IPV6
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TOPICS TO BE COVERED:

- IP
- IPv4 and Ipv6
- Header comparison of both IPv4 and IPv6
- Transitioning Ipv4 and IPv6
  - Dual stack
  - Tunneling
  - Translation
What is IP?

- Internet Protocol
- The method or protocol by which data is sent from one computer to another on the Internet. Each computer (known as a host) on the Internet has at least one IP address that uniquely identifies it from all other computers on the Internet.
- A packet-based protocol for delivering data across networks.
- Located on Internet Layer (network Layer)
IP versions

- IPv4
- Ipv6

Why IPv6?
- Because of IPv4 shortage.
- What we have tried before IPv6?
  - Sub netting
  - Natting - PAT
**Difference between IPv4 and IPv6**

**IPv4**
- Old
- 32 bits
- Decimal notation
- 4 octets of 8bit each
- For representation we use (.)
- Example: 128.34.56.76
- Support broadcast

**IPv6**
- New
- 128bits
- Hexadecimal notation
- 8 word of 16 bit each
- For representation we use (:)
- Example: 2001:0dbb:ac10:fe01:0000:0000:0000:0000
- Support multicast
IPv4 and IPv6 Header

IPv4 Header

20 Octets

- Version
- IHL
- Type of Service
- Total Length
- Identification
- Flags
- Fragment Offset
- Time to Live
- Protocol
- Header Checksum
- Source Address
- Destination Address
- Options
- Padding

Fields name kept from IPv4 to IPv6.
Fields not kept in IPv6.
Field name and position changed in IPv6.
New field in IPv6.

IPv6 Header

40 Octets

- Version
- Traffic Class
- Flow Label
- Payload Length
- Next Header
- Hop Limit
- Source Address
- Destination Address
## COMPARISON BETWEEN IPv4 AND IPv6 PACKET HEADER

<table>
<thead>
<tr>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The header length field is eliminated in IPv6 because the length of the header is fixed in this version.</td>
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<tr>
<td>2. The service type field is eliminated in IPv6. The priority and flow label fields together take over the function of the service type field.</td>
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<td>3. The total length field is eliminated in IPv6 and replaced by the payload length field.</td>
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<td>4. The identification, flag, and offset fields are eliminated from the base header in IPv6. They are included in the fragmentation extension header.</td>
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<tr>
<td>5. The TTL field is called hop limit in IPv6.</td>
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<tr>
<td>6. The protocol field is replaced by the next header field.</td>
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<td>7. The header checksum is eliminated because the checksum is provided by upper-layer protocols; it is therefore not needed at this level.</td>
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<tr>
<td>8. The option fields in IPv4 are implemented as extension headers in IPv6.</td>
</tr>
</tbody>
</table>
There are basically three methods available.

1. Dual-stack
2. Tunneling
3. Translation
DUAL-STACK APPROACH

- It allows Ipv4 and IPv6 works together in same network and device.
- Easiest approach
- Requires host and router to implement both Ipv4 and IPv6 protocols
- Which enable network to support both IPv4 and IPv6 services.
- Very useful now a days to introduce IPv6 in existing IPv4 architecture.
How this technique works?

Dual Stack Approach

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IPv6

A

Flow: X
Source: A
Dest: F
data

A to B:
IPv6

B

B to C:
IPv4

C

IPv4

D

Source: A
Dest: F
data

D to E:
IPv4

E

E to F:
IPv6

F

Source: A
Dest: F
data

Flow: ??

IPv6

IPv6

IPv4

IPv6
**Drawback:**

- Ipv4 address must be available for every dual-stack host or router,

- Where ipv6 is designed because shortage of IPv4
Tunneling

- It enables the interconnection of IPv4 and IPv6.
- Separate IPv6 network can be interconnected through native IPv4 services by means of tunnel.
- There are three ways by which we can establish a tunnel:
  1. Manually
     - Manual tunnel
  2. Semi-automated
     - Tunnel Broker
  3. Automatic
     - 6 over 4
     - 6 to 4
     - 6 to 4 relay
**Manually configured Tunnel**

- Very easy to setup and configure
- Good management potential
  - It is control of ISP’s deployment as IPS configure all the tunnels

Where It is used?
- mostly all academic site over IPv6 where native IPv6 connectivity is not available.
TUNNEL BROKER

- Very popular
- How it works?
  - client request tunnel
  - Broket sends configuration to tunnel server
  - Broker sends sconfiguration to client to create tunnel
  - Tunnel established


3. Tunnel broker configures the tunnel server or router.

4. Client establishes the tunnel with the tunnel server or router.
ISSUES WITH TUNNEL BROKER

- Advantage is it is manageable – ISP

- Drawbacks:
  - If tunnel broker is far from host or router then round trip times will be more
6 OVER 4

- Encapsulating the IPv6 packet in Ipv4 packet
- Can be used by routers or hosts
6 TO 4 TUNNEL

- AUTOMATIC TUNNEL METHOD
- Add prefix to the attached IPv6 network — --- 2002""""/16
- Requires one global IPv4 address
DIFFERENCE BETWEEN MANUAL AND AUTOMATED TUNNELING:

- Tunnel end points can be configured either by administrator or operating system.
- Manually configured tunnel is more deterministic and easier to debug than automatic – therefore it is recommended for large, well-administered tunnel.
- Automatic tunnel is ease of use.
Disadvantages of Tunneling

- If ipv4 network – theu which tunnel is created has NAT points, then it will break the tunnel encapsulation that we just made.

Solution:
- We can encapsulate the tunnel traffic within UDP packet. NAT does not blast at UDP packets.
REFERENCES:

- Data communication and networking by forouzan
- Google.com
THANK YOU...