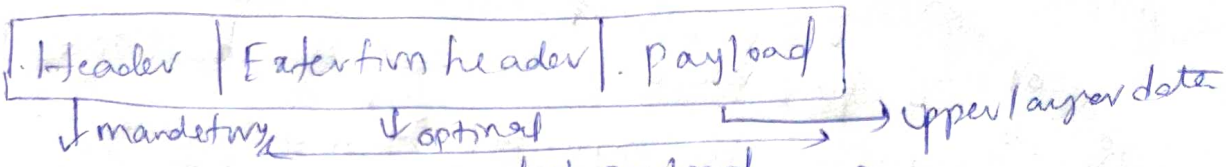
# IPv6

IPv6 packet

1) Version :- Version length is 4 bits value is 6 & Header.




2) Traffic class :- (Priority) (website)

We provide the priority, if traffic increased some packages are discarded.

→ highest priority packets are served first
→ lowest " " are discared
→ It is done by automatically
→ We controll the conjuntion (traffic) 0- Lowest priority, 1- highest priority
1) conjection (0-7) (conjuntion control traffic).
2) non-conjection priority are given (8-15)

If non-priority is specified then defaut it has '0'

priority of Conjection control

| priority | Meaning |
|---|---|
| 0 | No-specific traffic. (no prority is assigned) |
| 1 | Background data [ex delivery of news) |
| 2 | Un attended data traffic (email). |
| 3 | Reserved |
| 4 | Attended Bulk data traffic (FTP, http) (waiting for response) |
| 5 | Reserved. |
| 6 → | Interactive traffic. (User interaction) |
| | TELNET (needed user interaction) (protocol) |
| 7 → | control traffic ex OSPF, RIP, SNMP (open shortest path first) |
| | OSPF RIF, unique routing protocol |
| | Simple network management protocol (SNMP) |
| | regarding network issues (control) |
| | Issues – virtually solved and some are solved manually |

Non-Congestion priority

* In this the following thing takes place
  1. minimum delay expected
  2. Discarding the packets is not desirable
  3. Re-transmission is impossible in many cases
  4.

Ex Real time audio and video.

  8 — Data with great redundancy
  :
  15 — Least redundancy

Flow Label :- (Length is 20-bits)

→ A flow Label can be used to speed up the processing of a packet by a router, by reffering the flow label table

Payload Length :- (Length 16 bits)

This field is used to tell the router how much information a particular packet in its payload.

Next Header (8 bits)

This field is used to indicate either the the types of extension header (present in ppt)

Hop Limit (8-bits)

This field is used to stop packets to loop in network infinitely. The value of Hop Limit field is decremented by 1 as it passes a link. When the field reaches 0 the packet is discared

Source address (128 bit) :-

&

Destination

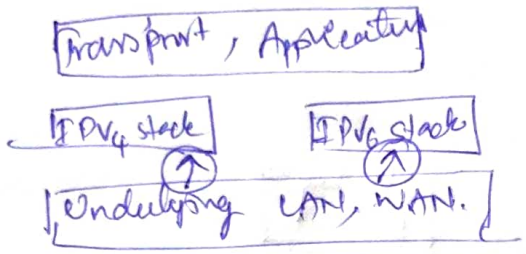
# Transiting from IPV4 to IPV6.

Some of the divices are connected in IPV6 and some are IPV4 to connect them we have three types of techniques

1) Dual stack 2) Tunneling 3) Header Translation

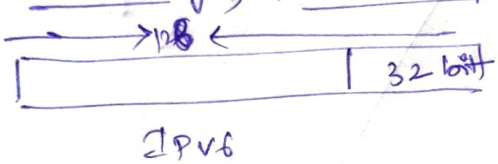
## ① Dual Stack

* It has two stack, here no need to manually translate because it has two stack defualtly it will be done



