The Internet Protocol version 4
(IPv4)
is the
mandatory, successful protocol
used in
today's network .

The Internet Protocol version 4 (IPv4)

is….

a simple protocol

The Internet Protocol version 4 (IPv4)

is….

a connectionless protocol

The Internet Protocol version 4 (IPv4)

Provides ….

Only best effort services

The Internet Protocol version 4 (IPv4)

provides

1. Addressing
2. Fragmentation
3. Preliminary QOS

The Internet Protocol version 4 (IPv4)

Doesn’t provide

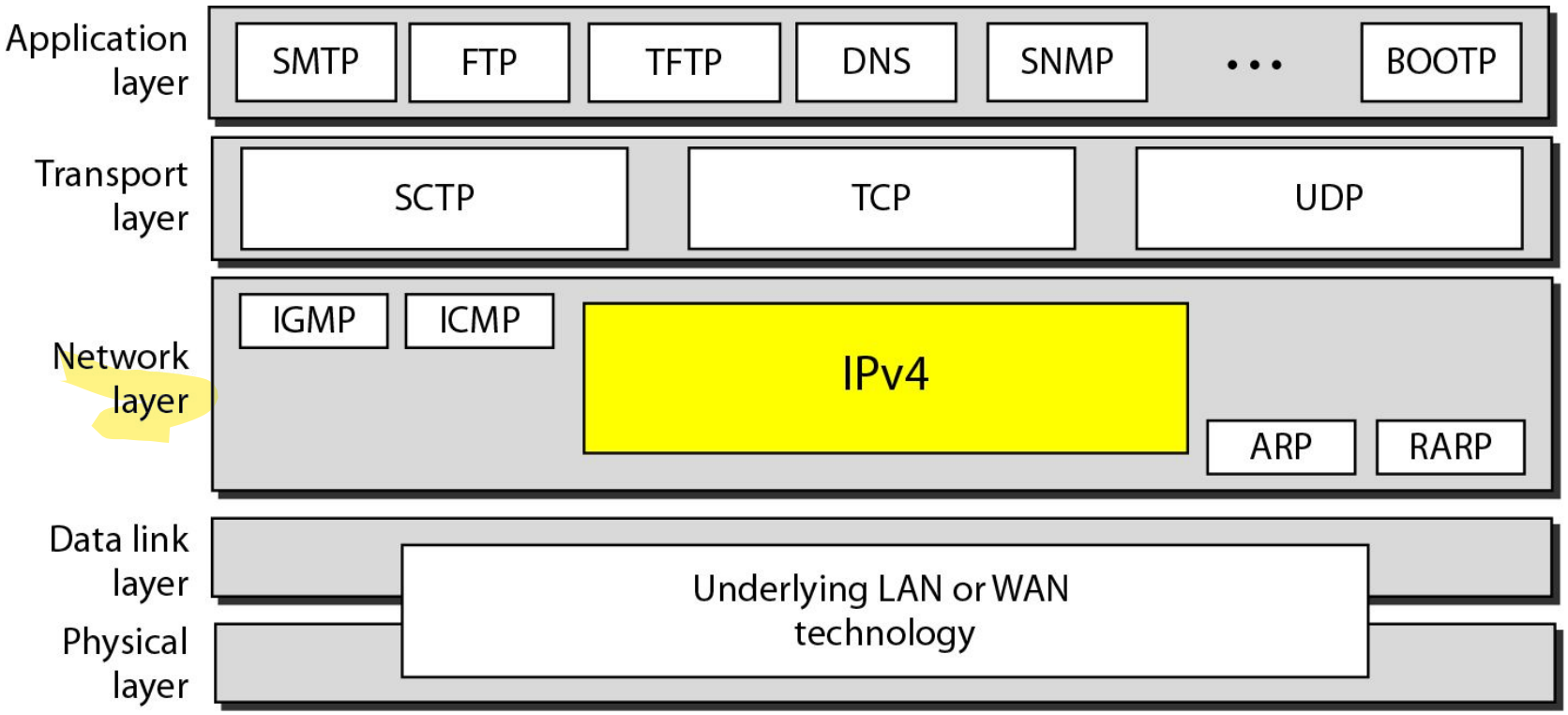
Error control

The Internet Protocol version 4 (IPv4)

Doesn’t provide

Flow control

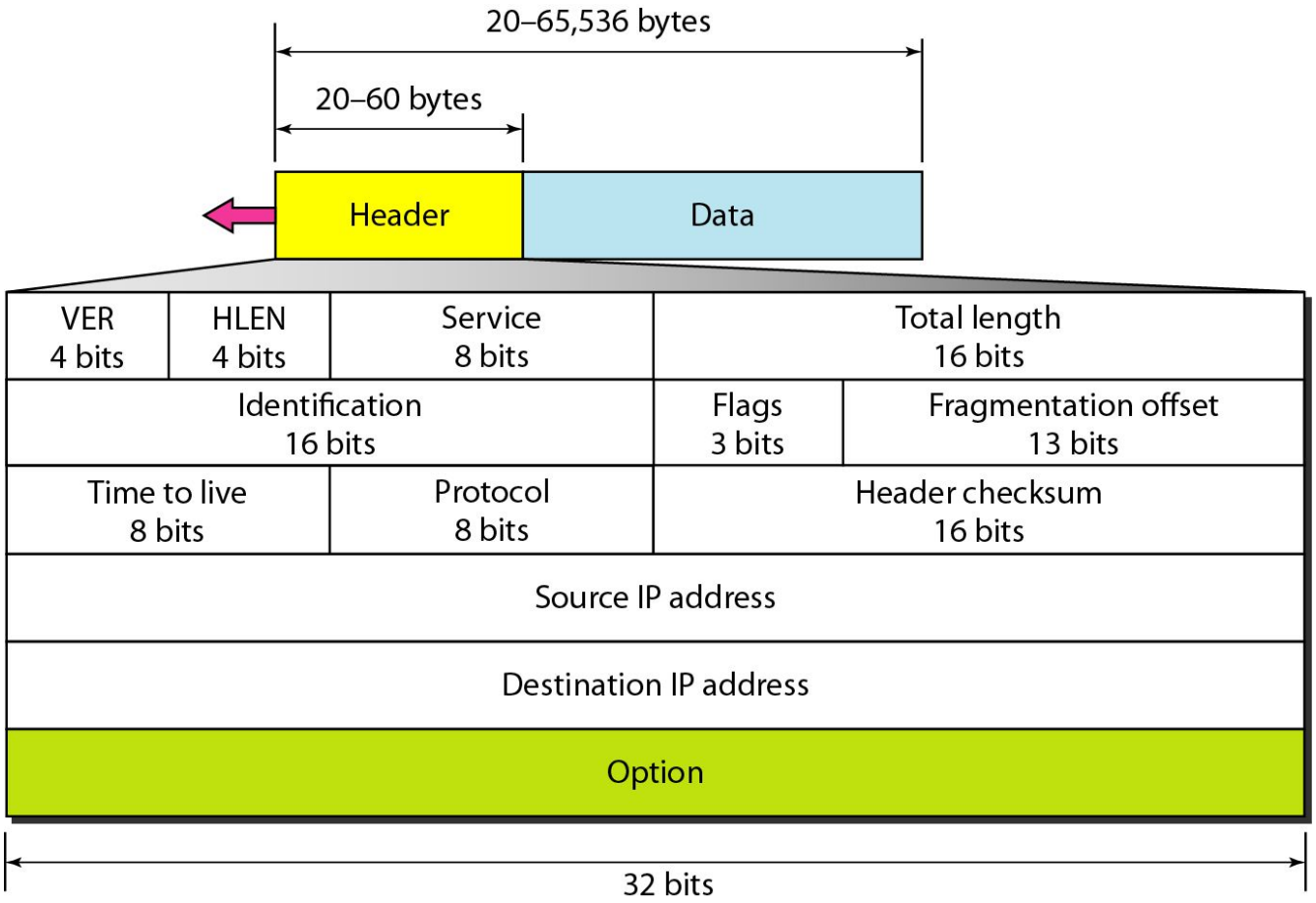
Figure 20.4 *Position of IPv4 in TCP/IP protocol suite*



