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INSTRUCTIONS

**Team project on designing a customized PC**

Examples of customized PC could include:

· CAD/CAM (computer-aided design/ computer-aided manufacturing) workstation

· Audio and video editing workstation

· Gaming PC

· **Home Theater PC or home server PC**

Choose one option for the PC and between low, medium and high budget.

You will have a lab to work on this project and the final presentation (5-7 minutes per student) will take place during the last lab of the semester**.**

Team: 2 students

**Design, in collaboration with teammates, a customized PC**

**Budget: 4 low**

**PC Build: Home Theater PC**

- Break-down the technical requirements of a specific high-end workstation

- Research for the characteristics of each computer component and software

- Analyze and study the compatibility of all components and compare the best quality/price ratio from different vendors

Cooperate on the final design of the customized computer to meet the requirements of the end-user workstation while guaranteeing the best performance of the system within a budget.

Students will consider the options they have along with the research findings, they will analyse these using specific criteria, then they will draw conclusions and judgments (actions) to select and interconnect hardware components to create computers that meet functional performance and cost goals.

Some important principles to keep in mind when customizing a system to meet customer needs:

- Meet applications requirements

- Balance functionality and budget.

- Consider hardware compatibility.

**RESEARCH**

Home Theater PC

A home theater PC is used to project movies , play songs and play games. It has a CD or/and a DVD drive in which we can play movies that will be displayed on a TV or monitor.

Break-down the technical requirements of a specific high-end workstation:

* CPU
* GPU
* RAM
* Motherboard
* System cooling
* PC peripherals (mouse, keyboard, mic, headset, monitor)
* OS
* Storage
* PC case
* PSU

Research for the characteristics of each computer component and software:

**CPU (Central Processing Unit):**

A CPU is the brain of the computer. It is in charge to perform all the arithmetical operations, controls input/output operations and executes all the instructions that are being assigned to the computer. There are different types of CPU that exist such as single-core CPU, dual-core CPU, and many more.

**GPU (Graphics Processing Unit):**

A GPU is necessary in a computer because it is in charge of the graphics and the overall output on a screen. They are useful in the creation of images and videos. They do rapid mathematical calculations to be able to supply images.

**RAM (Random Access Memory):**

RAM is used to store data temporarily to be used while the computer is in use. If the computer shuts down, all data that was in RAM disappears. It is easier to access than data in permanent memory which is located in a SSD or HDD.

**Motherboard:**

A motherboard is the board that keeps everything in place. It holds all the components such as CPU AND RAM. It has circuits to help with the communication between all the components. It also keeps them stable and in place to avoid them from running into each other as well as preventing damages. Motherboards nowadays come with GPUs integrated into them, even sometimes CPU as well.

**System Cooling:**

PC components radiate heat as they are being used. This can cause hardware damages and issues. Having a cooling system helps to prevent your components from overheating as well as to prevent consequences. There are two types of cooler: air cooler and liquid cooler.

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| --- | --- |
| Air cooler | Liquid cooler |
| An air cooler uses air to transfer heat. They help manage and reduce the flow of hot air produced by the use of the components of the PC. It has three separate parts which are the fan, the heat sink and the heat fins. Air from the case is used to cool the heat in the components inside. | A liquid cooler uses water to transfer heat. It consists of a fan and a heat sink as well as a pump and interconnecting pipes. The heat from the components are transferred into the pumps where it meets liquid to cool the system. |

**PC peripherals:**

PC peripherals are all the devices that correspond to the input/output. Such devices can be monitor, keyboard, mouse, headset, speakers. They are all the accessories and necessities that are needed for a user to be able to interact with a computer efficiently.

**OS (Operating System):**

An operating system (OS) is a software that is intermediate between the user and the hardware. It is in charge to do tasks, manage applications and overall perform all the actions that it is being told to do. It provides an user-interference which means it creates an environment for users to interact with a device. Since we are working with a Gaming PC, Windows is the best OS because it overall can support gaming and graphics.

**Storage:**

In a PC, juste like in any other device, it needs storage. It is needed to store data such as graphics, applications, documents, pictures and videos. There are two types of storage that can be used on a gaming PC: Solid-State Drives (SSDs) or Hard Disk Drive (HDDs).

