ICMP, IGMP, IPv6, Transition from IPv4 to IPv6

Lecture: 26-27

Department of Computer Science and Engineering,
Chitkara University, Punjab

Topic

- ICMP
- IGMP
- IPv6
- Transition from IPv4 to IPv6

Network Layer Protocols

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- Network Layer Protocols
  - *ARP*
  - *IPv4*
  - *ICMPv4*
  - *IPv6*
  - *ICMPv6*

Network Layer Protocols

- *ARP* Address Resolution Protocol
- *RARP* Reverse Address Resolution Protocol
- *IPv4* Internet Protocol Version 4
- *ICMPv4* Internet Control Message Protocol Version 4
- *IPv6* Internet Protocol Version 6
- *ICMPv6* Internet Control Message Protocol Version 6
- *IGMP* Internet Group Management Protocol

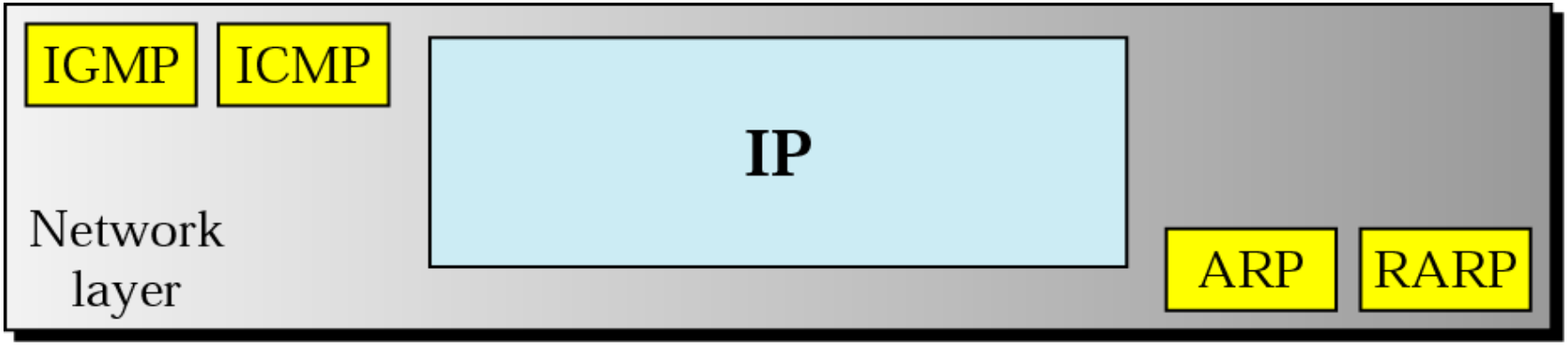

Figure 1 Network Layer Protocols

ICMP encapsulation

- ICMP encapsulation

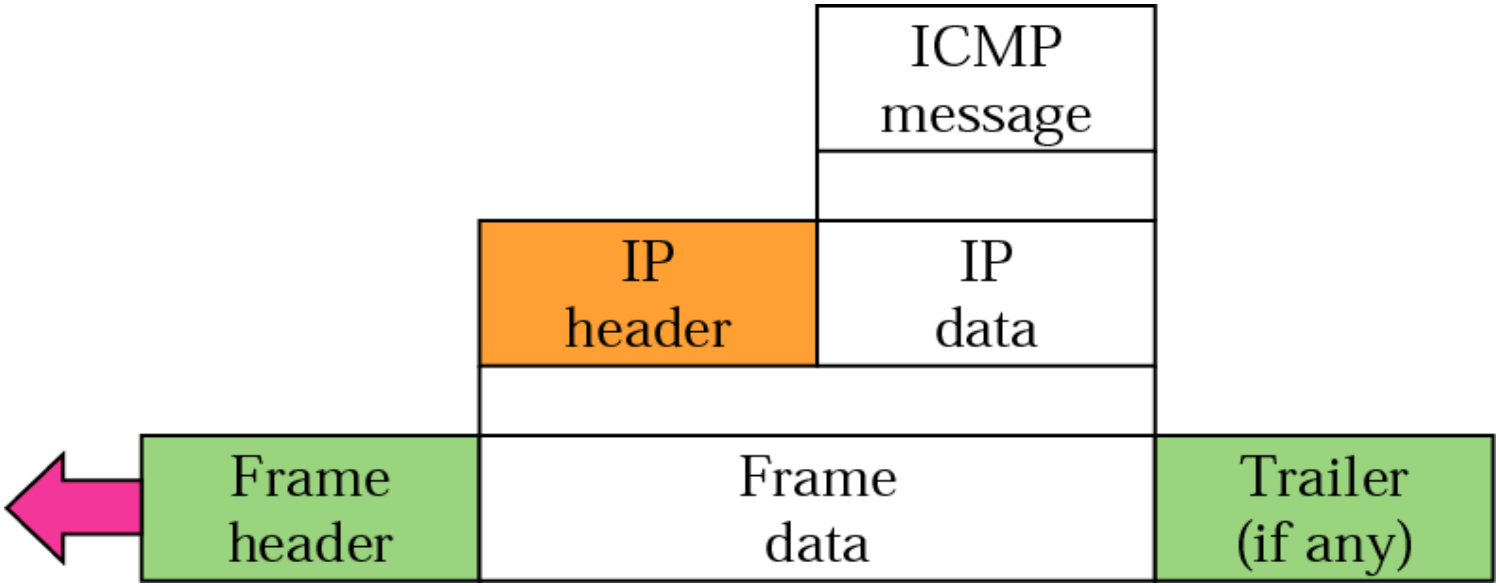

Figure 2 ICMP Encapsulation

ICMP need

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- Need of ICMP
  - *ICMP always reports error messages to the original source.*

ICMP encapsulation

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Table 1 *ICMP messages*

Category	*Type*	*Message*
Error-reporting messages	3	Destination unreachable
	4	Source quench
	11	Time exceeded
	12	Parameter problem
	5	Redirection
Query messages	8 or 0	Echo request or reply
	13 or 14	Timestamp request or reply
	17 or 18	Address mask request or reply
	10 or 9	Router solicitation or advertisement

