



SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE NAME :19IT401 COMPUTER NETWORKS

II YEAR /IV SEMESTER

Unit 3- Network layer

Topic 1and 2 : IPv6 Protocol



IPv4 vs IPv6



IPv4	IPv6
IPv4 has a 32-bit address length	IPv6 has a 128-bit address length
It Supports Manual and DHCP address configuration	It supports Auto and renumbering address configuration
In IPv4 end to end, connection integrity is Unachievable	In IPv6 end to end, connection integrity is Achievable
It can generate 4.29×10^9 address space	Address space of IPv6 is quite large it can produce 3.4×10^{38} address space
The Security feature is dependent on application	IPSEC is an inbuilt security feature in the IPv6 protocol
Address representation of IPv4 is in decimal	Address Representation of IPv6 is in hexadecimal
Fragmentation performed by Sender and forwarding routers	In IPv6 fragmentation performed only by the sender
In IPv4 Packet flow identification is not available	In IPv6 packet flow identification are Available and uses the flow label field in the header

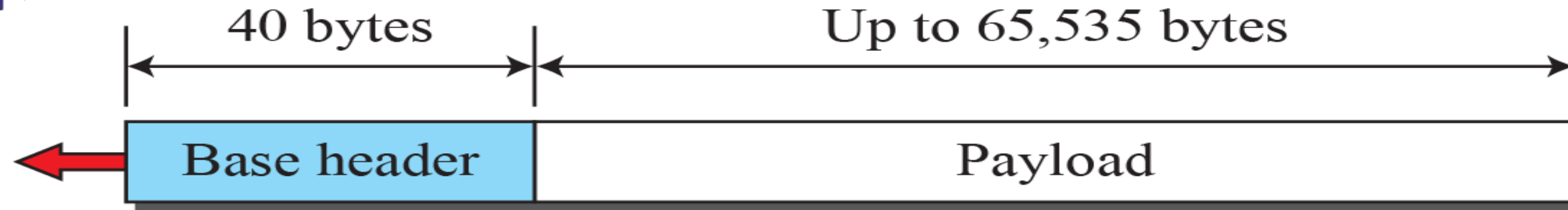


IPv6 Packet Format

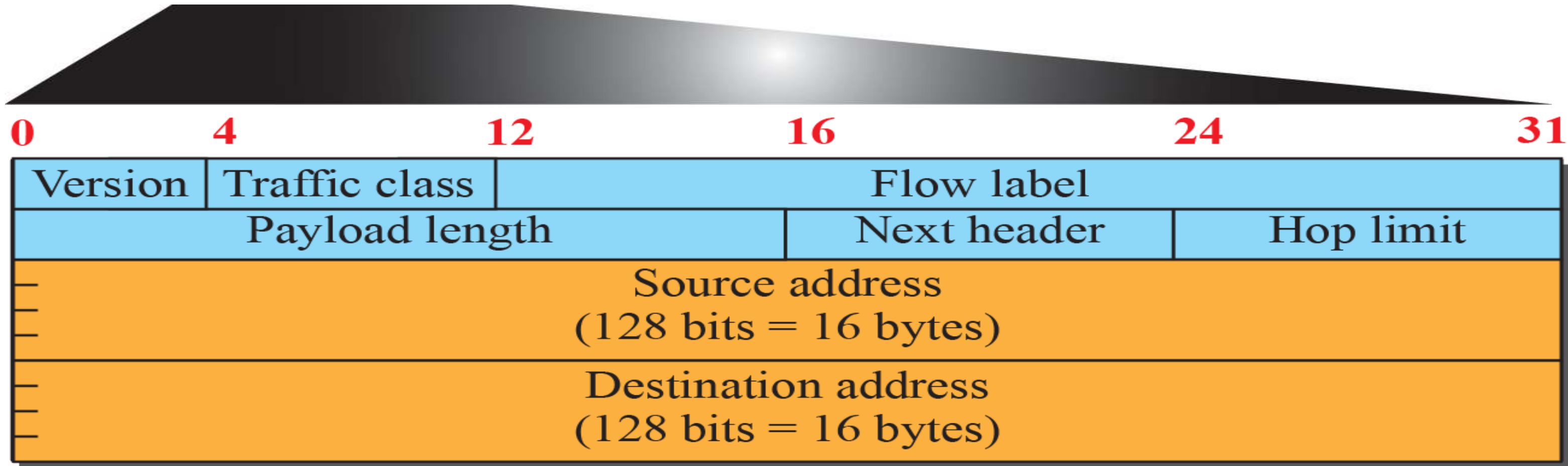


Each packet is composed of a base header followed by the payload. The base header occupies 40 bytes, whereas the payload can be up to 65,535 bytes of information. The description of fields follows.

