Figure 9.8: ARP packet

Hardware: LAN or WAN protocol
Protocol: Network-layer protocol

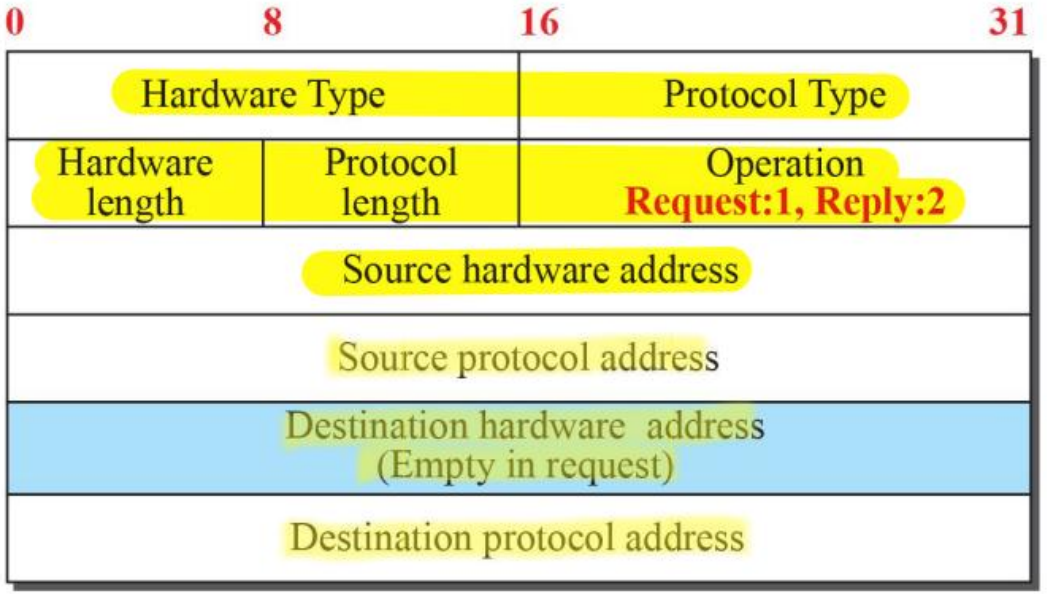


Figure 11.1: A frame in a character-oriented protocol

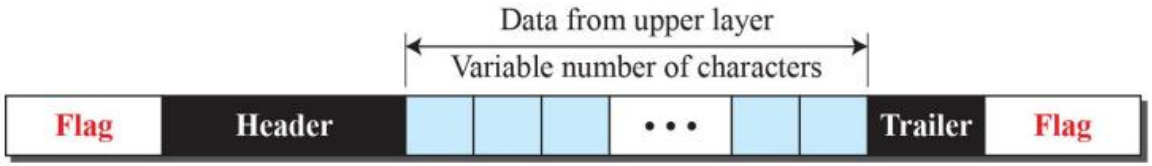
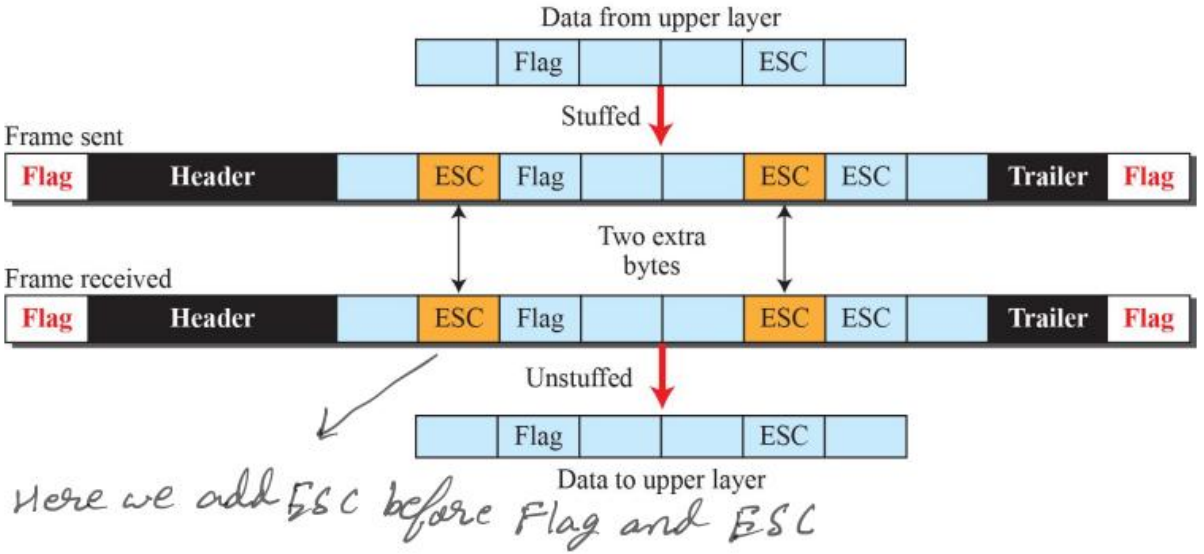


Figure 11.2: Byte stuffing and unstuffing

ESC → Escape Sequencing



Here we add ESC before Flag and ESC

Figure 11.16: HDLC frames

Frame start and end with specific bit pattern

Frame check sequence for error detection contain checksum, CRC

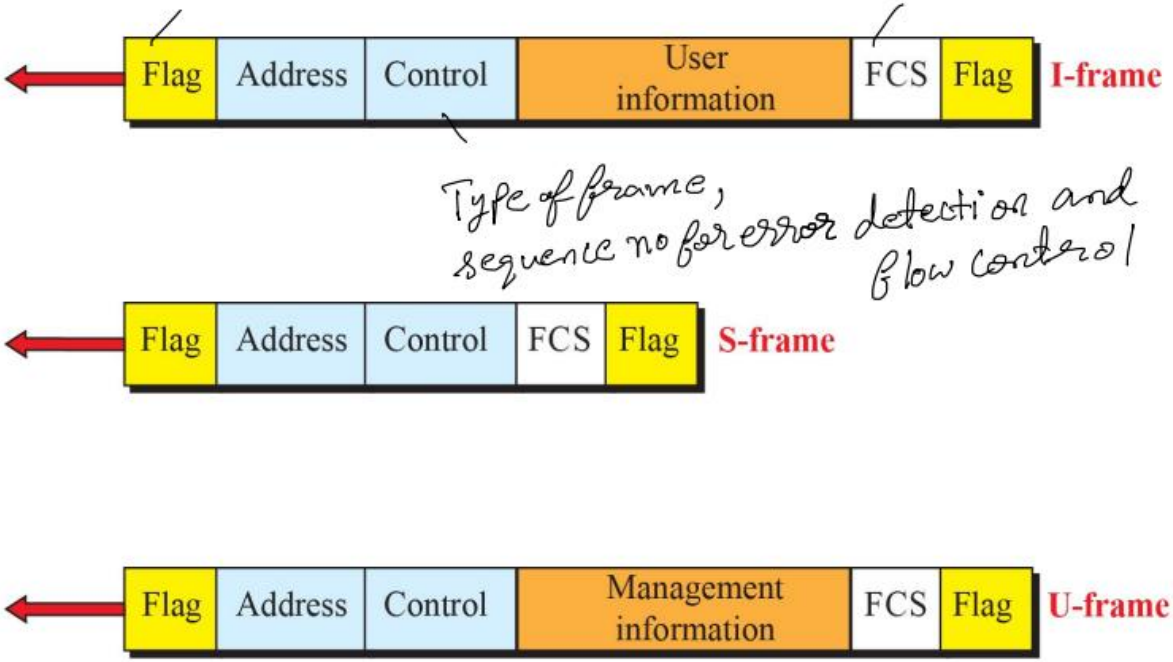


Figure 11.20: PPP frame format

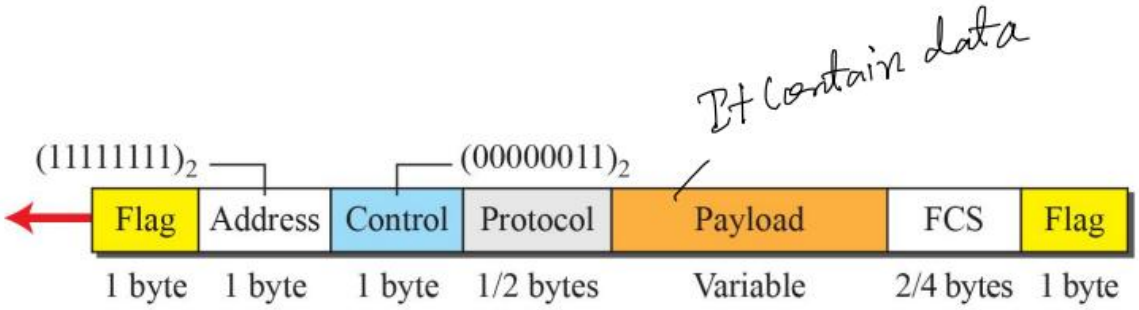


Figure 11.23: LCP packet encapsulated in a frame

Link Control protocol

Req, Ack, Rejection etc.

