

CS307-f20
Computer Networks
Assignment 4

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1 Introduction and Overview

The Internet Protocol (IP) is used for host-to-host datagram service in a system of interconnected networks called the Catenet. The network connecting devices are called Gateways. These gateways communicate between themselves for control purposes via a Gateway to Gateway Protocol (GGP). Occasionally a gateway or destination host will communicate with a source host, for example, to report an error in datagram processing. For such purposes this protocol, the Internet Control Message Protocol (ICMP), is used. ICMP, uses the basic support of IP as if it were a higher level protocol, however, ICMP is actually an integral part of IP, and must be implemented by every IP module.

ICMP messages are sent in several situations: for example, when a datagram cannot reach its destination, when the gateway does not have the buffering capacity to forward a datagram, and when the gateway can direct the host to send traffic on a shorter route.

2 Application

2.1 Error Handling

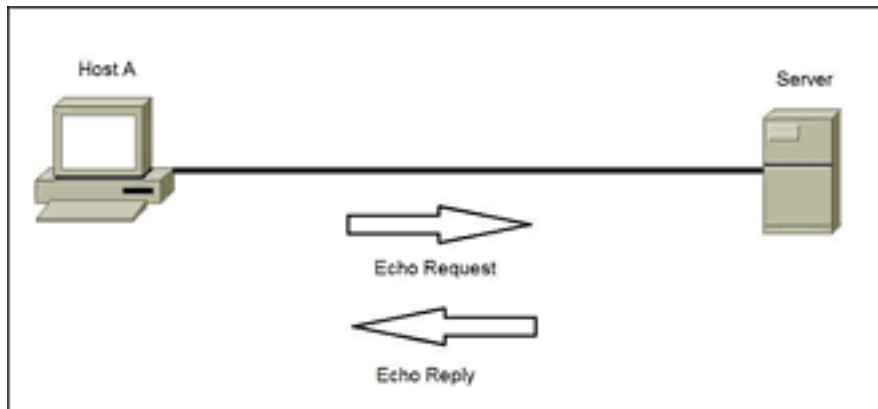
The Internet Protocol is not designed to be absolutely reliable. The purpose of these control messages is to provide feedback about problems in the communication environment, not to make IP reliable. There are still no guarantees that a datagram will be delivered or a control message will be returned. Some datagrams may still be undelivered without any report of their loss. For that purpose the ICMP is used which send a message to the sender that the particular packet is undelivered provided with the information of which packet is discarded and by which router

2.1.1 Note:

The ICMP messages typically report errors in the processing of datagrams. To avoid the infinite regress of messages about messages etc., no ICMP messages are sent about ICMP messages. Also ICMP messages are only sent about errors in handling fragment zero of fragmented datagrams. (Fragment zero has the fragment offset equal zero).

2.2 Request and Reply

The ICMP protocol is also used in the **Request and Reply** . It can be used either for requesting a specific packet or it can be used for **Ping** purpose in order to check the connection.



2.2.1 Ping Responses

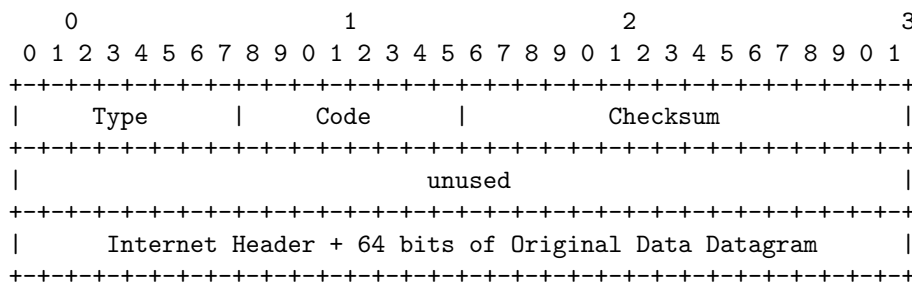
The ICMP echo request and the ICMP echo reply messages are commonly known as ping messages. Ping is a troubleshooting tool used by system administrators to manually test for connectivity between network devices, and also to test for network delay and packet loss. The ping command sends an ICMP echo request to a device on the network, and the device immediately responds with an ICMP echo reply. Sometimes, a company's network security policy requires ping (ICMP echo reply) to be disabled on all devices to make them more difficult to be discovered by unauthorized persons.

2.3 Source Quench

A gateway may discard internet datagrams if it does not have the buffer space needed to queue the datagrams for output to the next network on the route to the destination network. If a gateway discards a datagram, it may send a source quench message to the internet source host of the datagram. A destination host may also send a source quench message if datagrams arrive too fast to be processed. The source quench message is a request to the host to cut back the rate at which it is sending traffic to the internet destination. The gateway may send a source quench message for every message that it discards. On receipt of a source quench message, the source host should cut back the rate at which it is sending traffic to the specified destination until it no longer receives source quench messages from the gateway. The source host can then gradually increase the rate at which it sends traffic to the destination until it again receives source quench messages.

2.4 ICMP Header

The ICMP header looks like this:



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