Department of Information Engineering

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**COMPUTER NETWORK LAB TEST**

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Add to the program ping.c the capability of processing the "unreachable destination" ICMP message type reported in the RFC 792 (see next page), in addition to the usual ICMP "echo reply" messages.

The “unreachable destination” message can be generated by a router in the network if, while processing an IP datagram, it realizes that it is destined for an address that cannot be reached. In this case the router:

1. discards that IP packet (i.e. it erases it without forwarding it to any further hop).

2. creates the ICMP "unreachable destination" message

3. sends the ICMP message to the node that generated the IP packet with no reachable destination to warn it that it has thrown the packet away.

The modified program should

a) report that the echo request has not reached the destination and

b) specify the IP address of the router that discarded the echo request.

To test the program, make it send an "echo request" to an unreachable address (e.g. 216.51.250.1 ) to obtain a "Destination Unreachable" message and identify the ip address of the node that has generated the message.

In the top of your source program, add the following contents:

1. Describe the point of the program where you apply the changes
2. Define the logic of the changes
3. Report the results of the test

OR

1. RETIRED, if you want to cancel the exam.

**Advanced feature to implement for skillful students:**

Make the program able to report how many nodes the discarded packet has traversed before being discarded.

**PROGRAM DELIVERY BEFORE 16.15**

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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 |

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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.