

Overview:

Students work individually to understand and establish the specifications for a PC dedicated to a specific task or function. (The specific task or function will be assigned to the student from the list below.) The function and features of various hardware components are researched to develop a general understanding. Specific components and features are then selected based on appropriate need for the assigned task or function. The final product is a brochure that will be shared with other classmates during a tradeshow event.

Objectives:

- Use correct terminology to describe computer hardware, speed measurements, and size measurements
- Describe the functions of the internal components of a computer
- Describe the functions of common computer peripheral devices
- Assess user computing needs and select appropriate hardware components for different situations

Getting Started:

1. You will be required to design a “dream machine” personal computer (PC) for one of the tasks assigned to you from the list below.
2. To get started, develop a general understanding of what will be important features and what will be less important features of our dream machine. Consider the following:
 - a. Operating system software - Moderately Important
 - b. Special application software – Pretty Important
 - c. Processor & motherboard speed - Pretty Important
 - d. Main memory speed and size - Pretty Important
 - e. Secondary storage speed and size – Pretty Important
 - f. Graphics and display speed and resolution – Moderately Important
 - g. External devices (e.g. keyboard, pointing devices, joysticks, etc.) – Not too important
 - h. Network connectivity – Moderately Important
 - i. Power and data backup – Pretty Important
 - j. Printers, scanners, and similar equipment – Moderately Important
 - k. Portability and durability – Pretty Important
 - l. Budget (cost) considerations – Pretty Important

Specific Tasks & Functions

- A. **Game Computer:** Dedicated to playing PC games in a home environment
- B. **Photo Editing & Organization:** Dedicated to editing and producing photographs and images in a home or professional environment
- C. **Business Office Computer:** Dedicated to producing documents and presentations and communicating with other people in a professional office environment

- D. **Student Home Computer:** Dedicated to completing homework, paying bills, communicating with friends and other similar tasks in a home environment
- E. **Factory Floor Computer:** Dedicated to reading documents, filling in forms, processing orders, etc. in a factory or warehouse environment.
- F. **Media Production and Streaming Computer:** Dedicated to production and distribution of video and/or music media in a semi-professional environment
- G. **Web Surfing Computer:** Dedicated to surfing the web, streaming media, and communicating through on-line services in a home environment

Level 1: Processor & Memory

1. Research and summarize the main features and function of a CPU processor chip.
Consider the following:

- a. Physical packaging shape and size
- b. Processing speed and power
- c. Memory speed and size

There are 2 main manufacturers of CPUs which are Intel and AMD and they lead the market in terms of speed and quality. The main CPUs for Intel are Celeron, Pentium, and the i9. The Celeron speed can range from 1.6 GHz to 2.44 GHz while the capacity depends on the motherboard. The speed of the Pentium is 3.5 GHz while the capacity depends on the motherboard. The speed of the i9 can range from 3.6 GHz to 5 GHz while the capacity depends on the motherboard. The main CPUs for AMD are Sempron, Athlon, and Phenom. The speed of the Sempron can range from 1.0 GHz to 2.9 GHz while the capacity depends on the motherboard. The speed of the Athlon can range from 2.2 GHz to 2.4 GHz while the capacity depends on the motherboard. The speed of the Phenom can range from 1.8 GHz to 2.6 GHz while the capacity depends on the motherboard.

2. Research and summarize the history of how a CPU processor chip has changed over the years. Consider the following:

- a. Typical processor speed, size, model numbers in the early 1990's
- b. Typical processor speed, size, model numbers in the early 2000's
- c. Typical processor speed, size, model numbers in the current time

These complex units are considered the brain of the computer and they are constantly being improved. Overtime, engineers are able to cram more of these transistors in CPUs in the same amount of space. There was and still is a huge demand for making CPUs that are faster, smaller, heat up less, and more affordable to the public. The problem with old CPUs was that they were really big, not powerful, heated up very quickly and most of the public couldn't afford it. Now, there are many different companies that are competing to take the lead in this ever-growing market.

3. Research and summarize the main features of motherboards. Consider the following:
- Physical packaging shape and size
 - Speed and size

The different versions that had been available and currently available are the AT motherboard has speed of around 100 MHz and a capacity of 16 GB. The ATX motherboard has speed of around 200 MHz and a capacity of around 32 GB. Some other examples are the LPX, the BTX, the Pico BTX, and the Mini ITX motherboard. I will now explain information about the general motherboard. There are different “buses” that connect parts of the motherboard and allow information and data to travel. The speed of the bus which is just how much data can move across the bus is measured in megahertz (MHz). The amount of data that can move across the front side bus can range from 66 MHz to 800 MHz. The speed of the back-side bus is determined by the processor. The speed of the accelerated graphics port bus is usually 66 MHz.

