Unit 1 - Hardware

Networking

What is a network?

A computer network is essentially a connection between two or more computers.

This connection can be wired or wireless.

The purpose of a computer network is to exchange information.

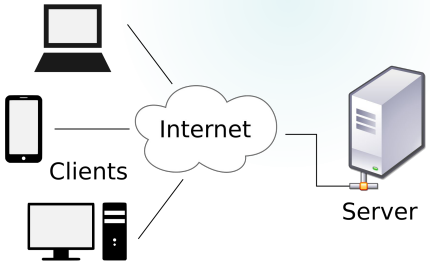
Why is networking important?

- **Share files:** Your computer accounts at school allow you to store your files on a shared network drive. Without a network connection, you would not be able to log in and access those files. More relevant, P2P networks….

- **Share resources:** Printers, hard drives, and even computing power are shared online.

- **Share programs:** Many of the apps on your computer accounts are *virtual*. They're run on your computer but installed on another computer. Example: Drive File Stream (formerly Google Drive)

Client-Server Networks



- **Server:** A computer that provides a resource on a network.
- **Client:** A computer that connects to a server to request a resource.
- **Client-Server Network:** A network that consists of clients and servers.
- **Examples:** The Internet! The servers are web servers and clients are personal computers accessing websites.

Peer-to-Peer Networks

- Each computer acts as a server *and* a client.
- As a computer retrieves resources, it also serves the resources that it's already downloaded.
- Napster was one of the early P2P networking services, but many others grew from there: BitTorrent, Limewire, etc.

Addressing on a Network

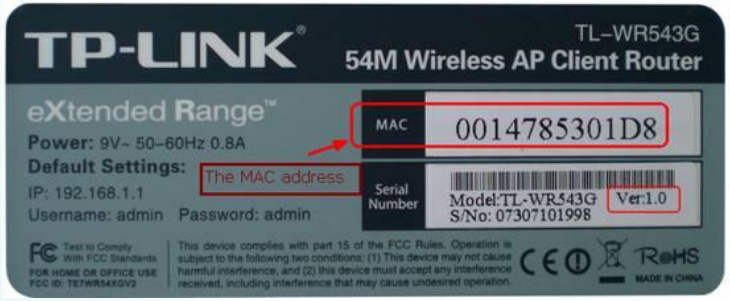
- Consider sending a letter or dialing a phone.
  - Every person needs a UNIQUE identifier.
    e.g. home address and phone number

- In order to send data to another device, we need some way of uniquely addressing it.

MAC Addresses

- Every piece of hardware capable of connecting to a network has a unique identifier called the MAC (Media Access Control) address.

- MAC addresses can be found directly on your router:



- Or on your Ethernet card through the command prompt by typing *ipconfig /all.*

IP Addresses

- MAC addresses are only used for local networking.
- To access a wider network (e.g. the Internet), devices require an IP address.
- To obtain an IP address, computers typically negotiate with a Dynamic Host Configuration Protocol (DHCP) server which *leases* one to the device.
- LEASES ARE TEMPORARY! Sometimes, when your device cannot connect to the network, it needs to *renew* the lease on its IP.

IP Addresses cont'd

- IP addresses are in the range:

0.0.0.0 to 255.255.255.255

- Under this addressing system, there are about 4 billion unique addresses. But they're being used up rapidly!

- Some IP addresses have special meaning. For instance, 127.0.0.1 loops you back to your own machine.

Websites and IP addresses

- Every website is associated with an IP address. Since IP addresses might change, we address webpages usings names e.g. www.google.ca
- A DNS (Domain Name Server) provides the translation from website name to IP addresses.
- This allows people to use website names instead of IP addresses!

Networking Tools

- Windows provides us with some handy tools for networking. These are accessed through the command prompt.

ipconfig	Displays basic network information about the computer
ipconfig /all	Displays detailed network information about the computer
ping xxx.xxx.xxx.xxx	Sends test data to the specified computer to determine: a) if it's alive b) how long it takes for the message to make a round trip
tracert xxx.xxx.xxx.xxx	Sends test data to the specified computer and tracks the data through all computers required to reach the specified address.