The Internet Protocol version 4 (IPv4)

Let us understand,
the **IP Header**

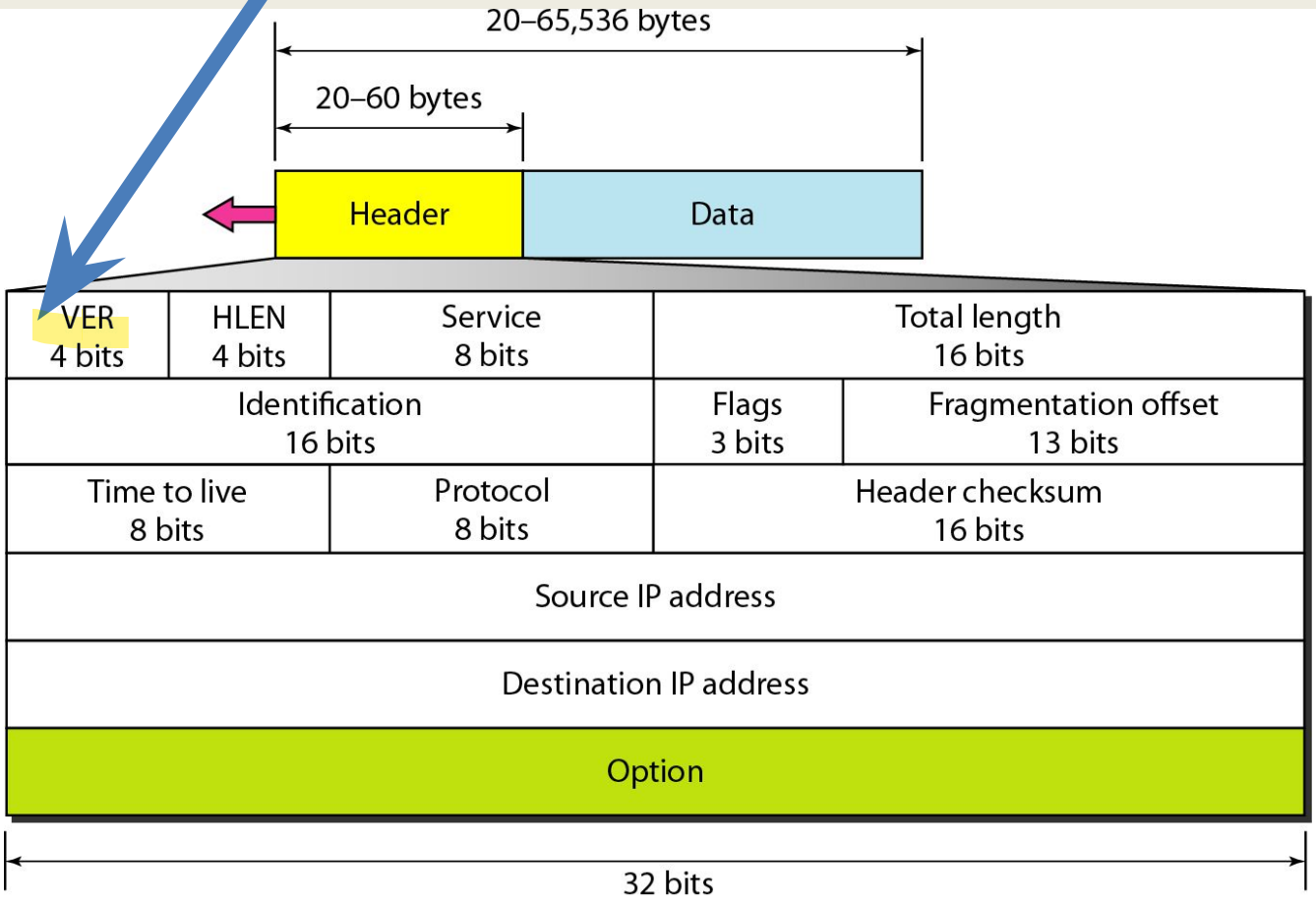
Figure 20.5 *IPv4 datagram format*



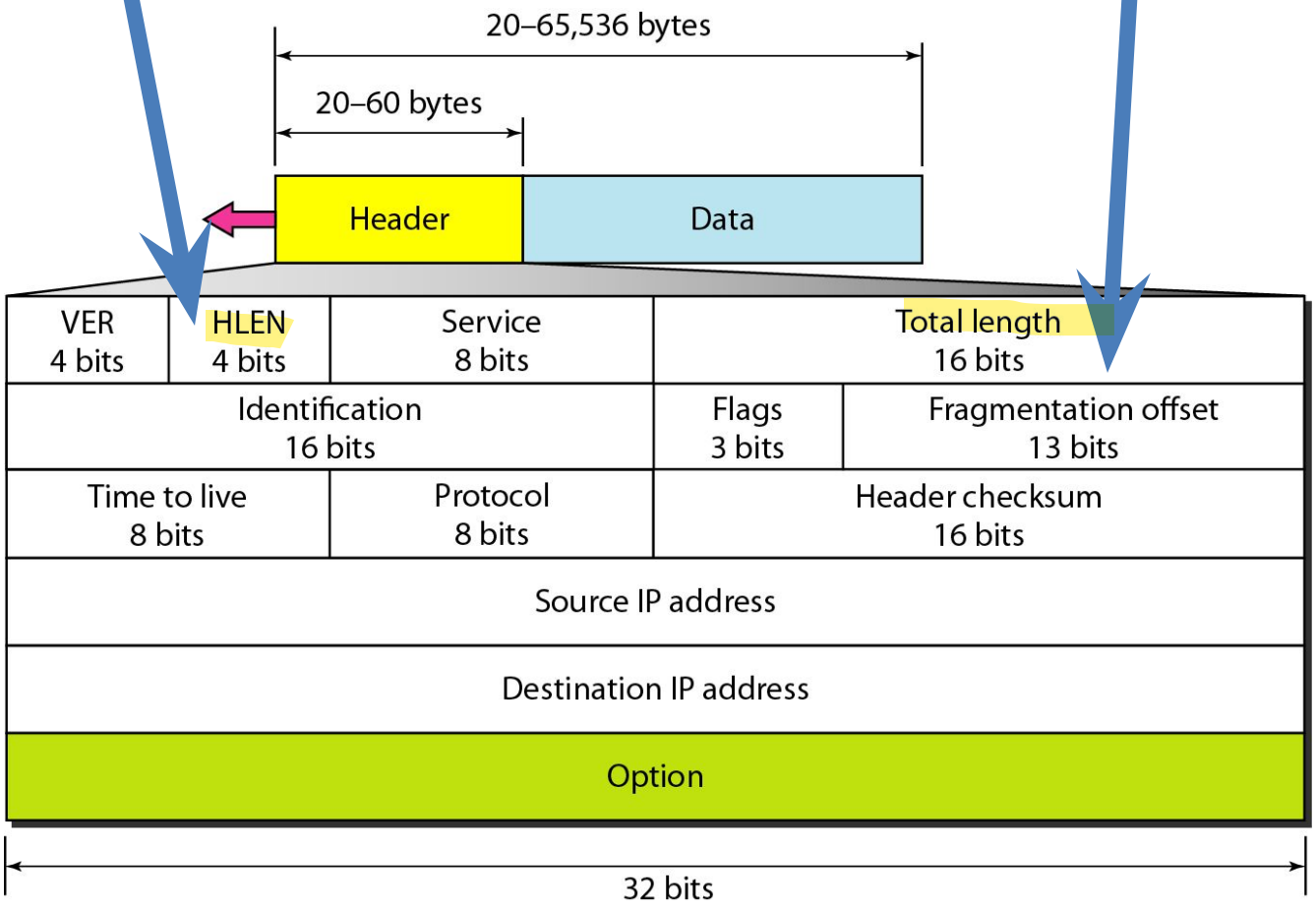
Represents the version

Current version is 4

Next version is #4