Types of Error Reporting Messages

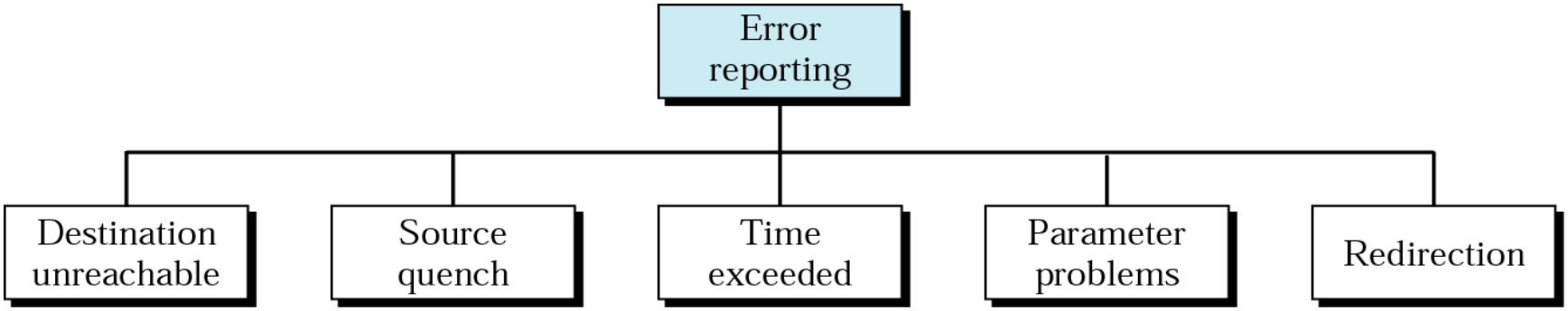

Figure 3 Types of Error Reporting Messages

Types of Error Reporting Messages

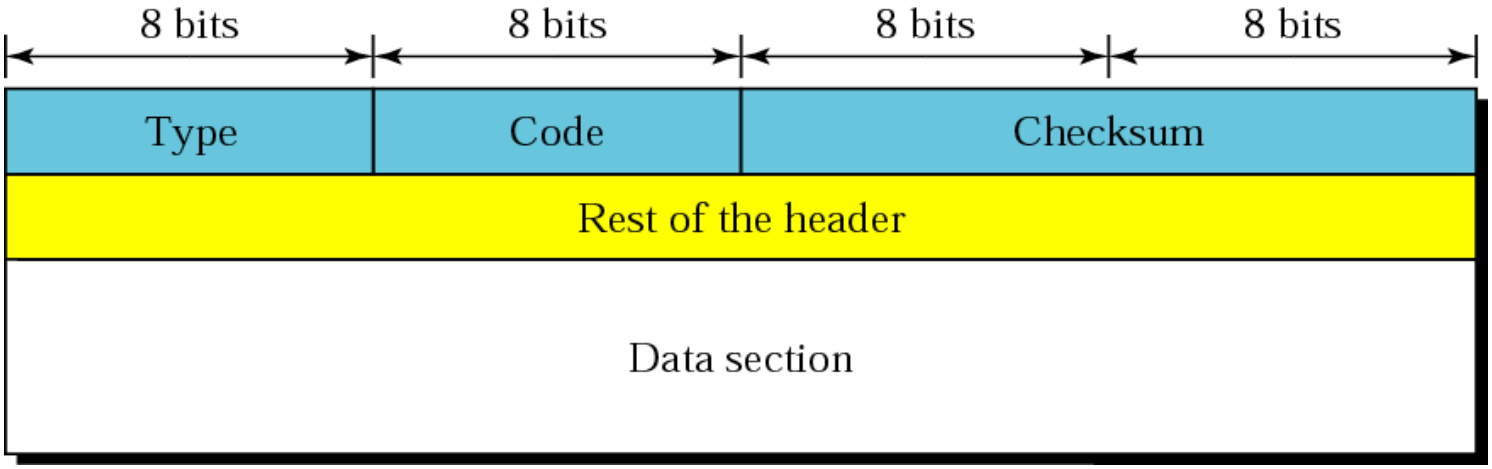

Figure 4 General Format of ICMP Messages

Types of IP protocol communication

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- The IP protocol can be involved in two types of communication: unicasting and multicasting.
- **Unicasting** is the communication between one sender and one receiver.
  - It is a **one-to-one** communication.
- However, some processes sometimes need to send the same message to a large number of receivers simultaneously. This is called **multicasting,**
  - which is a **one-to-many** communication.
- Multicasting has many applications. For example, multiple stockbrokers can simultaneously be informed of changes in a stock price, or travel agents can be informed of a plane cancellation. Some other applications include distance learning and video-on-demand.

IGMP

- The Internet Group Management Protocol (IGMP) is one of the necessary, but not sufficient, protocols that is involved in multicasting.
- IGMP is a companion to the IP protocol.
- IGMP is a group management protocol. It helps a multicast router create and update a list of loyal members related to each router interface.

