



# **SNS COLLEGE OF ENGINEERING**

Kurumbapalayam (Po), Coimbatore – 641 107

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## **DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**COURSE NAME :19IT401 COMPUTER NETWORKS**  
II YEAR /IV SEMESTER

**Unit 3-Network layer**

**Topic 5 : Internet Control Message Protocol (ICMP)**



# Internet Control Message Protocol (ICMP)



- IP is an **unreliable** method for delivery of network data.
- It has no built-in processes to ensure that data is delivered in the event that problems exist with network communication.
- If an intermediary device such as a router fails, or if a destination device is disconnected from the network, data cannot be delivered.
- Additionally, **nothing** in its basic design allows **IP to notify the sender that a data transmission has failed.**



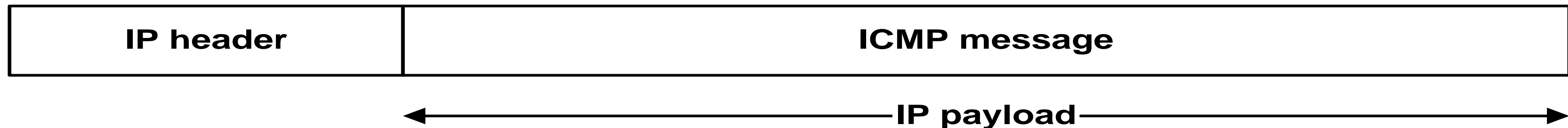
- Internet Control Message Protocol (ICMP) is the component of the TCP/IP protocol stack that **addresses this basic limitation of IP.**
- **ICMP does not overcome the unreliability issues in IP.**
- Reliability must be provided by upper layer protocols if it is needed.



The **Internet Control Message Protocol (ICMP)** is a helper protocol that supports IP with facility for

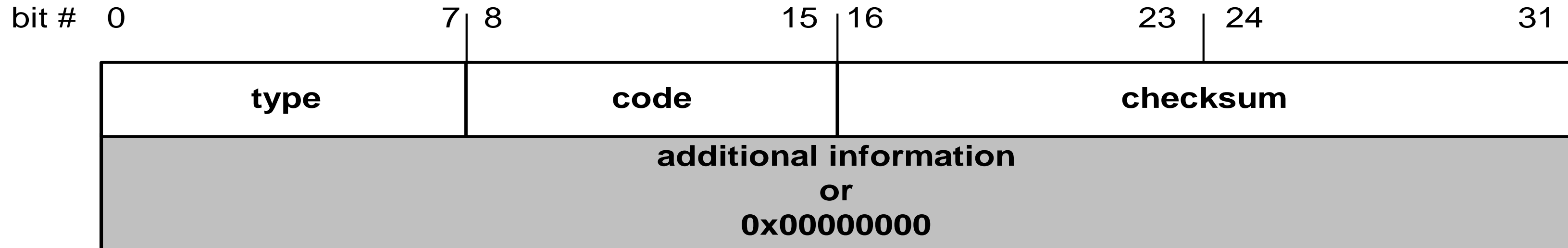
- Error reporting
- Simple queries

ICMP messages are encapsulated as IP datagrams:





# ICMP message format



## 4 byte header:

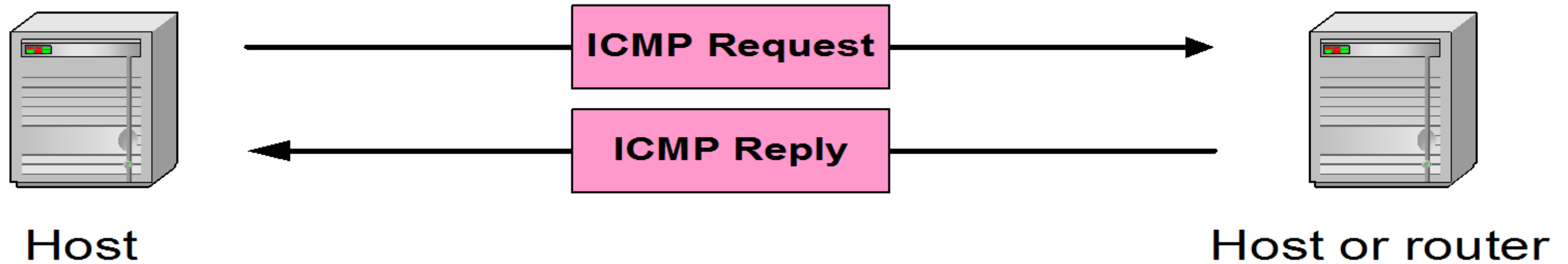
- **Type (1 byte):** type of ICMP message
- **Code (1 byte):** subtype of ICMP message
- **Checksum (2 bytes):** similar to IP header checksum. Checksum is calculated over entire ICMP message

If there is no additional data, there are 4 bytes set to zero.

