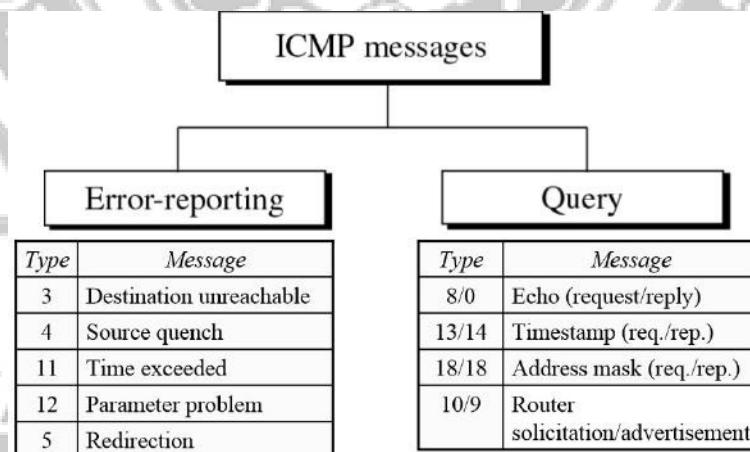# ICMP -Internet Control Message Protocol

- ➤ ICMP is a network-layer protocol.

- ➤ It is a companion to the IP protocol.

- ➤ Internet Control Message Protocol (ICMP) defines a collection of error messages that are sent back to the source host whenever a router or host is unable to process an IP datagram successfully.

ICMP MESSAGE TYPES

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

- ➤ The error-reporting messages report problems that a router or a host (destination) may encounter when it processes an IP packet.

- ➤ The query messages help a host or a network manager get specific information from a router or another host.

ICMP messages			

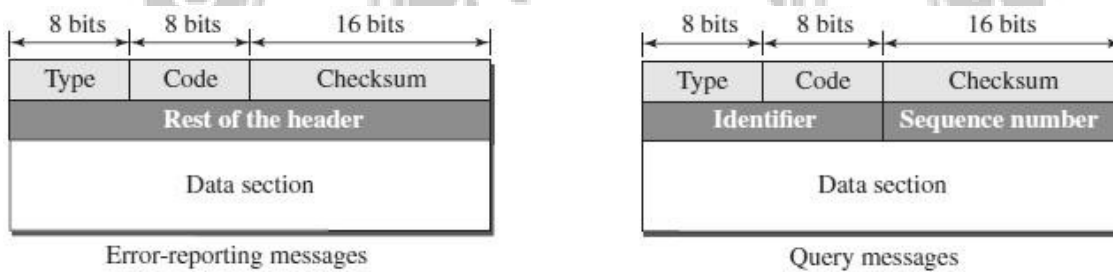| Error-reporting		Query	
Type	Message	Type	Message
3	Destination unreachable	8/0	Echo (request/reply)
4	Source quench	13/14	Timestamp (req./rep.)
11	Time exceeded	18/18	Address mask (req./rep.)
12	Parameter problem	10/9	Router solicitation/advertisement
5	Redirection		

ICMP Error – Reporting Messages

- ➤ ***Destination Unreachable***—When a router *cannot route* a datagram, the datagram is discarded and sends a destination unreachable message to source host.

- ➤ ***Source Quench***—When a router or host discards a datagram due to *congestion*, it sends a source-quench message to the source host. This message acts as flow

control.

➢ *Time Exceeded*—Router discards a datagram when TTL field becomes 0 and a time exceeded message is sent to the source host.

➢ *Parameter Problem*—If a router discovers ambiguous or *missing* value in any field of the datagram, it discards the datagram and sends parameter problem message to source.

➢ *Redirection*—Redirect messages are sent by the default router to inform the source host to *update* its forwarding table when the packet is routed on a wrong path.

ICMP MESSAGE FORMAT

⬚ An ICMP message has an 8-byte header and a variable-size data section.

8 bits	8 bits	16 bits		8 bits	8 bits	16 bits
Type	Code	Checksum		Type	Code	Checksum
Rest of the header				Identifier		Sequence number
Data section				Data section		
Error-reporting messages				Query messages		

Type	Defines the type of the message
Code	Specifies the reason for the particular message type
Checksum	Used for error detection
Rest of the header	Specific for each message type
Data	Used to carry information
Identifier	Used to match the request with the reply
Sequence Number	Sequence Number of the ICMP packet

ICMP DEBUGGING TOOLS

Two tools are used for debugging purpose. They are (1) Ping (2) Traceroute

Ping

- The *ping* program is used to find if a host is alive and responding.
- The source host sends ICMP echo-request messages; the destination, if alive, responds with ICMP echo-reply messages.
- The *ping* program sets the identifier field in the echo-request and echo-reply message and starts the sequence number from 0; this number is incremented by 1 each time a new message is sent.
- The *ping program* can calculate the round-trip time.
- It inserts the sending time in the data section of the message.
- When the packet arrives, it subtracts the arrival time from the departure time to get the round-trip time (RTT).

$ ping google.com

Traceroute or Tracert

- The *traceroute* program in UNIX or *tracert* in Windows can be used to trace the path of a packet from a source to the destination.
- It can find the IP addresses of all the routers that are visited along the path.
- The program is usually set to check for the maximum of 30 hops (routers) to be visited.
- The number of hops in the Internet is normally less than this.

$ traceroute google.com