Lab 03 – Hardware Hunt

Author: Raymond Ng
Course Number/Section: IS 3413-006
Date: September 14, 2022

INTRODUCTION

The purpose of this lab was to familiarize users with components of the components of the physical layer, as they relate to the Open Systems Interconnection (OSI) Model. Users found and reported on various types of hardware, including network interface cards (NIC), cables, connectors, and hubs/switches. Further, users leveraged organic tools on personal systems to estimate speeds of various types of adapters and cables.

PROCESS

Step 1: Detail My Hardware

Per the first set of situations of this lab, I investigated hardware components are they pertain to this lab and to the network enterprise established in my own home.

Network Interface Cards (NIC)

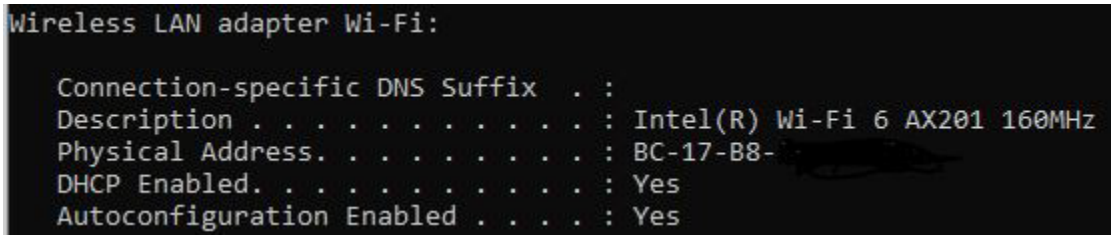

Figure 1: My wireless LAN network adapter information.

Figure 1 depicts my wireless LAN network adapter information, which was obtained by using `ipconfig/all` in the command line terminal of my laptop. This is a built-in component of the laptop I use for school. It's the only NIC I use to connect to the Internet. I do not use any other network adapters for this laptop.

Ethernet RJ-45 Connectors/Cables/Ports

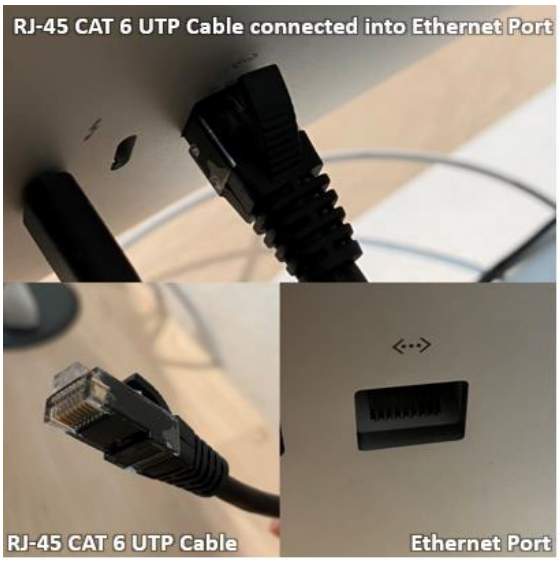

Figure 2: My RJ-45 CAT 6a UTP cable plugged into my ethernet port of my iMac computer

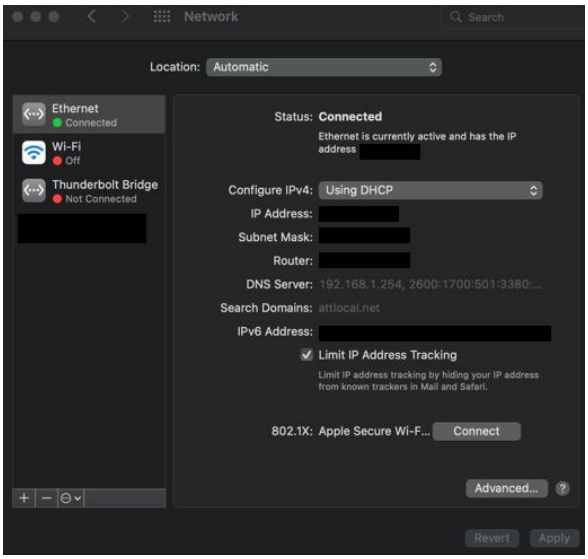

Figure 3: NIC information for my iMac

Figure 2 depicts the iMac I use at home for work. I have a RJ-45 CAT 6a UTP cable plugged into the ethernet port of my iMac. My employer restricts me to use solely wired, ethernet connection to connect to the Internet. As depicted in *Figure 3*, the only NIC with connectivity is ethernet.

USB-A/USB-C/etc. Connectors/Cables/Ports

Figure 4: My Apple USB-C to Lightning charging cable with 20W USB-C Power Adapter

Figure 5: USB-C to Lightning charging cable plugged into iPhone lightning charge port

For this section of the lab, I chose my Apple USB-C to Lightning cable, which I use to charge my Apple iPhone. As depicted in *Figure 4*, one end (USB-C end) of the cable plugs into the 20W USB-C Power Adapter. The other end (Lightning Cable) plugs only into other Apple devices with lightning ports, in this case my iPhone (*Figure 5*). I know that this cable serves as a data transfer cable as well because I have helped clients perform backups on a computer from their Apple devices.

