Lab 1:   
Data Communications\Networking

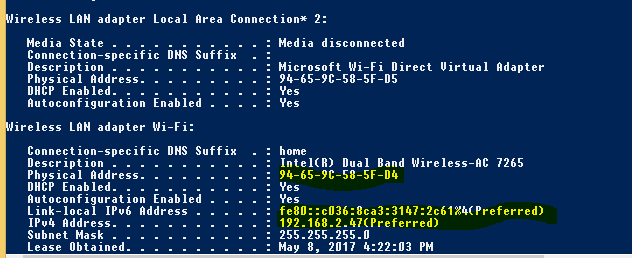
This course is essentially divided into two parts: Data Communications (weeks 1-5) and Networking (weeks 7-11). It is common for users, to use these terms synonymously; however, in this course we will me more technical and treat them differently. Data Communications involves transmitting signals which represent “0s” and “1s” between two hosts over a point-to-point circuit. Data communication uses the data link and physical layers of the TCP/IP protocol stack to provide framing, error checking, encoding\decoding and the type of transmission, synchronous or asynchronous. Networking is built on top of data communications and involves the logical connection of point-to-point circuits for the exchange and sharing of information among networked applications. Networking uses the application, transport and Internet layers of the TCP/IP protocol stack. This lab will introduce you to the concepts of data communications and networking.

Instructions:

* Open this file in MSWord and write your answers in the space provided.

**A Data Communications:**

1. Open a PowerShell console
2. Type **ipconfig /all**



You should see a screen like the one above. Notice you have two addresses: Physical Address and an IPv4 address. There is also a Link-local IPv6 address. (Note: you will only see an IPv6 addresses if you are connected via WiFi)

1. Write down your MAC address without the hyphens 🡪 BC091B5D6A1F.
2. Copy the MAC address to Windows Calculator. Make sure the Calculator is set to Programmer View and the input format is set to HEX
3. Click the BIN radio button. How many bits is the MAC address 🡪 48 Bits in total.

The MAC (Media Access Control) address is used by all LANs and most WANs to forward frames on a single switched network. A switched network consists of many point-to-point connections connecting hosts.

1. Click on the DEC radio button. What is the decimal conversion? 🡪 206,747,299,834,399.
2. Open a command line window as administrator, type **netsh interface ip delete arpcache**

The arp cache is a special area of memory used by the Internet layer to map IP addresses (which are used for routing) to Ethernet or MAC addresses (which are used for switching).

1. Get the IP address of your neighbour’s computer and type **ping < neighbour’s IP address>**
2. Get the IP address of another neighbour’s computer and PING their computer
3. View the arp cache, type **arp -a**Notice that the arp cache is a dynamic listing of all IP addresses you connect with and their associated Ethernet or MAC addresses. On a local area network only the MAC address is used to forward framesacross a single switched network.

**B Networking:**

1. Write down your IPv4 address? 🡪 192.168.2.152
2. Navigate to <http://www.subnetonline.com/pages/subnet-calculators/ip-subnet-calculator.php>
3. Type in the IP address and subnet mask. The purpose of the subnet mask is to place a binary “1” under the network portion of the address.   
   1. What is the network portion of the address? 🡪 The network portion of the address is **192.168.2.0**.
   2. What is the maximum number of hosts? 🡪 Maximum number of hosts are **254**.
   3. How many bits is the IPv4 address? 🡪 There are a total of **32 bits** in an IPv4 address in which **24 bits** are network address size and **8 bits** are host address size.

The IPv4 address is used to connect different single switched networks together so that packets can be routed to the destination network. Thus, the IP address is clearly a “networking” device while the MAC address is a data communications device.

1. Conduct a Google search and identify 2 devices used in data communications. (Note: data communication devices deal with sending “signals” and forward frames based on the MAC or physical address)

🡪Among all the data communication devices, the most common one is a **Modem**. One other device used in data communication is an **ISDN adapter.**

1. Who is the Father of” Data Communications” or the “Information Age” of today?  
     
   🡪**Claude Elwood Shannon** is the Father of Information Age.
2. Test you download speed.
3. Navigate to <http://www.speedtest.net>
4. Click the Go button. This web site will automatically download and upload a file and measure the speed of the connection.
   1. What is the PING value (latency or delay)? 🡪 1 ms.
   2. What is your download speed? 🡪 997.34 Mbps.
   3. What is your upload speed? 🡪 745.35 Mbps.

