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UNDERSTANDING IPV4 & IPV6 DIFFERENCES & TRANSITIONS MECHANISMS

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Overview: In this paper the understanding on the critical aspects of Internet Protocol Version (4) & Internet Protocol Version (6) is prescribed with differences to both and why we are making transitions in distinctively every sector to IPv6 Version of the Internet Protocol. This paper also highlights critical differences pointing out to various high or low level basic version deployment and development of Internet Protocol version (4) & (6). It also explains IPv6 in cloud computing environment with an increase of cloud computing domain to robust development of IPv6.

IPv4 (Internet Protocol Version 4): It is the forth version in the development of the Internet Protocol (IP) and is also the first version of the protocol that is most widely deployed. However it has another successor protocol version (IPv6), IPv4 is a connectionless protocol for use on packet switched networks it operates on the aspects of data integrity to (TCP/IP) upper layers, however the addressing uses 32-bit addresses that limits it to the address space of (232 addresses). It uses CIDR & NAT for address changes & network address transitions.

Uses and Applications:

1) It is used in Private networks
2) Virtual Private Networks (VPN)
3) Link Local Addressing
4) Loop back addressing
5) Address Resolution & Address Space Exhaustion.

IPv6 (Internet Protocol Version 6): Internet Protocol Version (IPv6) offers the potential of achieving the scalability, reachability and end to end internetworking, quality of service (QOS) and commercial robustness for data as well as (VOIP). Such capabilities compete for transition proactively in planning of transitions to IPv6.

Uses and Applications : The improved versions of the Internet Protocol suite, TCP/IP and which coexist with IPv4 for eventually providing better internetworking capabilities than the previous IPv4.

The differences of change in IPv6:

1) More efficient and robust mobility mechanisms.
2) End to end security with built-in strong IP- Layer encryption and authentication
3) Streamlined header format & flow identification
4) Enhanced support for Multicast & QOS

IPv6 Benefits:

1) Scalability
2) Security
3) Real time applications
4) Plug and Play
5) Mobility
6) Addressing & Routing

Basic IPv6 Terminologies:

- ➔ Address: An IP Layer identifier for an interface or set of interfaces
- ➔ Host: Any mode not a router
- ➔ Interface: A mode's attachment to a Link
- ➔ Link: A communication facility or medium over the nodes can communicate to link layer
- ➔ Link Layer Identifier: For the interface or (ISDN) Links
- ➔ Link Local Address: Every address to the Link Local Address
- ➔ Neighbour: A node attached to same link.
- ➔ Node: Device that implements IP
- ➔ Packet: IP header + Payload
- ➔ Prefix: Initial IP addressing bits to be shared
- ➔ Router: A node that forwards IP packets to be addressed
- ➔ Unicast Address: Identifier of single interface

Key Protocols of IPv6:

1) ICMP v6
2) IPv6
3) Multicast Discovery (MLD)
4) Neighbour Discovery (ND)

The Differences IPv4 & IPv6

a) The major differences between IPv4 & IPv6 is the number of IP Addresses: There are 4,294,967,296 IPv4 address or (2^{32}) users in contrast there are 340, 282, 366, 920, 938, 463, 374, 607, 431, 768, 211, 456 IPv6 addresses or (2^{128}) users. Most networks using IPv6 support the former also.

b) IP sec support is optional in IPv4 & in IPv6 it is inbuilt.

c) No packet flow identification in IPv4, Packet flow with header & footer using flow label field available in IPv6
d) Checksum field available in IPv4, no checksum is available in IPv6
e) Broadcast messages are available in IPv4, no broadcast messages are available in IPv6

IPv6 Transition Mechanism:

IPv6 Transition Mechanism is the technologies for transitioning the internet from its initial (current) IPv4 infrastructure to the successor addressing and Routing System of (IPv6). As (IPv4) & (IPv6) networks are not directly inter operable, these technologies are designed to permit hosts on either network to participate in networking with opposite network.

To the technical side IPv6 have a straight forward transition plan from the current IPv4. Internet Engineering Task force (IETF) conducts the working groups and discussions through IETF to develop these technologies.