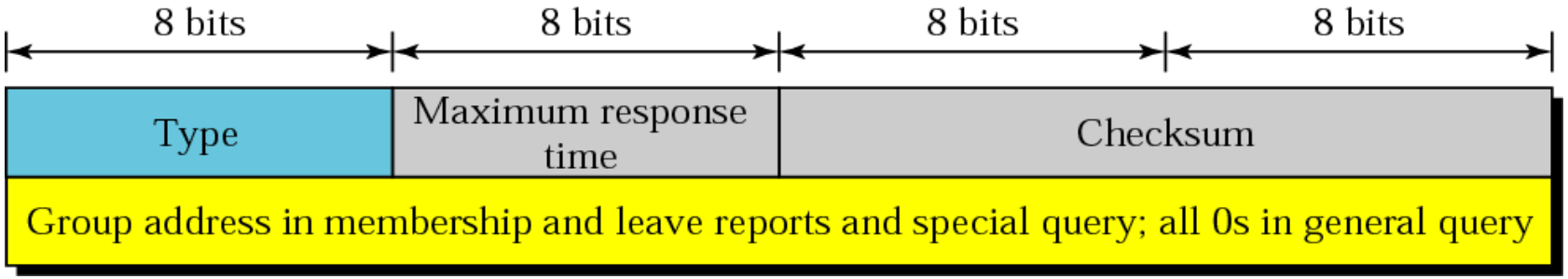

Figure 5 IGMP Message Format

- IGMP has three types of messages: the query, the membership report, and the leave report. There are two types of query messages, general and special.