Identifier

Length of LCP Packet

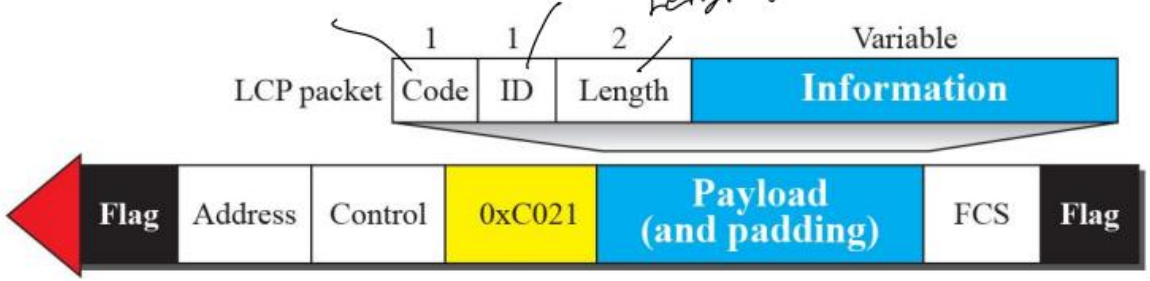


Figure 12.29: ***General rules and examples of creating Walsh tables***

$2^n = 2\ 4\ 8$ Here 2N → denote no of rows

$$W_1 = [+1] \quad W_{2N} = \begin{bmatrix} W_N & W_N \\ W_N & \overline{W_N} \end{bmatrix}$$

a. Two basic rules

$$W_2 = \begin{bmatrix} +1 & +1 \\ +1 & -1 \end{bmatrix} \quad W_4 = \begin{bmatrix} +1 & +1 & +1 & +1 \\ +1 & -1 & +1 & -1 \\ +1 & +1 & -1 & -1 \\ +1 & -1 & -1 & +1 \end{bmatrix}$$

b. Generation of W_1, W_2, and W_4

Figure 13.3: Ethernet frame

Preamble: 56 bits of alternating 1s and 0s

SFD: Start frame delimiter, flag (10101011)

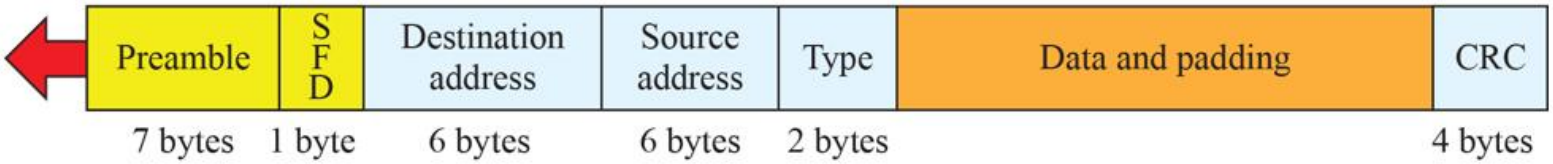
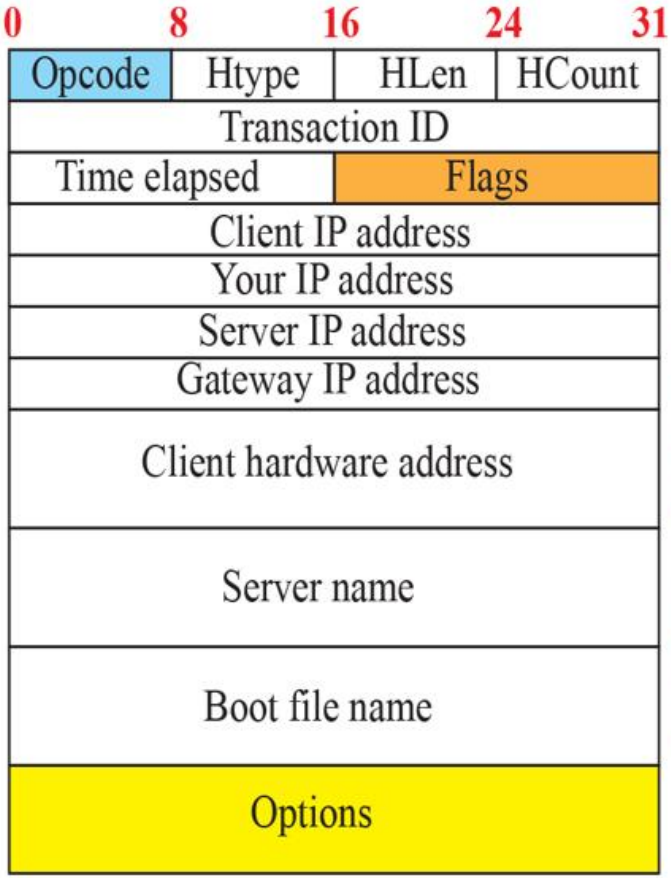


Figure 18.25: DHCP message format



Fields:

Opcode: Operation code, request (1) or reply (2)
Htype: Hardware type (Ethernet, ...)
HLen: Lengh of hardware address
HCount: Maximum number of hops the packet can travel
Transaction ID: An integer set by client and repeated by the server
Time elapsed: The number of seconds since the client started to boot
Flags: First bit defines unicast (0) or multicast (1); other 15 bits not used
Client IP address: Set to 0 if the client does not know it
Your IP address: The client IP address sent by the server
Server IP address: A broadcast IP address if client does not know it
Gateway IP address: The address of default router
Server name: A 64-byte domain name of the server
Boot file name: A 128-byte file name holding extra information
Options: A 64-byte field with dual purpose described in text

Figure 19.1: ***Position of IP and other network-layer protocols in TCP/IP protocol suite***