1. In the PowerShell console. Clear the screen. Type CLS and press enter

**We will use the PING command to test if a networked host is “alive”.**

1. Type PING my.senecacollege.ca. What is the IPv4 address returned? 🡪142.204.250.207.

1. Type **PING Google.ca.** What is the IPv4 address returned? 🡪172.217.13.195.  
   1. What is the average round-trip time? 🡪14ms.

1. Type **TRACERT Google.ca.** This command records the pathway taken when packets are routed from your computer to Google.ca web site. The first hop is your IP address.  
   1. What is the IP address of the first router? (2nd hop) 🡪10.50.44.36.
   2. How many hops (each hop is a server or a router) were taken? 🡪14 hops were taken in my case.
2. Name 4 applications, based on a client\server architecture, you use everyday?

I use many client/server based applications in my day to day life, they are mentioned below :-

🡪I use **Oracle SQL Developer** for my other course.

🡪I use Email applications such as **Gmail** and **Outlook** for communication in my daily life.

🡪I use a few banking apps as well. For instance, **CIBC Mobile Banking** and **Scotiabank**.

🡪Lastly, I spend extensive time searching up things on the Internet, so my browser like **Google Chrome** and **Microsoft Edge** also acts as a Client/Server based applications which gets back to me with a response when I send a request.

1. Notice the IPv6 address is not written in dotted decimal format.
   1. What format is it? 🡪 IPv6 addresses are displayed in **hexadecimal** format. Basically, there are eight 4-digit hexadecimal digits separated by colons in an IPv6 address.
   2. How many bits long is it? 🡪 IPv6 addresses are **128 bits** long.

The local-link address is a specific address used by hosts which can not get an IP address from the network. On Windows machines this block will have the address 169.254.0.0/16 . We will discuss IP addressing in week 5.

1. Conduct a Google search and identify 2 devices used in networking? Note: networking devices deal with routing packets by IP address and the interoperability of information\sharing of resources)

🡪 One of the most common networking device is a **Router**. One other example is a **Hub**.

1. In one sentence explain the following acronyms PAN, LAN, MAN, and WAN

🡪 **PAN**- Personal Area Network- It can be referred as a network where two or more devices located within a single person connects with each other. For instance- Connection of a wireless keyboard & mouse with a Laptop or a PC via Bluetooth can be considered as PAN.

🡪 **LAN**- Local Area Networks- These type of networks generally comprises a group of devices in close proxity connected with each other. For instance- 5 computers connected in an office via a CAT5 cable.

🡪 **MAN-** Metropolitan Area Networks**-** These networks are high speed private networks which generally creates a link between let’s say two LAN networks. For instance- A large research

centre has many buildings and all of the buildings have their own LANs, but all the building together can be connected through a MAN type of network.

🡪 **WAN-** Wide Area Network- This type of network connects two or more LANs but these network generally is used over large distances, which can even be across the whole world. For instance- My internet connection can be referred as WAN as well.

1. What is the most popular local networking technology today? 🡪 In my opinion, most popular local networking technology is Wi-Fi or Ethernet cables within a LAN. Whereas, if we take consider wireless communication, 5G is the most popular wireless networking technology.
2. What address does Ethernet use to forward frames MAC or IP? 🡪 Ethernet uses MAC address to forward frames where frames contain the source and destination MAC addresses.
3. The protocol TCP/IP is used to network single switched networks together.
   1. What does this protocol acronym mean?   
        
      🡪TCP/IP – Transmission Control Protocol/Internet Protocol is an entire suite with a set of rules and regulations to connect devices on the Internet.
4. Which Internet pioneers invented TCP/IP and are generally regarded as the “Fathers of the Internet”. 🡪 Bob Kahn and Vint Cerf together invented TCP/IP protocol and are referred as “Fathers of the Internet”.

**Grading:**

* learnname\_Lab1\_DataCommNetworkingOverview.docx

Remember replacing **learnname** with **your name** for submission.

Submit using the Lab1 Submission link under MySeneca\Graded Work