



# **SNS COLLEGE OF ENGINEERING**



**Kurumbapalayam(Po), Coimbatore – 641 107**

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## **Department of Information Technology**

**Course Name – 19IT401 Computer Networks**

**II Year / IV Semester**

**Unit 3 – Network Layer**

**Topic 3- ICMPv4**





# ICMPv4



- The IP protocol is a best-effort delivery service.
- It has no error-reporting or error-correcting mechanism and also lacks mechanism for host and management queries.
- A host sometimes needs to determine if a router or another host is alive. And sometimes a network manager needs information from another host or router.
- The Internet Control Message Protocol version 4 (ICMPv4) has been designed to compensate for the above two deficiencies.

## MESSAGES

- ICMP messages are divided into two broad categories:
  - error-reporting messages and
  - query messages.

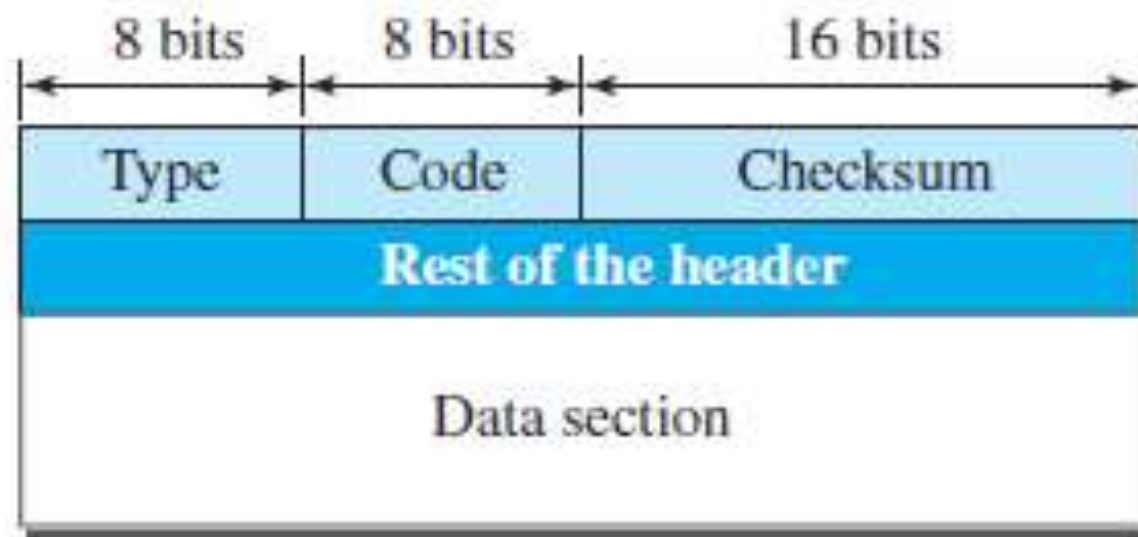


# ICMPv4

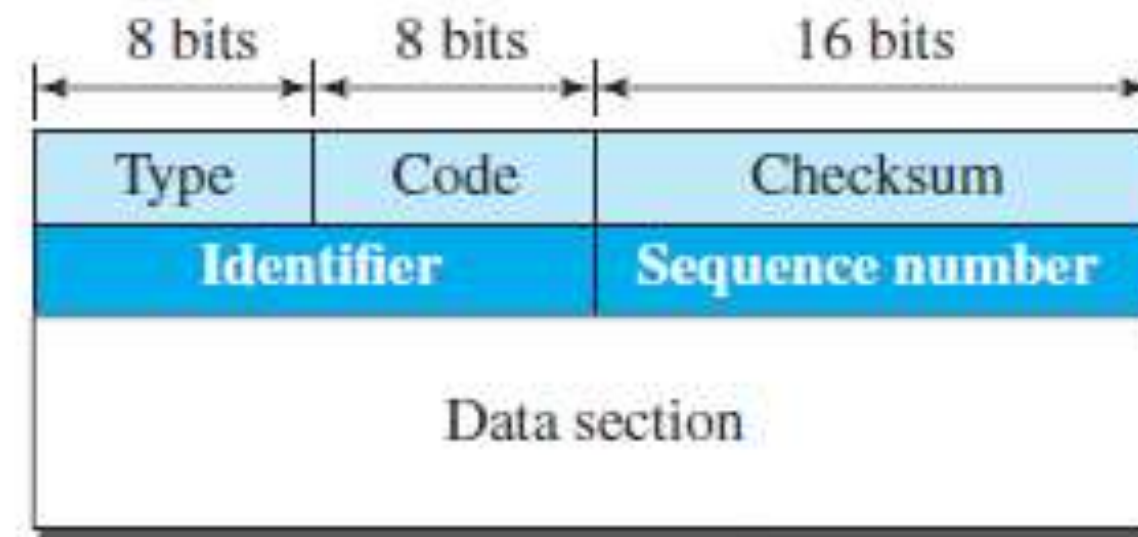


- The **error-reporting messages** report problems that a router or a host (destination) may encounter when it processes an IP packet.
- The **query messages**, which occur in pairs, help a host or a network manager get specific information from a router or another host.
- An ICMP message has an 8-byte header and a variable-size data section.
- Although the general format of the header is different for each message type, the first 4 bytes are common to all.

