

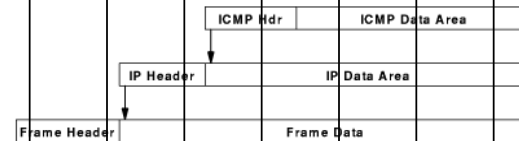
Chapter 23 Internet Control Message Protocol (ICMP)

The Problem

- There are lots of things that can go wrong with IP
 - packets can be dropped at routers
 - the receiver may be down
 - routes might be incorrectly configured
 - packets may be corrupted
 - TTL expires
- IP can detect some of these errors
- IP uses **ICMP** to **report errors**
- ICMP **does not** necessarily **correct error**

ICMP message transport

- ICMP messages contain IP error information
- ICMP messages usually sent from the receiver (or an intermediate router) back to the sender
- ICMP messages sent in response to incoming datagrams with problems
- ICMP encapsulated in IP



ICMP Message Types

- **Internet Control Message Protocol (ICMP)** defines error and informational messages
- **Error messages:**
 - Source quench (slow down sending rate)
 - Time exceeded (TTL expired)
 - Destination unreachable
 - Redirect (Change your route)
 - Fragmentation required
- **Informational messages:**
 - Echo request/reply
 - Address mask request/reply
 - Router discovery

Echo Requests/Reply

- UNIX **ping** program uses ICMP **echo request** and **echo reply** messages to test if the receiver is reachable and alive.
- sender issues an ICMP echo request.
- IP layer on the receiver gets the request and sends an ICMP echo reply

Redirection Requests

- Default route may cause extra hop (i.e., is a non-optimal route)
- Router that forwards datagram on same interface sends ICMP redirect
- Host installs new route with correct router as next hop

Tracing a Route

- List of all routers on path from A to B is called the route from A to B
- The UNIX `traceroute` program uses UDP to a non-existent port and TTL field to find routes via an **expanding ring search**
- Sends ICMP echo messages with increasing TTL
 - Router that decrements TTL to 0 sends ICMP time exceeded message, with router's address as source address
 - First, with TTL 1, gets to first router, which discards and sends time exceeded message
 - Next, with TTL 2, gets through first router to second router
 - Continue until message from destination received

NOTES

Lined area for notes, consisting of 20 vertical lines.

Shortcomings of ICMP