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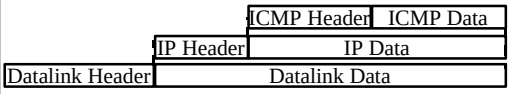
Overview

- What is ICMP?
- ICMP Messages
- ICMP applications: Ping, Traceroute discovery
- Ref: Chap 6

ICMP Features

- Used by IP to send error and control messages
- Uses IP to send its messages
- Does not report errors on ICMP messages.
- ICMP message are not required on datagram checksum errors.
- ICMP reports error only on the first fragment



ICMP Message Format

IP Header	
Type of Message	8b
Error Code	8b
Checksum	16b
Parameters, if any	Var
Information	Var

Sample ICMP Messages

- Source Quench: Please slow down! I just dropped one of your datagrams.
- Time Exceeded: Time to live field in one of your packets became zero." or "Reassembly timer expired at the destination.
- Fragmentation Required: Datagram was longer than MTU and "No Fragment bit" was set.

Sample ICMP Messages (Continued)

- Address Mask Request/Reply: What is the subnet mask on this net? Replied by "Address mask agent"
- Redirect: Send to router X instead of me.
- Time Stamp Request/Reply: used to find current time or RTT.
- ICMP error messages normally include the IP header of the datagram that generated the error, plus at least 8 bytes following the IP header => ICMP message sizes = 70 bytes

ICMP: Message Types Summary

Type	Message
0	Echo reply
3	Destination unreachable
4	Source quench
5	Redirect
8	Echo request
11	Time exceeded
12	Parameter unintelligible
13	Time-stamp request
14	Time-stamp reply
15	Information request
16	Information reply
17	Address mask request
18	Address mask reply

Ping

- Ping: Used to test
  - destination reachability,
  - compute round trip time
  - count the # of hops to destination
  - may provide record route option. Sample output:

Reply from 164.107.144.3: 48 bytes in 47 msec. TTL: 253

Traceroute

- Traceroute: Exploit TTL and ICMP
  - Send the packet with time-to-live = 1 (hop)
  - The first router discards the packet and sends an ICMP "time-to-live exceeded message"
  - Send the packet with time-to-live = 2 (hops) etc…
  - Does not use optional features like record route

Path MTU Discovery

- Send a large IP datagram with "Don't fragment" bit set.
  - Failure to fragment at a link will result in ICMP message.
- Reduce MSS until success (No ICMP message received)

Summary

- ICMP is the control sibling of IP
- ICMP is used by IP and uses IP as network layer protocol
- ICMP is used for ping, traceroute, and path MTU discovery.