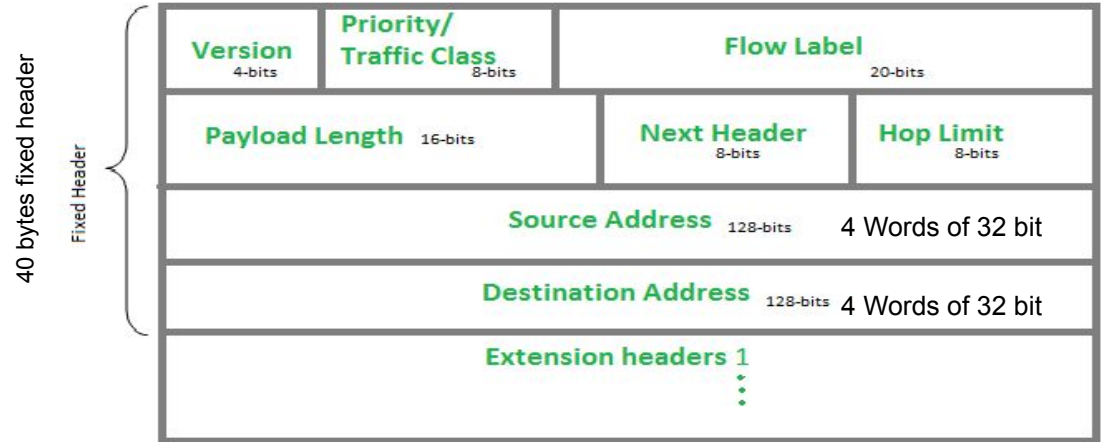# IPv6 Addressing Scheme

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Previous Session

- Fragment Offset and TTL - IPv4

- IPv6 Packet Structure

  - 40 byte Header, Optional and Unlimited Extensions Header

Image Source : Internet

Fields which are not included from IPv4: IHL, Identifier, Flag, Fragment offset, Header Checksum

2001 : 0db8 : 85a3 : 0000 : 0000 : 8a2e : 0370 : 7334

1   2   3   4   5   6   7   8

- Unicast
- Multicast
- Broadcast
- Anycast

IPv6 Addressing Scheme

2001 : 0db8 : 85a3 : 0000 : 0000 : 8a2e : 0370 : 7334

2001 : 0db8 : 85a3 : 0 : 0 : 8a2e : 0370 : 7334

2001 : 0db8 : 85a3 : : 8a2e : 0370 : 7334

IPv6 Address hexadecimal values are written in lowercase letters.

2001 : 0db8 : 85a3 : 0000 : 0001 : 8a2e : 0370 : 7334

2001 : 0db8 : 85a3 : 0: 1 : 8a2e : 0370 : 7334

0 : 0 : 0 : 0 : 0 : 0 : 0 : 1

:: 1

0 : 0 : 0 : 0 : 0 : 0 : 0 : 0

::

2001 : 0db8 : 0000 : 1 : 1 : 1 : 1 : 1

2001 : 0db8 : 0 : : 1

Compression is applied only for Zeros.
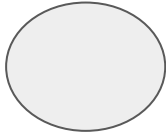
2001 : 0 : 0 : 0 : 8a2e : 0 : 0 : 1