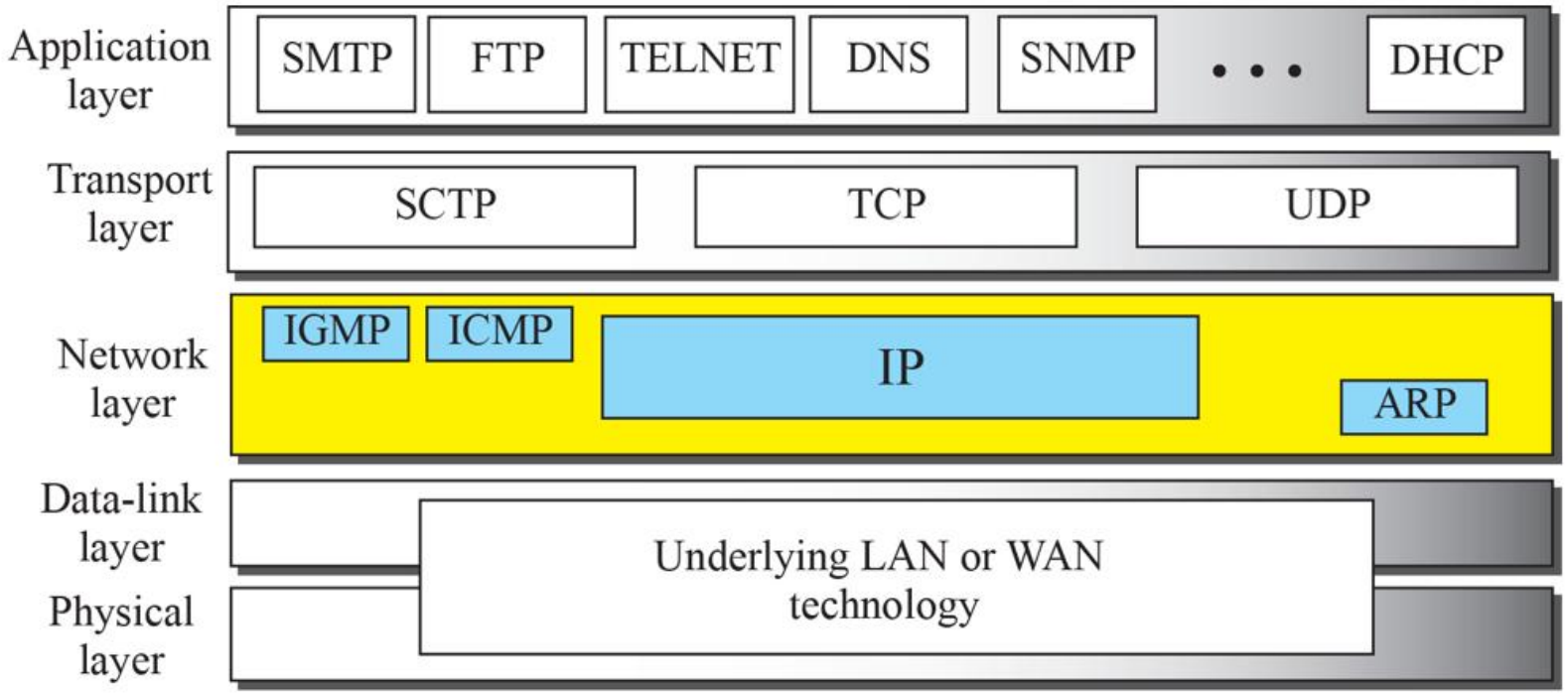


Figure 19.2: IP datagram

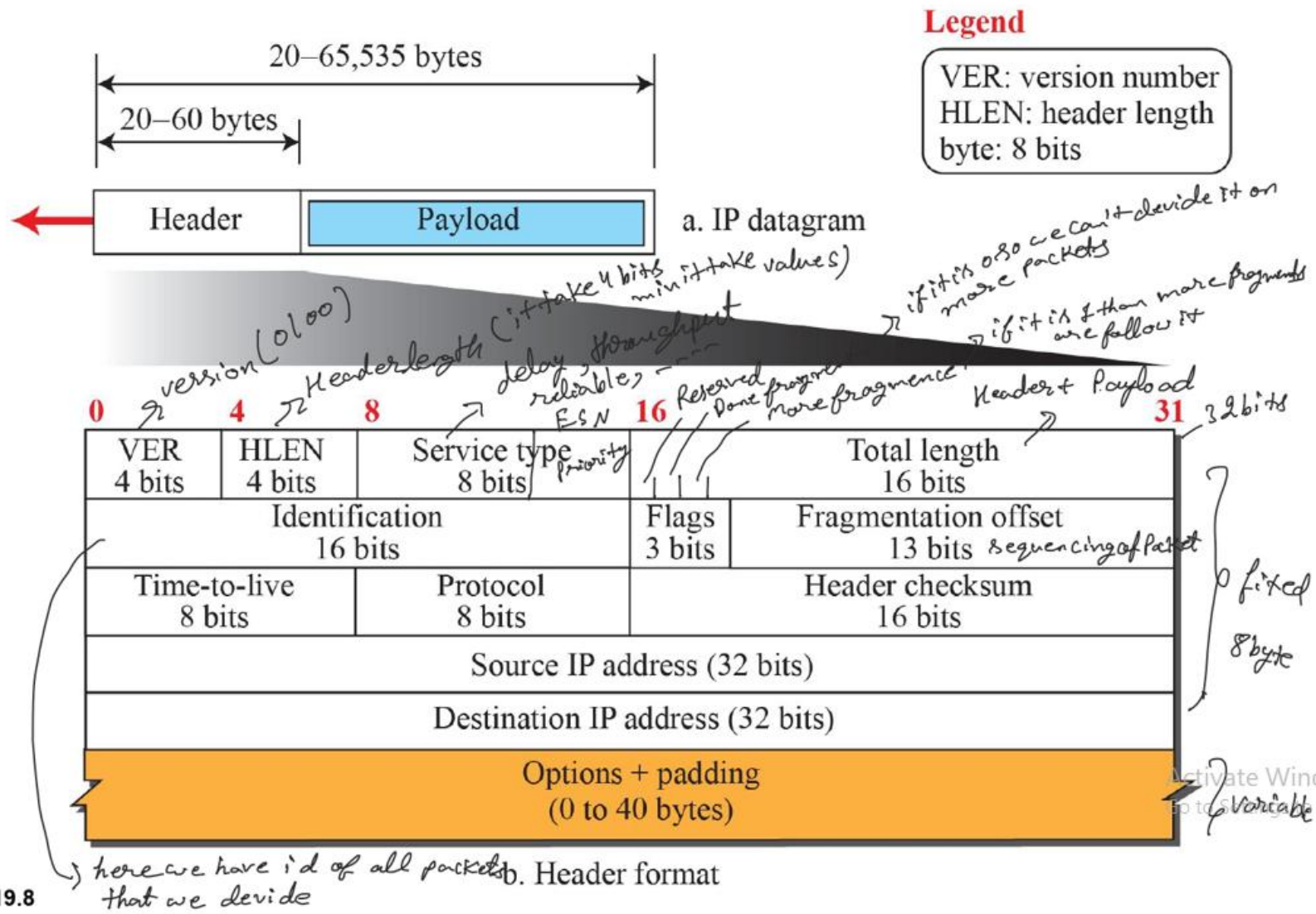
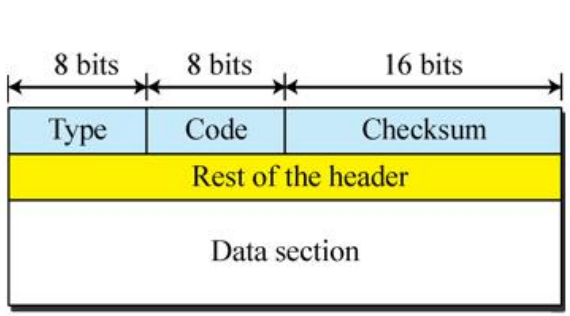
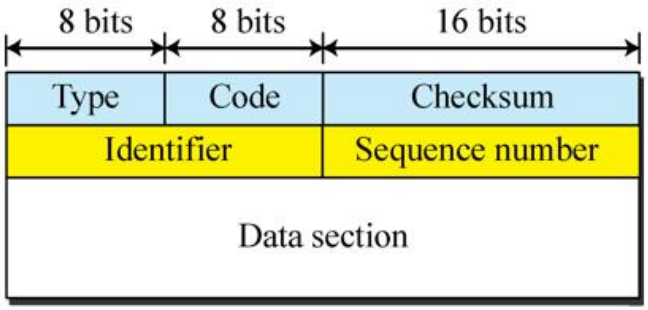


Figure 19.8: General format of ICMP messages



Error-reporting messages



Query messages

Type and code values

Error-reporting messages	**Query messages**
03: Destination unreachable (codes 0 to 15)	08 and 00: Echo request and reply (only code 0)
04: Source quench (only code 0)	13 and 14: Timestamp request and reply (only code 0)
05: Redirection (codes 0 to 3)	
11: Time exceeded (codes 0 and 1)	
12: Parameter problem (codes 0 and 1)	

Note: See the book website for more explanation about the code values.