→ each ICMP messages is at least 8 bytes long



# ICMP Query message



## ICMP query:

- **Request** sent by host to a router or host
- **Reply** sent back to querying host



# Example of ICMP Queries



## Type/Code:

8/0  
0/0

Echo Request  
Echo Reply

13/0  
14/0

Timestamp Request  
Timestamp Reply

10/0  
9/0

Router Solicitation  
Router Advertisement

} The ping command  
uses Echo Request/  
Echo Reply

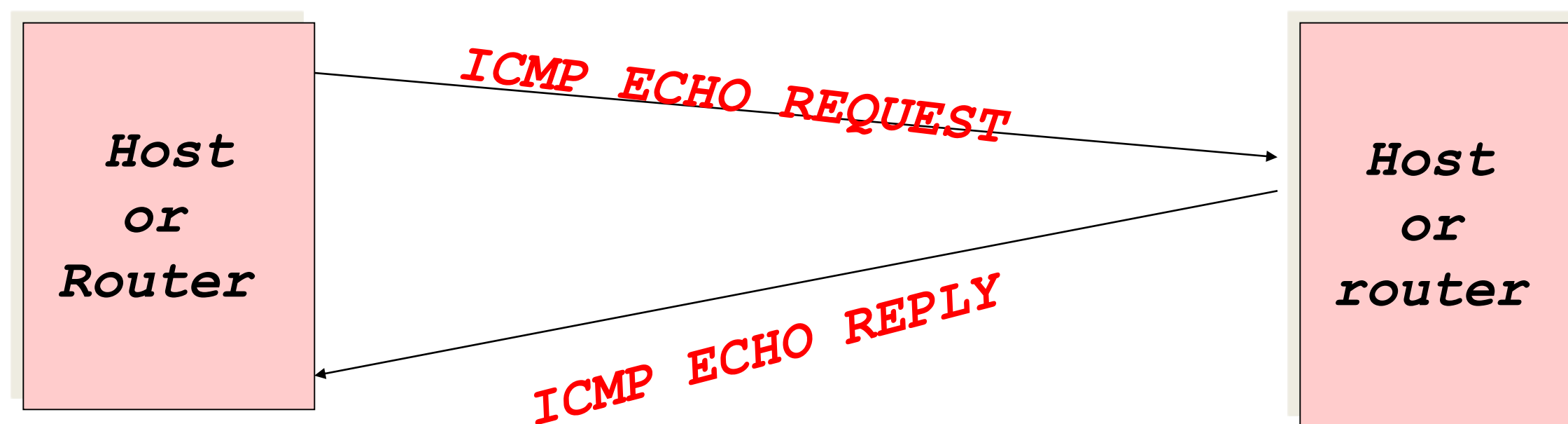


# Example of a Query: Echo Request and Reply

Ping's are handled directly by the kernel

