

Internet Engineering

241-461

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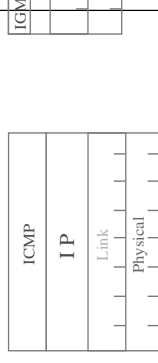
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ICMP

◊ Internet Control Message Protocol



◊ 3 ICMP message types

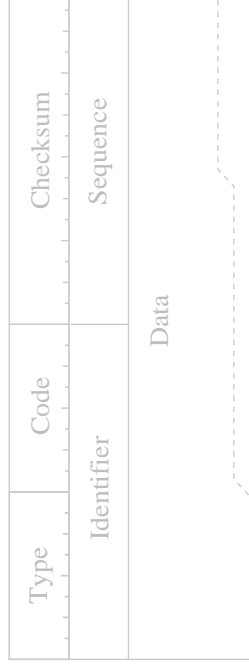
- Requests
- Replies
- Error Reports

ICMP format



- ◊ Type
 - eg: echo
 - request to return data
 - echo reply
 - reply to earlier echo
- ◊ Code
 - Minor variations of type

ICMP Requests & Replies



- ◊ **Type**
 - Select particular request or reply
- ◊ **Code**
 - 0 (unused)
- ◊ **Identifier**
 - Used to match reply with request (port)
- ◊ **Sequence**
 - Used to match reply with request (counter)

ICMP Requests

Request	Type	Reply Type
Echo	8	0
Timestamp	13	14
Router Solicitation	10	9

ICMP Echo

- ◊ Data can be anything
 - ◊ Same Data returned in ICMP Echo Reply
- ```
02:27:06.1105890 192.168.192.23 > 192.168.192.22: icmp: echo request seq 0
4500 0054 3e8d 0000 ff01 7b9c c0a8 c017
c0a8 c016 0800 b620 0642 0000 0abe 0d3f
379d 0100 0809 0a0b 0c0d 0e0f 1011 1213
1415 1617 1819 1a1b 1c1d 1e1f 2021 2223
2425 2627 2829 2a2b 2c2d 2e2f 3031 3233
3435 3637

02:27:06.1106051 192.168.192.22 > 192.168.192.23: icmp: echo reply seq 0
4500 0054 86dc 0000 ff01 334d c0a8 c016
c0a8 c017 0000 be20 0642 0000 0abe 0d3f
379d 0100 0809 0a0b 0c0d 0e0f 1011 1213
1415 1617 1819 1a1b 1c1d 1e1f 2021 2223
2425 2627 2829 2a2b 2c2d 2e2f 3031 3233
3435 3637

02:27:07.1110189 192.168.192.23 > 192.168.192.22: icmp: echo request seq 1
02:27:07.1110337 192.168.192.22 > 192.168.192.23: icmp: echo reply seq 1
02:27:08.120183 192.168.192.23 > 192.168.192.22: icmp: echo request seq 2
```

## ICMP Timestamp Req/Reply

|                            |      |          |
|----------------------------|------|----------|
| Type                       | Code | Checksum |
| Identifier                 |      | Sequence |
| Request Transmit Timestamp |      |          |
| Receive Timestamp          |      |          |
| Reply Transmit Timestamp   |      |          |

- ◇ Reply contains 3 timestamps
  - Time request transmitted
    - inserted by sender of request, copied into reply
  - Time request received
    - inserted by receiver of request
  - Time reply transmitted
    - inserted by sender of reply
- ◇ Times in milliseconds since midnight (UT)
  - Or other representation with MSB set

## Router Advertisement (v4)

|                    |               |          |
|--------------------|---------------|----------|
| Type               | Code          | Checksum |
| Num Adrrs          | Addr Ent Size | Lifetime |
| Router Address [1] |               |          |
| Preference [1]     |               |          |
| Router Address [2] |               |          |
| Preference [2]     |               |          |
| ...                |               |          |
| (etc)              |               |          |

- ◇ Router gives all its addresses
  - On the subnet it sends the message
- ◇ And a preference for each address
  - Relative to all router addresses on the net

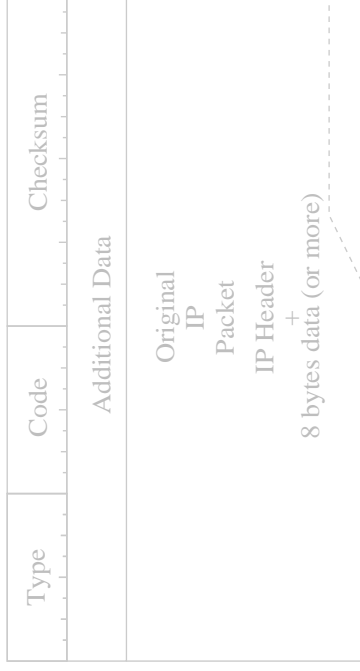
## Router Advertisement (v4)