4. Research and summarize the history of how motherboards have changed over the years. Consider the following:
- Typical speed, size, model numbers in the early 1990’s
 - Typical speed, size, model numbers in the early 2000’s
 - Typical speed, size, model numbers in the current time

Originally, the motherboard had very minimal integrated devices and other main components were connected through expansion slots. Overtime though, more components were integrated into the motherboard which resulted in higher speed devices and faster buses. The downside of this initially was that it was difficult to remove certain integrated part on the motherboard. This has been improved over time. Motherboards have been made smaller and more powerful so this results in faster speeds and increased capacity.

5. Research and summarize the main features and function of RAM memory. Consider the following:
- Physical packaging shape and size
 - Speed and size

The different versions that are currently available are Static RAM (SRAM), Dynamic RAM (DRAM), Synchronous Dynamic RAM (SDRAM), Single Data Rate Synchronous Dynamic RAM (SDR SDRAM) and Double Data Rate Synchronous Dynamic RAM (DDR SDRAM). The system memory for SRAM is around 20-40ns while the capacity can vary. The system memory for DRAM is around 80-100ns while the capacity can vary. The speed of the SDRAM can range from 100 MHz to 166 MHz while the capacity can vary. The speed of the SDR SDRAM is around 133 MHz to 200 MHz while the capacity can vary. The speed of the DDR SDRAM is around 133 MHz to 200 MHz while the capacity can vary.

6. Research and summarize the history of how RAM memory has changed over the years.

Consider the following:

- a. Typical speed, size, model numbers in the early 1990's
- b. Typical speed, size, model numbers in the early 2000's
- c. Typical speed, size, model numbers in the current time

Initially, RAM was very slow and it took very long to access files. The different versions used to be very large and slow. But the demand for products that were faster, smaller and cheaper resulted in the creation of different RAM. These were faster and had a lot more capacity while having smaller sizes and being more compatible. RAMs took a lot of space but now that it has evolved, the sizes of the versions of RAMs have decreased in centimeters.

7. Research and summarize the main features and function of Hard Disk Drives (HDD).

Consider the following:

- a. Physical packaging shape and size
- b. Speed and size

The different versions that are currently available are the PATA, SATA, SCSI, and SSD. The PATA drive has speeds of 133 MBs/second and a capacity of 137 GB. The SATA drive has speeds of 600 MBs/second and a capacity that can range from 500 GB to 8 TB. The SCSI drive has speeds of 640 MBs/second and a capacity that can range from 147 GB to 320 GB. The SSD drive has speed from 654 MBs/second to 712 MBs/second and a capacity ranging from 1 TB to 4 TB.

8. Research and summarize the history of how Hard Disk Drives (HDD) have changed over the years. Consider the following:

- a. Typical speed, size, model numbers in the early 1990's
- b. Typical speed, size, model numbers in the early 2000's
- c. Typical speed, size, model numbers in the current time

Throughout the 1980s and onwards, hard drive makers have developed hard disk drives that are smaller than before. The sizes of the hard disk drive was being reduced in inches! There was an increasing need for better, faster, more reliable and smaller hard disk drives which resulted in the creation of drives such as the SATA and SCSI drives. The hard disk drives are being improved in terms of their speed and capacity at a rapid speed.

9. Explain and justify the processor and memory requirements for your 'dream machine' task.

Discuss the following:

- a. Minimum and "would be nice" requirements for the CPU chip
- b. Minimum and "would be nice" requirements for the Motherboard
- c. Minimum and "would be nice" requirements for the RAM memory
- d. Minimum and "would be nice" requirements for the HDD

Processor & motherboard speed is pretty important while minimum is Intel Core i5. The motherboard choice is flexible. Main memory speed and size is pretty important while minimum is 8GB of RAM. Secondary storage speed and size is pretty important while minimum is 1TB storage (HDD).

Level 2: Display & Peripherals

1. Research and summarize the main features and function of Computer Display Monitor. Consider the following:

- a. Physical construction (CRT, LCD, etc)
- b. Display Standards (CGA, VGA, SVGA, XGA, etc.)
- c. Resolution & Colour depth

The main types of monitors are CRT monitors, LCD monitors, and LED monitors. CRT monitors used to be commonly used but are not being used often now due to better monitors such as LCD and LED. CRT monitors have an intense stream of electron to form images on the fluorescent screen. But these are heavy, cost a lot, and take up a lot of energy. A VGA connected to this CRT monitor can produce resolutions up to 2048x1536. LCD and LED monitors are usually Flat Panel Technology because they are thinner, lighter and more portable. This means they use thin panel design instead of the old CRT design.