Figure 19.14: Agent advertisement

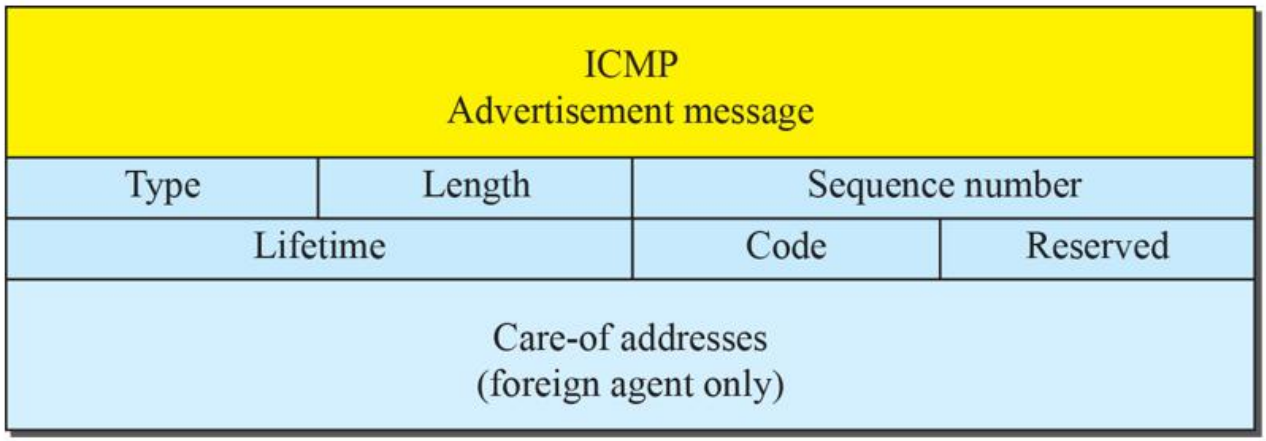


Figure 19.16: ***Registration request format***

Figure 19,17: Registration reply format

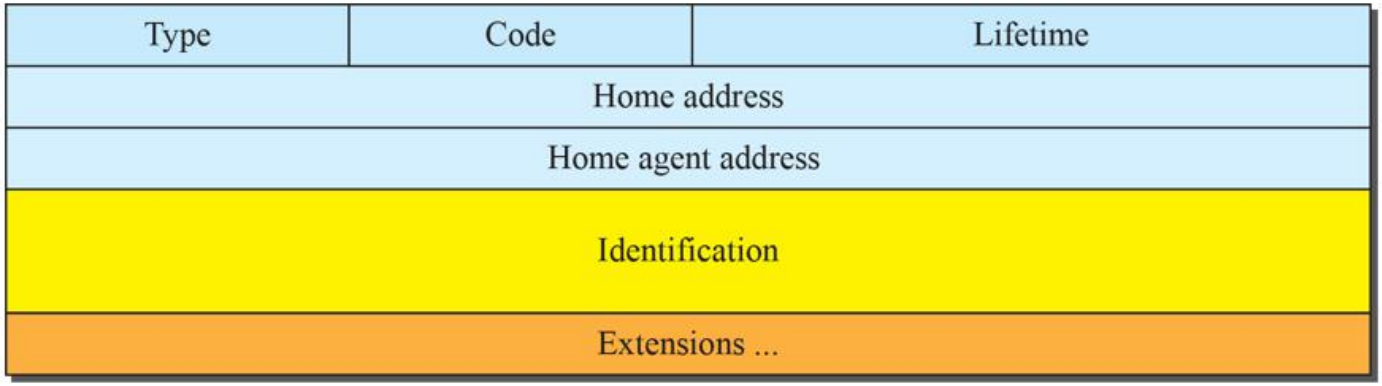


Figure 22.6: ***IPv6 datagram***

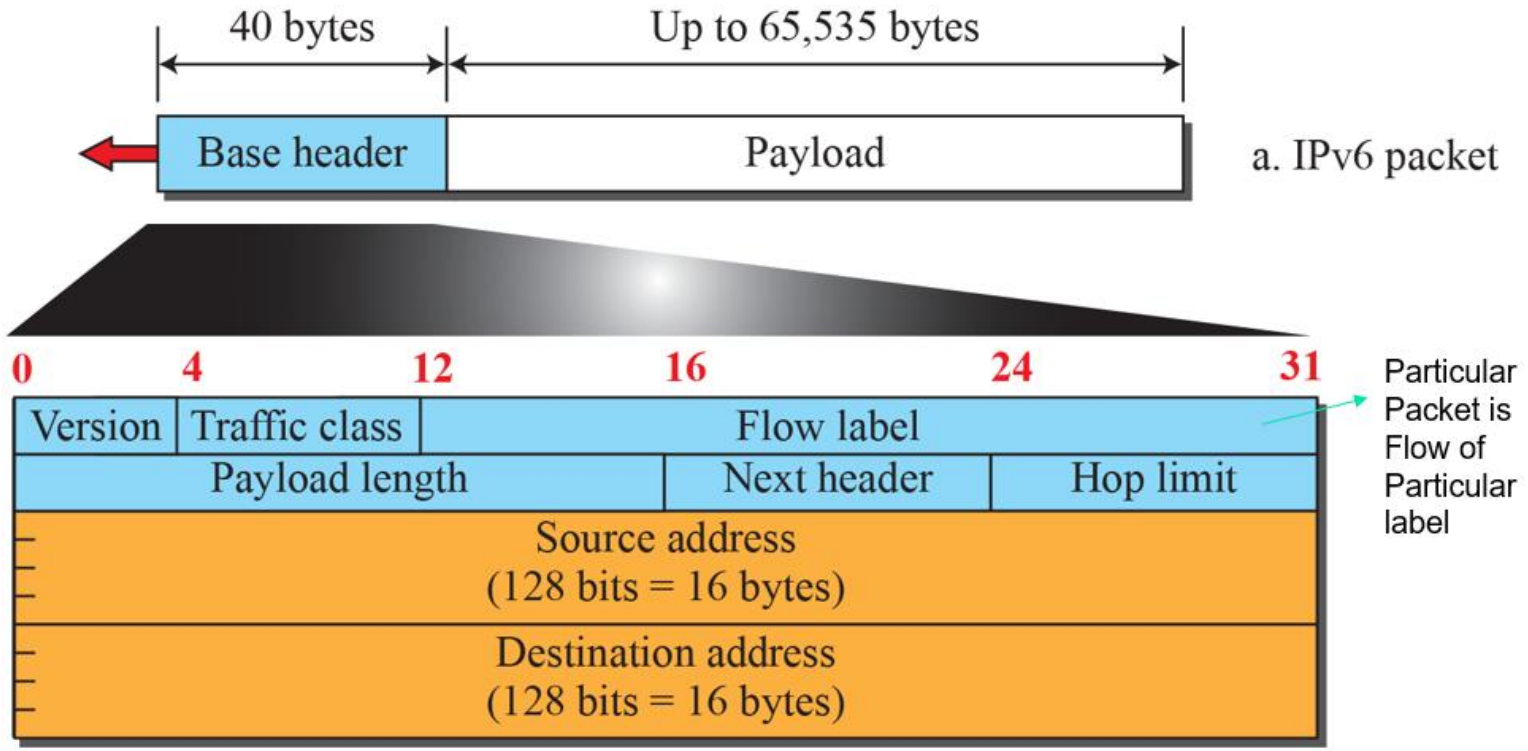
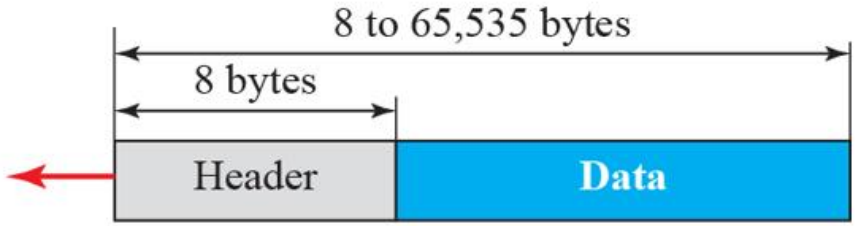
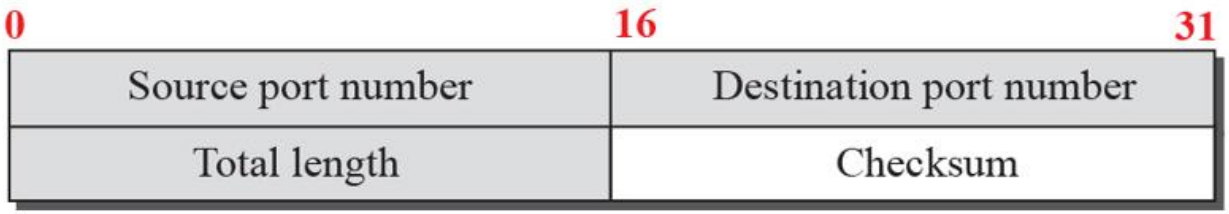