2001 : : 8a2e : : 1

2001 : 0 : 0 : 0 : 8a2e : 0 : 0 : 1 ⟶ 2001 : : 8a2e : : 1

Only LSB Zeros will be compressed

2001 : 0 : 0 : 8a2e : 0 : 0 : 0 : 1

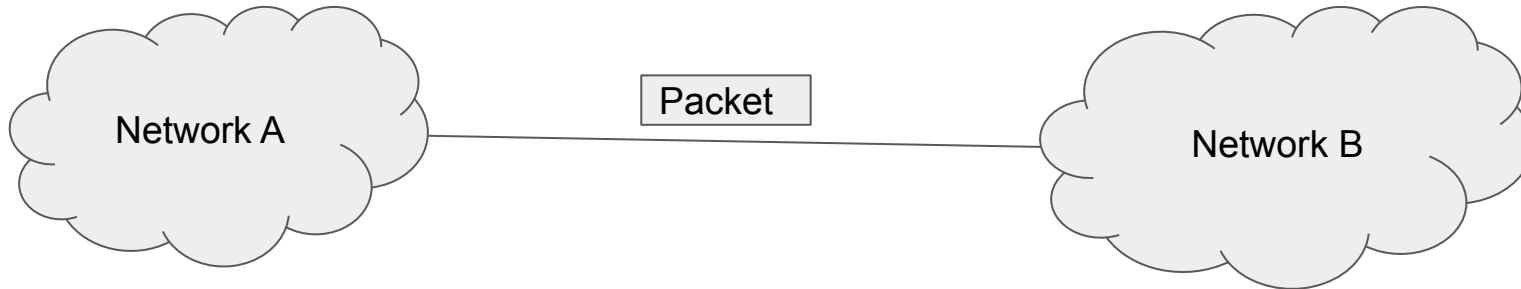2001 : : 8a2e : 0 : 0 : 1

Router ?

2001 : 0 : 0 : 0 : 8a2e : 0 : 0 : 1

What About Loopback Address in IPv6 ?

- 127.0.0.1 - IPv4

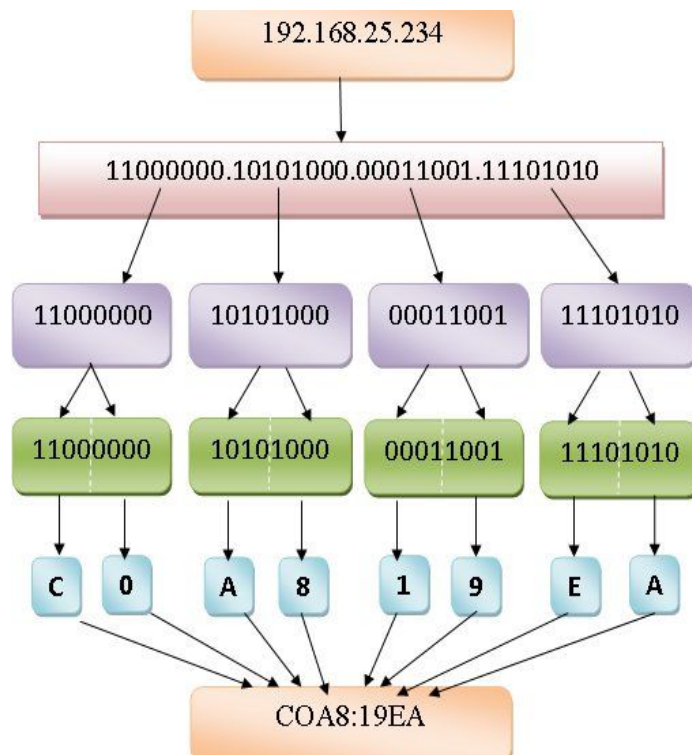- 0 : 0 : 0: 0 : 0 : 0 : 0 : 1 - IPv6

80 bits	16	32 bits
0000 --0000	FFFF	IPv4 address

Network A

Packet

Network B

IPv4 Addressing Scheme

IPv6 Addressing Scheme

192.168.25.234

11000000.10101000.00011001.11101010

| 11000000 | 10101000 | 00011001 | 11101010 |

| 11000000 | 10101000 | 00011001 | 11101010 |

C 0 A 8 1 9 E A

COA8:19EA

IPv6 Address   ::ffff:Coa8:19ea

80 bits	16	32 bits
0000 --------------------------------0000	FFFF	IPv4 address

Decimal	Hex	Binary
1	01	00000001
2	02	00000010
3	03	00000011
4	04	00000100
5	05	00000101
6	06	00000110
7	07	00000111
8	08	00001000
9	09	00001001
10	0A	00001010
11	0B	00001011
12	0C	00001100
13	0D	00001101
14	0E	00001110
15	0F	00001111

Image Source : researchgate.com and https://www.oreilly.com/library/view/ip-routing-on/9780133846751/app01.html