2. Research and summarize the main features and function of a Computer Graphics Card. Consider the following:

- a. Physical packaging (e.g. On the motherboard, expansion card, etc.)
- b. Speed and frame rate (2D vs 3D)
- c. Resolution, colour depth, and memory size

The graphics components are the part of your computer that control and enhance how graphics (pictures, videos, programs, animation, 3D) are displayed on your computer screen. The graphics card decides how to use the pixels on the screen to create the image. It then sends that information to the monitor through a cable. To make a 3D image, the graphics card first creates a wire frame out of straight lines. Then, it rasterizes the image which is just filling in the remaining pixels. It also adds lighting, texture and color.

3. Research and summarize the history of how Computer Display Technology has changed over the years. Consider the following:

- a. Display standards and capabilities in the late 1980's
- b. Display standards and capabilities in the late 1990's
- c. Display standards and capabilities in the 2000's

The old CRT monitors used to be bulky and dull coloured. Due to increasing consumer demand for more and for less cost, companies continue to improve their technologies and improve the

experience of the consumers. There are now monitors with 4k quality and curving displays. Old monitors and TVs used to be very large in-order to accommodate the cathode ray tubes in CRT. LCD monitors were then developed and they didn't need to be as big as CRT monitors. They also created sharper images and used less energy. But they were very expensive and not affordable by everyone. Now, there are even more types of monitors and TVs such as LED, QLED, OLED by different companies. They are now sharper, smaller in width and bigger in display, and they cost less.

4. Research and summarize the main features and function of External Storage and Backup. Consider the following:

- a. Removable media (e.g. floppy disks, CD/DVD-RW, CompactFlash, etc.)
- b. USB media (e.g. Memory Stick, External HDD, etc.)
- c. Cloud based storage

Floppy Disks - A Floppy Disk is a soft magnetic disk used for storage. It was called floppy because we could wave it. They were made up of thin magnetic storage material. Floppy disks have limited uses and their capacity is not that much. They were first available in the 1960s and 1970s and they were one the ways to store data.

CD-ROM / DVD / Recordable CD/DVD - A CD-ROM is a CD that can be read using an optical drive. The data in the disk is read only and this means that is cannot be altered or erased. Due to this feature and their large capacities, they were great for media format. They are used today and can store different kinds of data.

USB Memory Drives - Also known as USB Flash Drive, it is a data storage device that includes flash memory with USB interface. It is lightweight, easily transportable, high storage capacity with a low price. USB Memory Drives were first introduced in the early 2000s are still in use today.

Compact Flash Memory - Compact flash memory is a mass storage device used in mainly portable electronic devices. It is one the first and most successful memory cards. They are very small, lightweight, transportable, and have huge storage capacities. They are used in cameras with companies such as Canon and Nikon.

Cloud Based Storage - It is a model of computer data storage but where digital data is stored and can be shared. There are cloud storage providers and this makes the data available and accessible and it is safe. Cloud based storage could be used to store user, organization or application data.

5. Research and summarize the history of how External Storage and Backup has changed over the years. Consider the following:

- a. Typical speed, size, model numbers in the early 1990's
- b. Typical speed, size, model numbers in the early 2000's
- c. Typical speed, size, model numbers in the current time

There was Compact Flash, CD Rom, and Floppy disks. External storage in the 1990s was in the form of floppy disks, flash drives, zip drives, DVD and cd. These forms were not too effective in terms of storage, but they were really big in size dimensions. For floppy disks, a bigger disk resulted in more data it could store. During the 2000s, the use of SD card and blue ray disks became popular due to its immense amount of storage capacity and size. The use of floppy disks started to decrease due to its big size and a less storage capacity. Currently, data is mainly stored on a cloud storage. Cloud based storage dominated in sector because it has a lot of capacity despite it being on the internet. Currently, nobody uses floppy disks as they are not needed.