Figure 24.2: ***User datagram packet format***



a. UDP user datagram



b. Header format

Figure 24.3: Pseudoheader for checksum calculation

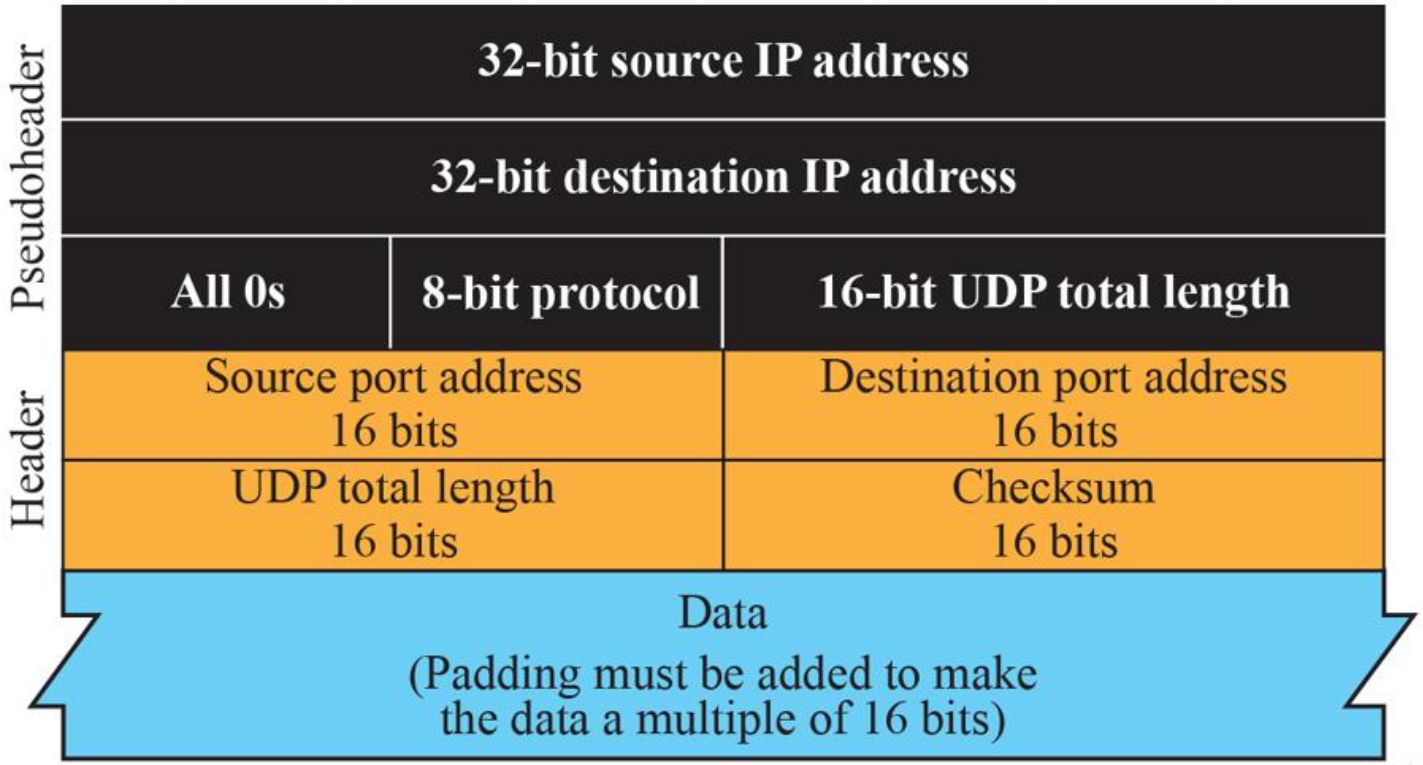


Figure 24.7: TCP segment format

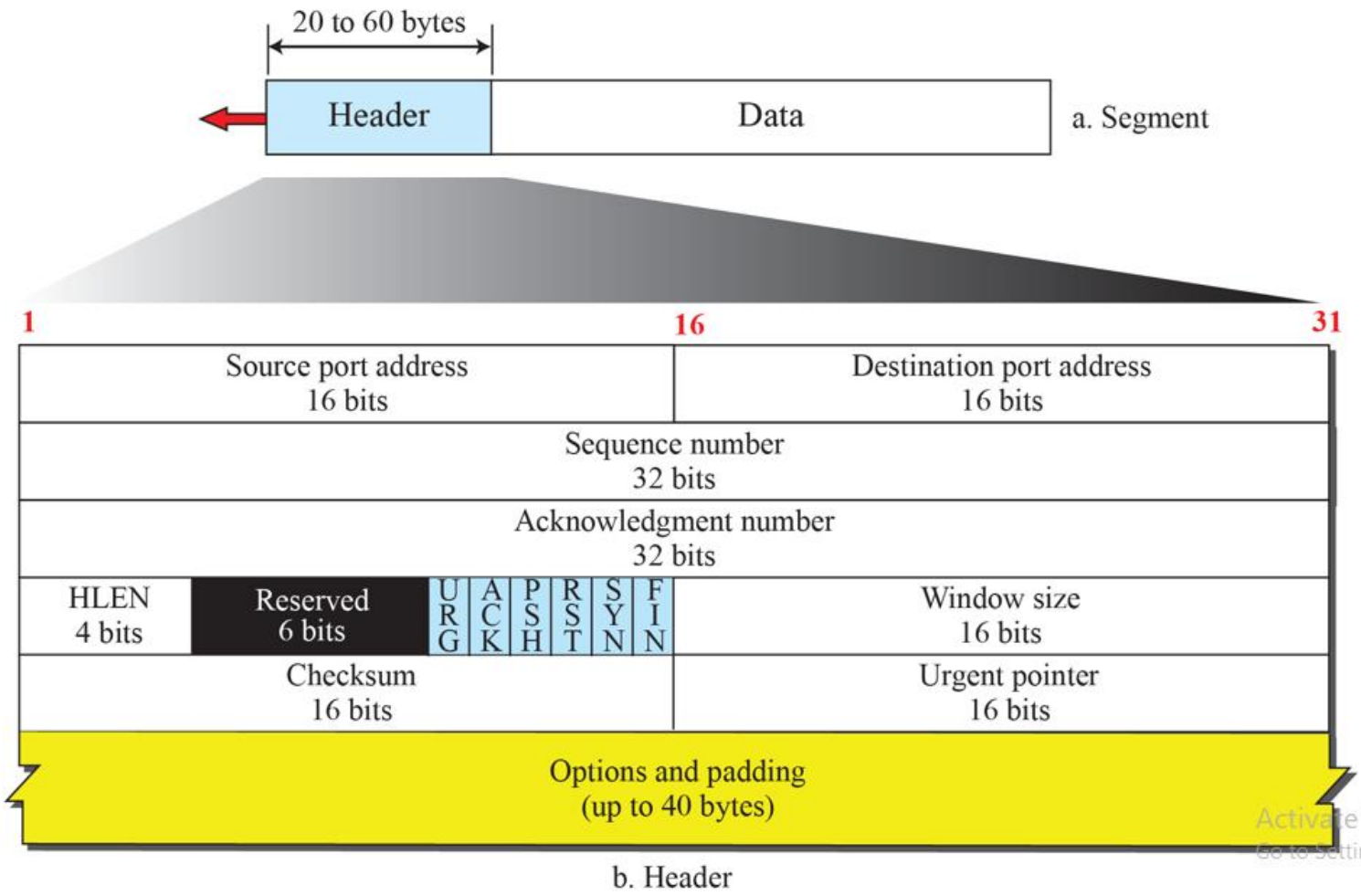
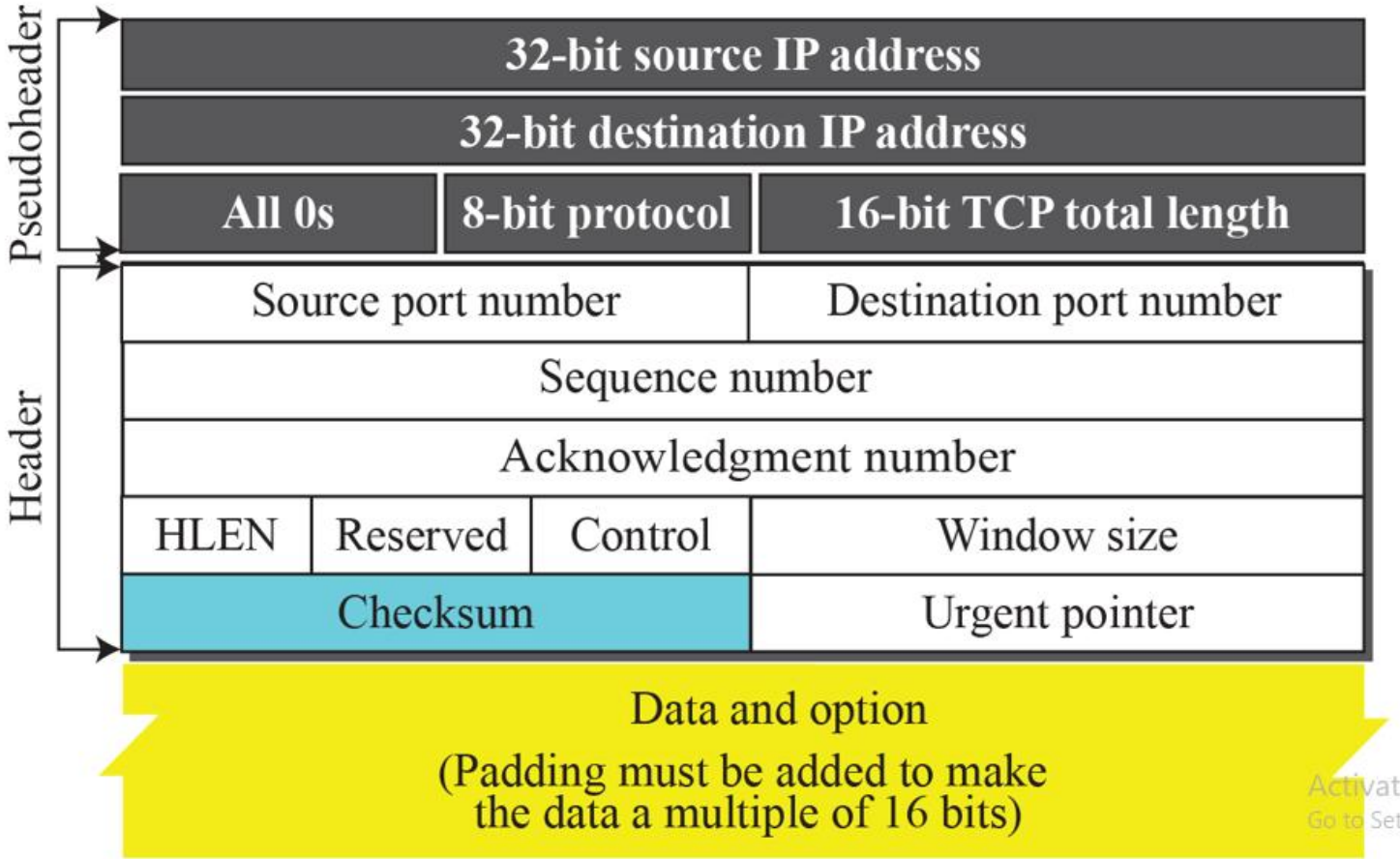
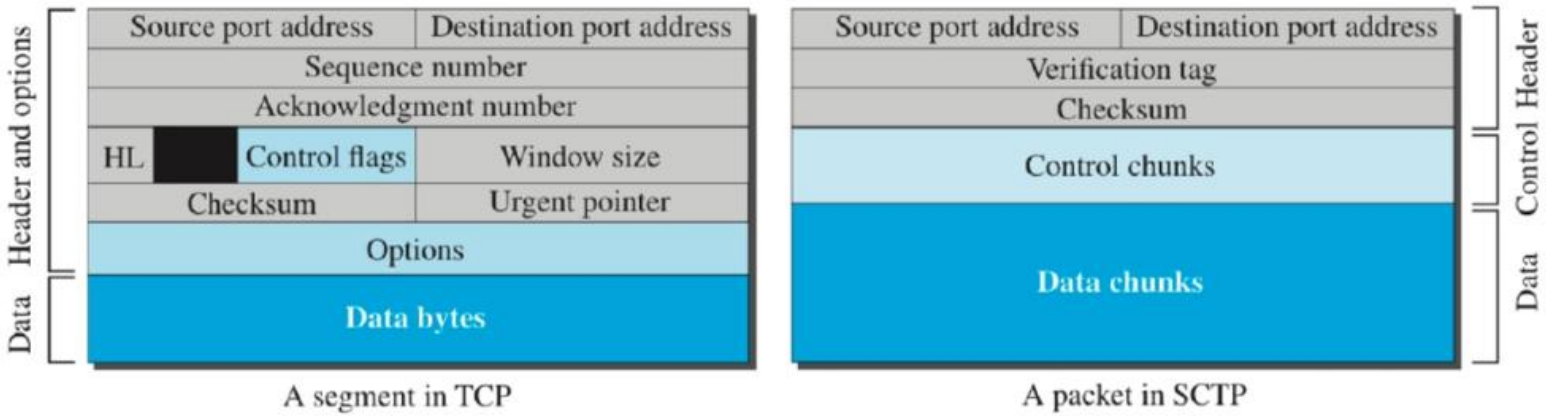