Hubs, Switchers, or Routers

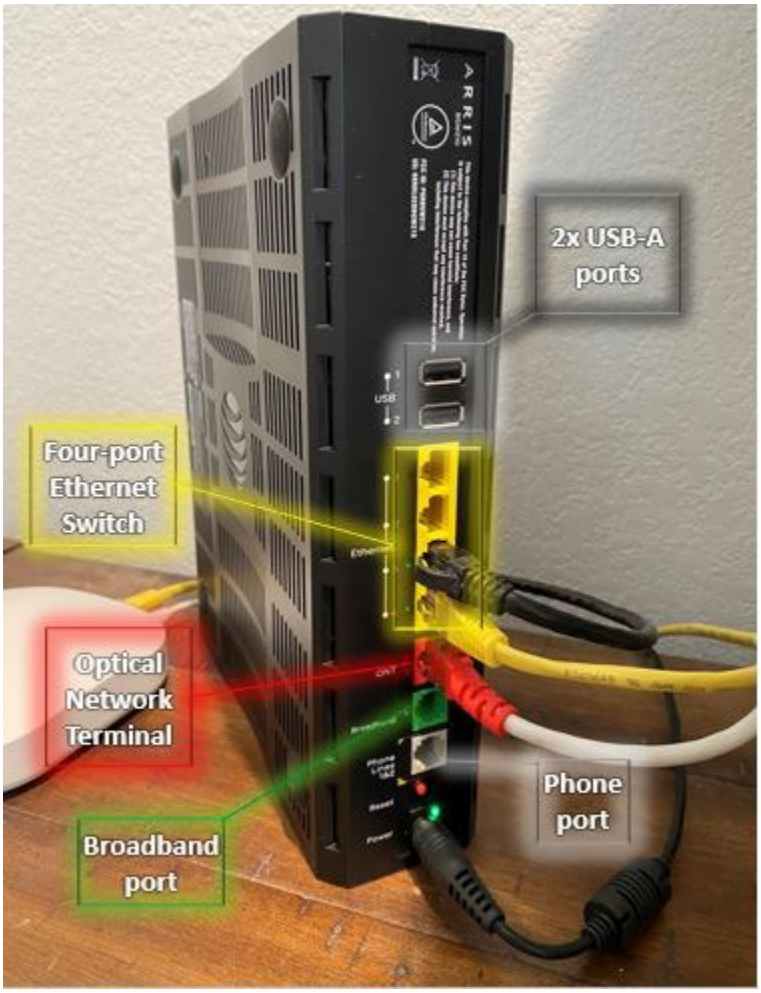

Figure 6: My At&t 802.11b/g/n/ac Modem & Wi-Fi Router

Figure 6 depicts the modem that was provided by Internet carrier, At&t. As depicted, the modem contains a four-port ethernet switch to connect devices that require a wired connectivity like my work iMac. Additionally, observing the wire plugged into Optical Network Terminal (ONT) port is the fiber optic cable that routes me to access my carrier's high-speed Internet. Furthermore, this modem has a built-in Wi-Fi router that connects all my wireless devices like my iPhone and laptops to the Internet.

Step 2: Detail Your Device Speeds

```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\rayng> Get-NetAdapter | select interfaceDescription, name, status, linkSpeed

interfaceDescription                    name                          Status       LinkSpeed
--------------------                    ----                          ------       ---------
Bluetooth Device (Personal Area Network)  Bluetooth Network Connection  Disconnected 3 Mbps
VMware Virtual Ethernet Adapter for VMnet8 VMware Network Adapter VMnet8 Up           100 Mbps
VMware Virtual Ethernet Adapter for VMnet1 VMware Network Adapter VMnet1 Up           100 Mbps
Intel(R) Wi-Fi 6 AX201 160MHz           Wi-Fi                         Up           433.3 Mbps
```

Figure 7: Finding NIC link speeds through Powershell

Figure 7 depicts the link speeds of the NICs on my personal laptop via Windows PowerShell by executing `Get-NetAdapter | select interfaceDescription, name, status, linkSpeed`. I was particularly curious about my Wi-Fi NIC which depicts a link speed of 433.3Mbps.

Figure 2 depicted the RJ-45 CAT 6a UTP that is plugged into my work iMac. I know it's a CAT 6 cable because it was clearly marked with CAT 6 on the cable and there was a 500MHz marking, indicating the bandwidth, which I know is associated with Category 6a with a link speed of up to 10Gbps (10,000Mbps), according to *triplite.com*. I already knew that I would get less than 1Gbps because my carrier, At&t, only offers up to 1Gbps, but I wanted to test the connection to gain fidelity of my link speed [1].