Comparing those two types of storage:

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| --- | --- |
| Solid-State Drive (SSD) | Hard Disk Drive (HDDs) |
| Data stored in a flash-memory chip.   * Small * Has good speed * Durable because it has no moving parts * More expensive * Doesn't make noise | Data is stored on a spinning platter.   * Takes more space * Takes time to speed up * Has moving parts, have to be careful to not drop/damage it. * Good price * Makes noise * Great capacity |

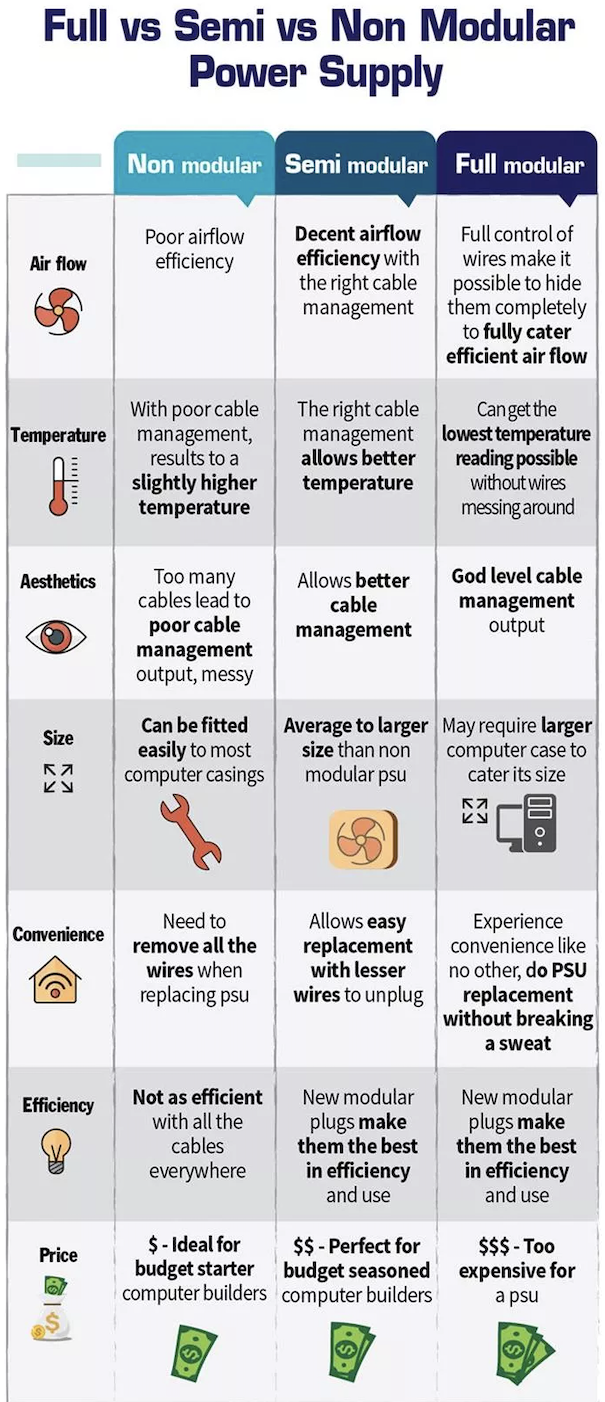
**PC case:**

PC cases are where all the components of the computer are in. It helps to protect all the parts from harms such as water and dust and it keeps everything in place.

**PSU (Power Supply Unit):**

The PSU is essential in a PC because it provides power to all the components in the case.It uses electric current to get the power, measured in watts. There are three types of PSU that can function with a computer: modular PSU, semi-modular PSU and non-modular PSU.