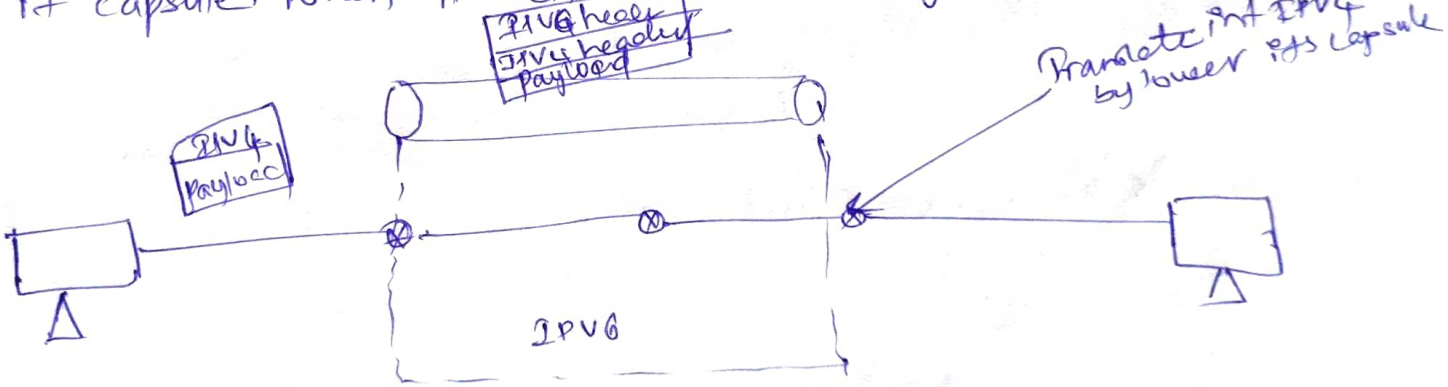

How to identify which stack is used?
Based on first feild version.
* version feild in network

## ② Tunneling → IPV6-128, IPV4=32




If a capsule is added to 32 bit it will be converted into IPV6

* Tunneling can be done by encapsulating IPV6 packet in an IPV4 packet, when it enters the region (IPV6) and leaves it capsule, when it enters into the region IPV4



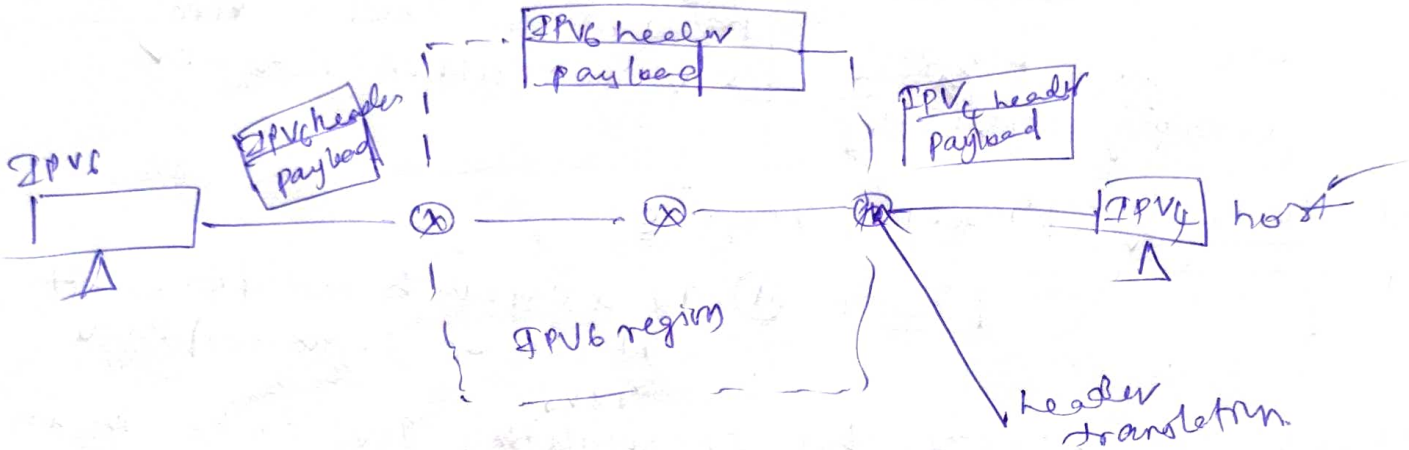

## Header Translation:-

It is used to convert, header IPV6 to IPV4

Header Translation procedure :- It has some rules

1) IPV6 mapped address is changed to an IPV4 address by extracting the rightmost 32 bits
2) The value of the IPV6 priority feild is discarded
3) The type of service feild in IPV4 is set '0'
4) The checksum in IPV4 is calculated and inserted in the correspondig feild

