Experimenting with Ethernet

Gates, Ozturk, & Shah
CISC 7332X Section T6 - Local Area Networks
Brooklyn College 2019

***Abstract*— This is a detailed review of our completion of the project "Experimented with Ethernet." The objectives of this project were as follows,**

- **to gain an understanding the implementation of the physical and link layers in a computer system;**
- **to gain hands-on experience using Ethernet for communication;**
- **to learn the concept of Socket API and raw sockets;**
- **to become familiar with the essential services that Ethernet provides to hosts;**
- **to gain hands-on experience observing network traffic; and**
- **to gain hands-on experience diagnosing potential communication problems in Ethernet.**

The following text will detail a brief overview of how we completed this project and the steps we took to do so, along with answering the questions that were posed during the process.

I. Project Description Overview

In this project we were tasked with setting up virtual machines that we could then use for our network programming and experimentation throughout the course of this assignment. The individual tasks involved in the VM Setup are detailed here.

After we individually completed setting up the virtual machines, we were then tasked with starting our experiments concerning Ethernet. The individual steps we were tasked with following is detailed here.

Our individual experiments and our group's analysis will be covered in the following sections.

II. VM Setup and Ethernet Questions

A. 3.1 Ethernet Frame Capture and Injection

1) Locate the frame transmitted from etherinj and list the values of all fields of the captured Ethernet frame that carries the Hello, World message using Table 1: An example frame transmitted from Alice's etherinj to Bob can be seen in Figure 1.

Captured Frame

```
Captured at interface: eth1 frame from 08:00:27:32:8b:aa

0000  08 00 27 c3 d1 74 08 00 27 32 8b aa 00 2e 48 65       ..'..t..'2....He
0010  6c 6c 6f 2c 20 57 6f 72 6c 64 00 00 00 00 00 00       llo, World......
0020  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00       ................
0030  00 00 00 00 00 00 00 00 00 00 00 00                   ............
```

	Destination Address:	08 00 27 c3 d1 74
Frame Header:	Source Address:	08 00 27 32 8b aa
	Type or Length of Frame:	00 2e
Body of Frame:		48 65 6c 6c 6f 2c 20 57 6f 72 6c 64 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Fig. 1. Captured Frame

2) Can you run etherinj and ethercap without using sudo?: Unfortunately no, you cannot.

3) Explain from the computer security perspective, why does Linux require you to run such programs using a special permission, such as using sudo?: Sudo is used whenever you are attempting to do something that standard users should not be able to do. Without these precautions, a standard user could potentially change something (like an important system configuration) that could drastically damage the system. It would be very easy for something incorrect to be done. Sudo/Root is used whenever you are doing something that a standard user should not have the capability of doing for risk of damaging/changing the system configuration in a way that the Administrator of the system would not normally allow.

B. 3.2 Unicast, Broadcast, and Multicast

1) Explain the difference among Ethernet unicast, broadcast, and multicast addresses.:

- Unicast is a type of information transfer when there is only a single sender and a single recipient. This is simply put a one to one transmission.
- Broadcast is a type of information transfer when there is a single sender to all devices on the network. This is simply put a one to all transmission.
- Multicast is a type of information transfer when there is one or more senders and one or more recipients. This is simply put a group to group transmission.

2) Describe the examples and observations in the report.:

- Unicast: To send a message from Alice to Bob using their unicast address, we have to first use the command "ip address show". This will display the addresses for both the sending and recipient machines.
- Broadcast: To have Alice send the same message to Bob using broadcast transmission, you will use the same sending address but have "ff:ff:ff:ff:ff:ff" as the recipient address. This will have Alice send the message to every virtual machine that was created during the VM setup phase.
- Multicast: To have Alice send a message to Bob using a multicast transmission we will once again keep the sending address the same and change the recipient address. We will change the "08" in Bob's unicast address to "09". If you convert the "09" to binary, you will see that the last bit is a one, indicating a multicast address.

III. Services Provided by Ethernet

Ethernet is a way of connecting devices in a Local Area Network. Ethernet defines how many conductors are required for a connection, the performance thresholds, and the framework for data transmission. It allows the host to transmit messages at any time, without having to wait for network permission. Ethernet provides consistent and reliable speeds that will not be effected by environmental factors. There is no chance of any form of security breaches, such as data loss or hacking, since data sent over the Ethernet connection can only be accessed by other devices physically attached to the network.