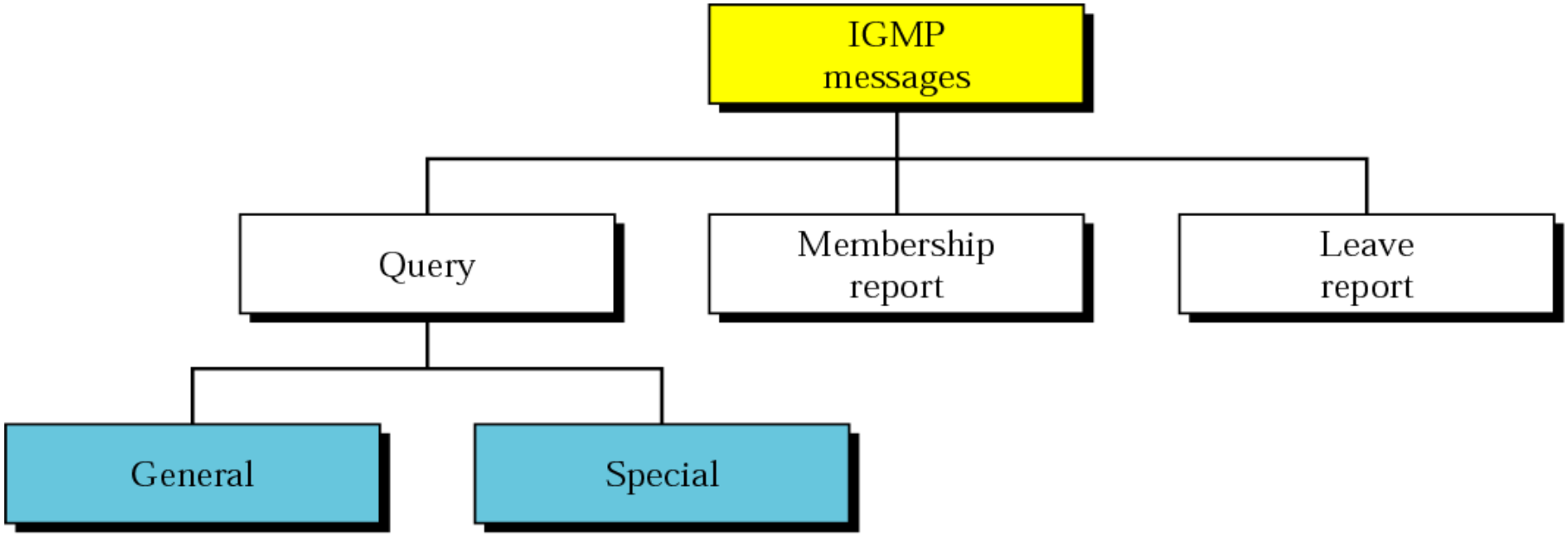

Figure 6 IGMP Message Types

Query Messages

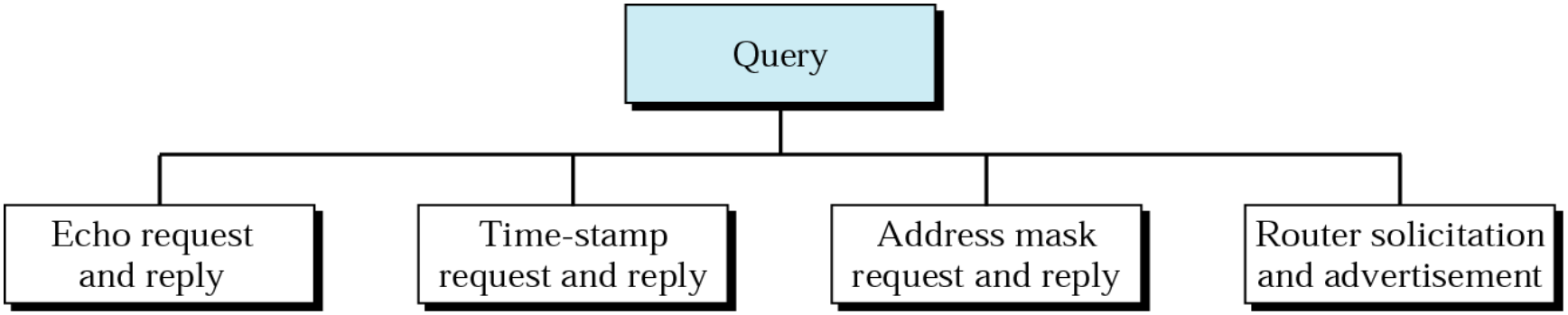

Figure 7 IGMP Query Message

IPv6 address

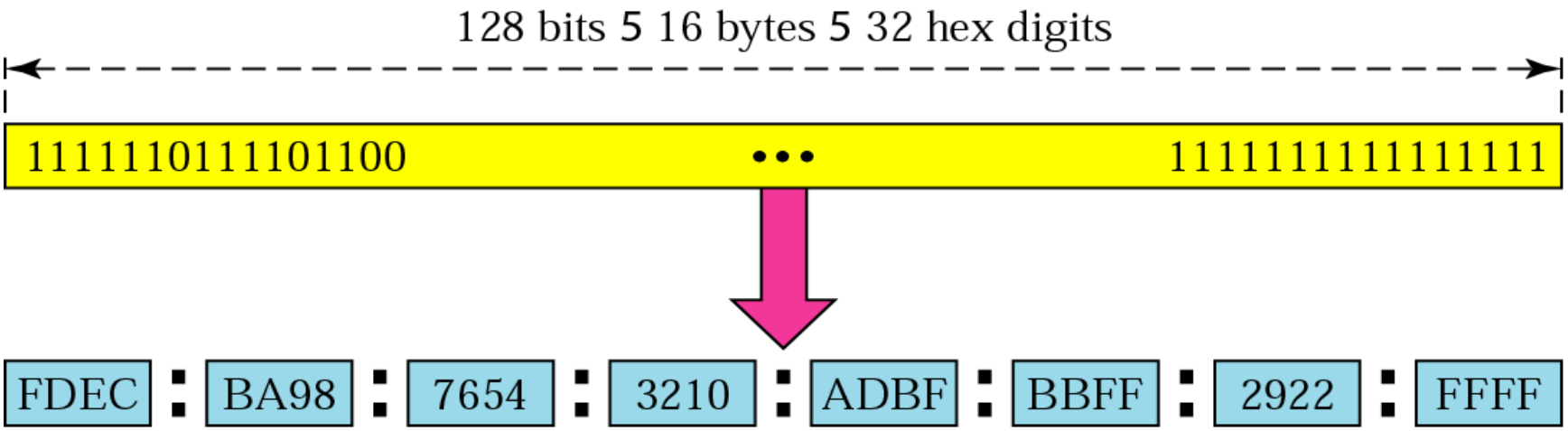

Figure 8 IPv6 Address Format

Abbreviated Address

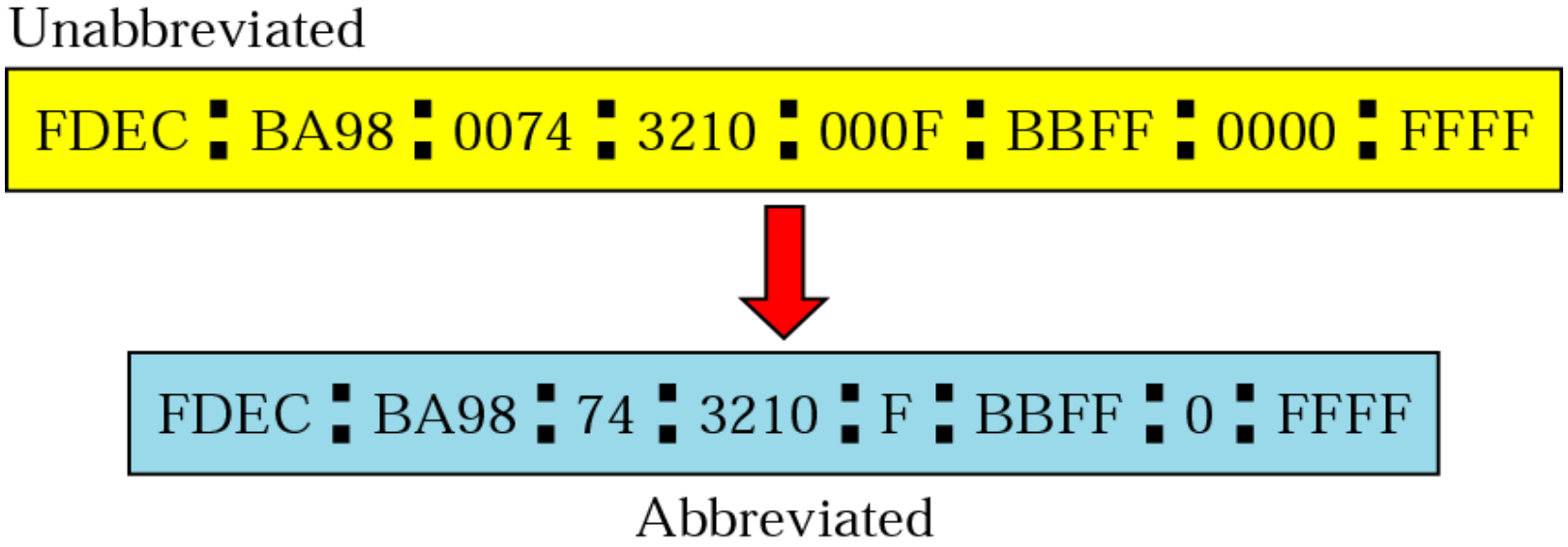

Figure 9 IPv6 Abbreviated Address

Abbreviated address with consecutive zeros

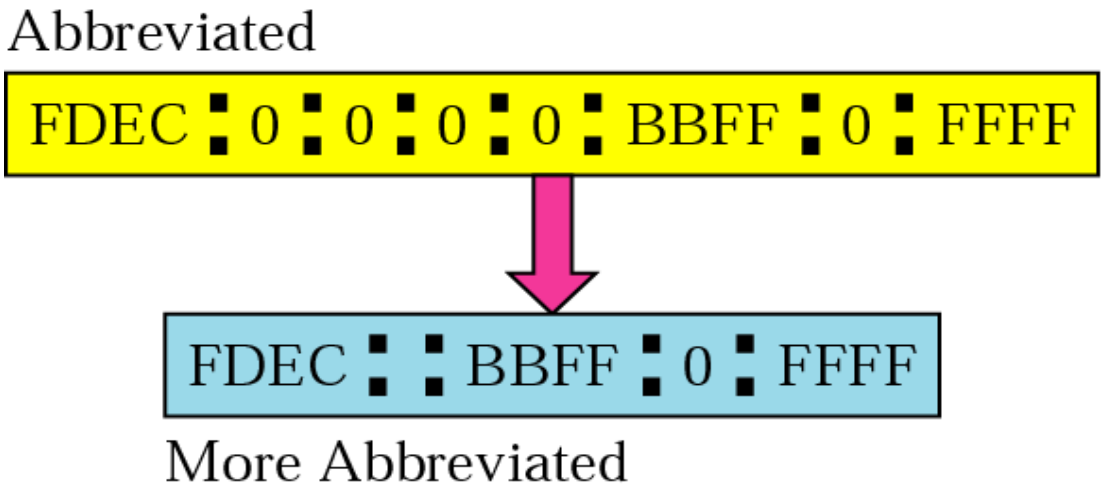

Figure 10 IPv6 Abbreviated Address with Consecutive Zeros

CIDR address

Figure 11 IPv6 CIDR Address Format