5) The IPV6 flow label field is ignored
6) Compatable extension header are converted to options and inserted in the IPV4 header. Some may have to be dropped
7) The length of IPV4 header is calculated and inserted into the corresponding field
8) The total length of the IPV4 packet is calculated and inserted in the corresponding field
9)



Types of IPV6 addresses

1) Unicast Address

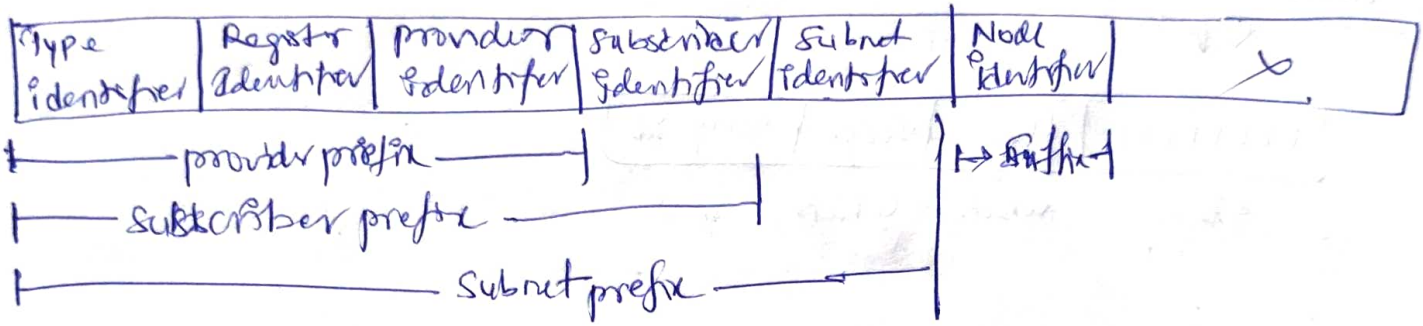
(1) Unicast address.
* Single system sharing.

Unicast addresses are defined as two types

i) (Geographically based) (2) provided Based (Now)
(future implemented)

provided Based

Similar to IPV4 this IPv6 has prifix and suffix
* Internet Service provided




Type identifier :- (3 bit)
It is a 3 bit field defines the address as a provider based address

Registry Identified :- (5 bit)
It indicates the agency that has registred the addresses.

Three types are agency in world

| Agency | code |
|---|---|
| INTER NIC | 11000 |
| RIPNIC | 01000 |
| APNIC | 10100 |

* InterNIC is North America agency
* RIP NIC European agency
* AP is Asian Pacific countries.

provider identifier (16-bit field)
It defines the provider for Internet access (ISP)

Subscriber (24-bit field).
* we can subscribe the Internet by an organization.

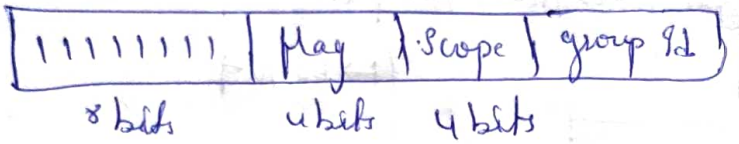
Subnet Identifier (32-bit)
* Each subscriber can have many different subnetworks
* each subnet can have an identifier.