6. Research and summarize the main features and function of Network Connectivity. Consider the following:

- a. Connection technology (e.g. Dial-Up, Ethernet, WiFi, BlueTooth, Fibre, etc.)
- b. Upload and download speed
- c. Security

A Network interface card, NIC, or Network card is an electronic device that connects a computer to a computer network, usually a LAN. It is considered a piece of computer hardware. Today, most computers have network cards. Network cards let a computer exchange data with the network. To achieve the connection, network cards use a suitable protocol, for example CSMA/CD. Network cards usually implement the first two layers of the OSI model, that is the physical layer, and the data link layer. Today, most network cards use Ethernet. Other network types are ARCNET, introduced in 1977, LocalTalk or Token Ring. There are many network cards which are compatible to only respective software. depending on your computer architecture you have to find a compatible network card. They are needed to access the Internet and local networks, and they can function with custom networks types.

7. Research and summarize the history of how Network Connectivity has changed over the years. Consider the following:

- a. Typical speed, size, model numbers in the early 1990's
- b. Typical speed, size, model numbers in the early 2000's
- c. Typical speed, size, model numbers in the current time

At 1990, Kalpana, which is a U.S network hardware company, developed and introduced the first network switch in 1990. The majority of people used Ethernet or dial up to get their internet access. However, the connection was very slow and it took a very long time just for a website to load and this was very inconvenient. In 2000, 802.11g devices were available to the public which provided connection speeds up to 20 Mbps which was a significant improvement over 1990. Currently, we have much better Wi-Fi connections and can get over 1 Gb of internet. This means

that webpages and downloads will be significantly faster and instant. Fibre optics is also a very good source of internet, it will also make loading significantly faster as you have light travelling through the network.

8. Research and summarize the main features and function of Printer Technology. Consider the following:

- a. Printing Technology (e.g. Dot Matrix, Ink Jet, Laser, etc.)
- b. Connection Technology (e.g. Parallel Port, USB, WiFi, Network, etc.)
- c. How printing has changed over the years

Dot Matrix uses a print head which moves back and forth and strikes an ink soaked cloth against a paper to print. This was a very old printer. The dot-matrix printer was a popular low-cost personal computer printer that used to strike the paper a line at a time. Ink jet printing technology is a computer printing in which a digital image is created by the propelling of ink which drops onto the paper. Ink jet is one of the most common printers in the world. The inkjet sprays ink from an ink cartridge at very close range to the paper as it rolls by. Laser printing produces high quality images and is created by it repeatedly passing a laser beam continuously over the drum. The drum is a negatively charged cylinder which collects electrically charged ink and transfers the image to paper. The laser printer uses a laser beam reflected from a mirror to attract ink, called toner, to selected paper areas as a sheet rolls over a drum.

Parallel port is a connection technology for connecting peripheral devices and they send multiple bits of data at once. They can achieve this by having multiple data lines in their cables and port connectors. Wi-Fi is when the computer connects to a wireless signal which is produced by the router. You can print using Wi-Fi as the computer send a signal through the wireless network to the printer which prints the image. Before, people would print by hand and draw. Then, the Dot Matrix Printers were used in the early 2000's and then the Ink Jet printers which majority of individuals use.

9. Explain and justify the processor and memory requirements for your 'dream machine' task. Discuss the following:

- a. Minimum and "would be nice" requirements for the Computer Display
- b. Minimum and "would be nice" requirements for External Storage and Backup
- c. Minimum and "would be nice" requirements for Network Connectivity
- d. Minimum and "would be nice" requirements for Printer Technology

Graphics and display speed and resolution is moderately important while minimum is Intel HD graphics. External devices (e.g. keyboard, pointing devices, joysticks, etc.) is not too important. Network connectivity is moderately important while minimum is a NIC 100Mbps. Power and

data backup is not too important because data backed up in External Hard Drive(EHD). Printers, scanners, and similar equipment are not too important.

Level 3: Building Your Dream Machine

1. Identify the minimum requirements for each component of your dream machine as follows::

- a. CPU processor chip speed and type
- b. Motherboard type
- c. RAM memory speed and size
- d. HDD speed and size
- e. Display Monitor resolution, type, and size
- f. Graphics card resolution and type
- g. Audio card type
- h. Audio Speakers type
- i. External backup type and size
- j. Network interface requirements
- k. Printing Technology
- l. Other Peripherals (e.g. mouse, keyboard, joystick, etc.)

Operating system software - Moderately Important while minimum is windows 10.

Special application software – Pretty Important while minimum is Microsoft Office and internet browsers such as Google Chrome and Safari.

Processor & motherboard speed - Pretty Important while minimum is Intel Core i5. The motherboard choice is flexible.

Main memory speed and size - Pretty Important while minimum is 8GB of RAM.