IPv6 datagram



a. IPv6 packet



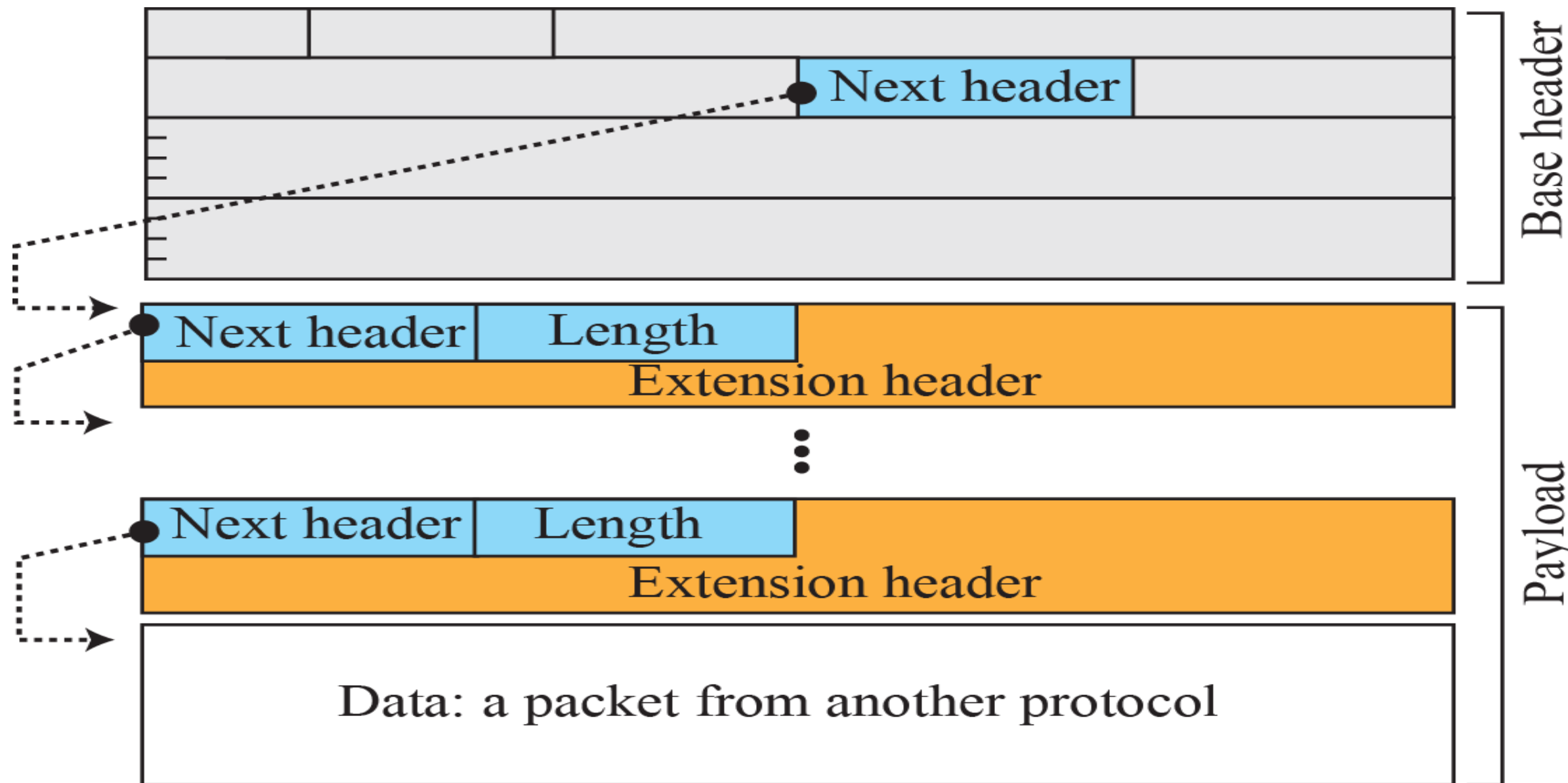
b. Base header



- ❑ Version. The 4-bit version field defines the version number of the IP. For IPv6, the value is 6.
- ❑ Traffic class. The 8-bit traffic class field is used to distinguish different payloads with different delivery requirements. It replaces the type-of-service field in IPv4.
- ❑ Flow label. The flow label is a 20-bit field that is designed to provide special handling for a particular flow of data. We will discuss this field later.
- ❑ Payload length. The 2-byte payload length field defines the length of the IP datagram excluding the header. Note that IPv4 defines two fields related to the length: header length and total length. In IPv6, the length of the base header is fixed (40 bytes); only the length of the payload needs to be defined.
- ❑ Next header. The next header is an 8-bit field defining the type of the first extension header (if present) or the type of the data that follows the base header in the datagram. This field is similar to the protocol field in IPv4, but we talk more about it when we discuss the payload.
- ❑ Hop limit. The 8-bit hop limit field serves the same purpose as the TTL field in IPv4.
- ❑ Source and destination addresses. The source address field is a 16-byte (128-bit) Internet address that identifies the original source of the datagram. The destination address field is a 16-byte (128-bit) Internet address that identifies the destination of the datagram.
- ❑ Payload. Compared to IPv4, the payload field in IPv6 has a different format and Meaning.



Payload in an IPv6 datagram



Some next-header codes

- 00: Hop-by-hop option
- 02: ICMPv6
- 06: TCP
- 17: UDP
- 43: Source-routing option
- 44: Fragmentation option
- 50: Encrypted security payload
- 51: Authentication header
- 59: Null (no next header)
- 60: Destination option



