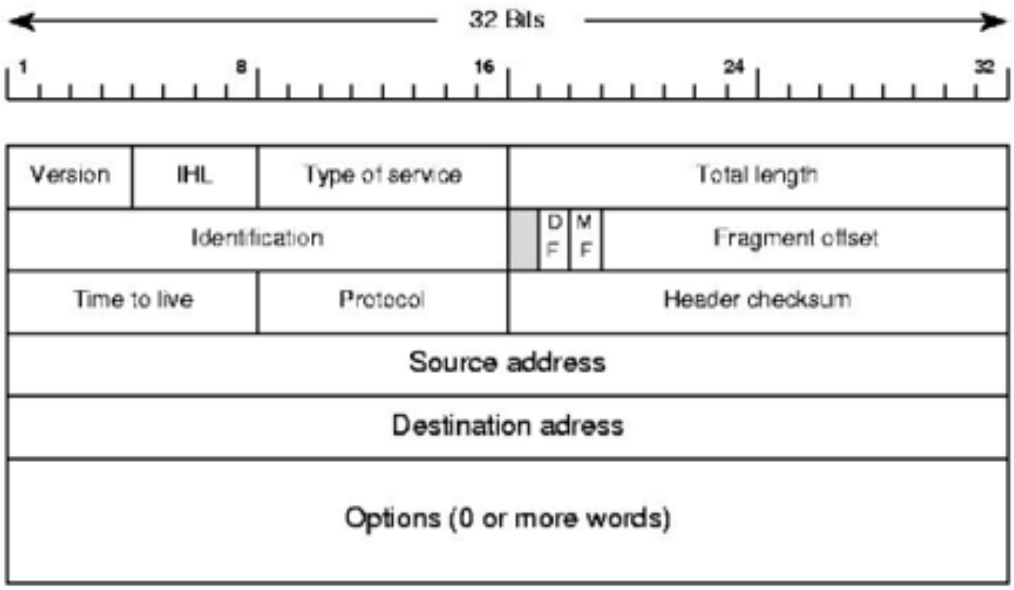
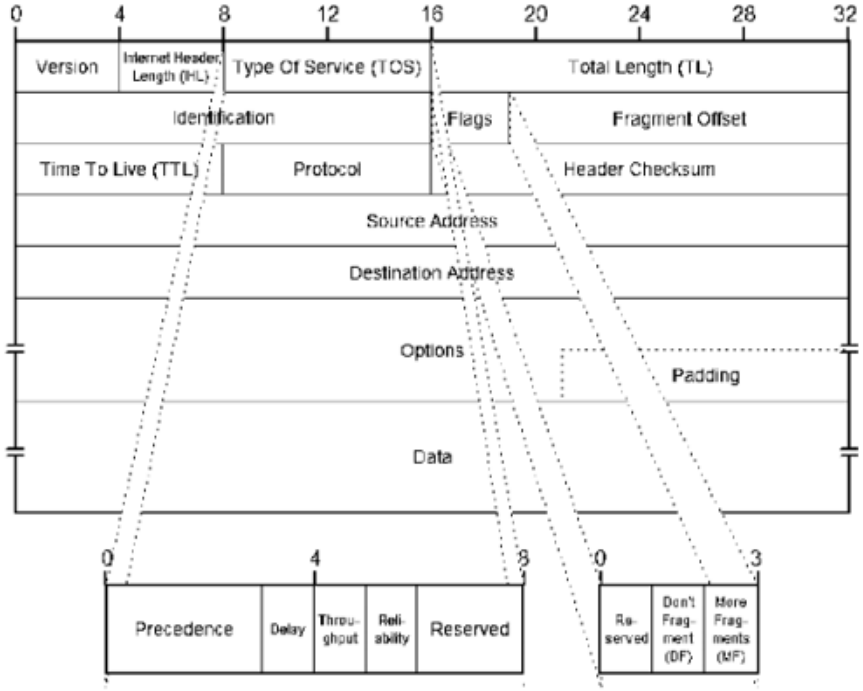
IPv4 Packet Structure Explained





IPv4 Packet Structure Explained

An IPv4 packet is the fundamental unit of data used in Layer 3 (the Network Layer) of the OSI model.
It consists of two main parts: the Header and the Payload.

1. **Header** — contains control and routing information.
2. **Payload** — carries the actual data from upper layers (e.g., TCP or UDP).

IPv4 Header Fields (typically 20 bytes, up to 60 bytes with options):

Field	Length (bits)	Description
Version	4	IP version — for IPv4, the value is 4.
IHL (Internet Header Length)	4	Header length in 32-bit words (usually 5 → 20 bytes).
Type of Service (ToS) / DSCP	8	Specifies service priority (Quality of Service - QoS).
Total Length	16	Total size of the packet (Header + Data), max 65,535 bytes.
Identification	16	Identifier used for fragmentation and reassembly.
Flags	3	Controls fragmentation (DF = Don't Fragment, MF = More Fragments).
Fragment Offset	13	Position of this fragment within the original packet.
Time To Live (TTL)	8	Limits packet lifetime (decrements by 1 per router).
Protocol	8	Specifies upper-layer protocol (TCP=6, UDP=17, ICMP=1).
Header Checksum	16	Verifies integrity of the header only.
Source IP Address	32	The sender’s IP address.
Destination IP Address	32	The receiver’s IP address.
Options (optional)	Variable	Rarely used; for security, testing, etc.
Padding	Variable	Ensures header is a multiple of 4 bytes.

Payload:
The payload carries the data from the upper layer, commonly a TCP segment, UDP datagram, or ICMP message.
Payload size = Total Length – Header Length.

Example Layout:

Version	IHL	ToS	Total Length
Identification	Flags	Fragment Offset
TTL	Protocol	Header Checksum
Source IP Address
Destination IP Address
Options (optional)
---------- Payload ----------

| TCP / UDP / ICMP Data ... | ###

Summary of Key Fields:

Field	Purpose
Version	Indicates IPv4 or IPv6
IHL	Header length
Total Length	Total packet size
TTL	Limits packet lifetime
Protocol	Defines upper-layer protocol

| Source / Destination IP | Identifies sender and receiver |
| Checksum | Ensures header integrity |

In short, the IPv4 packet provides the structure that enables routing and delivery of data across networks.