These fields are used to indicate the length of the datagram



This field is used to provide QOS

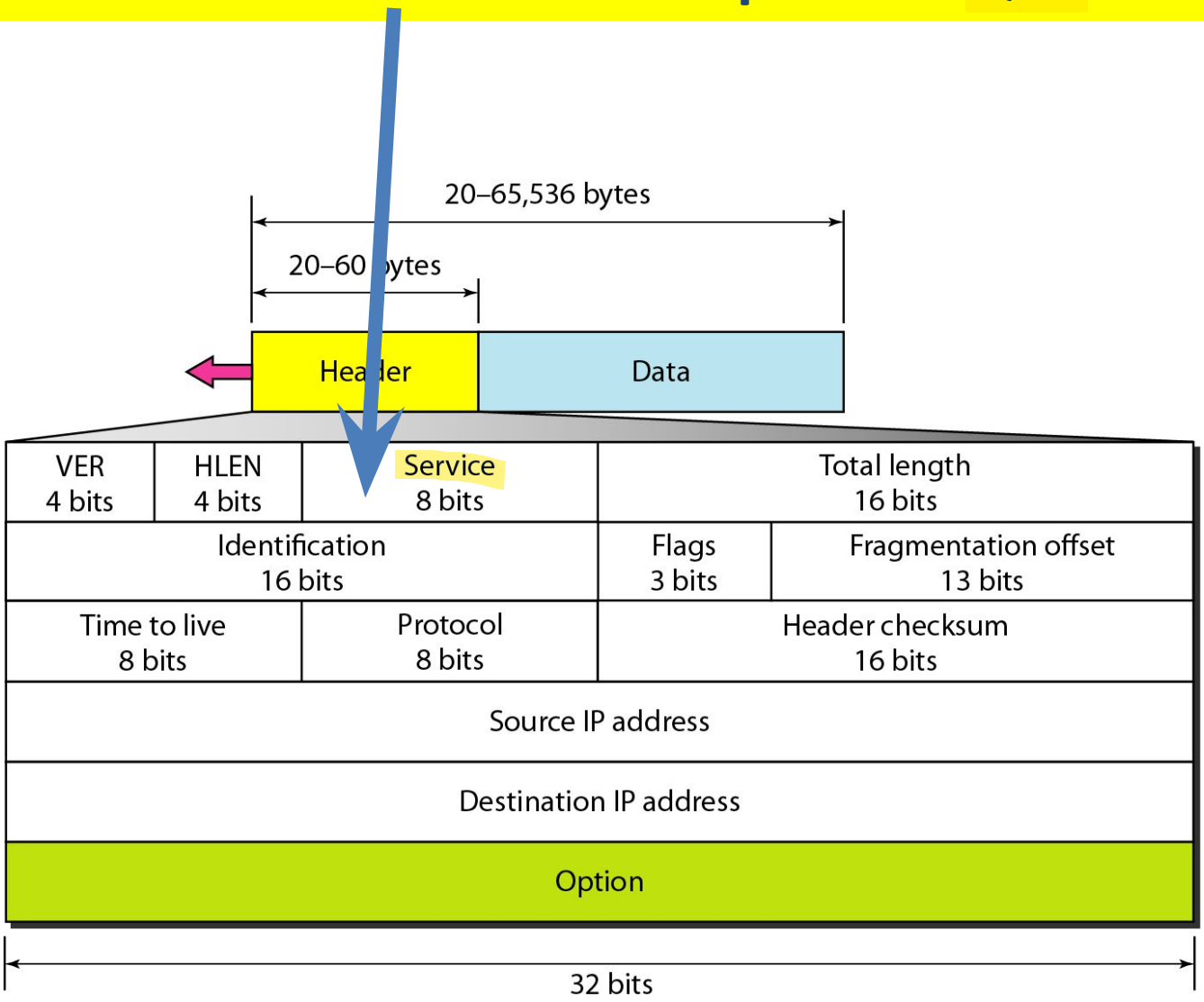


Figure 20.6 *Service type or differentiated services*

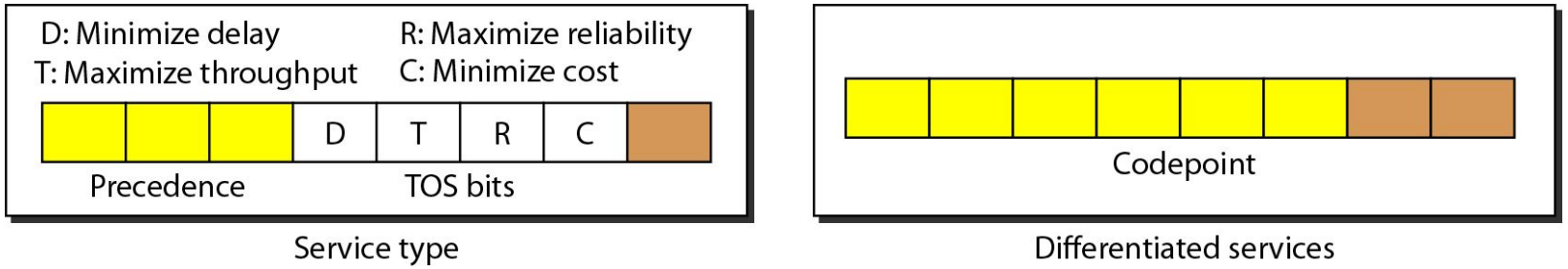
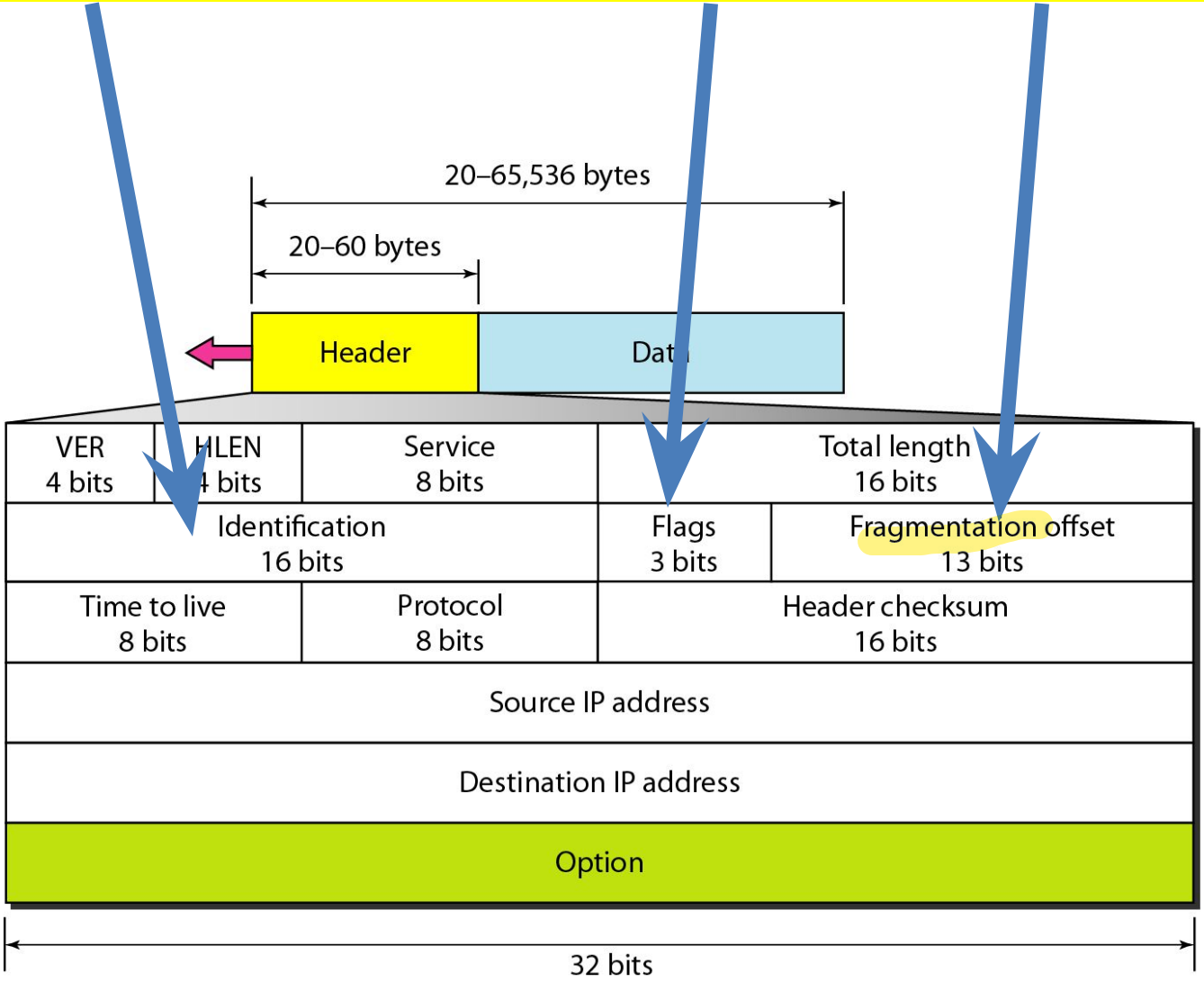