Figure 24.9: ***Pseudoheader added to the TCP datagram***



In TCP, a segment carries data and control information. Data are carried as a collection of bytes; control information is defined by six control flags in the header. The design of SCTP is totally different: data are carried as data chunks, control information as control chunks. Several control chunks and data chunks can be packed together in a packet. A packet in SCTP plays the same role as a segment in TCP. Figure 24.40 compares a

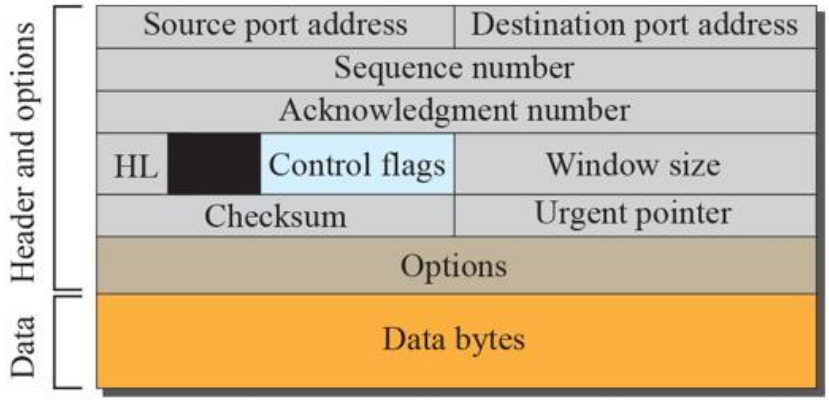
Figure 24.40 *Comparison between a TCP segment and an SCTP packet*



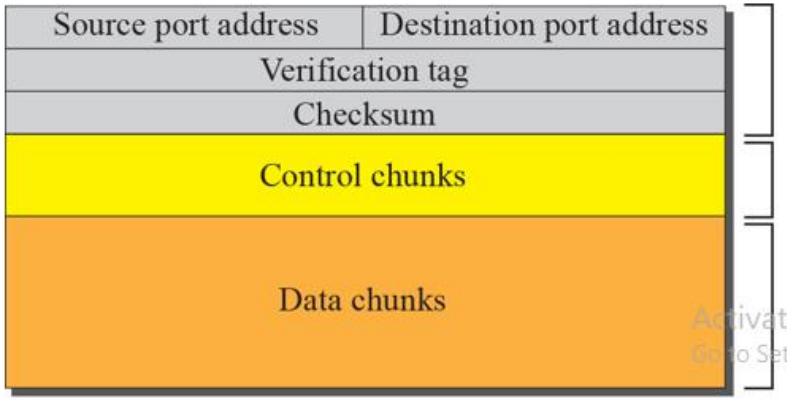
segment in TCP and a packet in SCTP. We will discuss the format of the SCTP packet in the next section.

