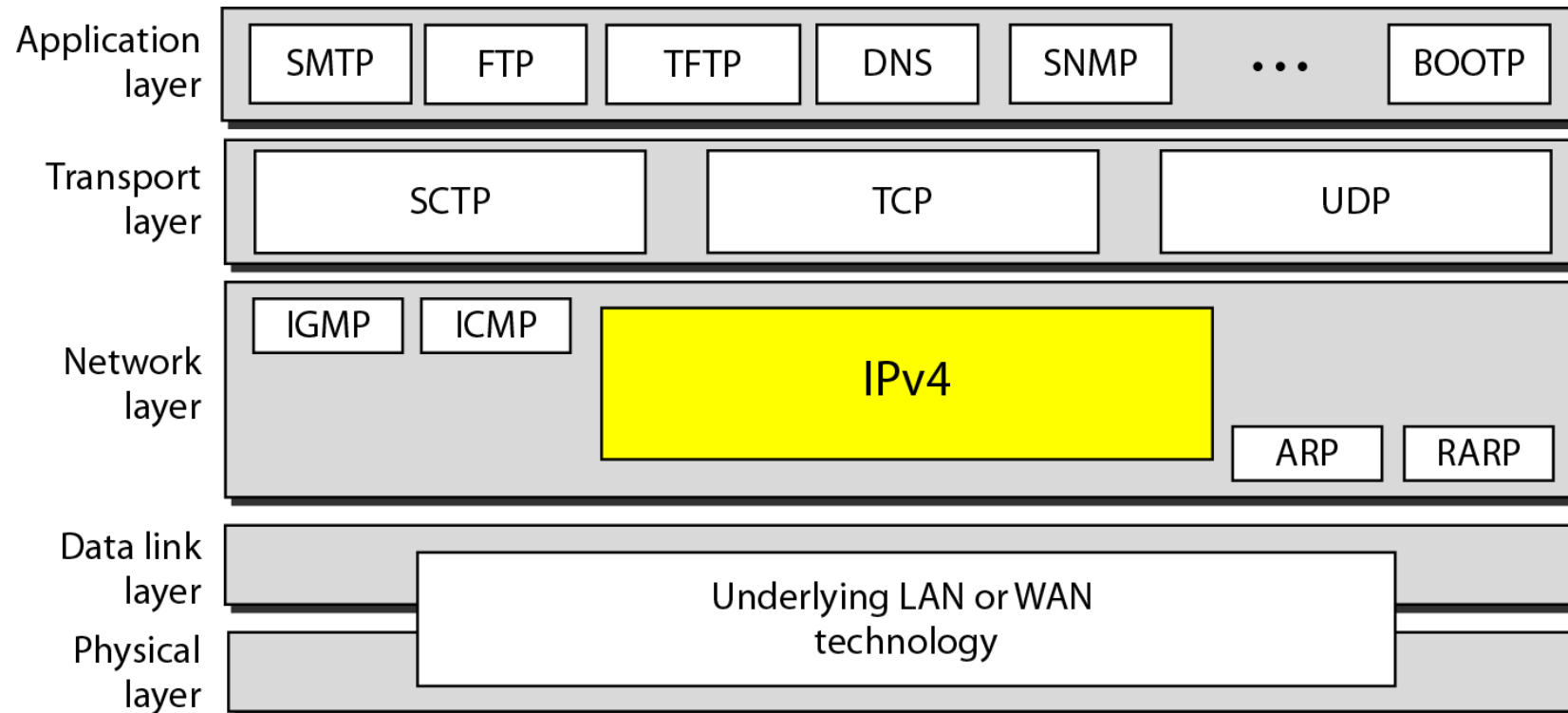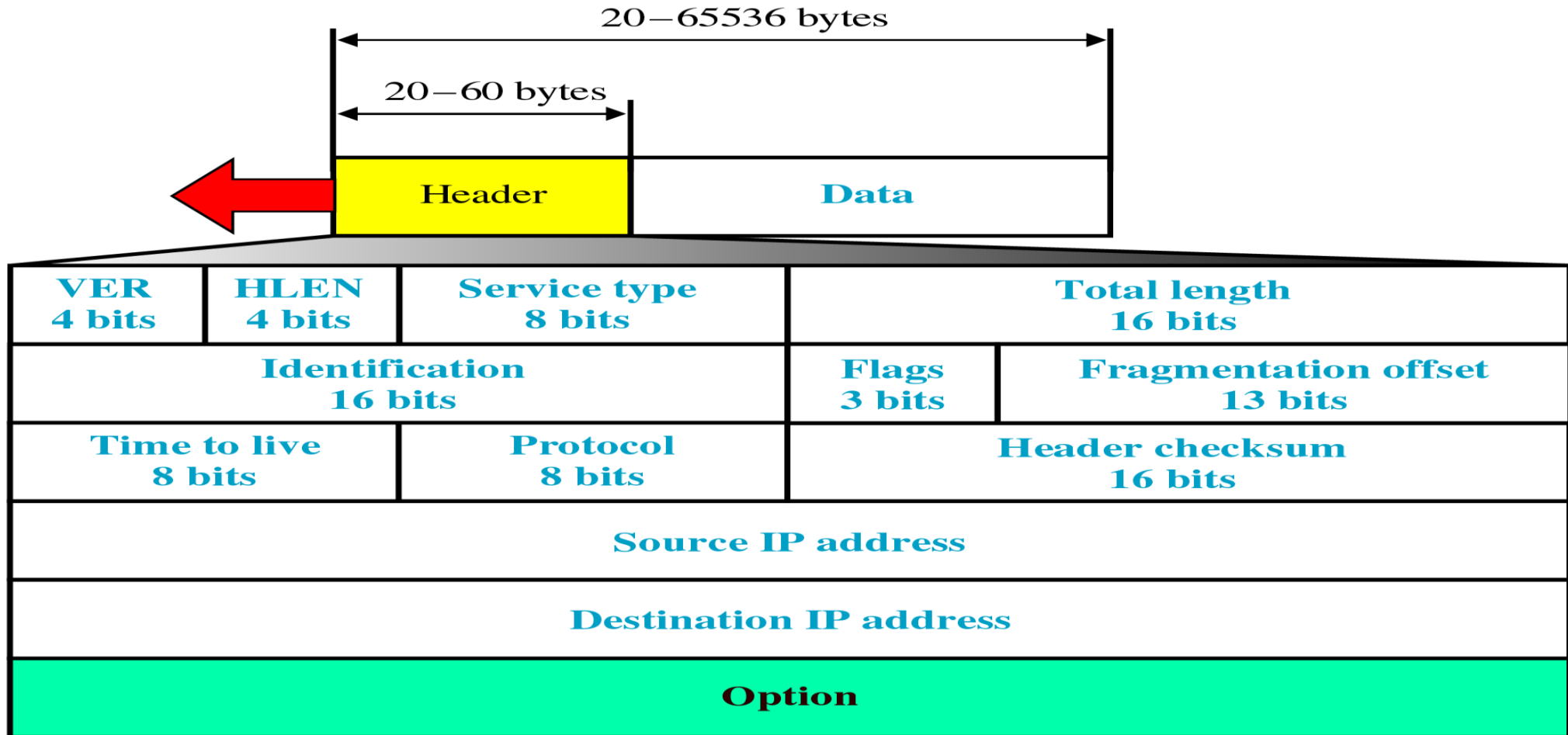# COMPUTER NETWORKS RCS – 601