Network A

Network B

Packet
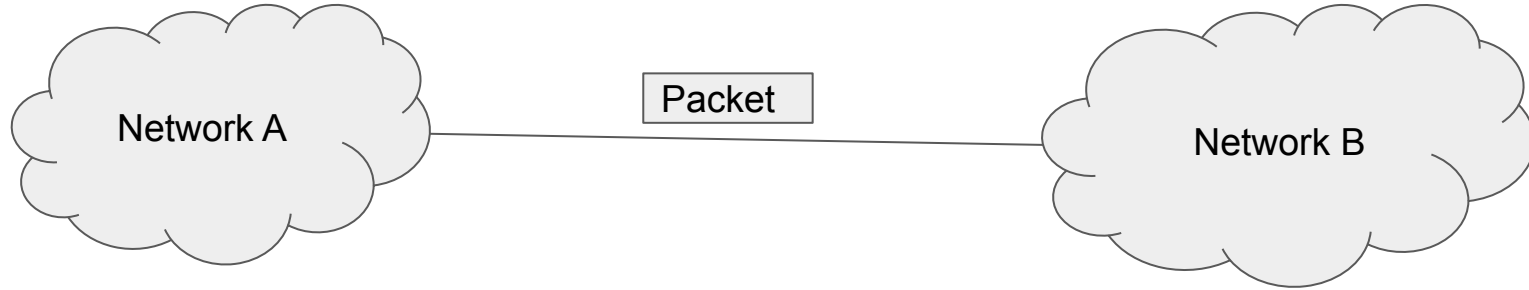
v6 Addressing Scheme

v4 Addressing Scheme

Is it possible to convert v6 to v4 address ?

Whether v6 will runout of IP Addresses ?

Possible IP Addresses : 2^{128} = 340,282,366,920,938,463,463,374,607,431,768,211,456

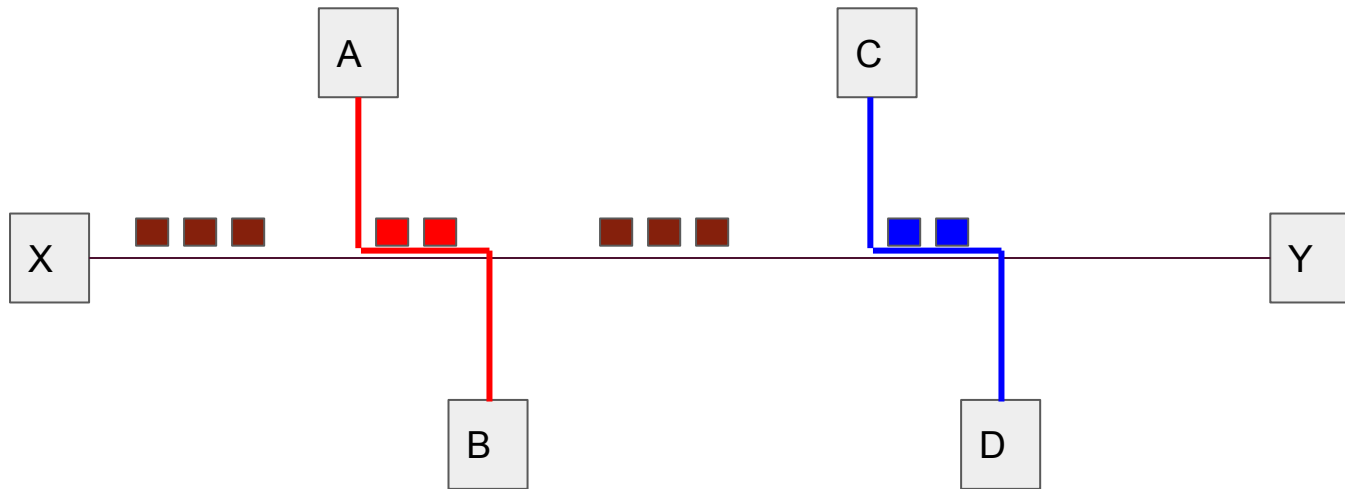# Whether v6 is used in real world ?

YES.

20 - 22% of the world has adopted to IPv6.

Whether v6 will be success in the real world ?

- Debating question

- Today's networking devices switches , routers, NAT, DHCP etc are mainly configured for IPv4.

- It is a clean slate approach.

Routing Algorithms

- Finding the optimal path between the source node to the destination node.

- Feature of routing algorithms

  - Correctness

    - Packet should not be directed in the opposite direction of the destination.

  - Simplicity

    - Should not take much time for finding the path.

    - Route discovery latency. Should be as less as possible.

  - Robustness

    - Topology Changes, host/route down, Link failure, Congestion, Adversaries

  - Fairness

    - It should not be biased.

A

C

X

Y

B

D

● Adaptive

● Non Adaptive