Table 20.1 *Types of service*

TOS Bits	*Description*
0000	Normal (default)
0001	Minimize cost
0010	Maximize reliability
0100	Maximize throughput
1000	Minimize delay

These fields are used to take care of FRAGMENTATION



What is Fragmentation in IP?

Internet is the network of network of networks

Though IP is the common layer 3 , Network Layer Protocol,
there are variety of Layer 2 protocols like
Ethernet, HDLC, SDLC, Bluetooth

Packet has to travel through many data links

Each data link can allow a maximum size of frame

This is called Maximum Transfer Unit

{MTU }

This process is called fragmentation

Table 20.5 *MTUs for some networks*

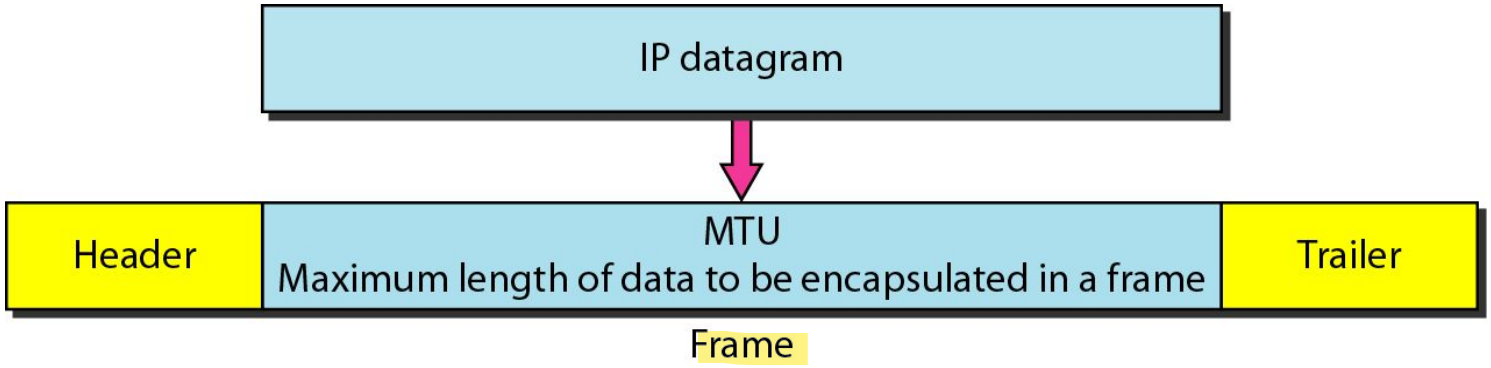
Protocol	*MTU*
Hyperchannel	65,535
Token Ring (16 Mbps)	17,914
Token Ring (4 Mbps)	4,464
FDDI	4,352
Ethernet	1,500
X.25	576
PPP	296

So,

Datagram may have to be split
in to smaller chunks ,
either at source host
or
at intermediate routers
to suit the
Maximum Transfer Unit
{MTU }

