Written Lab 2: Ethernet Networking & Data Encapsulation

Key Networking Terms:

1. Individual/Group bit- first bit in a MAC; 0 means that the address is a MAC address; 1 means the address represents a broadcast.
2. Global (Universal)/Local bit- the second bit in a MAC address, 0 means the address assigned by the IEEE; 1 means the address is locally governed and assigned.
3. Nibble- a group of 4 bits, half of a byte
4. Ethernet Frame (left -> right):
   1. Preamble (7 bytes)- alternating 0/1s which lets the receivers lock the incoming stream of bits
   2. Start Frame Delimiter (SDF) (1 byte) /Synch- allows a receiver to sync up to find the start of the data
   3. Destination Address (6 bytes)- Where to send the packet. Ordered by LSB first.
   4. Source Address (6 bytes)- MAC address to identify the transmitting device. Like the one above, also LSB first.
   5. Length/Type (2 bytes)- Protocol used to send.
   6. Data (46/1500 bytes) [packet]- all/portion of data being sent
   7. Frame Check Sequence (FCS) (4 bytes)- stores an answer to the cyclical redundancy check (CRC); basically error/security checking.

Procedures:

2.2.1: Carrier Sense Multiple Access with Collision Detection steps after a collision, in order:

1. A jam signal informs all devices that a collision occurred.

2. The collision invokes a random backoff algorithm.

3. Each device on the Ethernet segment stops transmitting for a

short time until the timers expire.

4. All hosts have equal priority to transmit after the timers have

expired.

2.3.(1-8): Identify the type of cable needed to make the connections:

1. Host to host- crossover

2. Host to switch or hub- straight-through

3. Router direct to host- crossover

4. Switch to switch- crossover

5. Router to switch or hub- straight-through

6. Hub to hub- crossover

7. Hub to switch- crossover

8. Host to a router console serial communication (COM) port- rolled cable

2.4.1: The transmitting device encapsulation is as follows:

1. User information is converted to data for transmission on the

network.

2. Data is converted to segments, and a reliable connection is set up

between the transmitting and receiving hosts.

3. Segments are converted to packets or datagrams, and a logical

address is placed in the header so each packet can be routed

through an internetwork.

4. Packets or datagrams are converted to frames for transmission on

the local network. Hardware (Ethernet) addresses are used to

uniquely identify hosts on a local network segment.

5. Frames are converted to bits, and a digital encoding and clocking

scheme is used.

Conclusions and Discussion:

The readings helped correct a misconception I had about the Transport Layer. I had previously thought that the transport layer would be the one to “transport” to data, but it seems the Data Link layer is the portion responsible for actually putting the data on a wire; the transport layer seems more like a director in conjunction with the network layer. The readings also really helped me put together how the layers of the OSI model interact with one another; this topic was always mentioned in passing but not in detail, like it is in this chapter. It made a lot of sense to me that each layer would put its own kind of “stamp of approval” before sending it down to the next layer, every one has their own 2-cents to put in.

This chapter also reviewed some material I previously learned, like number systems and their conversions. The reading also brought up a question about how my router connects to my computer with a cat5 cable at my house, when the book mentions it should be a crossover cable… I am betting it is the auto-detection system we mentioned in class, I might check next time I am at home.

Feedback

Just an excellent lab report all around! The key networking terms identified help us establish stable Ethernet-based communications, with framing allowing for the ARP protocol to be used for translating IP addresses to specific MACs needed for communication within a LAN. ﻿﻿﻿﻿﻿﻿﻿﻿

The procedures section clearly indicates the CSMA/CD mechanism; the types of cables needed for specific hardware connections are listed accurately; encapsulation of data within the TCP/IP reference model is explained succinctly.

The C&D section is particularly insightful. It clearly notes how prior thinking about specific topics has been updated. The analogy of the Transport layer serving as a "director" is quite appropriate.

Good work John.