Each Ping is translated into an **ICMP Echo Request**

The Ping'ed host responds with an **ICMP Echo Reply**



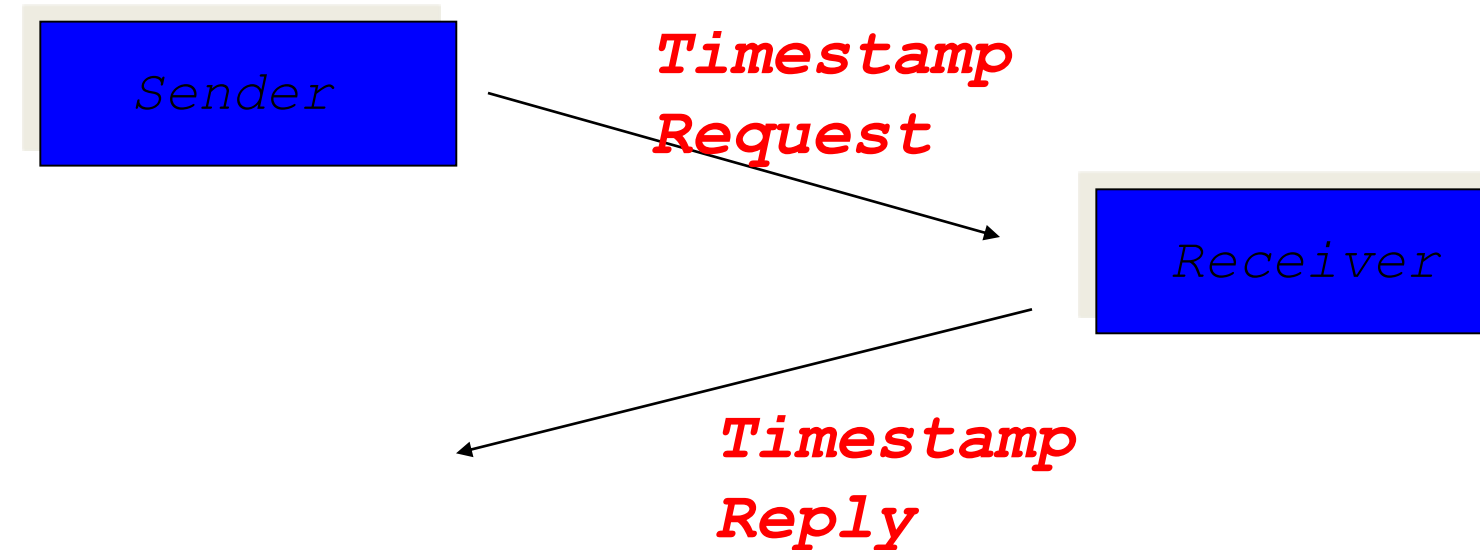




# Example of a Query: ICMP Timestamp

A system (host or router) asks another system for the current time.

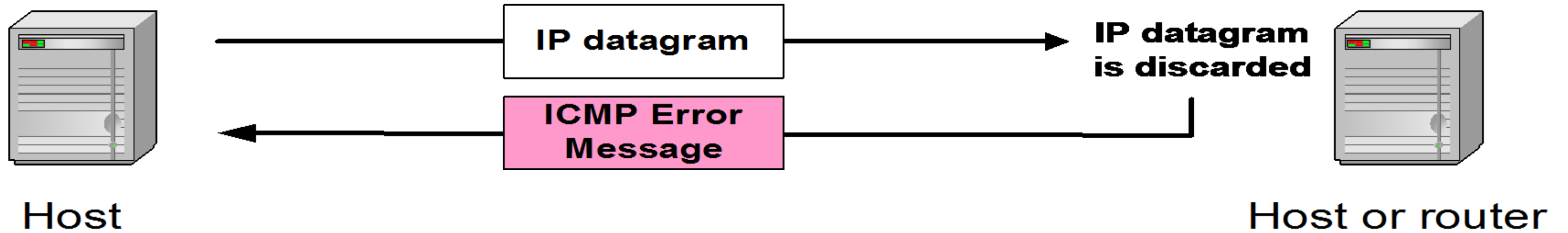
Sender sends a **request**, receiver responds with **reply**



Type (= 17 or 18)	Code (=0)	Checksum
identifier		sequence number
32-bit sender timestamp		
32-bit receive timestamp		
32-bit transmit timestamp		