This process is ca

Figure 20.9 *Maximum transfer unit (MTU)*



These fields are used to take care of FRAGMENTATION

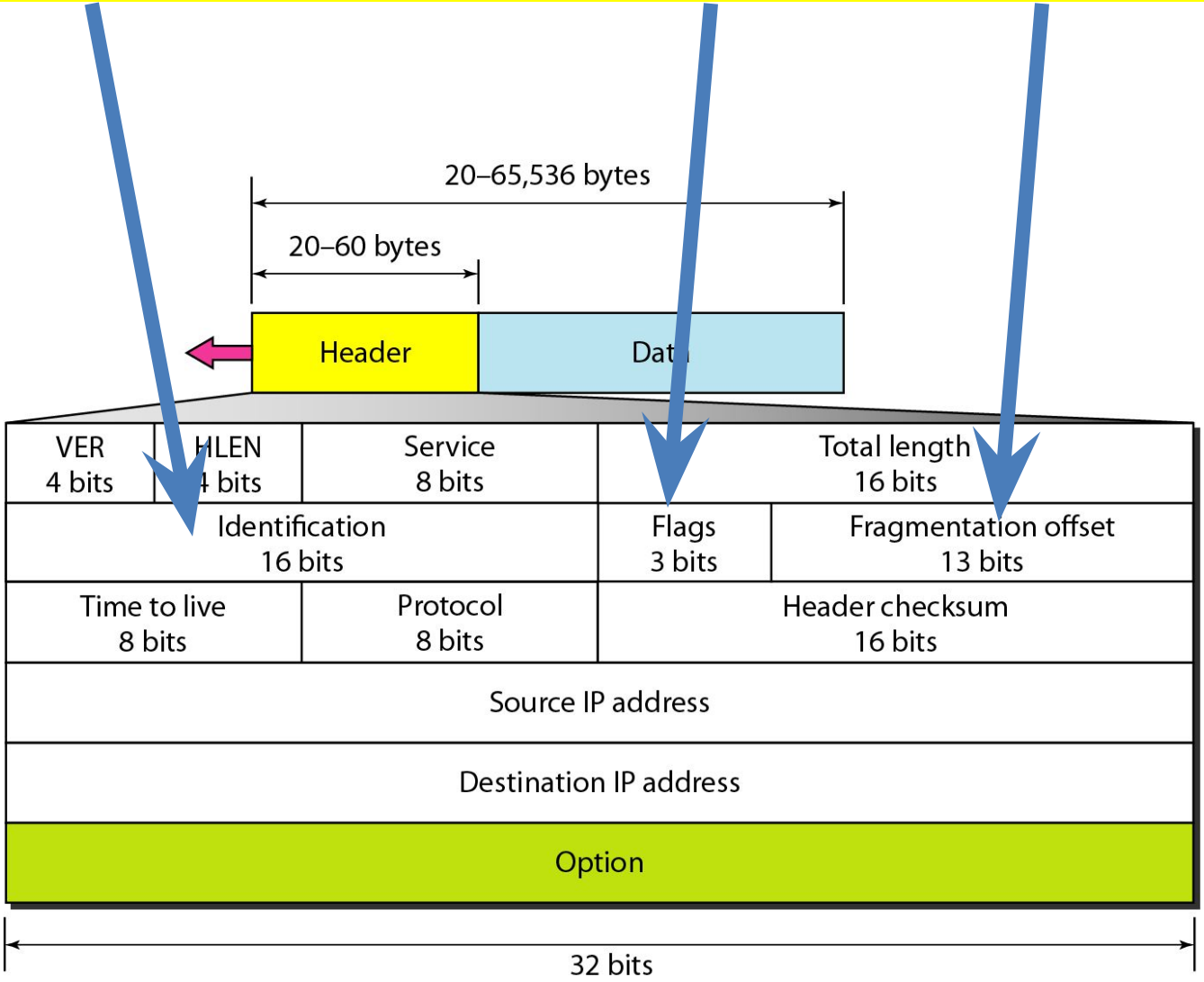


Figure 20.10 *Flags used in fragmentation*

Figure 20.11 *Fragmentation example*

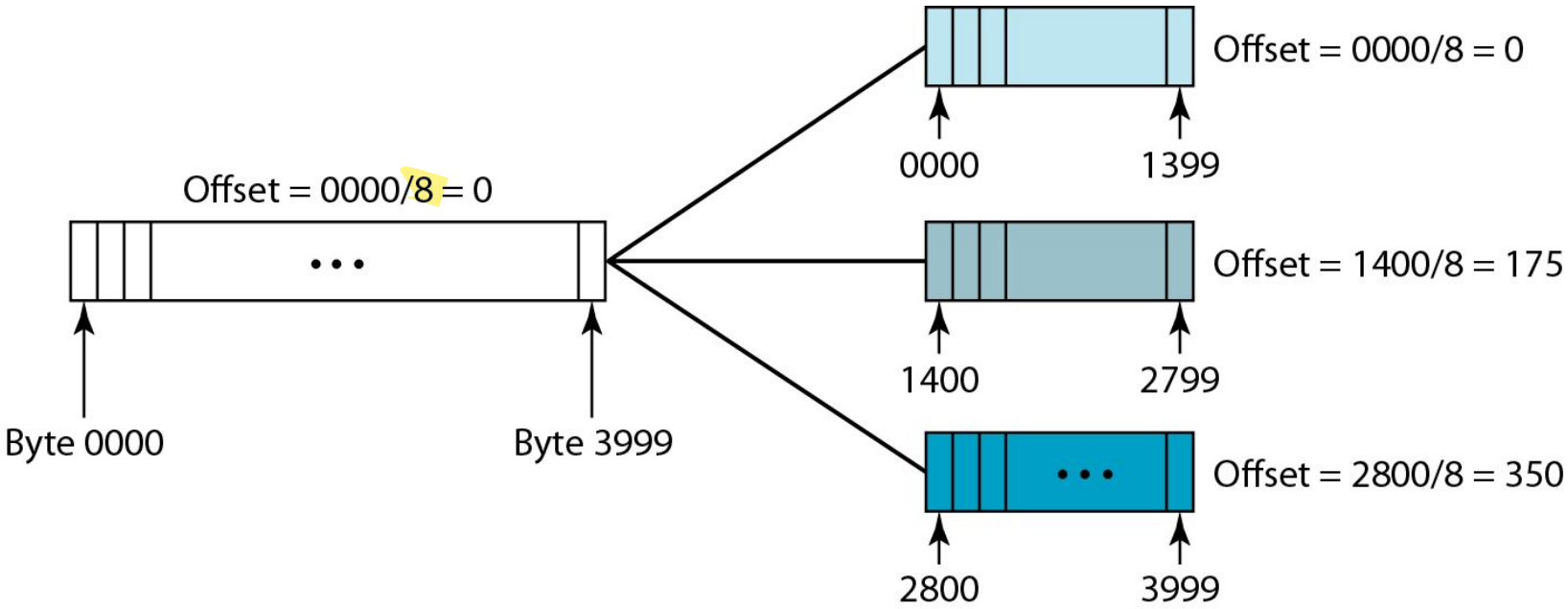
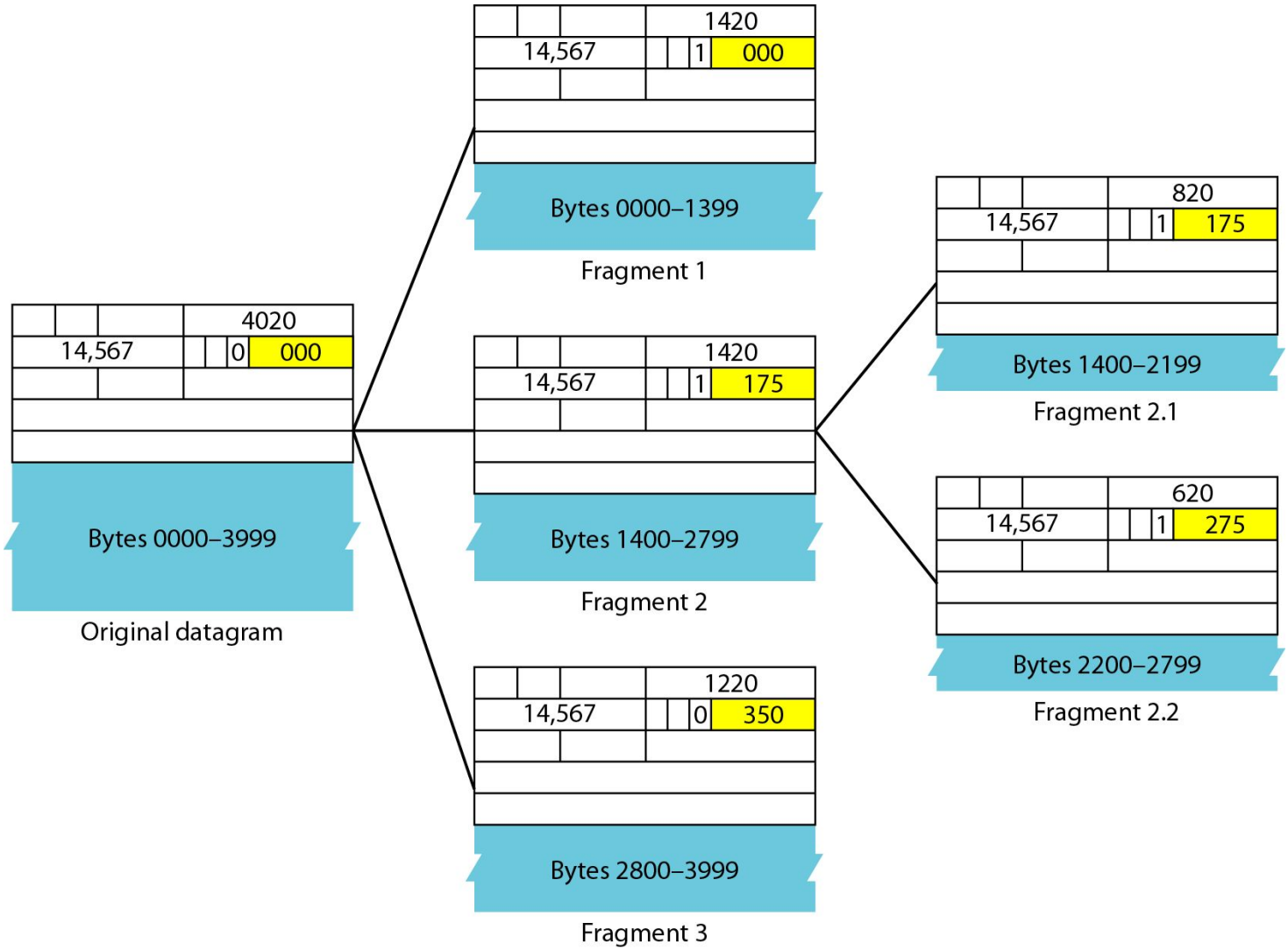


Figure 20.12 *Detailed fragmentation example*



Example 20.5

A packet has arrived with an M bit value of 0. Is this the first fragment, the last fragment, or a middle fragment? Do we know if the packet was fragmented?

