Computer Network

Lecture-30

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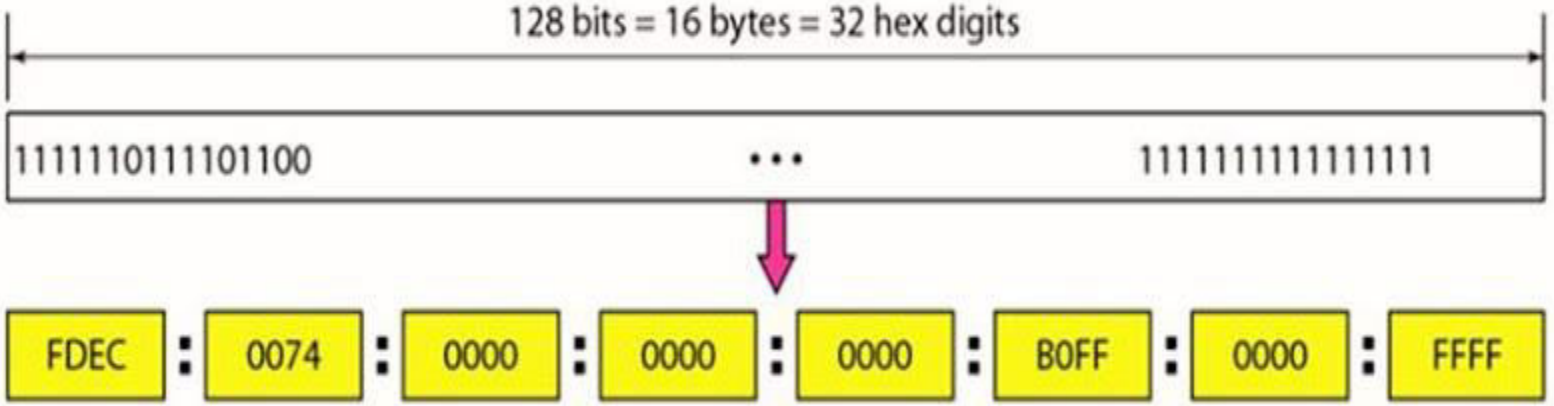
Logical Addressing

IPv6 ADDRESSES

An IPv6 address consists of 16 bytes (octets) i.e. it is 128 bits long.

Hexadecimal Colon Notation

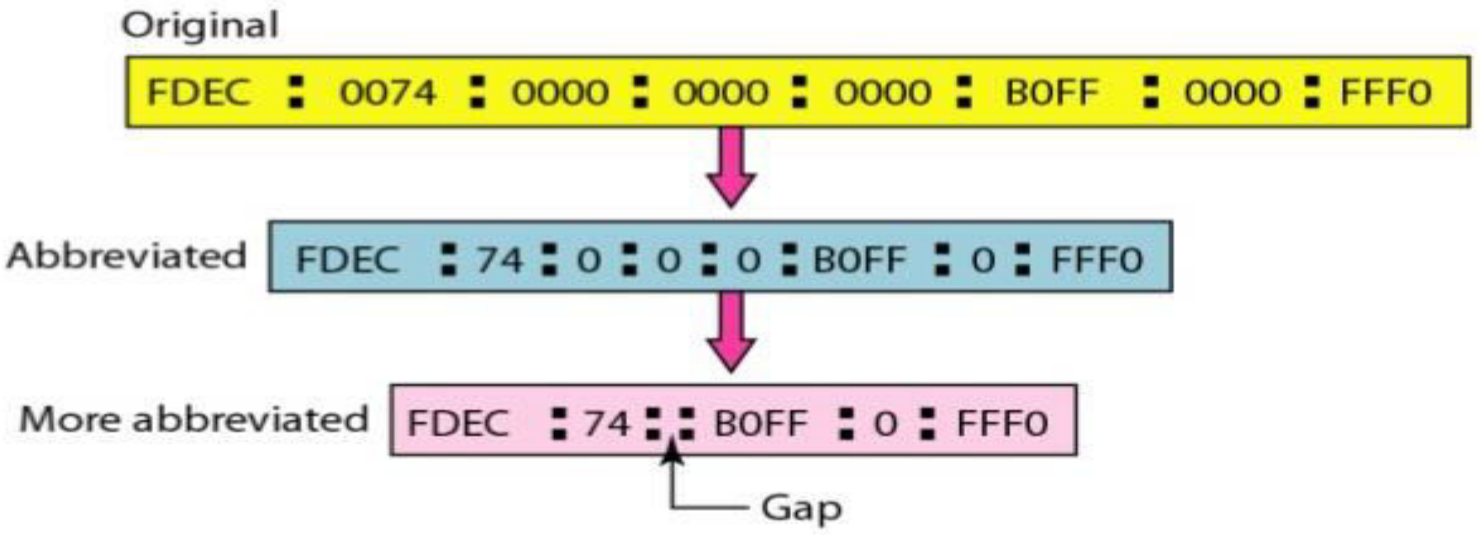
In this notation, 128 bits is divided into eight sections, each 2 bytes in length. Two bytes in hexadecimal notation requires four hexadecimal digits. Therefore, the address consists of 32 hexadecimal digits, with every four digits separated by a colon, as shown in figure:-