Secondary storage speed and size – Pretty Important while minimum is 1TB storage.

Graphics and display speed and resolution – Moderately Important while minimum is Intel HD graphics.

External devices (e.g. keyboard, pointing devices, joysticks, etc.) – Not too important.

Network connectivity – Moderately Important while minimum is a NIC 100Mbps.

Power and data backup – Not too important because data backed up in External Hard Drive(EHD).

Printers, scanners, and similar equipment – Not too Important

Portability and durability – Not too Important

2. Prioritize your list of components from question #1 from those that are essential down to those that would be nice.

Essential:

CPU processor chip speed and type

RAM memory speed and size

HDD speed and size

Would be nice:

Motherboard type

Display Monitor resolution, type, and size

Graphics card resolution and type

Audio card type

Audio Speakers type

External backup type and size

Network interface requirements

Printing Technology

Other Peripherals (e.g. mouse, keyboard, joystick, etc.)

3. Establish a target budget (cost) for your dream machine.
 - a. Justify your cost based on your projected component needs.
 - b. Justify your cost based on a realistic assessment of your application and target user

The budget (cost) considerations are pretty important and cost should be aiming below \$1500. This is important because the company may need this is masses and a cheaper but still useful computer can save them a lot of money. The target cost of \$1500 is reasonable because it allows for a decent priced computer that is powerful and can perform tasks for the business.

4. Build your dream machine or locate a ready to buy machine using on-line vendor web sites.

- a. Find at least two sources for your dream machine
- b. Provide a copy of the cost and feature list summary for each source
- c. Explain how the machine from each source matches (or is different) from your ideal configuration.

Best Buy - OptiPlex 5260 All-in-One

The processor is Intel Core i5-8500 (6 Cores/9MB/6T/up to 4.1GHz/65W) and supports Windows 10/Linux. The operating system is Windows 10 Pro 64bit. There is a Microsoft Office 30 Day Trial. RAM: It is 4GB 1X4GB DDR4 2666MHz. Storage: 2.5" 500GB 7200RPM SATA Hard Disk Drive. Intel Integrated Graphics Dual-band 2x2 802.11ac Wi-Fi Black Dell KB216 Wired Keyboard Dell MS116 Wired Mouse This has a total cost of \$1,109. The Dell OptiPlex 5260 All-In-One has been able to meet almost all of the "would be nice" requirements for my dream business computer. It was not able to meet the requirements of RAM and the storage. But it made up for it because of its low cost.

Dell - New Precision 5720 All-in-One

The processor is 7th Gen Intel Core i5-7500 (Quad Core 3.4GHz, 3.8Ghz Turbo, 6MB) and supports Windows 10/Linux. The operating system is Windows 10 Pro 64bit. There is a Microsoft Office 30 Day Trial. RAM: It is 8GB 1x8GB DDR4 2400MHz Non-ECC. Storage: 2.5" 500GB 7200RPM SATA FIPS Hard Drive. Graphics Card: AMD Radeon Pro WX 4150 w/4GB GDDR5. Dell KB216 Wired Keyboard English Black. Dell MS116 Wired Mouse Black. Qualcomm QCA61x4A 2x2 801.11ac + Bluetooth 4.1. This has a total cost of \$1,699. The New Precision 5720 All-In-One met almost all of the requirements except for the Storage and the price.

Suggested on-line computer sources:

- www.bestbuy.ca/
- www.dell.com/en-ca
- www.staples.ca
- www.tigerdirect.ca/
- www.canadacomputers.com

Level 4: Sharing Your Dream Machine

1. Prepare a brochure documenting your dream machine options and choices.
 - a. The target audience is other students in the class
 - b. You should explain your target task (e.g. game computer) and how this affects configuration choices.
 - c. You should explain your configuration choices in greater detail
 - d. Your two purchase options should be explained and compared

One of the company's most critical assets is the computer. A business office computer is used to connect to partners and clients, processes payments, balance accounts, and to create spreadsheets. A business office computer contains the company's important information such as tax codes, inventory records, employee information, trades, profits and much more. It runs the software that helps a business become successful. Fundamentally, a business computer is not something to take lightly. Working efficiency is key and time cannot be wasted. A business computer must run multiple apps simultaneously and process data quickly.

2. Share your brochure
 - a. By uploading it to your repository
 - b. By presenting it during the in-class tradeshow (date TBD)
3. Visit and report on other trade show presentations / brochures
 - a. Complete the Passport Template (TBD) as you participate in the in-class tradeshow.