Node identifier (48-bits)
Also it defines the identity of the node connected to a subnet

## Multicast Addresses :-

* Multicast address all start with "FF"
* Multicasting :- group of node has different network
  we send msg to different nodes

## Multicasting




flag :- two types

| | |
|---|---|
| Permanent | 0000 |
| transient | 0001 |

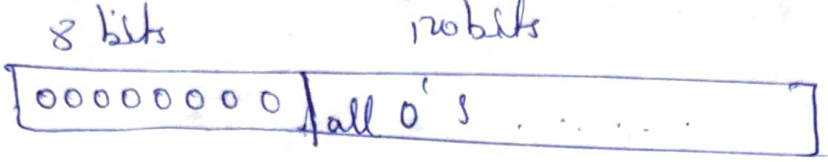
Scope :-

| | |
|---|---|
| Reserved | 0000 |
| Node local | 0001 |
| link local | 0010 |
| site local | 0101 |
| Organizational | 1000 |
| Global | 1110 |
| Reserved | 1111 |

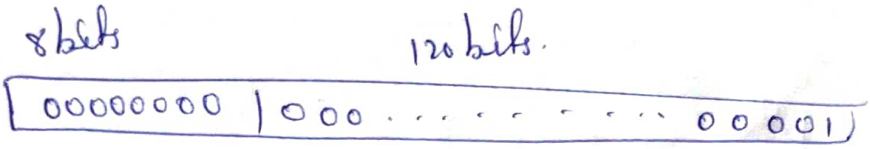
* 3) Reserved Address :- These addres are start with 8 zero's
  - sub categorized into 4 parts
  i) Un specified address  ii) loopback address  iii) Compatable address
  iv) Mapped address

1) Un specified addres :- It is used when host doesn't known its own address and send an enquiry to find it's address

Format

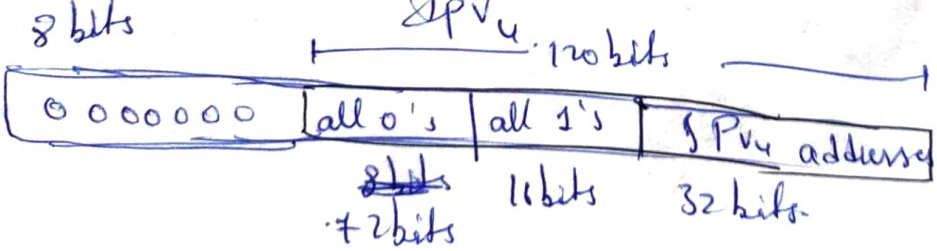



2) loop back address :- It is used by a host to test itself without going into the internet




3) Compatable address :- It is used during the transition from $IPv_4$ to $IPv_6$. that is when a Computer using $IPv_6$ wants to send a msg to another Computer using $IPv_6$ but the msg need to pass through a part of the network that still operates in $IPv_4$.

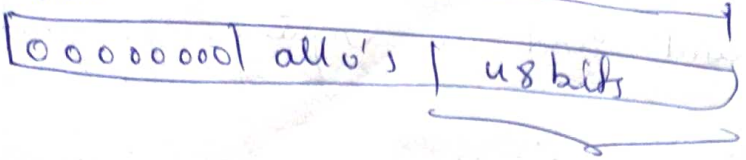
4) Mapped address :- Source is the $IPv_6$ and receiver host is




5] Local address :- local addresses providing addressing for private addresses.

There two types of addresses are defined

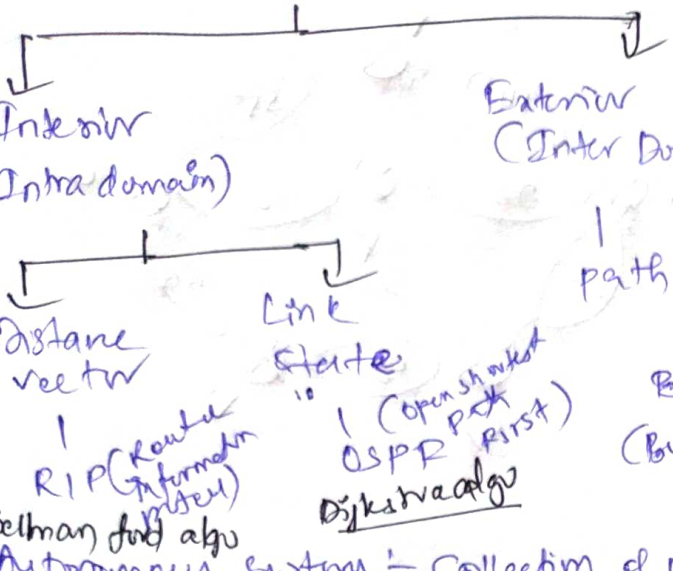
* 8 bits — 120 bits.




