

IPV6

Q1) How long is IPv6 header?

→ An IPv6 basic header is fixed as 40 bytes long and has eight fields. Unlike IPv4 where there is 20-60 bytes variable header length, IPv6 has fixed length of 40 bytes.

Q2) What are the differences between IPv6 and IPv4 header?

→ Major differences :-

1. Address Length:

IPv4: 32 bits (4 bytes), allowing for approximately 4.3 billion unique addresses.

IPv6: 128 bits (16 bytes), allowing for approximately 3.4×10^{38} unique addresses.

Header Size:

IPv4: Variable, typically 20 bytes without options.

IPv6: Fixed, 40 bytes.

Header Complexity:

IPv4: Contains fields for fragmentation, header checksum, and options.

IPv6: Simplified with fewer fields, no header checksum, and no fragmentation fields (handled by extension headers).

Fragmentation:

IPv4: Supports fragmentation and reassembly by routers.

IPv6: Fragmentation is only handled by the source, not by routers along the path.

Checksum:

IPv4: Includes a header checksum for error-checking.

IPv6: No header checksum (error-checking is assumed to be handled by upper-layer protocols like TCP and UDP).

Options:

IPv4: Includes optional fields that can increase header size.

IPv6: Uses extension headers instead of options, allowing for more efficient processing.

Quality of Service (QoS):

IPv4: Uses the Type of Service (ToS) field, also known as DSCP and ECN.

IPv6: Uses the Traffic Class field, with additional support from the Flow Label field.

Q3) What is the purpose of each header field in the IPv6?

→ The purpose of each field are:-

. Version (4 bits): Indicates the version of the Internet Protocol being used. For IPv6, this value is always set to 6 (0110).

Traffic Class (8 bits): Similar to the Type of Service (ToS) in IPv4 i.e. DSCP and ENC, it is used to identify and distinguish between different classes or priorities of IPv6 packets, aiding in Quality of Service (QoS) management. It facilitates differentiated services and QoS by indicating the priority and handling requirements of the packet.

Flow Label (20 bits): Used to identify packets requiring special handling by routers.

Payload Length (16 bits): Indicates the length of the payload (i.e., the data) following the IPv6 header, measured in octets (bytes). It does not include the length of the IPv6 header itself, which is fixed at 40 bytes. It specifies the size of the data being transported, which helps in efficient allocation and processing of the packet by the receiving node.

Next Header (8 bits): Identifies the type of header immediately following the IPv6 header. It can point to an upper-layer protocol (like TCP or UDP) or an extension header (like Routing or Fragmentation headers). This field's functionality is similar to the Protocol field in IPv4.

Hop Limit (8 bits): Specifies the maximum number of hops (routers) a packet can pass through before being discarded. Each router that forwards the packet decrements this value by one. If the Hop Limit reaches zero, the packet is discarded.

Source Address (128 bits): The IPv6 address of the originating node. It identifies the sender, which is essential for responses and routing the packet back if needed.

Destination Address (128 bits): The IPv6 address of the intended recipient node. It identifies the receiver, ensuring the packet reaches the correct destination.