Format of an IPv6 datagram

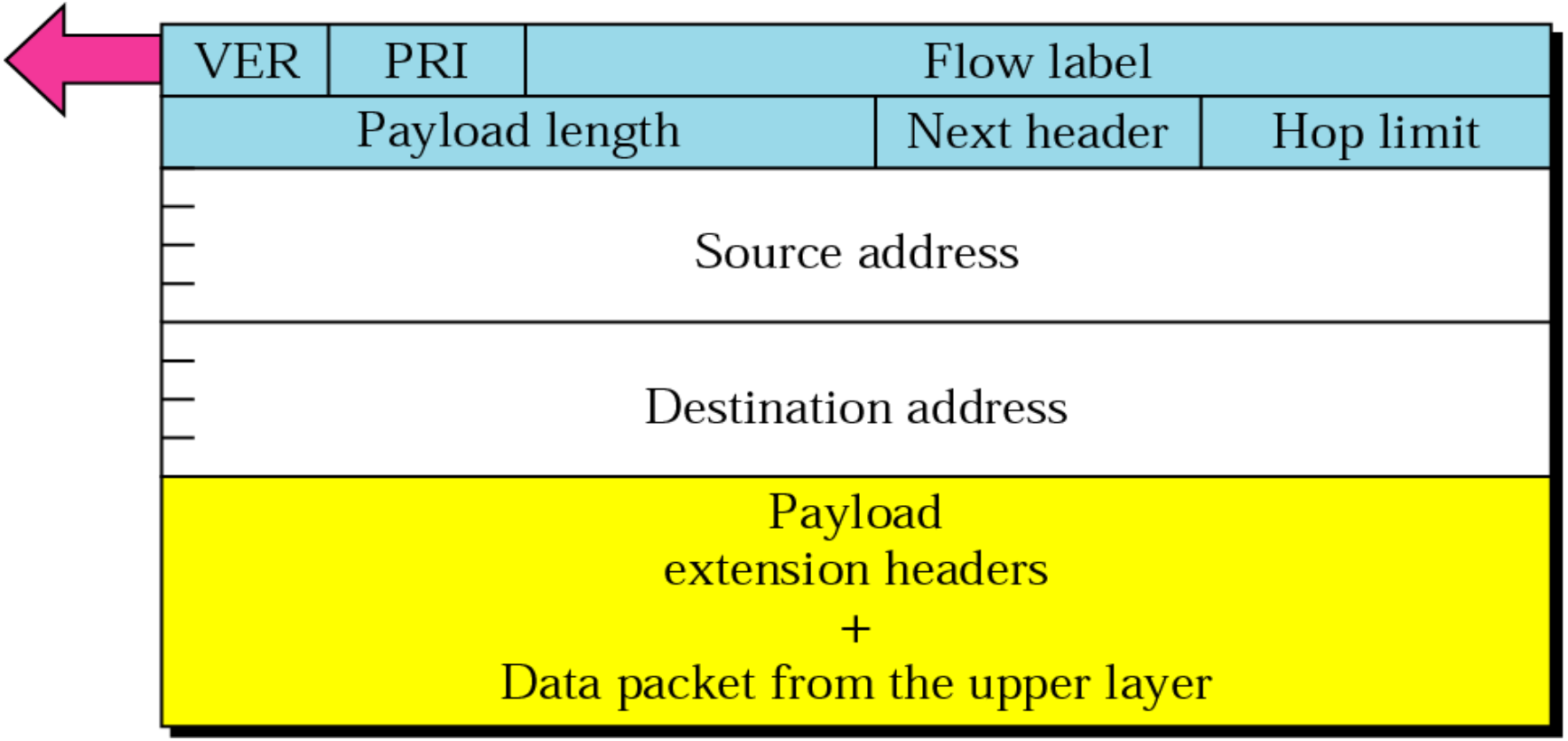

Figure 12 IPv6 Datagram Format

IPv4 Vs IPv6

IPv4	IPv6
Deployed 1981	Deployed 1998
32-bit IP address	128-bit IP address
4.3 billion addresses Addresses must be reused and masked	7.9×10^{28} addresses Every device can have a unique address
Numeric dot-decimal notation 192.168.5.18	Alphanumeric hexadecimal notation 50b2:6400:0000:0000:6c3a:b17d:0000:10a9 (Simplified - 50b2:6400::6c3a:b17d:0:10a9)
DHCP or manual configuration	Supports autoconfiguration