Node addresses.

These addresses are used in an isolated site with several subnets

# Unicast routing protocols




Autonomous system :- Collection of routers of all routers under

protocols working within the autonomous system is called Intra Domain

protocols working on between Autonomous System is called inter Domain.

## Distance Vector Routing

(*) Each router periodically shares its knowledge about the entire internet with its neighbours

(**) The three key feature for this routing are

(1) Sharing knowledge about the entire autonomous system (AS)

(*) each router shares its knowledge about the entire AS with its neighbours whether it is important or not

(2) Sharing only with only neighbours

(**) each router sends its knowledge only to its neighbours through all its interfaces.

(3) Sharing at regular intervals.

* each router sends its knowledge to its neighbours at fixed intervals.

for example

* for every 30 seconds.

* Routing Table

* every router ~~table~~ ~~keeps~~ keeps a routing table that has one entry for each destination network of which the router is aware; the entry consists of the destination network address, the hop count to reach the destination, the next router to which the packet should be delived to reach its final destination

(*) here the hop count is the no. of networks.

(*) The routing table may contain other information like the subnet mask etc...

PTO

| Destination network | Hop count | Next node |
|---|---|---|
| 163.5.0.0 | 7 | 172.6.23.4 |
| 197.5.13.0 | 5 | 176.32.17.5 |
| 183.45.0.0 | 4 | 200.5.1.6. |

## How to Update Routing Table

* The routing table is updated based on receipt of RIP response message

Step1

Add 1 hop to hop count for each advertised destination

Step2

Repeat the following steps for each advertised destination

If (Destination not in the routing table)

Add the advertised information to that table

Else

if (Next-hop field is the same)

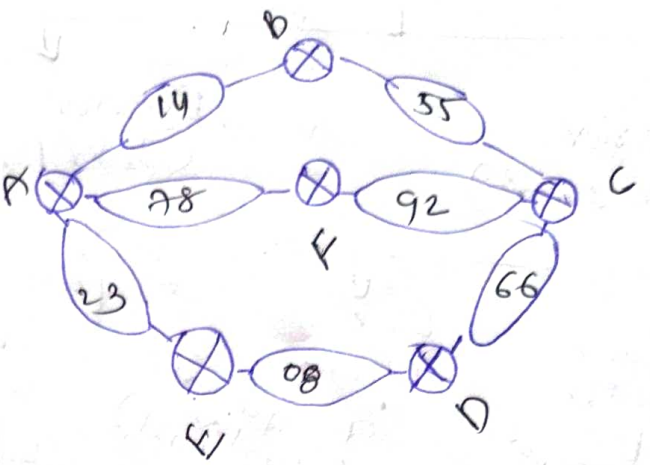
Replace entry in the table with advertised one

else

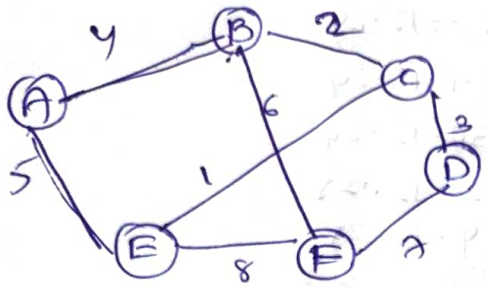
if (Advertised hop count smaller than one in the table)

Replace entry in the routing table

Step3 return.



## Link state Algo




| A | |
|---|---|
| Seq no | |
| Age | |
| B | 4 |
| E | 5 |

| F | |
|---|---|
| Seq no | |
| Age | |
| B | 6 |
| D | 7 |
| E | 8 |

| | B | C | D | E | F |
|---|---|---|---|---|---|
| A | (4) | ∞ | ∞ | 5 | ∞ |
| AB | (4) | 6 | ∞ | (5) | 10 |
| ABE | (4) | (6) | ∞ | (5) | 10 |
| ABEC | (4) | (6) | 9 | (5) | 10 |
| ABECD | (4) | (6) | (9) | (5) | (10) |

## Path Vector Routing protocol

It is Implement in b/w the autonomous system.