In SCTP, we have data chunks, streams, and packets. An association may send many packets, a packet may contain several chunks, and chunks may belong to differ-

Figure 24.40 : ***Comparison between a TCP segment and an SCTP packet***



A segment in TCP



A packet in SCTP

Figure 24.43 : SCTP packet format

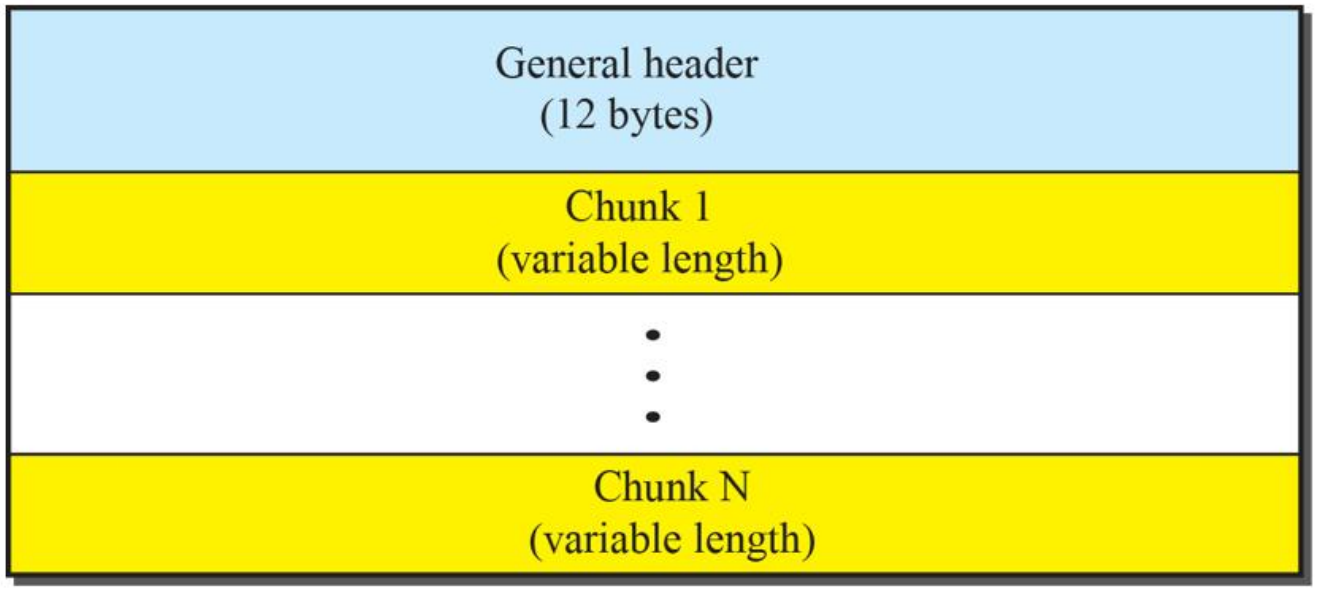


Figure 8.50 : General header

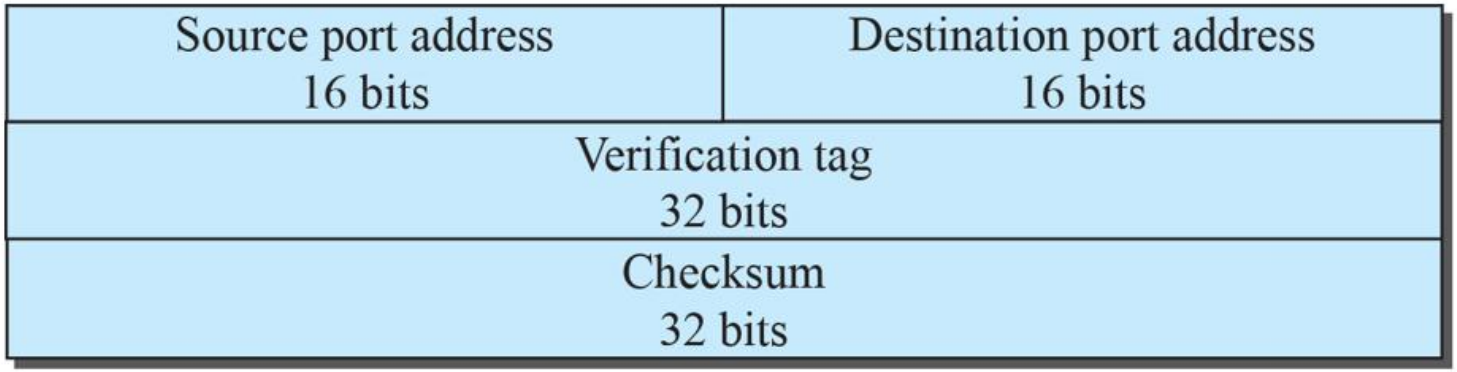


Figure 26.2: Browser

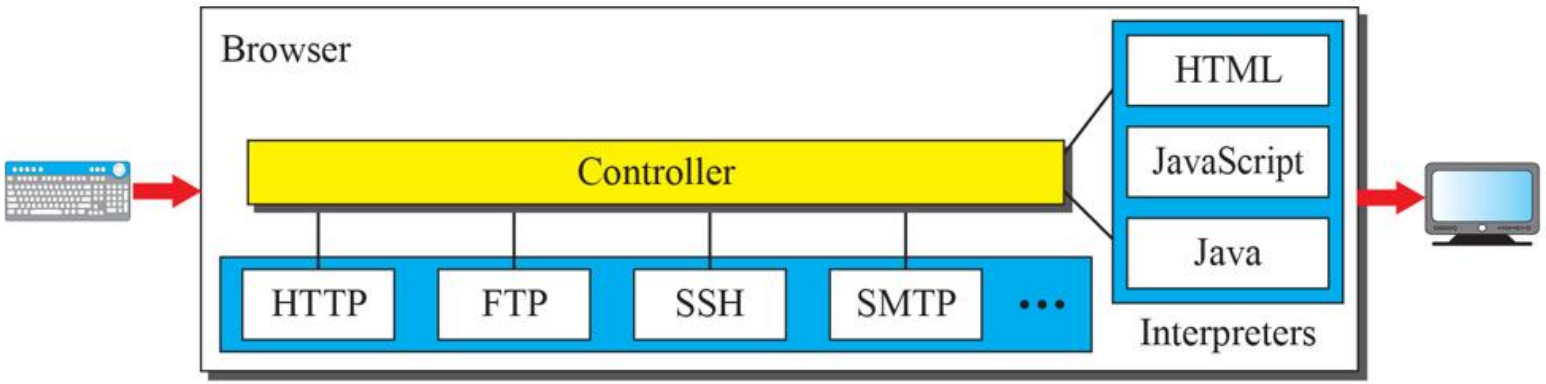