- ◇ Router also gives a lifetime (seconds)
- ◇ Num Adrrs
  - Number of Addresses in message
- ◇ Addr Ent Size
  - Size in 32 bit words of each entry (2)
- ◇ Solicitation

|          |      |          |
|----------|------|----------|
| Type     | Code | Checksum |
| Reserved |      |          |

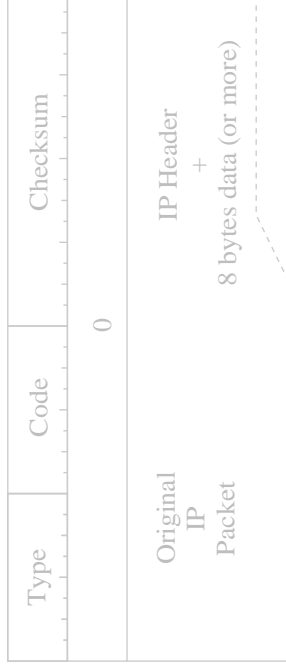
- Request routers to send Router Advert

# ICMP errors



- ◇ **Additional Data**
  - Sometimes indicates where error occurred
- ◇ **Original Packet**
  - Allows source to recognise
    - which packet had problem
  - 8 data bytes is usually transport header
    - or part of it

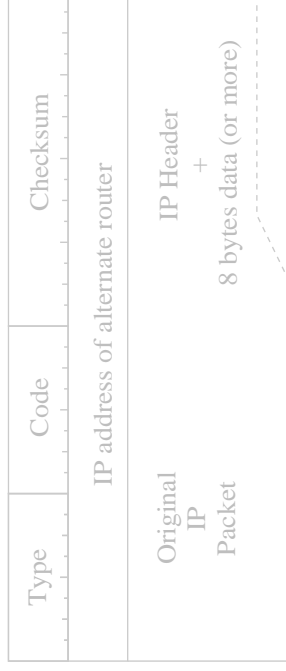
# ICMP Unreachable



- ◇ **Packet could not be delivered**
- ◇ **No additional data**
  - Except modern Fragmentation Required: MTU
- ◇ **Code: Why...**

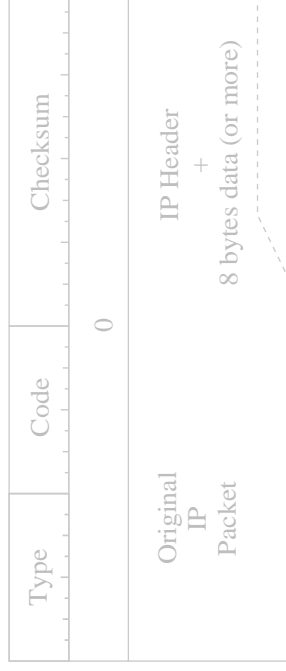
|                |                  |                   |
|----------------|------------------|-------------------|
| Network        | Host             | Protocol          |
| Port           | Need to Fragment | Source Route Fail |
| Net Unknown    | Host Unknown     | Source Isolated   |
| Net Prohibited | Host Prohibited  | Bad TOS (Net)     |
| Bad TOS (Host) | Admin Prohibit   |                   |

# ICMP Redirect



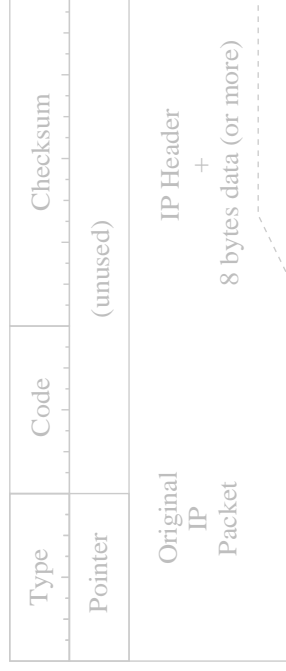
- ◇ **If host chooses wrong router**
  - hosts have no information to make choice
- ◇ **router still forwards packet**
- ◇ **router also returns redirect**
  - next packet to destination should be sent
  - to the alternate router address specified
- ◇ **Code:**
  - host or net; always, or for TOS used

## ICMP Time Exceeded



- ◇ TTL decremented to 0
- ◇ Code 0
  - In Transit
    - ▷ while being forwarded
- ◇ Code 1
  - In reassembly queue
    - ▷ waiting for later fragments to arrive
    - ▷ only first fragment (offset == 0)

## ICMP Parameter Problem



- ◇ Error of some kind in headers
  - Packet was discarded
    - ▷ No ICMP error sent if packet forwarded
- ◇ Pointer is offset to the byte of the header
  - where the error was detected

## ICMP Error Rule

- ◇ Never send ICMP error packet if
  - packet with the problem was an ICMP error packet
- ◇ Error types
  - Unreachable (3) Source Quench (4)
  - Redirect (5) Time Exceeded (11)
  - Param Prob (12)
- ◇ Not Errors
  - Echo/Reply (8/0) Time/Reply (13/14)
  - Info/Reply (15/16) Mask/Reply (17/18)
  - Router Solicit/Advert (10/9)
- ◇ What about type 6?