IP PROTOCOL- IPv4

Internet Protocol(IP)

- The Internet Protocol version 4 (IPv4) is the delivery mechanism used by the TCP/IP protocols.

- Enables networking across networks that are not connected at level 2 (data-link).

- Defines IP addresses and how to route network packets.

- Defines a uniform mechanism to access resources between internets

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

IP Packet Format


```
                    20−65536 bytes

            20−60 bytes

←    [ Header ]    [         Data         ]
```

VER 4 bits	HLEN 4 bits	Service type 8 bits		Total length 16 bits
Identification 16 bits			Flags 3 bits	Fragmentation offset 13 bits
Time to live 8 bits		Protocol 8 bits	Header checksum 16 bits	
Source IP address				
Destination IP address				
Option				

Fields of IP Header

- **Version:** Version no. of Internet Protocol used (e.g. IPv4).
- **IHL:** Internet Header Length; Length of entire IP header.
- **DSCP:** Differentiated Services Code Point; this is Type of Service.
- **ECN:** Explicit Congestion Notification; It carries information about the congestion seen in the route.
- **Total Length:** Length of entire IP Packet (including IP header and IP Payload).
- **Identification:** If IP packet is fragmented during the transmission, all the fragments contain same identification number. to identify original IP packet they belong to.
- **Flags:** As required by the network resources, if IP Packet is too large to handle, these 'flags' tells if they can be fragmented or not. In this 3-bit flag, the MSB is always set to '0'.
- **Fragment Offset:** This offset tells the exact position of the fragment in the original IP Packet.

Fields of IP Header

- **Time to Live:** To avoid looping in the network, every packet is sent with some TTL value set, which tells the network how many routers (hops) this packet can cross. At each hop, its value is decremented by one and when the value reaches zero, the packet is discarded.

- **Protocol:** Tells the Network layer at the destination host, to which Protocol this packet belongs to, i.e. the next level Protocol. For example protocol number of ICMP is 1, TCP is 6 and UDP is 17.

- **Header Checksum:** This field is used to keep checksum value of entire header which is then used to check if the packet is received error-free.

- **Source Address:** 32-bit address of the Sender (or source) of the packet.

- **Destination Address:** 32-bit address of the Receiver (or destination) of the packet.

- **Options:** This is optional field, which is used if the value of IHL is greater than 5. These options may contain values for options such as Security, Record Route, Time Stamp, etc.