IPV6

IPV6 ADDRES

- An IPv6 address is 128 bits (16 bytes) long, compared to 32-bit IPv4.
- Written in Hexadecimal Colon Notation.
- Divided into 8 blocks of 4 hexadecimal digits (16-bit each).

- Example:
- 2001:0db8:85a3:0000:0000:8a2e:0370:7334.

ABBREVIATION RULES

- IPv6 addresses can be long, but abbreviation makes them shorter.
- Leading zeros in each block can be removed.
- Example: 0074 → 74, 000F → F.
- Consecutive zero blocks can be replaced by ::.
- Example: 2001:0db8:0000:0000:0000:0000:0370:7334 →
- 2001:0db8::0370:7334.

IPV6 ADDRESS SPACE

Addresses are divided into categories by prefix bits.

Categories include:

- Unicast – One-to-one communication.
- Multicast – One-to-many communication.
- Anycast – One-to-nearest communication.
- Reserved addresses – Special purposes.
- Local addresses – For private/internal networks.

UNICAST ADDRESSES

- Used for unique device identification (like IPv4 addresses).
- Provider-based unicast (most common):
  - Includes fields such as Type ID, Registry ID, Provider ID, Subscriber ID, Subnet ID, Node ID.
  - Example: Identifies ISP → subscriber → subnet → device.
- Geographically-based unicast – planned for future use.
- Ensures each device has a globally unique address.

MULTICAST & ANYCAST ADDRESSES

Multicast Addresses:

- Used when one sender needs to reach many receivers.
- Two types:
- Permanent (always available, assigned by Internet authorities).
- Transient (temporary, e.g., online meetings or streaming).

Anycast Addresses:

- Similar to multicast but sent to only the nearest member.
- Reduces delay and improves performance.
- Example: User request goes to the nearest ISP router instead of all routers.

RESERVED & LOCAL ADDRESSES

Reserved Addresses:

- Unspecified (::) – used when device doesn’t yet know its address.
- Loopback (::1) – used by a host to test itself.
- Mapped / Compatible – helps during IPv4 ↔ IPv6 transition.

Local Addresses

- Link-local – used inside a single subnet (automatic assignment).
- Site-local – used inside an organization with multiple subnets.
- Provide private communication within local networks.

THANK YOU