Figure 26.5: Formats of the request and response messages

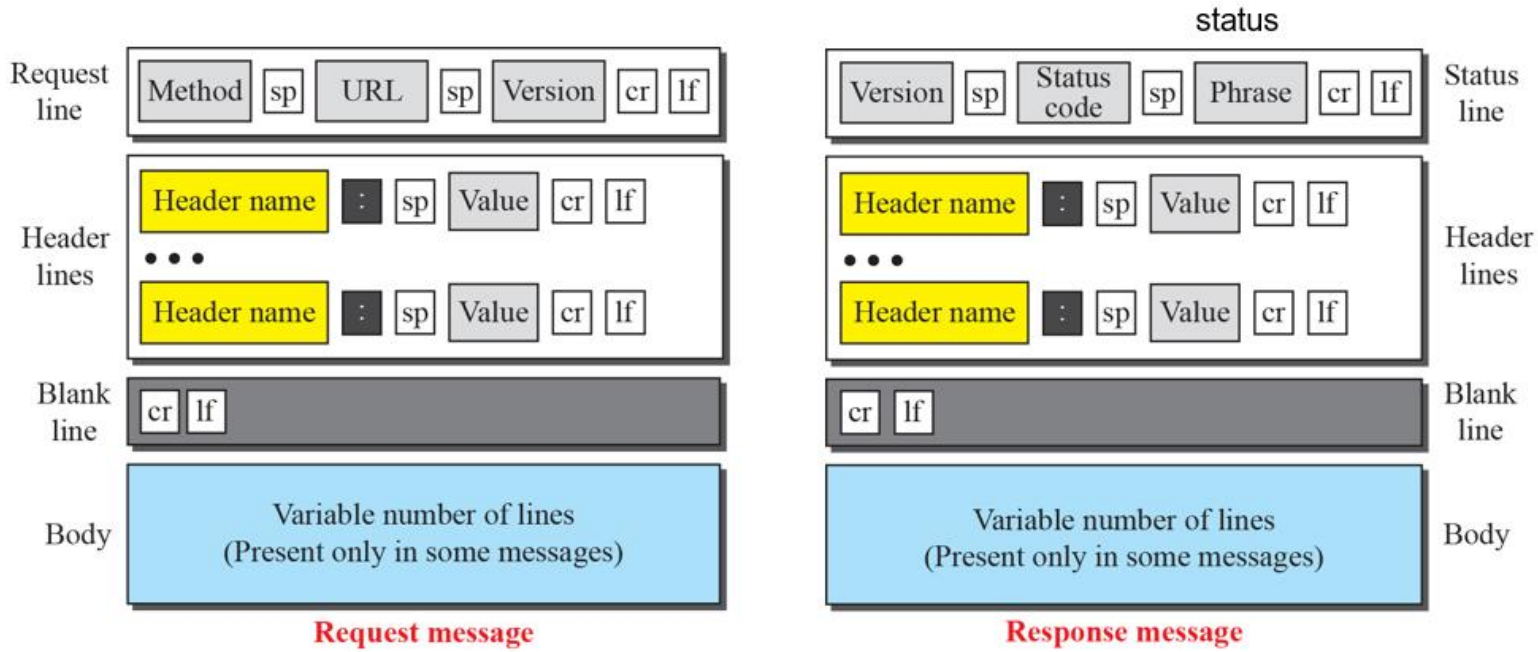


Figure 26.5: Formats of the request and response messages

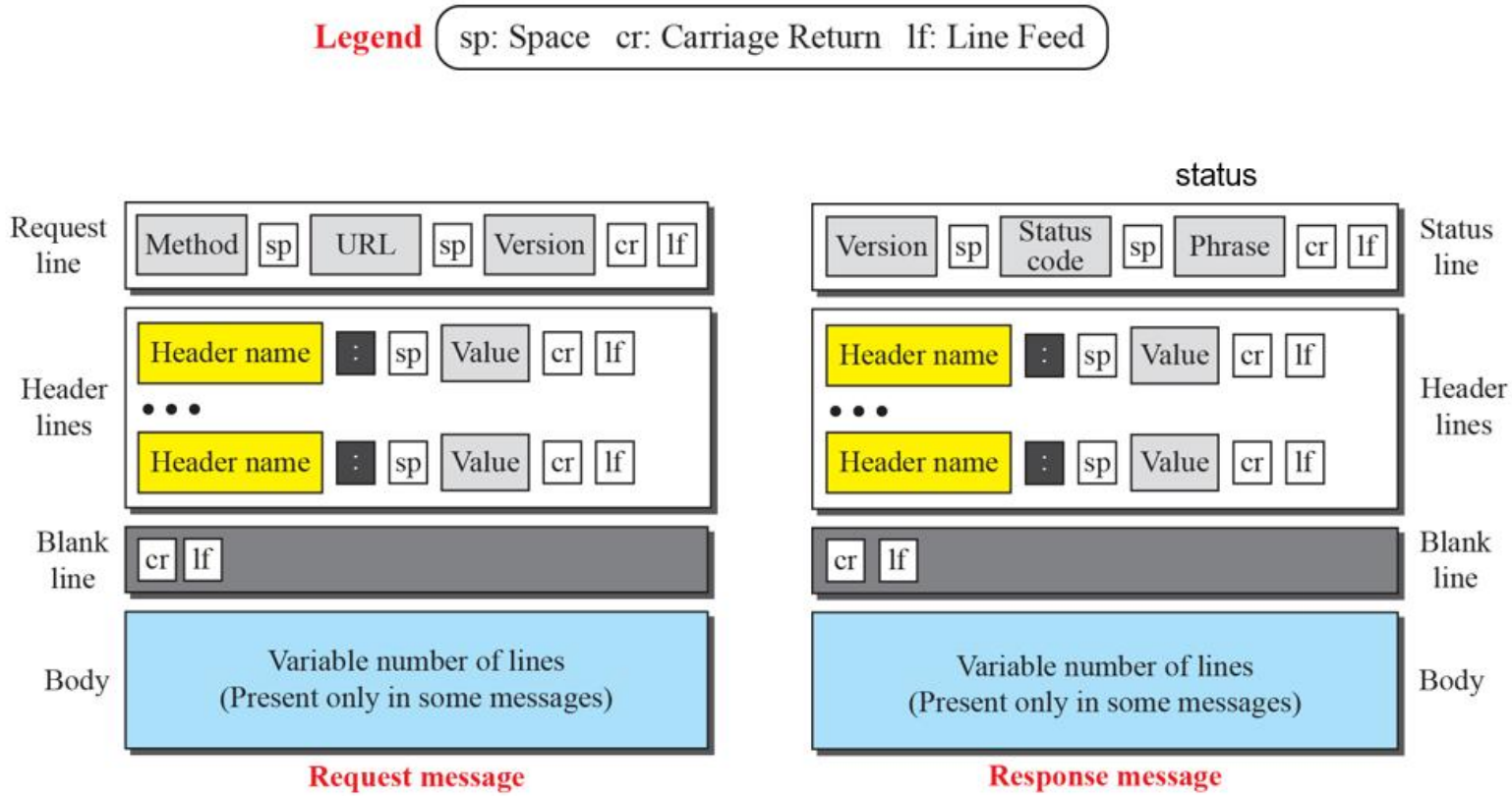
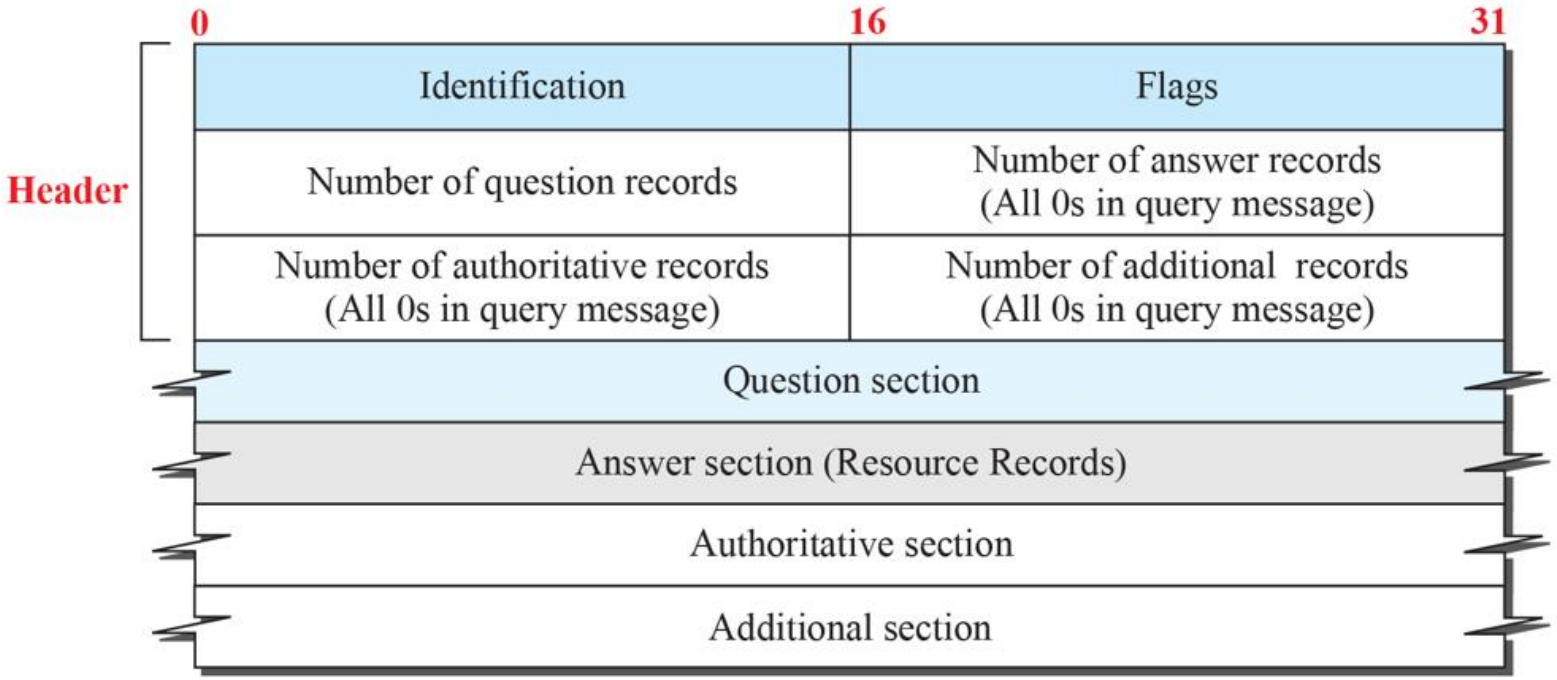


Figure 26.27: SSH Packet Format

Figure 26.38: DNS message



Note:

The query message contains only the question section. The response message includes the question section, the answer section, and possibly two other sections.