

* What is IPV6 (1)

Internet protocol version 6 (IPV6) is the most recent version of the Internet Protocol (IP), the communications protocol that provides an identification and location system for computers on networks and routes traffic across the internet.

* limitation of IPV4 (1+1+1+1)

The network layer protocol in the TCP/IP protocol suite is currently IPV4 (Internetworking Protocol, version 4). IPV4 provides the host-to-host communication between systems in the Internet.

IPV4 has some deficiencies that make it unsuitable for the fast growing Internet. They are listed below:-

- Despite all short term solutions, such as subnetting, classless addressing and NAT, address depletion is still a long-term problem in the Internet.
- The Internet must accommodate real-time audio & video transmission. This type of transmission requires minimum delay strategies & reservation of resources not provided in the IPV4 design.

The Internet must accommodate encryption & authentication of data for some applications. No encryption or authentication is provided by IPv4.

* Advantages of IPv6 (1+1+1)

(Q) How can IPv6 reduce problem of IPv4? (1+1+1)

(1) Larger address space
The address space of IPv6 contains 2^{128} addresses. This address space is very large compared to the IPv4 address.

(2) Better header format

IPv6 uses a new header format in which options are separated from the base header and inserted, when needed. This reduces processing delay due to fixed header size and there is no header checksum.

(3) Support for more security

The encryption and authentication options in IPv6 provide confidentiality and integrity of the packet.

(4) Possibility of extension

IPv6 has been designed in such a way that there is possibility of extension of protocol if required.

(Q) Explain different transition strategies? (1+1+1+1+1)

(Q) Methods to Interoperate IPv6 & IPv4 (1+1)

Because (of the) huge number of systems on the Internet, the transition from IPv4 to IPv6 cannot happen suddenly. IPv4 capable systems are not capable of handling IPv6 datagrams. It takes a considerable amount of time before every system in the Internet can move from IPv4 to IPv6.

The transition must be smooth to prevent any problems between IPv4 to IPv6 systems. Several strategies have been devised to help the transition.

Dual stack

Tunneling

Header
translation

Fig:- Transition methods from IPv4 to IPv6.

(1) Dual stack operation (15)

Here a node has both IPv4 and IPv6 implementation, referred to as IPv6/IPv4 node which has ability to send and receive both IPv4 and IPv6 datagram.

When inter-operating with an IPv4 node, an IPv6/IPv4 node can cause IPv4 datagrams and when inter-operating with an IPv6 node, it can speak IPv6.

In other words, a station must run IPv4 and IPv6 simultaneously until all the Internet uses IPv6.