Comparison of network layers in version 4 and version 6

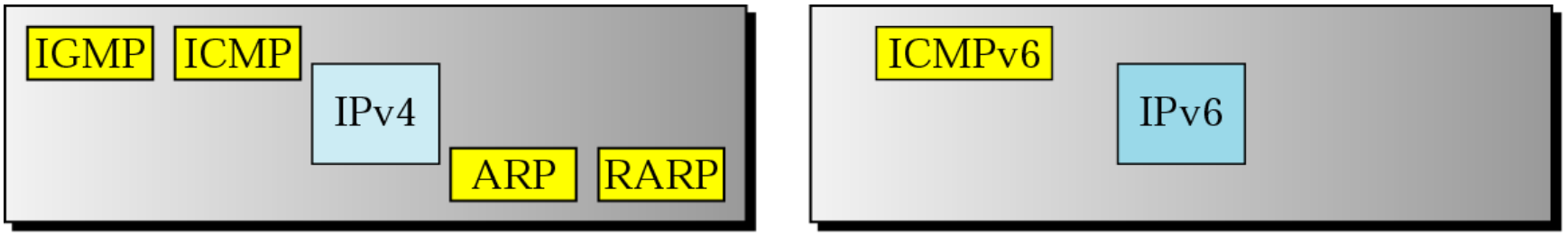

Figure 13 Comparison of Network Layers in IPv4 and IPv6

Practice Questions

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Question 1

ICMP always reports error messages to ------- during error reporting.

A. Source
B. Destination
C. Station
D. None of these

Question 2

The Internet Control Message Protocol (ICMP) is the companion of -----.

E. IP Transmission
F. IP Packet
G. IP Frame
H. IP protocol

Practice Questions

Question 3

The Internet Control Message Protocol (ICMP) has the header size of ----- .

A. 12 bytes
B. 10 bytes
C. 8 bytes
D. 32 bytes

Question 4

The Internet Control Message Protocol (ICMP) messages are divided into two broad categories namely ---------.

E. Query and error reporting messages
F. Request and response messages
G. Request and reply messages
H. None of the above

Practice Questions

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Question 5

IGMP stands for -------- .

A. Internet Group Management Package
B. Internet Group Management Path
C. Internet Group Management Protocol
D. Internet Group Management Ping

Question 6

The Internet Protocol (IP) packet that carries an Internet Group Management Protocol (IGMP) packet has a value of ------- .

E. 0
F. 1
G. 2
H. -1

Practice Questions

Question 7

Internet Protocol Version (IPv6) has a larger address space of -------- .

A. 2^{16}
B. 2^{32}
C. 2^{64}
D. 2^{128}

Question 8

The Internet Protocol Version 4 (IPv4) address is displayed as ------- .

E. 4 bits
F. 8 bits
G. 16 bits
H. 32 bits

Thank You