Lab 1:
Data Communications\Networking

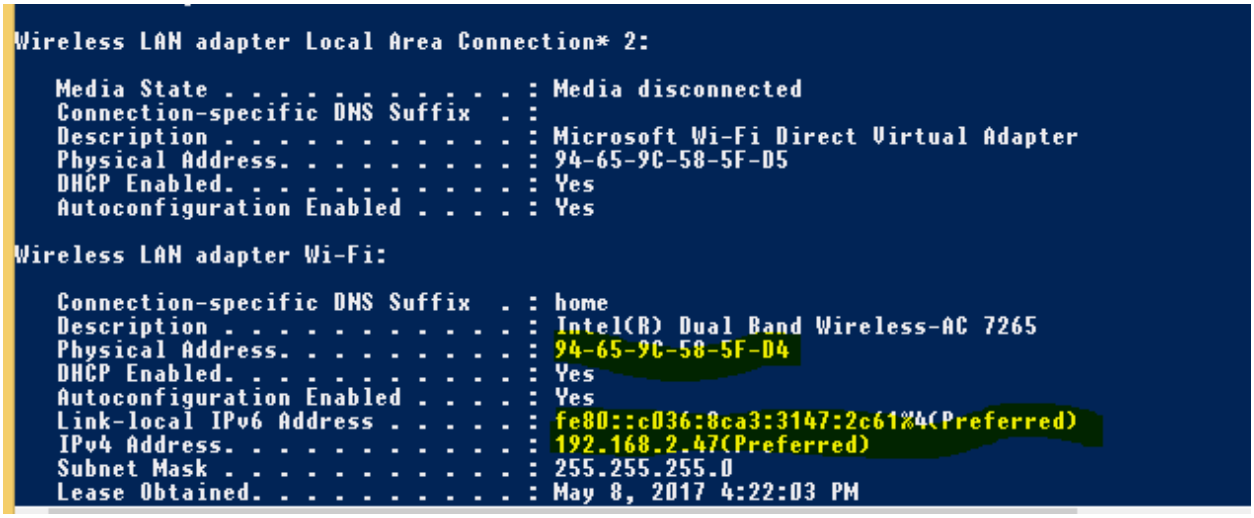
This course is essentially divided into two parts: Data Communications (weeks 1-5) and Networking (weeks 7-11). It is common for users, to use these terms synonymously; however, in this course we will me more technical and treat them differently. Data Communications involves transmitting signals which 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)

3. Write down your MAC address without the hyphens_____D83BBF473B19_____.

4. Copy the MAC address to Windows Calculator. Make sure the Calculator is set to Programmer View and the input format is set to HEX

5. Click the BIN radio button. How many bits is the MAC address ____1101 1000 0011 1011 1011 1111 0100 0111 0011 1011 0001 1001____?

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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.

6. Click on the DEC radio button. What is the decimal conversion?
___237,751,123,786,521_____

7. 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).

8. Get the IP address of your neighbour's computer and type **ping < neighbour's IP address>**
9. Get the IP address of another neighbour's computer and PING their computer
10. 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 frames across a single switched network.

B Networking:

11. Write down your IPv4 address? ____192.168.2.14_____.

12. Navigate to http://www.subnetonline.com/pages/subnet-calculators/ip-subnet-calculator.php
13. 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.

    a. What is the network portion of the address? _____192.168.2_____

    b. What is the maximum number of hosts? _____254_____

    c. How many bits is the IPv4 address? _____32 bits_____

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.

14. 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)

    ____Smartphones_____

    ____Modem_____

15. Who is the Father of" Data Communications" or the "Information Age" of today?

    ____Claude Shannon_____

16. Test you download speed.
17. Navigate to http://www.speedtest.net
18. Click the Go button. This web site will automatically download and upload a file and measure the speed of the connection.
    a. What is the PING value (latency or delay)? __5 ms_____
    b. What is your download speed? ___393.24 Mbps_____
    c. What is your upload speed? ___140.32 Mbps_____

19. 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".

20. Type PING my.senecacollege.ca. What is the IPv4 address returned? ___142.204.250.207_____
21. Type **PING Google.ca.** What is the IPv4 address returned? ___142.251.41.35_____
    a. What is the average round-trip time? ___4 ms_____
22. 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.
    a. What is the IP address of the first router? (2nd hop) _10.11.7.65_____
    b. How many hops (each hop is a server or a router) were taken? _11_____

23. Name 4 applications, based on a client\server architecture, you use everyday?

    _Google_____

    _Facebook_____

    _Instagram_____

    _Snapchat_____

24. Notice the IPv6 address is not written in dotted decimal format.
    a. What format is it? __Hexadecimal number system_____

    b. How many bits long is it? __128 bits_____

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.

25. 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)

    ____Repeater_____

    ____Router_____

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

__PAN – (Personal Area Network) is a network of more than one devices to a personal user's area or workspace.__

_LAN – (Local Area Network) is a network of devices within a limited area or workspace. For an instance, network in school building.__

__MAN – (Metropolitan Area Network) It is a network of devices within a particular geographic area, smaller than the WAN in terms of size and area._____

__WAN – (Wide Area Network) is a network of large number of devices in a large geographically separated area.___

27. What is the most popular local networking technology today? _Ethernet_____

28. What address does Ethernet use to forward frames MAC or IP? _____MAC_____

29. The protocol TCP/IP is used to network single switched networks together.
    a. What does this protocol acronym mean?

    ___TCP-Transmission Control Protocol_____
    ___IP-Internet Protocol_____

30. Which Internet pioneers invented TCP/IP and are generally regarded as the "Fathers of the Internet".

➔ Vinton Gray Cerf ForMemRS and Robert Kahn.

Grading:

- learnname_Lab1_DataCommNetworkingOverview.docx

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

Submit using the Lab1 Submission link under MySeneca\Graded Work