Solution

If the M bit is 0, it means that there are no more fragments; the fragment is the last one. However, we cannot say if the original packet was fragmented or not. A non-fragmented packet is considered the last fragment.

Example 20.6

A packet has arrived with an M bit value of 1. Is this the first fragment, the last fragment, or a middle fragment? Do we know if the packet was fragmented?

Solution

If the M bit is 1, it means that there is at least one more fragment. This fragment can be the first one or a middle one, but not the last one. We don't know if it is the first one or a middle one; we need more information (the value of the fragmentation offset).

Example 20.7

A packet has arrived with an M bit value of 1 and a fragmentation offset value of 0. Is this the first fragment, the last fragment, or a middle fragment?

Solution

Because the M bit is 1, it is either the first fragment or a middle one. Because the offset value is 0, it is the first fragment.

Example 20.8

A packet has arrived in which the offset value is 100. What is the number of the first byte? Do we know the number of the last byte?

Solution

To find the number of the first byte, we multiply the offset value by 8. This means that the first byte number is 800. We cannot determine the number of the last byte unless we know the length.

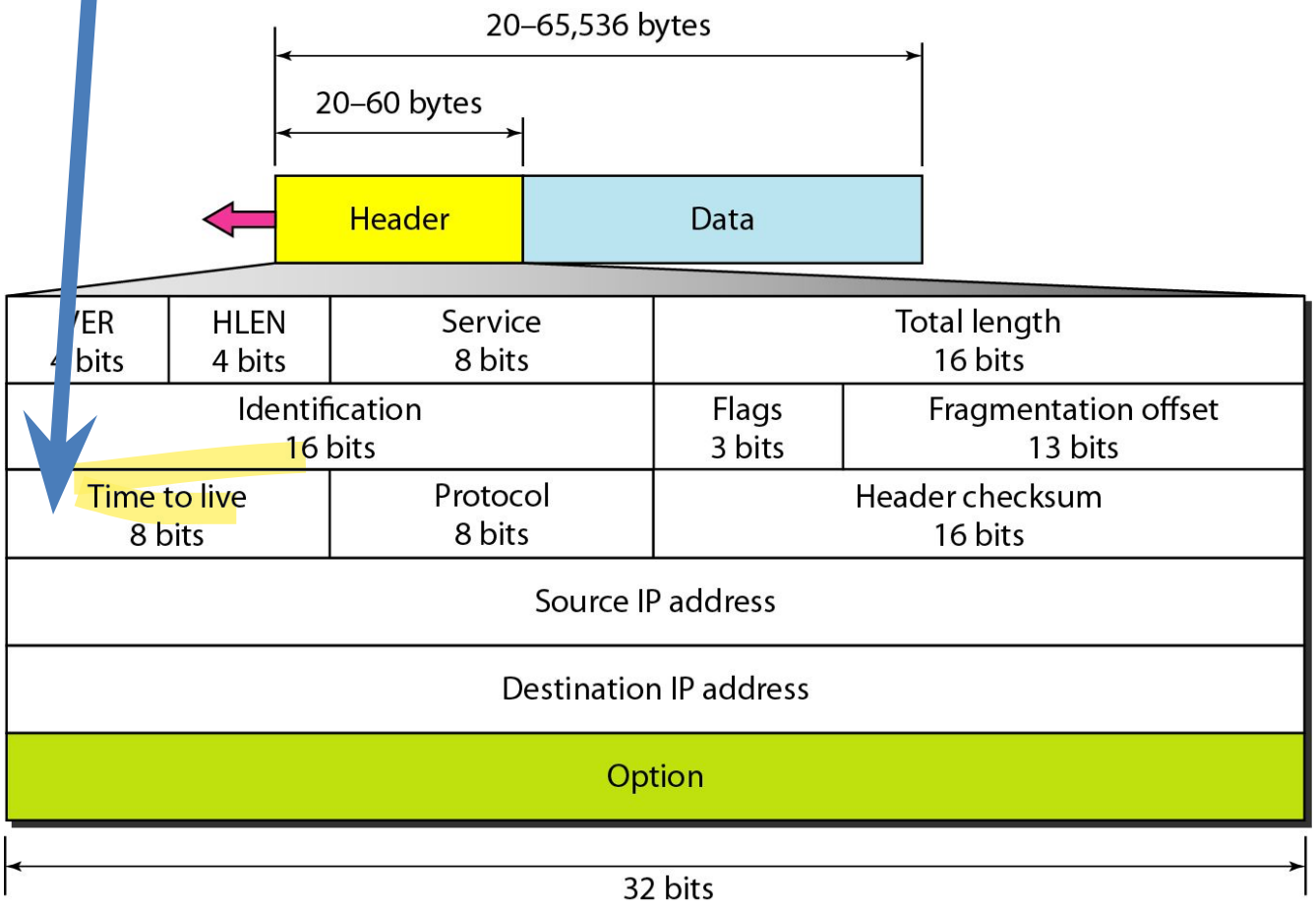
Example 20.9

A packet has arrived in which the offset value is 100, the value of HLEN is 5, and the value of the total length field is 100. What are the numbers of the first byte and the last byte?

Solution

The first byte number is 100 × 8 = 800. The total length is 100 bytes, and the header length is 20 bytes (5 × 4), which means that there are 80 bytes in this datagram. If the first byte number is 800, the last byte number must be 879.