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Error-reporting messages



Query messages

## Type and code values

### Error-reporting messages

- 03: Destination unreachable (codes 0 to 15)
- 04: Source quench (only code 0)
- 05: Redirection (codes 0 to 3)
- 11: Time exceeded (codes 0 and 1)
- 12: Parameter problem (codes 0 and 1)

### Query messages

- 08 and 00: Echo request and reply (only code 0)
- 13 and 14: Timestamp request and reply (only code 0)



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## Error Reporting Messages

- Since IP is an unreliable protocol, one of the main responsibilities of ICMP is to report some errors that may occur during the processing of the IP datagram.
- ICMP does not correct errors, it simply reports them.
- ICMP uses the source IP address to send the error message to the source (originator) of the datagram.

## Rules

- First, no error message will be generated for a datagram having a multicast address or special address (such as this host or loopback).
- Second, no ICMP error message will be generated in response to a datagram carrying an ICMP error message.
- Third, no ICMP error message will be generated for a fragmented datagram that is not the first fragment.





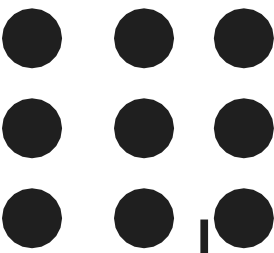
# ICMPv4

## Error Reporting Messages

- **Destination Unreachable** (type 3) - This message uses different codes (0 to 15) to define the type of error message and the reason why a datagram has not reached its final destination.
- **Source Quench** (type 4)- This message informs the sender that the network has encountered congestion and the datagram has been dropped; the source needs to slow down sending more datagrams.
- **Redirection Message** - The redirection message (type 5) is used when the source uses a wrong router to send out its message. The router redirects the message to the appropriate router, but informs the source that it needs to change its default router in the future. The IP address of the default router is sent in the message.
- **Time Exceeded** - When a datagram visits a router, the value of TTL field is decremented by 1. When the value reaches 0, after decrementing, the router discards the datagram and a time-exceeded message (type 11) is sent to the original source.
- **Parameter Problem** - This message (type 12) can be sent when either there is a problem in the header of a datagram (code 0) or some options are missing or cannot be interpreted (code 1).



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## Query Messages

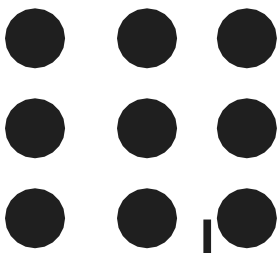
Interestingly, query messages in ICMP can be used independently without relation to an IP datagram.

Query messages are used to probe or test the

- liveliness of hosts or routers in the Internet,
- find the one-way or the round-trip time for an IP datagram between two devices, or
- even find out whether the clocks in two devices are synchronized.
  
- Naturally, query messages come in pairs: request and reply.
  
- **The echo request (type 8) and the echo reply (type 0)** pair of messages are used by a host or a router to test the liveliness of another host or router.
  
- A host or router sends an echo request message to another host or router; if the latter is alive, it responds with an echo reply message. Example application - ping and traceroute.



# ICMPv4



## Query Messages

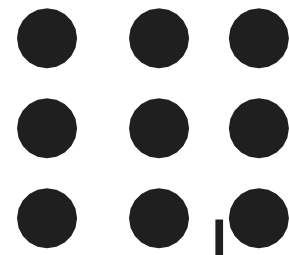
- **The timestamp request** (type 13) and the timestamp reply (type 14) pair of messages are used to find the round-trip time between two devices or to check whether the clocks in two devices are synchronized.

## Deprecated Messages

Three pairs of messages are declared obsolete by IETF:

- Information request and replay messages are not used today because their duties are done by the Address Resolution Protocol (ARP).
- Address mask request and reply messages are not used today because their duties are done by the Dynamic Host Configuration Protocol (DHCP).
- Router solicitation and advertisement messages are not used today because their duties are done by the Dynamic Host Configuration Protocol (DHCP).





**THANK YOU**