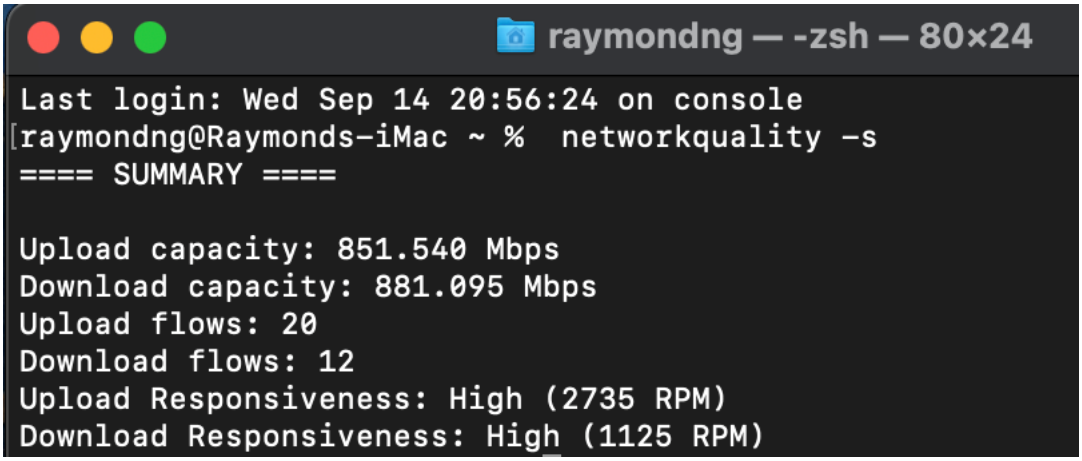

Figure 8: Link speed of my ethernet connection

In Figure 8, I executed `networkquality -s` on the terminal on my work iMac to gain fidelity of my link speed. Of note, I noticed the link speed for ethernet connection is a lot faster than Wi-Fi connection on my personal laptop, Wi-Fi speed is nearly half of the ethernet speed. Then, I remembered that I use Eero devices that extend the Wi-Fi range in my home which can only provide up to 500Mbps.

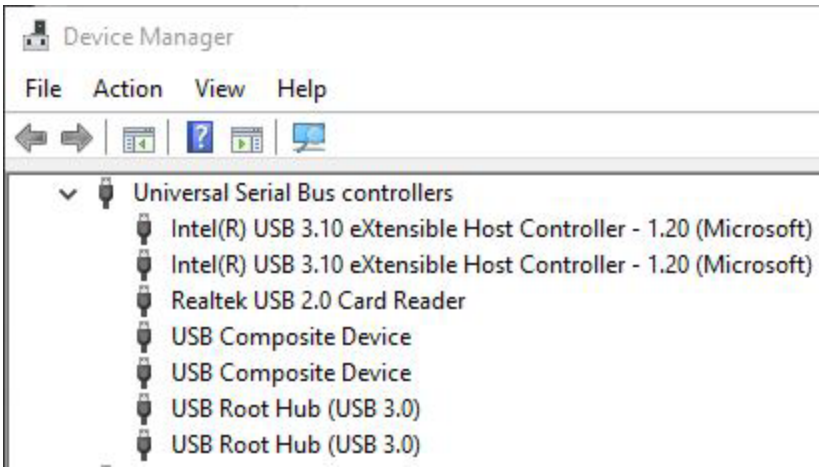

Figure 9: Types of USB ports on my personal laptop via Device Manager

From visually observing my personal laptop I have 1x USB-C and 2x USB-A ports. In *Figure 9*, I went into Device Manager on my personal laptop to determine what type of USB ports I had and how fast of a link speed they can support. According *tripplite.com*, I likely had a USB 3.2 Gen 2 USB ports based on the year of laptop and the `USB 3.10` identifier depicted in *Figure 9*, which can support a data link speed of up to 10Gbps [2].

Referencing back to *Figure 2* concerning my Apple USB-C to Lightning cable. I mentioned that it served as a data transfer cable as well. The cable is limited to a link speed of approximately 480Mbps, per Apple's website [3].

LIMITATIONS/CONCLUSION

As an introductory experiment for the novice user like myself, I thought the lab's difficulty was fairly simple. I do not think there were any limitations because everything was executed in a live environment versus a controlled environment, like on a virtual machine. Moreover, there were plenty of online resources to guide the user. One of the major takeaways from this lab was understanding the functionality of each hardware component as it relates to network connectivity and interpreting the limitations of each component, i.e. the link speed associated with each port and/or cable. I'm assess cybersecurity analyst need to comprehend the aforementioned as they tackle daily problem sets and to determine what tools can be used to analyze and exploit enduring (and emerging) threats to the cyber domain.

REFERENCES

[1] TrippLite [Online]. "Ethernet Cables Explained", 2022. Available: https://www.tripplite.com/products/ethernet-cable-types [Accessed: 14-Sep-2022]

[2] TrippLite [Online]. "USB: Port Types and Speeds Compared", 2022 Available: https://www.tripplite.com/products/usb-connectivity-types-standards [Accessed: 14-Sep-2022]

[3] Apple [Online]. "Compared with Apple USB-C Charge Cable", April 28, 2020. Available: https://support.apple.com/en-us/HT208368 [Accessed: 14-Sep-2022]

COLLABORATION

The entirety of this lab was executed independently by the author. No additional collaboration to report.