This field is to indicate the life of the packet



This field is to indicate the upper layer protocol

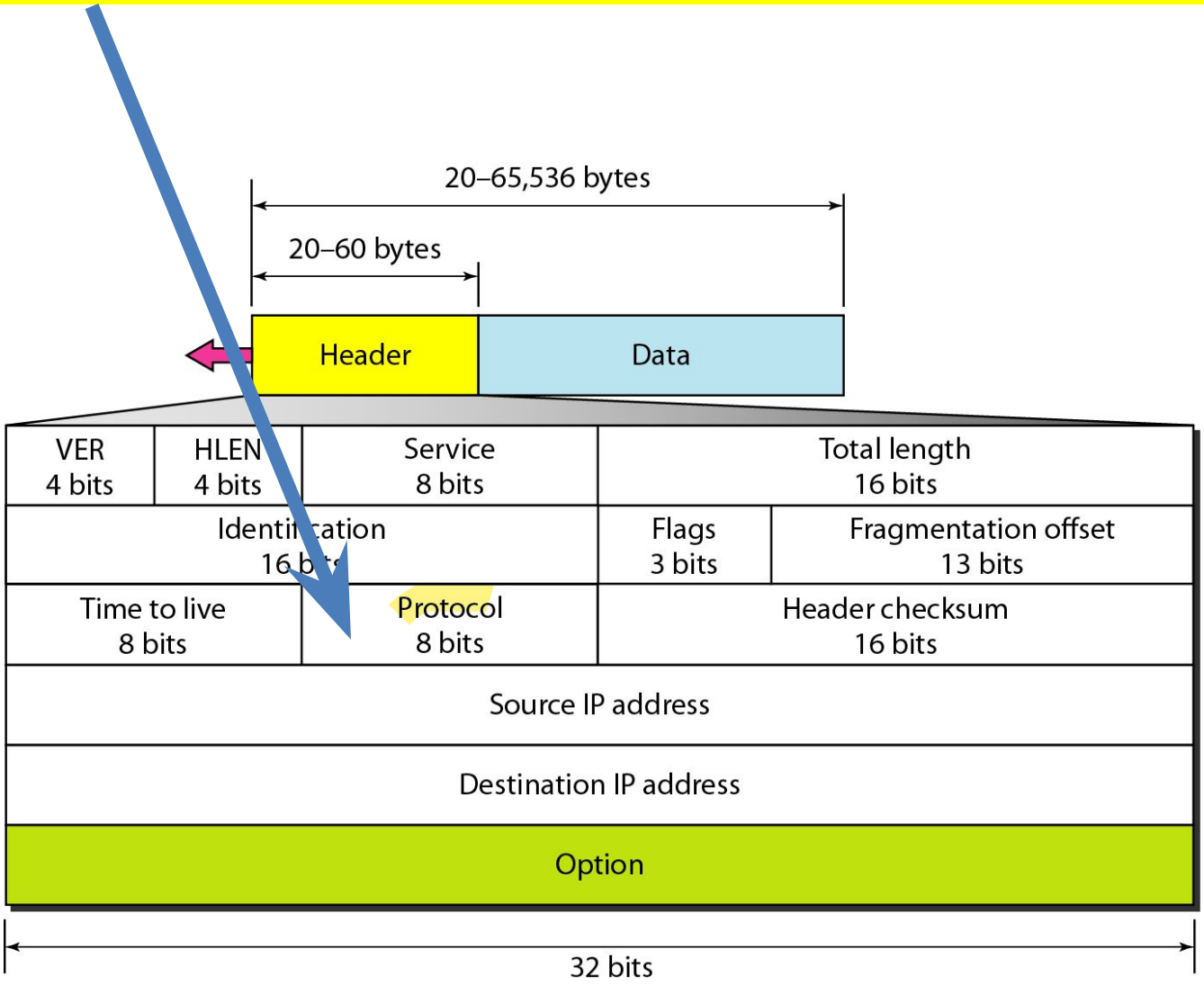


Figure 20.8 *Protocol field and encapsulated data*

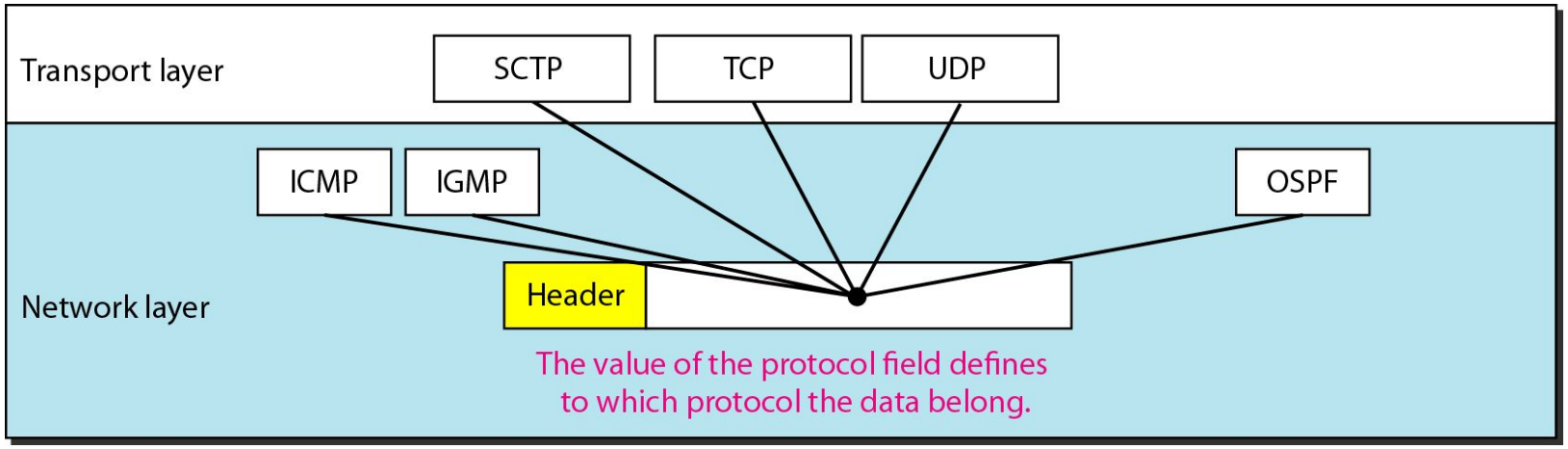
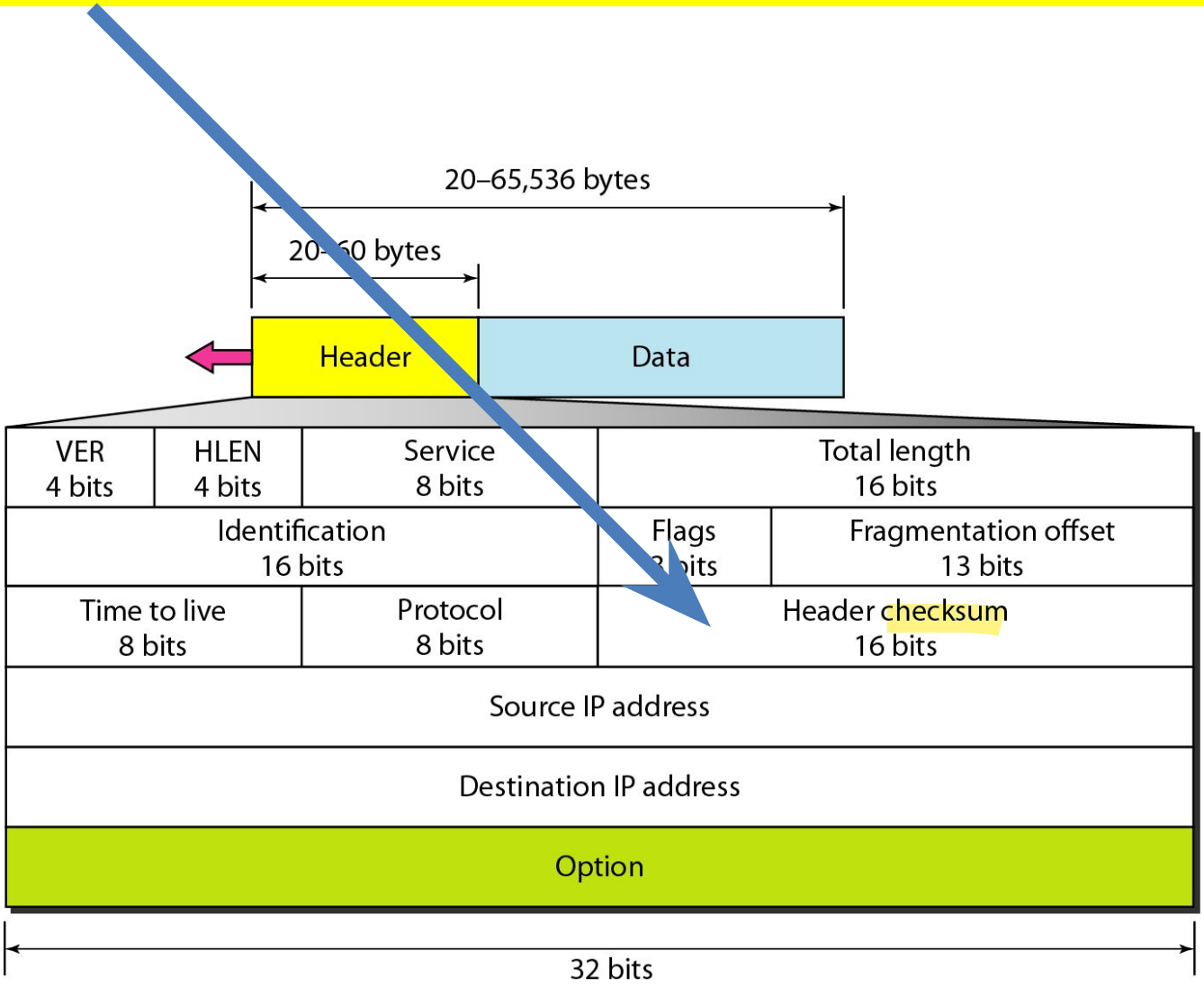


