FIT1047 Tutorial 8 – Sample Solution

Topics and goals

Network layers and protocols

- Physical layer: learn about the speed of light in cables
- Data link layer: analyse Ethernet packets and Wireless LANs

Note: You will need to use your own laptop for task 2.

Task 1: Physical layer

How long is a bit? This sounds like a silly question, but we can actually compute it.

The speed of light is approximately 3×10^8 m/s. But signals in copper cables are slower, they travel with approximately 70% of the speed of light.

Now if we assume that bits are transmitted sequentially through a copper cable (one after the other), and if we know how many bits are transmitted per second, we can calculate how long the signal is (in meters) for each bit!

Compute the length of a bit for the orginal Ethernet, which ran at 10 Mbit/s.

$$\frac{0.7 \times 3 \times 10^8 \text{ m/s}}{10 \times 10^6 \text{ bits/s}} = 21 \text{ m/bit}$$

Task 2: Wireless networks

This task helps you prepare for Assignment 2. You will need to use your own laptop, because the Monash lab computers are not equipped with wireless network interfaces.

1. Download and install a tool for analysing wireless networks. You can use e.g. Acrylic Wifi (`https://www.acrylicwifi.com/en/`) or inSSIDer-2 (`http://bit.ly/1KcqkN2`) for Windows, or NetSpot (`http://www.netspotapp.com`) for Mac OS and Windows.
2. Open the tool and familiarise yourself with the interface. Start a network analysis.
3. Take a look at the gathered data. You should be able to see networks such as eduroam, Monash Free WiFi, and Guest-wireless. The analysis will show different parameters such as signal strength, channels, and security features. Find out what some of these parameters mean.

Task 3: Data link layer / Ethernet

This activity is a continuation of the packet sniffing we did in the previous lab. In this activity you will use **Wireshark** to capture the live network traffic into and out of your computer.

1. Open Wireshark and start capturing packets from the appropriate network interface. In the Monash labs, that would usually be an *Ethernet* interface. You can select that interface on the main Wireshark screen, or select *Interfaces* from the *Capture* menu.
2. The Wireshark window will now start filling up with packets. Open the following URL in a web browser:

   `http://s-cah-mwallace.infotech.monash.edu/~guidot/image.php`
3. Answer the following questions, based on the contents of the Ethernet frame containing the HTTP GET message.

   a) What is the value of the Ethernet address of your computer? (Hint: on Windows, use the `ipconfig /all` command line tool)

   b) What is the destination address in the Ethernet frame? Is this the Ethernet address of `www.csse.monash.edu`?

   The destination MAC address belongs to the router that your computer is connected to, not to `www.csse.monash.edu`.

   c) How many bytes from the very start of the Ethernet frame does the ASCII "G" in "GET" appear in the Ethernet frame?
4. Next, answer the following questions, based on the contents of the Ethernet frame containing the first byte of the HTTP response message.

   a) What is the value of the Ethernet source address? Is this the address of your computer, or of www.csse.monash.edu?

   The source MAC address belongs to the router that your computer is connected to, not to `www.csse.monash.edu`.

   b) What is the destination address in the Ethernet frame? Is this the Ethernet address of your computer?

   The destination MAC address should be your own computer.

   c) How many bytes from the very start of the Ethernet frame does the ASCII "O" in "OK" (i.e., the HTTP response code) appear in the Ethernet frame?