Stateless IP/ICMP Translation:

Stateless IP/ICMP Translation translates between packet header formats of IPv6 & IPv4. The prefix translated formats can be written as::ffff:o:a:b:c:d in which IPv4 address is a.b.c.d refers to enabled mode of IPv6.

Tunnel Broker Mechanism:

A tunnel broker combines several IPv6 mechanism and enables any user to use them actively.

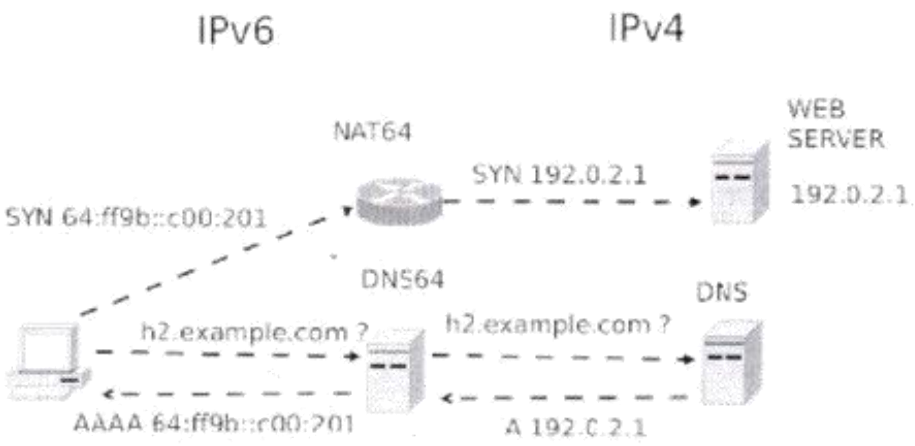
IPv6 in IPv4 tunneling is done with the help of 6 in 4, TSP or AYIYA tunnels.

6rd :

6rd is mechanism to facilitate rapid deployment of IPv6 services across IPv4 on ISP's it uses the stateless address mapping mechanism to transmit packets between IPv4 & IPv6. It is used in first stage large deployment on ISP's from the year 2007.

NAT 64 :

NAT 64 allows IPv6 hosts to communicate with IPv4 servers. The NAT 64 server is endpoint for at least one IPv4 address and IPv6 network segment of 32 bits. Other types are also NAT-PT & NAPT-PT also known as Deprecated Methods



Transport Relay Transition:

Transport Relay Transition is a common form of DNS transition scheme to conversion of IPv4 & IPv6 packets

DNS 64 & Dual Stack Lite (DS- Lite):

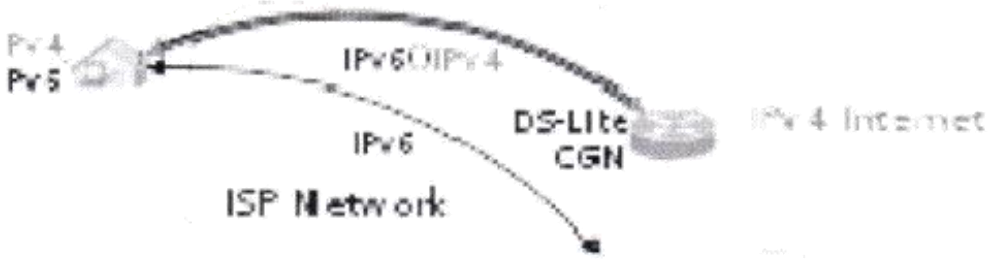
DNS 64 describes a DNS Server that when asked for a domain record for a domain XXXX records but finds only X records synthesis the XXXX records from X records. The first path is IPv6/IPv4 translator and second IPv4 address.

Two issues of transition Mechansim

1) It only works for cases where DNS is used to find the host address IPv4 literals are used the DNS 64 will not be involved.
2) Validation of records fails if not returned by DNS.

Dual Stack Lite (DS-Lite)

DS Lite was designed to let the ISP's omit the deployment of any IPv4 address to customer's process delivery equipment (CPDE) instead only global IPv6 addresses are provided. Further can be understood from diagram of DS- Lite.



IPv6 Internet

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