

Chap 6 – ICMP

Internet Control Message Protocol

ICMP data are encapsulated in IP datagrams

IP header – 20 bytes
ICMP Message (4 bytes + variable length part)

ICMP header format

type specifier
function code
16 bit checksum

Type specifier values

48 #define ICMP_ECHOREPLY	0 /* Echo Reply */
49 #define ICMP_DEST_UNREACH	3 /* Destination Unreachable */
50 #define ICMP_SOURCE_QUENCH	4 /* Source Quench */
51 #define ICMP_REDIRECT	5 /* Redirect (change route) */
52 #define ICMP_ECHO	8 /* Echo Request */
53 #define ICMP_TIME_EXCEEDED	11 /* Time Exceeded */
54 #define ICMP_PARAMETERPROB	12 /* Parameter Problem */
55 #define ICMP_TIMESTAMP	13 /* Timestamp Request */
56 #define ICMP_TIMESTAMPREPLY	14 /* Timestamp Reply */
57 #define ICMP_INFO_REQUEST	15 /* Information Request */
58 #define ICMP_INFO_REPLY	16 /* Information Reply */
59 #define ICMP_ADDRESS	17 /* Address Mask Request */
60 #define ICMP_ADDRESSREPLY	18 /* Address Mask Reply */

Two basic classes

Query

- Ping request/reply
- Timestamp request/reply
- Address-mask request/reply

Error

- Destination unreachable
- Redirect
- Time (hop count) exceeded
- Bad parameters
- Contains IP header + 1st 8 bytes of offending datagram

ICMP Query examples

Packet format

- ICMP Header
- Identifier / Sequence number
- Query specific data

ICMP Echo

- Intended to test for reachability
- Now neither a necessary nor sufficient condition to ensure reachability

ICMP Address Mask

- Intended for diskless workstations
- Query specific data is the address mask
- Note bugs explained in examples in book
 - svr4 sends wrong mask
 - bsd1 broadcasts the reply. (see fig 6.5)

ICMP Timestamp

Originate timestamp –	Requester
Receive timestamp –	Reply
Transmit timestamp –	Reply

- Time is in milliseconds since midnight UTC
- Use has been somewhat obsoleted by NTP

ICMP Error messages

Ethernet header
IP header (Dest = originator)
8 byte ICMP header
Original IP header + at least 8 bytes of message.

ICMP *error messages* are never generated in response to:

Receipt of an ICMP error.
A datagram carrying a broadcast address
A datagram sent as a link layer broadcast
Other than the first fragment
A datagram whose source address doesn't define a single host.
(Some of these rules were learned the hard way!)

Error codes for type=3 *Unreachable*

```
#define ICMP_NET_UNREACH      0 /* Network Unreachable */
#define ICMP_HOST_UNREACH    1 /* Host Unreachable */
#define ICMP_PROT_UNREACH    2 /* Protocol Unreachable */
#define ICMP_PORT_UNREACH    3 /* Port Unreachable */
#define ICMP_FRAG_NEEDED     4 /* Fragmentation Needed/DF set */
#define ICMP_SR_FAILED       5 /* Source Route failed */
#define ICMP_NET_UNKNOWN     6
#define ICMP_HOST_UNKNOWN    7
#define ICMP_HOST_ISOLATED   8
#define ICMP_NET_ANO         9
#define ICMP_HOST_ANO       10
#define ICMP_NET_UNR_TOS    11
#define ICMP_HOST_UNR_TOS   12
#define ICMP_PKT_FILTERED   13 /* Packet filtered */
#define ICMP_PREC_VIOLATION 14 /* Precedence violation */
#define ICMP_PREC_CUTOFF    15 /* Precedence cut off */
```

Error codes for type=11 *Time Exceeded*

```
#define ICMP_EXC_TTL         0 /* TTL count exceeded */
#define ICMP_EXC_FRAGTIME    1 /* Fragment Reass time exceeded */
```