Modify the ping.c program to implement the basic functions of the IP node, so that it is able to recognize, in reception, as well as the usual ICMP "message *echo reply*", also another type of ICMP message, called "*unreachable destination*" for which the documentation from RFC 792 is reported.

Note that the "message *unreachable destination*" is generated by a router on the network, in the event that it detects that the IP datagram that is forwarding is intended for an address that can never be reached. In this case the router:

1. delete that IP packet (i.e. do not forward it to any other router).
2. create ICMP message "unreachable destination"
3. sends the ICMP message to the node that generated the IP packet without destination reachable to warn that it has deleted the packet.

Try to receive as many different type (“codes”) in reply by sending appropriate packets in the network (ICMP/IP or TCP/IP).

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From RFC 792:

Destination Unreachable Message

0 1 2 3

0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

| Type | Code | Checksum |

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

| unused |

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

| Internet Header + 64 bits of Original Data Datagram |

+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

IP Fields:

Destination Address

The source network and address from the original datagram's data.

ICMP Fields:

Type

3

Code

0 = net unreachable;

1 = host unreachable;

2 = protocol unreachable;

3 = port unreachable;

4 = fragmentation needed and DF set;

5 = source route failed.

Checksum

The checksum is the 16-bit ones's complement of the one's

complement sum of the ICMP message starting with the ICMP Type.

For computing the checksum , the checksum field should be zero.

This checksum may be replaced in the future.

Internet Header + 64 bits of Data Datagram

The internet header plus the first 64 bits of the original

datagram's data. This data is used by the host to match the

message to the appropriate process. If a higher level protocol

uses port numbers, they are assumed to be in the first 64 data

bits of the original datagram's data.

Description

If, according to the information in the gateway's routing tables,

the network specified in the internet destination field of a

datagram is unreachable, e.g., the distance to the network is

infinity, the gateway may send a destination unreachable message

to the internet source host of the datagram. In addition, in some

networks, the gateway may be able to determine if the internet

destination host is unreachable. Gateways in these networks may

send destination unreachable messages to the source host when the

destination host is unreachable.

If, in the destination host, the IP module cannot deliver the

datagram because the indicated protocol module or process port is

not active, the destination host may send a destination

unreachable message to the source host.

Another case is when a datagram must be fragmented to be forwarded

by a gateway yet the Don't Fragment flag is on. In this case the

gateway must discard the datagram and may return a destination

unreachable message.

Codes 0, 1, 4, and 5 may be received from a gateway. Codes 2 and

3 may be received from a host.