Lab 1:   
Data Communications\Networking

This course is essentially divided into two parts: Data Communications (weeks 1-5) and Networking (weeks 7-12). 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 hosts. Data communication uses the data link and physical layers of the OSI 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 Network layers of the OSI protocol stack. This lab will introduce you to the concepts of data communications and networking.

Instructions: Instructions:

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

**A Data Communications:**

1. Open a Windows Command Prompt console as **Administrator** (right-click and “Run as Administrator”)
2. Type **ipconfig /all**

Text

Description automatically generated

You should see a screen like the one above. Of the many addresses, we will focus on just a few for now: the Physical Address, an IPv4 address and an IPv6 Link-Local address.

The Physical, or MAC (Media Access Control), Address is used by the Local Area Network to forward frames on a network. Functioning at Layer 2 (The Data-Link Layer), devices on a single LAN can communicate with each other using the unique addresses that they have been assigned. At Layer 2, we are unable to communicate with devices that are not on our local network.

1. Write down your Default Gateway address from the ipconfig /all output: **192.168.0.1**.
2. Write down your MAC addr!ess (without the hyphens) = **00155D4AE453**.  
   1. Open the Windows Calculator and place it in Programmer Mode. Click on HEX to place the calculator in Hexadecimal mode. Copy the MAC address to the Windows Calculator.
   2. Click the BIN radio button. How many bits is the MAC address (count them): **12**.
   3. Click on the DEC radio button. What is the decimal conversion: **91,759,502,419**.
3. The arp cache is a special area of memory used by the Network layer to map IP addresses (which are used for routing) to Ethernet or MAC addresses (which are used for switching). View the arp cache by typing **arp -a** in your Command Prompt window.
4. The arp cache is a dynamic table of IP addresses and MAC addresses. It supports connections to a Layer 2 device using a Layer 3 address (you type in the IP Address, the computer connects to a computer on the local network using the MAC address).
5. Locate the IP Address of your Default Gateway in the arp cache. Find the MAC Address of your Default Gateway and write it down here: **00-00-00-00-00-02** .

**B Networking:**

1. Write down your IPv4 address from the ipconfig /all output: **192.168.0.11**.
2. Write down your Subnet Mask: **255.255.255.0**.
3. Navigate to <http://www.subnetonline.com/pages/subnet-calculators/ip-subnet-calculator.php>
4. Type in the IP address and subnet mask, then press Calculate.   
   1. What is the Network Address? **192.168.0.0**
   2. What is the maximum number of hosts? **254**
   3. What are the Start and End host Addresses: **192.168.0.1** and **192.168.0.254**

An IPv4 address functions at Layer 3 (the Network Layer) of the OSI model and is used to address hosts on an internetwork. This type of address allows a host to communicate with hosts on other networks. A host is able to determine, by the IP Address and Subnet Mask, if a destination host is local or not. If the host is not local, the message is routed to another network.

1. Test you download speed by visiting <http://www.speedtest.net>
2. 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 (in ms)? **1ms**

Ping is a measure of latency, which measures how long, in milliseconds, it takes for the message to make the trip to the remote host and for a reply to come back.

* 1. What is your download speed? **1.6GBPS**
  2. What is your upload speed? **996mbps**

Speed is a measure of the volume of traffic, in bits-per-second, between your host and a system somewhere on the internet. Answer the following questions in full sentences:

1. How might the reported internet speed be affected if the system on the internet is far away (for example, if you are in Toronto and the test site is in New Delhi)?
2. As a programmer, you have been asked to modify some software so that it runs in the cloud instead of on the corporate server (platform independent, it doesn’t matter). Discuss how latency and bandwidth might play a role when the software is moved from the controlled corporate server environment to the Internet.

**Answers:**

1. Depends on the CDN that test site is utilizing. If the CDN is also far away then the latency increases a lot. In contrast, if the CDN is really close to the actual location regardless of where the test site is deployed in the world, the latency won’t be affected much and will either average out or decrease by a lot.
2. Accessing the site remotely ( cloud ) might increase the site’s latency and without a proper caching mechanism in place locally, this decrease will stay the same. Bandwidth, again, without proper caching will have to be increased in order to satisfy the network calls to the cloud. Failing to do so may result in a bottleneck, where all systems try to utilize the last remaining bandwidth at the same time.`

**Grading:**

* <Seneca ID>\_Lab1\_DataCommNetworkingOverview.docx

Remember replacing **<Seneca ID>** with **Seneca College login name (the first part of your email address)** for submission.

Submit using the Lab1 Submission link on Blackboard.