

Internet Control Message Protocol

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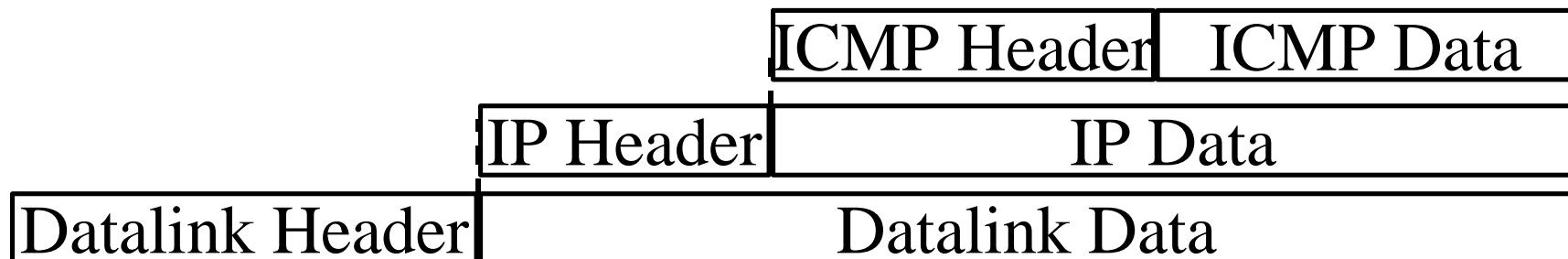
<http://www.cis.ohio-state.edu/~jain/>



- q What is ICMP?
- q ICMP Messages
- q ICMP applications: Ping, Traceroute, Path MTU discovery

ICMP Features

- q ICMP: Used by IP to send error and control messages
- q ICMP uses IP to send its messages (Not UDP)
- q ICMP does not report errors on ICMP messages.
- q ICMP message are not required on datagram checksum errors. (Some implementations still do)
- q 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

ICMP: Message Types

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

ICMP Messages

- q Source Quench: Please slow down! I just dropped one of your datagrams.
- q Time Exceeded: Time to live field in one of your packets became zero.” or “Reassembly timer expired at the destination.
- q Fragmentation Required: Datagram was longer than MTU and “No Fragment bit” was set.
- q Address Mask Request/Reply: What is the subnet mask on this net? Replied by “Address mask agent”

Destination Unreachable

Code	Meaning
0	Network unreachable
1	Host unreachable
2	Protocol unreachable
3	Port unreachable
4	Fragmentation need and don't fragment bit set
5	Source route failed
6	Destination network unknown
7	Destination host unknown
8	Source host isolated
9	Communication with dest net administratively prohibited
10	Communication with dest host administratively prohibited
11	Network unreachable for type of service
12	Host unreachable for type of service

Other ICMP Messages

- q Redirect: Please send to router X instead of me.
 - 0 = Redirect datagrams for the network
 - 1 = Redirect datagrams for the host
 - 2 = Redirect datagrams for the type of service and net
 - 3 = Redirect datagrams for the type of service and host
- q Time Stamp Request/Reply:

0	8	16	31
Type	Code	Checksum	
Identifier		Sequence Number	
Originate Timestamp			
Receive Timestamp			
Transmit Timestamp			

Other ICMP Messages (Cont)

- q Information Request/Reply:
Set source and destination addresses to 0 in the request and broadcast
Server replies back with your IP address
(Not used. Replaced by RARP and BOOTP)

Ping

q Sample Output

Wed, 05 Feb 1997 15:21:37

Pinging snoopy.cis.ohio-state.edu [164.107.144.3] with 48 data bytes

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

Reply from 164.107.144.3: 48 bytes in 46 msec. TTL: 253

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

Reply from 164.107.144.3: 48 bytes in 46 msec. TTL: 253

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

PING Statistics for snoopy.cis.ohio-state.edu

5 packets transmitted, 5 packets received, 0% packet loss

round-trip (ms) min/avg/max = 46/46/47

q Uses ICMP Echo request/reply messages

Traceroute: Sample Output

164.107.61.200 164.107.61.1 164.107.120.1 164.107.144.3

Wed, 05 Feb 1997 14:57:33

Sending 48 data bytes to snoopy.cis.ohio-state.edu
[164.107.144.3]

1:Received echo from ? [164.107.61.1] in 110 msec.

2:Received echo from avon-120.cis.ohio-state.edu
[164.107.120.1] in 45 msec.

3:Received 48 bytes from snoopy.cis.ohio-state.edu
[164.107.144.3] in 49 msec.

TraceRoute Statistics for snoopy.cis.ohio-state.edu

3 packets transmitted, 3 packets received, 0% packet loss

round-trip (ms) min/avg/max = 45/68/110

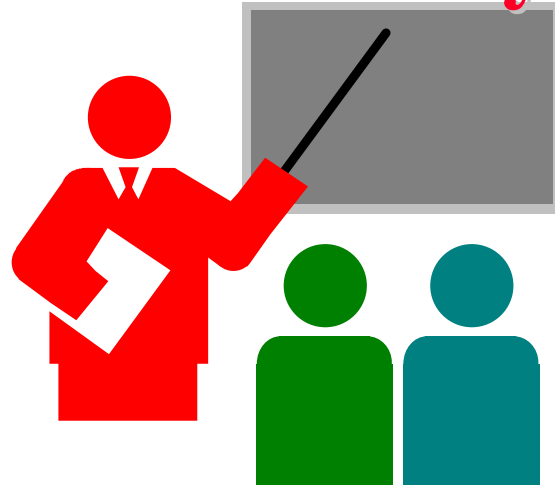
Traceroute Mechanism

- q Send the packet with time-to-live = 1 (hop)
- q The first router discards the packet and sends an ICMP “time-to-live exceeded message”
- q Send the packet with time-to-live = 2 (hops)
- q The second router discards the packet and sends an ICMP “time-to-live exceeded message”
- q This is repeated until the response is received from the destination.

Path MTU Discovery

- q Send a large IP datagram with “No fragment” bit set.
- q Reduce size until success (No ICMP message received)

Summary



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