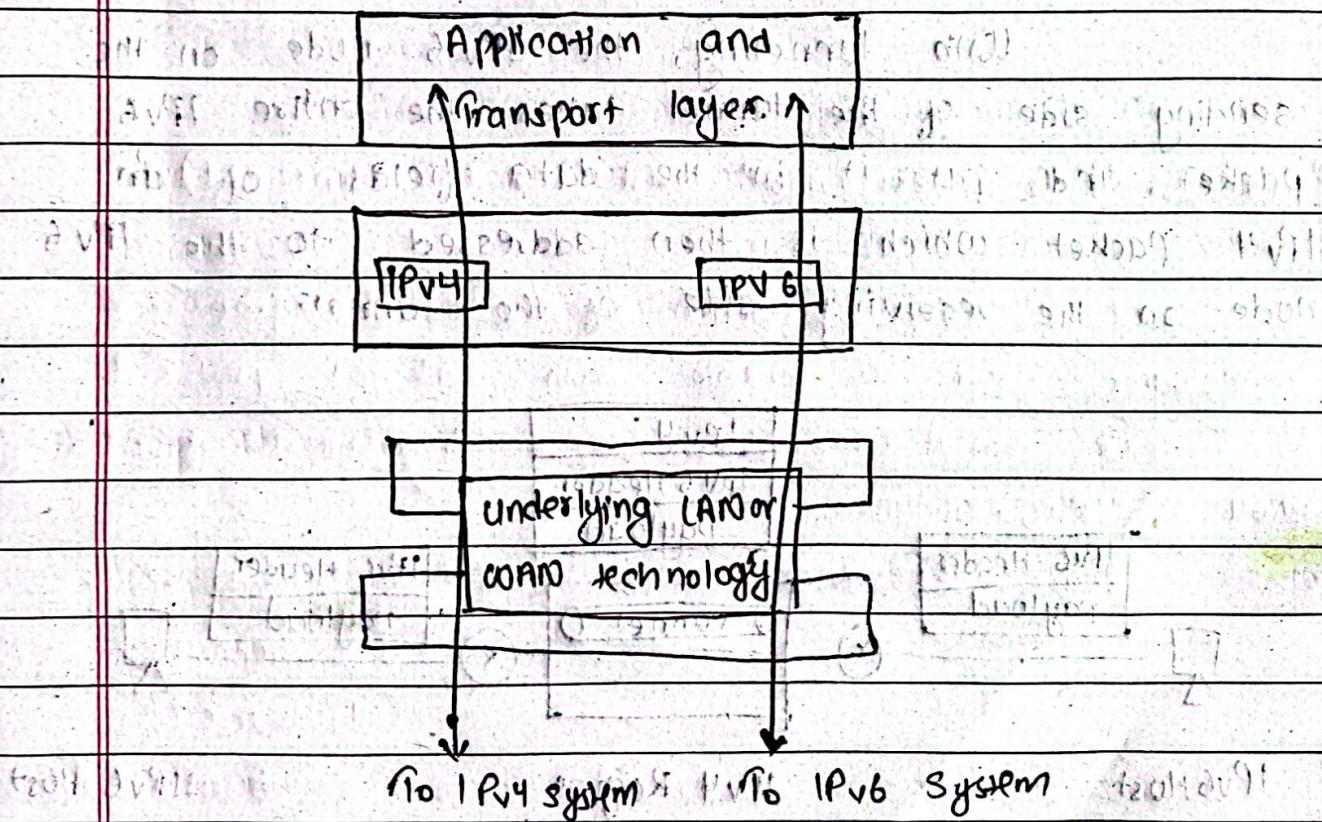


Fig: Dual stack

To determine which version to use when sending a packet to a destination, the source host queries the DNS. If the DNS returns an IPv4 address, the source host sends an IPv6 packet.

Q) Tunneling (1)

Tunneling provides a way to use an existing IPv4 routing infrastructure to carry IPv6 traffic.

Tunneling is a strategy used when two computers using IPv6 want to communicate with each other and the packet must pass through a region that uses IPv4.

With tunneling, the IPv6 node on the sending side of the tunnel takes the entire IPv6 packet and put it in the data field of an IPv4 packet which is then addressed to the IPv6 node on the receiving side of the tunnel.

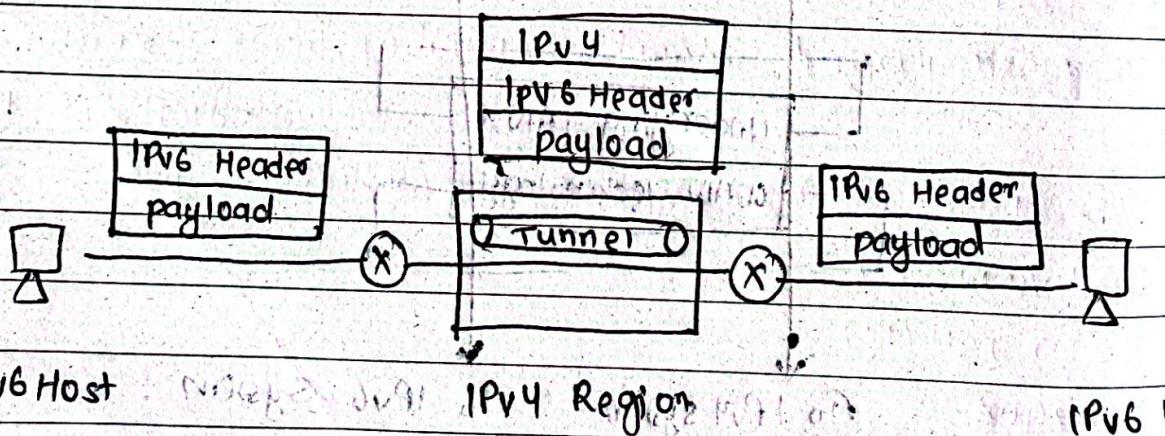


Fig: Tunneling

3) Header Translation (It)

Header Translation is necessary when the majority of the Internet has moved to IPv6 but some still use IPv4. The sender wants to use IPv6, but the receiver does not understand IPv6. Tunneling does not work in this situation because the packet must be in IPv4 format to be understood by the receiver. In this case, the header format must be totally changed through header translation. The header of the IPv6 packet is converted to an IPv4 header. Header translation uses the mapped address to translate an IPv6 address to an IPv4 address.

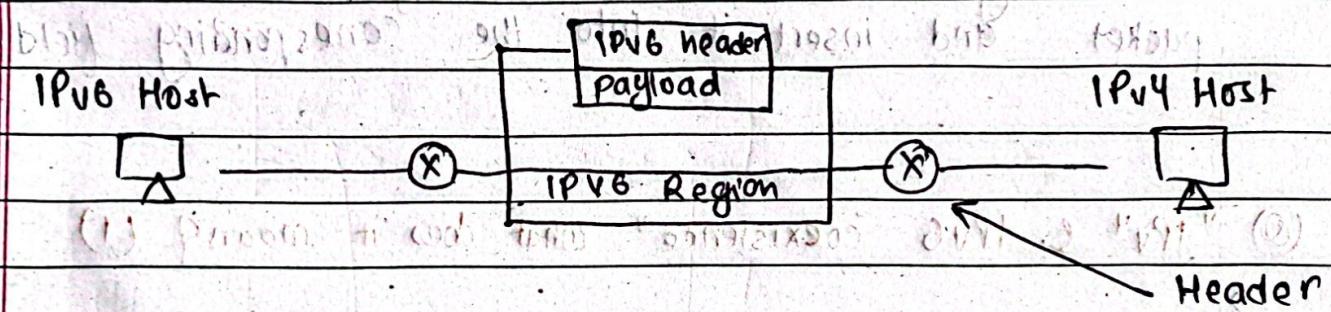


Fig: Header Translation

Header translation procedure:

- Change the IPv6 mapped address to an IPv4 address by extracting the rightmost 32 bits.
- Discard the value of IPv6 priority field.
- Set the type of service field in IPv4 to be zero.