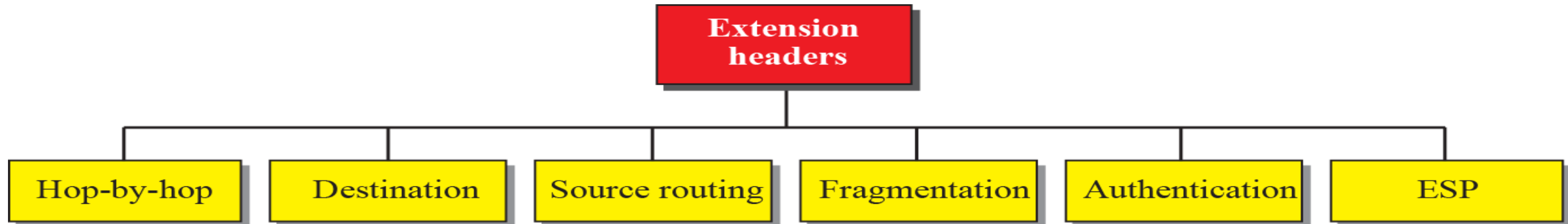
Extension Header



An IPv6 packet is made of a base header and some extension headers. The length of the base header is fixed at 40 bytes. However, to give more functionality to the IP datagram, the base header can be followed by up to six extension headers. Many of these headers are options in IPv4. Six types of extension headers have been defined. These are hop-by-hop option, source routing, fragmentation, authentication, encrypted security payload, and destination option.



Extension Header Types





Comparison of network layer in version 4 and version 6



Network layer in version 4



Network layer in version 6



Better header format. IPv6 uses a new header format in which options are separated from the base header and inserted, when needed, between the base header and the data. This simplifies and speeds up the routing process because most of the options do not need to be checked by routers.

New options. IPv6 has new options to allow for additional functionalities.

Allowance for extension. IPv6 is designed to allow the extension of the protocol if required by new technologies or applications.

Support for resource allocation. In IPv6, the type-of-service field has been removed, but two new fields, traffic class and flow label, have been added to enable the source to request special handling of the packet. This mechanism can be used to support traffic such as real-time audio and video.

Support for more security. The encryption and authentication options in IPv6 provide confidentiality and integrity of the packet.



Assessment



- a).What is IPv6?
- b) Compare IPv4 and IPv6
- c) What is traffic class?





Reference



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Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

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