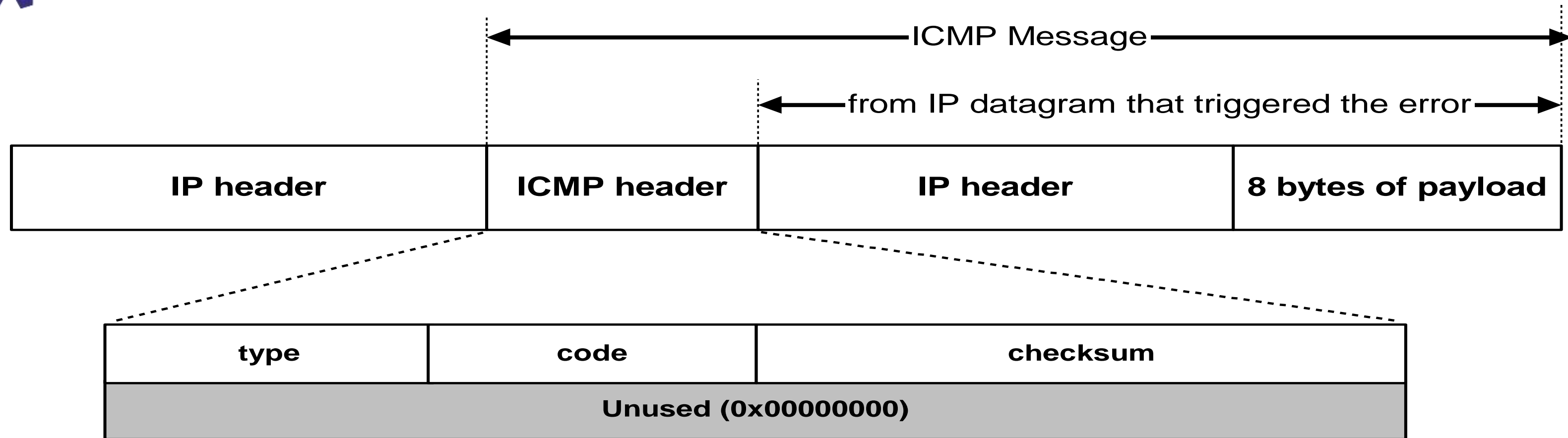
# ICMP Error message



- ICMP error messages report error conditions
- Typically sent when a datagram is discarded
- Error message is often passed from ICMP to the application program



# ICMP Error message



- ICMP error messages include the complete IP header and the first 8 bytes of the payload (typically: UDP, TCP)



# Frequent ICMP Error message



Type	Code	Description	
3	0–15	Destination unreachable	Notification that an IP datagram could not be forwarded and was dropped. The code field contains an explanation.
5	0–3	Redirect	Informs about an alternative route for the datagram and should result in a routing table update. The code field explains the reason for the route change.
11	0, 1	Time exceeded	Sent when the TTL field has reached zero (Code 0) or when there is a timeout for the reassembly of segments (Code 1)
12	0, 1	Parameter problem	Sent when the IP header is invalid (Code 0) or when an IP header option is missing (Code 1)



# Some subtypes of the “Destination Unreachable”



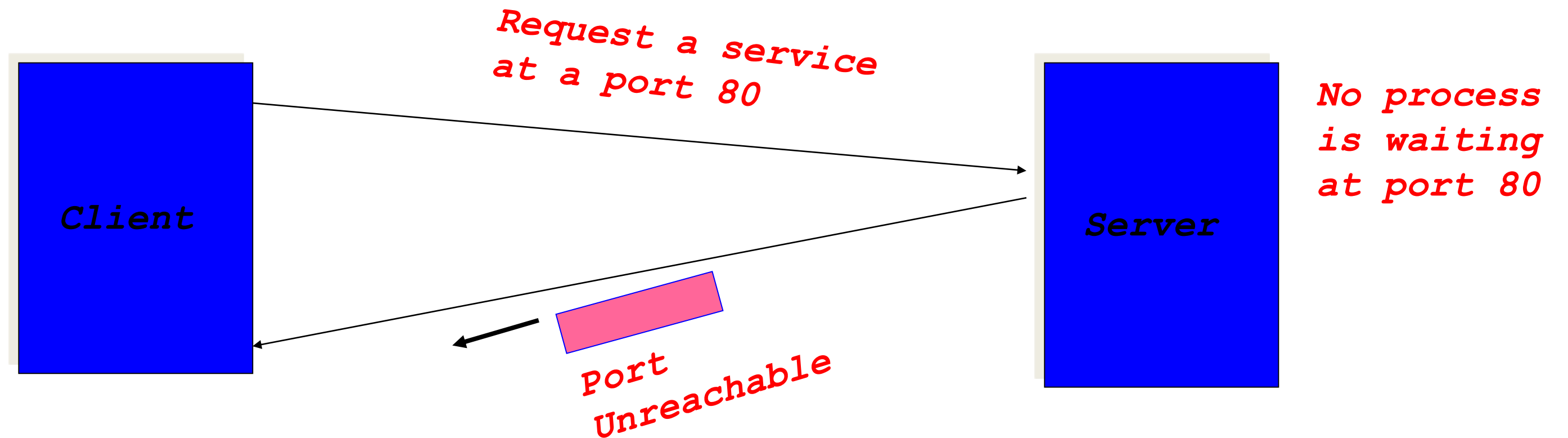
Code	Description	Reason for Sending
0	Network Unreachable	No routing table entry is available for the destination network.
1	Host Unreachable	Destination host should be directly reachable, but does not respond to ARP Requests.
2	Protocol Unreachable	The protocol in the protocol field of the IP header is not supported at the destination.
3	Port Unreachable	The transport protocol at the destination host cannot pass the datagram to an application.
4	Fragmentation Needed	IP datagram must be fragmented



# Example: ICMP Port Unreachable

If, in the destination host, the IP module cannot deliver the datagram because the indicated protocol module or process port is not active, the destination host may send a destination unreachable message to the source host.

Scenario:





# Assessment



- a) What is ICMP?
- b) Discuss ICMP message format?
- c) What is Classful addressing?





# Reference



## TEXT BOOKS

Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

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3. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.
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