Logical Addressing

Abbreviation

- The leading zeros of a section can be omitted.
- If there are consecutive sections consisting of zeros only. We can remove the zeros altogether and replace them with a double colon. Note that this type of abbreviation is allowed only once per address.



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Example

Expand the address 0:15::1:12:1213 to its original.

Address Space

- IPv6 has a much larger address space; 2^{128} addresses are available. The designers of IPv6 divided the address into several categories. A few leftmost bits, called the **type prefix**, in each address define its category.
- Following table shows the prefix for each type of address. The third column shows the fraction of each type of address relative to the whole address space.

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Type Prefix	*Type*	*Fraction*
00000000	Reserved	1/256
00000001	Unassigned	1/256
0000001	ISO network addresses	1/128
0000010	IPX (Novell) network addresses	1/128
0000011	Unassigned	1/128
00001	Unassigned	1/32
0001	Reserved	*1/16*
001	Reserved	1/8
010	Provider-based unicast addresses	*1/8*

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Type Prefix	*Type*	*Fraction*
011	Unassigned	1/8
100	Geographic-based unicast addresses	1/8
101	Unassigned	1/8
110	Unassigned	1/8
1110	Unassigned	1116
11110	Unassigned	1132
1111 10	Unassigned	1/64
1111 110	Unassigned	1/128
11111110 a	Unassigned	1/512
1111 111010	Link local addresses	111024
1111 1110 11	Site local addresses	1/1024
11111111	Multicast addresses	1/256

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Exercise

1. Find the class of the following IP addresses.

a. 208.34.54.12

b. 238.34.2.1

c. 114.34.2.8

d. 129.14.6.8.

2. Find the class of the following IP addresses.

a. 11110111 11110011 10000111 11011101

b. 10101111 11000000 11110000 00011101

c. 11011111 10110000 00011111 01011101

d. 11101111 11110111 11000111 00011101

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3. Find the netid and the hostid of the following IP addresses.

a. 114.34.2.8

b. 132.56.8.6

c. 208.34.54.12

4. In a block of addresses, we know the IP address of one host is 25.34.12.56/16. What are the first address (network address) and the last address (limited broadcast address) in this block?

5. An organization is granted the block 16.0.0.0/8. The administrator wants to create 500 fixed-length subnets.

a. Find the subnet mask.

b. Find the number of addresses in each subnet.

c. Find the first and last addresses in subnet 1.

d. Find the first and last addresses in subnet 500

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6. Write the following masks in slash notation (/n).

a. 255.255.255.0

b. 255.0.0.0

c. 255.255.224.0

d. 255.255.240.0

7. Find the range of addresses in the following blocks.

a. 123.56.77.32/29

b. 200.17.21.128/27

c. 17.34.16.0/23

d. 180.34.64.64/30

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8. An ISP is granted a block of addresses starting with 150.80.0.0/16. The ISP wants to distribute these blocks to 2600 customers as follows.

a. The first group has 200 medium-size businesses; each needs 128 addresses.

b. The second group has 400 small businesses; each needs 16 addresses.

c. The third group has 2000 households; each needs 4 addresses.

Design the subblocks and give the slash notation for each subblock. Find out how many addresses are still available after these allocations.

9. Show the shortest form of the following addresses.

a. 2340: lABC:119A:A000:0000:0000:0000:0000

b. 0000:00AA:0000:0000:0000:0000: 119A:A231

c. 2340:0000:0000:0000:0000: 119A:A001:0000

d. 0000:0000:0000:2340:0000:0000:0000:0000

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10. Show the original (unabbreviated) form of the following addresses.
    a. 0::0
    b. 0:AA::0
    c. 0: 1234::3
    d. 123::1:2
11. What is the type of each of the following addresses?
    a. FE80::12
    b. FEC0: :24A2
    c. FF02::0
    d. 0::01
12. What is the type of each of the following addresses?
    a. 0::0
    b. 0: :FFFF:0:0
    c. 582F:1234::2222
    d. 4821::14:22
    e. 54EF::A234:2