

Name: _____

Experiment 1.5

Build an IP Fragmenter

Purpose

To learn how to fragment IP datagrams on a network processor.

Background Reading And Preparation

Read Section 5.9 in Network System Design with Network Processors for information on IP fragmentation and reassembly. Consult RFC 791 to learn more details of IP header fields used in fragmentation, and RFC 815 for information about reassembly.

Overview

Construct and test a network processor application that fragments IP datagrams.

Procedure And Details (checkmark as each is completed)

- _____ Create an application using the simplified API that forwards frames between two Ethernet segments. Have the application forward all frames except IP datagrams that are larger than some fixed MTU (e.g. 128). (Do not count the Ethernet header when computing the size of the IP datagram.) The application should drop frames containing IP packets that exceed the chosen MTU. Allow the MTU to be set using the "send_command" application.
- _____ Modify your application so that instead of dropping IP frames that exceed the (artificial) MTU, it fragments them according to IP fragmentation rules. Your application should be able to fragment frames that contain both whole and previously fragmented IP datagrams.
- _____ Test your application by connecting two hosts to independent Ethernet segments and connecting those Ethernet segments to the network processor. Send large IP or UDP packets from one host to the other using either Ping, Netcat, or an equivalent program and check that they are received properly on the destination host.
- _____ Try sending packets of various sizes including: packets less than the MTU of both Ethernet and the fragmentor, packets smaller than the IP-over-Ethernet MTU (1460 bytes) but larger than the fragmentor MTU, and packets larger than both MTUs. Change the MTU on your application and test the application again.

Optional Extensions (checkmark options as they are completed)

- _____ Extend your fragmentor so that it sends the appropriate ICMP message back to the source host when it would fragment a datagram with the Don't Fragment bit set. (It should also drop the original datagram.)
- _____ Have your fragmentor implement PATH MTU discovery. When it fragments a datagram have it also set the Don't Fragment bit in the datagram. If it receives an ICMP Destination Unreachable datagram with a Code of 4 (fragmentation needed and DF bit set) the application should make an entry in a table for the destination address of the datagram and fragment all subsequent datagrams to that destination at a smaller MTU. If it receives subsequent ICMP messages for a given destination it should continue to decrement the MTU for that destination.
- _____ Create a network processor application that performs IP reassembly.

Notes