwide) can be : 2^x



Topic : Host Identifier



→ Unique host identifier (y - bits) per network
[Range : 0 to $(2^y - 1)$]

→ Assigned to each connected host in the network

Total no. of hosts per network =
 $[2^y - \text{No. of special IP Address}]$



Topic : IP Address



Two IP versions :

1. IPv4

→ IPv4 Address (32 - bits) ✓

→ 4 bytes [$x + y = 32$]

2. IPv6

→ IPv6 Address (128 - bits)

→ 16 bytes [$x + y = 128$]



Topic : IPv4 Address



→ Size of IPv4 Address field = 32 - bits

→ Two representation of IPv4 address :

1. Binary Representation [32 - bits]

2. Dotted Decimal Representation

→ 4 Octet, separated by period (.)

→ P . Q . R . S

→ Range value of every octet is 0 to 255

[8-bit Range : 0 to $(2^8 - 1)$]

[0 to 255]

$0 \leq P, Q, R, S \leq 255$

IP: 20.210.20.172



Topic : Binary Code



→ Weighted Code

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0
128	64	32	16	8	4	2	1



Topic : Binary Code



$$\boxed{00000000 = 0}$$

$$0000000\underline{1} = 1$$

$$00000\underline{1}0 = 2$$

$$0000\underline{1}00 = 4$$

$$000\underline{1}000 = 8$$

$$00\underline{1}0000 = 16$$

$$0\underline{1}00000 = 32$$

$$0\underline{1}000000 = 64$$

$$\underline{1}0000000 = 128$$

$$\underline{1}0000000 = \underline{128}$$

$$\underline{1}\underline{1}000000 = \underline{192}$$

$$11\underline{1}00000 = \underline{224}$$

$$111\underline{1}0000 = \underline{240}$$

$$1111\underline{1}000 = \underline{248}$$

$$11111\underline{1}00 = \underline{252}$$

$$111111\underline{1}0 = \underline{254}$$

$$\boxed{1111111\underline{1} = 255}$$



Topic : Binary Code



$$00000001 = \underline{1}$$

$$00000011 = \underline{3}$$

$$00000111 = \underline{7}$$

$$00001111 = \underline{15}$$

$$00011111 = \underline{31}$$

$$00111111 = \underline{63}$$

$$01111111 = \underline{127}$$

$$11111111 = \underline{255}$$

#Q. Consider given IPv4 address in binary representation, identify correct decimal representation of it?

85 219 165 119
0 1 0 1 0 1 0 1 . 1 1 0 1 1 0 1 1 . 1 0 1 0 0 1 0 1 . 0 1 1 1 0 1 1 1

- ~~(A)~~ 85 . 219 . 164 . 119
~~(B)~~ 85 . 218 . 165 . 119
~~(C)~~ 85 . 219 . 165 . 118
✓ (D) 85 . 219 . 165 . 119

Ans: D

#Q. Consider given IPv4 address in decimal representation, identify correct binary representation of it?

200 . 100 . 150 . 50

200 → 11001000

100 → 01100100

150 → 10010110

50 → 00110010

~~(A)~~ 11001000 01100100 10010110 00110110

~~(B)~~ 11001000 01100100 10010100 00110010

✓ (C) 11001000 01100100 10010110 00110010

~~(D)~~ 11001000 01100110 10010110 00110010

Ans: C



Topic : IPv4 Address



Problem : How many bits are assigned for network id field?

→ IPv4 address are categorized into two type :

1. Classfull IPv4 Address

→ Static Assignment : NetID field size defined implicitly

2. Classless IPv4 Address ✓

→ Dynamic Assignment : Need to define NetID field size explicitly



Topic : Classless IPv4 Address

- Number of bits for network id field are assigned 'Dynamically'
- Classless IPv4 Address : P.Q.R.S / x
- Prefix / Slash notation [x] represent "number of network id bits"



Topic : Network Address

- Special IP address (32-bits) ✓
- It can not be an IP address of any host in the network
- Used to represent a network

NetID field = As Assigned

HostID field = All Zero Bits



x bits

y bits

#Q. Consider a class-less IPv4 network where network id bits assigned to this network are "1100 1100 1010", identify correct decimal representation of network address (special IPv4 address) which is used to represent this network?

(A) 204.144.0.0

✓ (B) 204.160.0.0

(C) 212.144.0.0

(D) 212.160.0.0

NetID \Rightarrow 1100 1100 1010
(12 bit)

HostID \Rightarrow
(32 - 12) = 20 bits

Network Address = 204.160.0.0/12

1100 1100 1010 0000 0000 0000 0000 0000
12 bit NetID 20 bit HostID

Ans: B



Topic : Modes of Transmission

→ Three modes of IP transmission :

1. Unicast
2. Broadcast
3. Multicast



Topic : Unicast Transmission

- One-to-one transmission
- One host is sender and one host is receiver

Source IP Address = [Host IP Address]

Destination IP Address = [Host IP Address]



Topic : Broadcast Transmission

→ One-to-All transmission

→ One host is sender and all host (of a network) are receiver

Source IP Address = [Host IP Address]

Destination IP Address = [Broadcast IP Address]



Topic : Broadcast Address

- Special IP address (32-bits) ✓
- Network Directed Broadcast Address
- It can not be an IP address of any host in the network
- Used to broadcast a packet to all hosts belongs to a network

NetID field = As Assigned

HostID field = All One Bits

Network Id	Host Id [1 1 1 1 1 1 1]
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x bits

y bits



#Q. Consider a class-less IPv4 network where network id bits assigned to this network are "1100 1100 1010", identify correct decimal representation of broadcast address (special IPv4 address) which is used to broadcast a packet in this network?

- (A) 204.160.0.0
- (B) 204.160.255.255
- (C) 204.175.0.0
- ☒ (D) 204.175.255.255

Ans: 1

NetID \Rightarrow 1100 1100 1010 | HostID \Rightarrow
(12 bits) (32-12)=20 bits

Broadcast Address = 204.175.255.255/12

11001100 1010 | ||||| ||||| |||||

(12 bit Net ID) 20 bit Host ID

#Q. Consider a class-less IPv4 network, the network address (special IPv4 address) of this network is "145 . 75 . 80 . 0", which is/are can be a broadcast address (special IPv4 address) of this network ?

- ~~(A)~~ 145 . 75 . 80 . 0
 ✓ (B) 145 . 75 . 80 . 255
~~(C)~~ 145 . 75 . 95 . 0
 ✓ (D) 145 . 75 . 95 . 255

Network Address = 145.75.80.0

145.75.01010000.00000000

min^m 20 bit
Net ID

max^m 12 bit host ID

Broadcast Add.

① 12 bit Host ID \Rightarrow 145.75.95.255

145.75.01011111.11111111

Ans: B & D

$145.75.01010000.00000000$
24 bit NetID 8 bit HostID

Broadcast Add.

(2) 8 bit HostID $\Rightarrow 145.75.80.255$

$145.75.01010000.11111111$

Hw.

(3) 11 bit HostID

10

9

7

6

5

4

3

2

2-bit HostID

#Q. Consider a class-less IPv4 network, the broadcast address (special IPv4 address) of this network is “175 . 175 . 175 . 255”, which is/are can be a network address (special IPv4 address) of this network ?

H. W.

- (A) 175 . 160 . 0 . 0
- (B) 175 . 175 . 0 . 0
- (C) 175 . 175 . 160 . 0
- (D) 175 . 175 . 175 . 0



2 mins Summary



Topic

Network Address

Topic

Broadcast Address

Topic

~~Network Mask~~



THANK - YOU