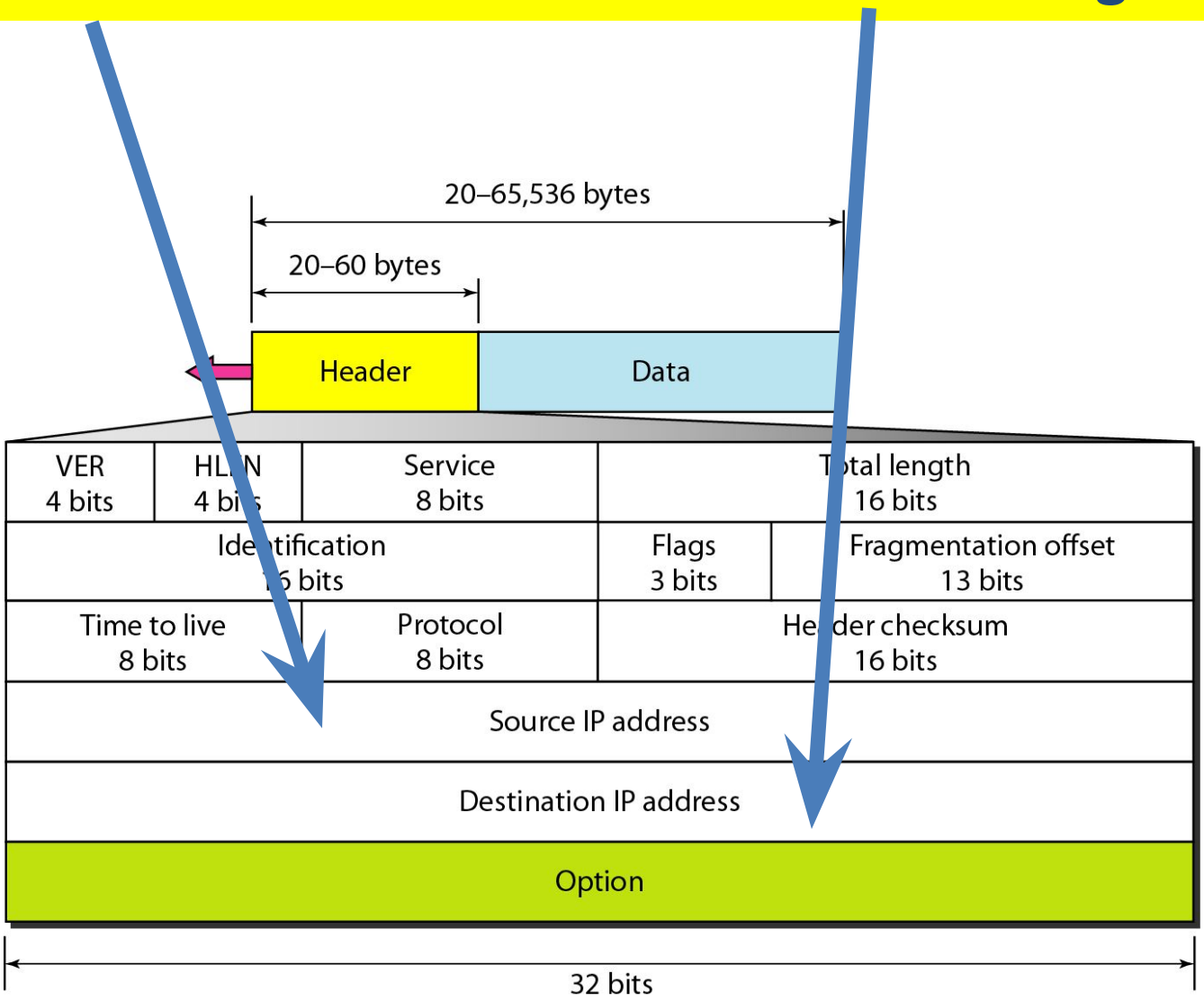
Table 20.4 *Protocol values*

Value	*Protocol*
1	ICMP
2	IGMP
6	TCP
17	UDP
89	OSPF

This field is check the error in the header



These fields are used for addressing



These are the optional fields to provide additional fields

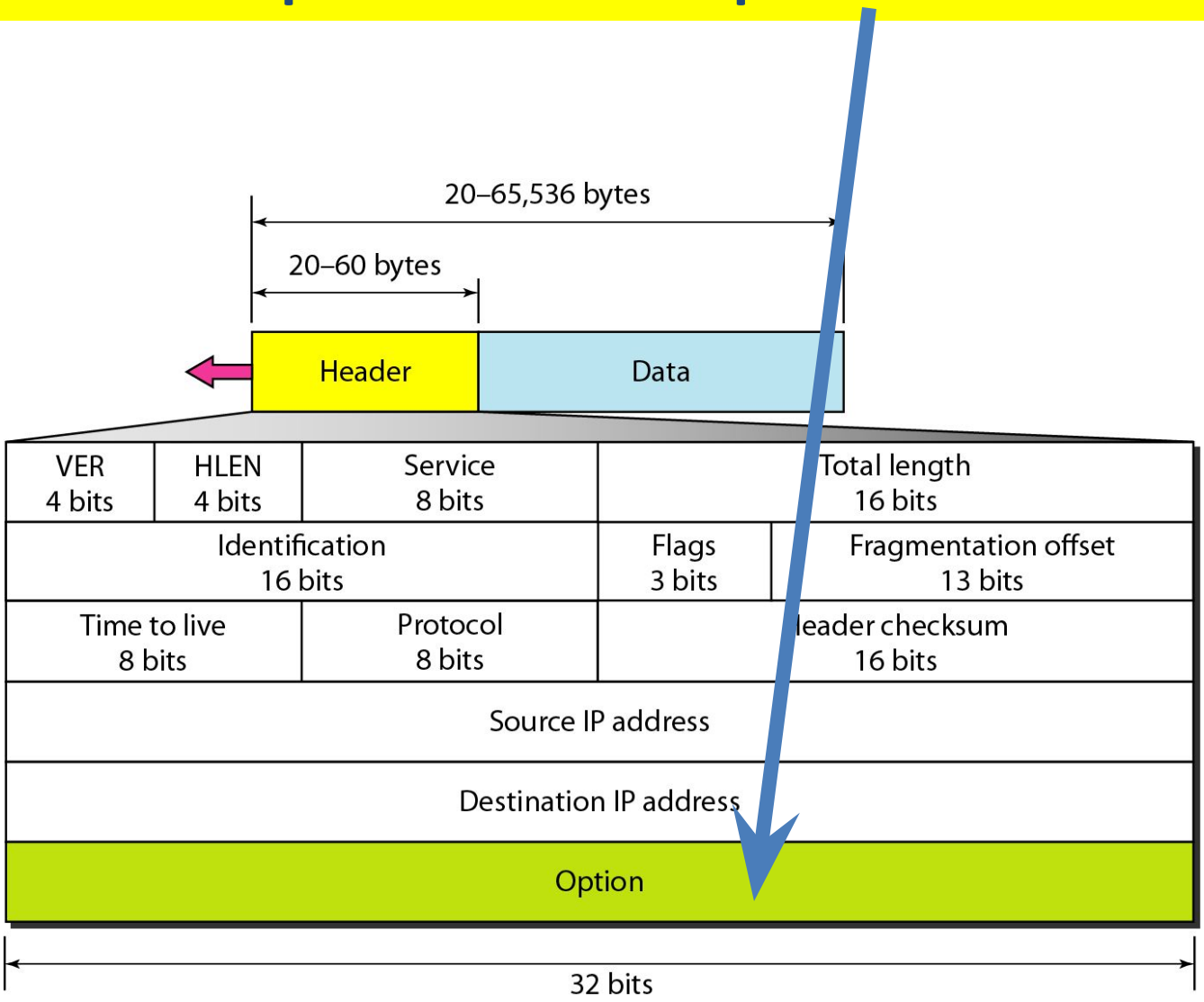


Figure 20.14 *Taxonomy of options in IPv4*