Comparison between those 3 PSUs:



**Home Theatre PC Build**

Analyze and study the compatibility of all components and compare the best quality/price ratio from different vendors:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **COMPONENT** | **VENDOR 1** | **PRICE 1** | **VENDOR 2** | **PRICE 2** |
| **CPU**  **AMD Ryzen 3 3200G 3.6 GHz Quad-Core Processor** | ShopRBC | [$159.95+](https://www.shoprbc.com/ca/shop/product_details.php?pid=52679224) | Vuugo | [$179.05+](https://www.vuugo.com/amd-cpu-YD3200C5FHBOX.html?tracking=5108053939762) |
| **RAM**  **G.Skill Ripjaws V Series 8 GB (2 x 4 GB) DDR4-3200 CL16 Memory** | MemoryExpress | [$74.99+](https://www.memoryexpress.com/Products/MX59299) | NewEgg | [$79.99+](https://www.newegg.ca/g-skill-8gb-288-pin-ddr4-sdram/p/N82E16820231939?Item=N82E16820231939&nm_mc=AFC-RAN-CAN&cm_mmc=AFC-RAN-CAN&utm_medium=affiliates&utm_source=afc-PCPartPicker&AFFID=2558510&AFFNAME=PCPartPicker&ACRID=1&ASID=https%3a%2f%2fca.pcpartpicker.com%2f&ranMID=44589&ranEAID=2558510&ranSiteID=8BacdVP0GFs-31GpEutn6r2DNvUByIAdVw) |
| **MOTHERBOARD**  **ASRock B450M PRO4 Micro ATX AM4 Motherboard** | Canada Computers | [$94.88+](https://www.canadacomputers.com/product_info.php?cPath=26_1832_1833&item_id=123862) | Vuugo | [$93.93+](https://www.vuugo.com/asrock-motherboards-B450M-PRO4.html?tracking=5108053939762) |
| **SYSTEM COOLING**  **be quiet! Pure Rock Slim 35.14 CFM CPU Cooler** | Canada Computers | [$39.99](https://www.canadacomputers.com/product_info.php?cPath=8_129&item_id=137827) | Amazon | [$44.25](https://www.amazon.ca/dp/B01KVNCEIG?tag=pcp0f-20&linkCode=ogi&th=1&psc=1) |
| **OS** |  | Windows | 10 |  |
| **STORAGE (HDD since we have a budget)**  **HDD: Seagate Barracuda Compute 2 TB 3.5" 7200RPM Internal Hard Drive**  **SSD: Western Digital Blue SN550 250 GB M.2-2280 NVME Solid State Drive** | MemoryExpress  Canada Computers | [$59.99+](https://www.memoryexpress.com/Products/MX76126)  [$59.99+](https://www.canadacomputers.com/product_info.php?cPath=179_1927_1930&item_id=164132) | Vuugo  MemoryExpress | [$63.75+](https://www.vuugo.com/seagate-hdd-ST2000DM008.html?tracking=5108053939762)  [$59.99+](https://www.memoryexpress.com/Products/MX80113) |
| **POWER SUPPLY**  **EVGA SuperNOVA GM 450 W 80+ Gold Certified Fully Modular SFX Power Supply** | Canada Computers | [$94.99+](https://www.canadacomputers.com/product_info.php?cPath=33_1938&item_id=134874) | Vuugo | [$109.75+](https://www.vuugo.com/evga-power-supply-123-GM-0450-Y1.html?tracking=5108053939762) |
| **PC CASE**  **Silverstone GD09B HTPC Case** | Canada Computers | [$139.99+](https://www.canadacomputers.com/product_info.php?cPath=6_1937&item_id=081334) | PCCanada | [$171.99+](https://www.pc-canada.com/item/SST-GD09B.html?utm_source=pcpartpicker&utm_medium=affiliate&utm_campaign=pcpartpicker) |

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| **PC PERIPHERALS** | **VENDOR 1** | **PRICE 1** | **VENDOR 2** | **PRICE 2** |
| **Keyboard**  **Logitech K400 Plus Wireless Mini Keyboard** | Vuugo | [$32.56+](https://www.vuugo.com/logitech-keyboards-920-007119.html?tracking=5108053939762) | Amazon | [$39.00](https://www.amazon.ca/dp/B014EUQOGK?tag=pcp0f-20&linkCode=ogi&th=1&psc=1) |

**PC Parts Explained (Things we can say about the build)**

Features and utilization;

1. Budget friendly build under 1000$
2. 4K streaming at 60hz
3. Comfortability for a home theatre
4. Small form factor
5. Low power consumption

**CPU:**

**AMD Ryzen 3 3200G 3.6 GHz Quad-Core Processor**

The CPU is based on AMD’s Zen+ architecture, and was built upon a 12 nm manufacturing process. The Ryzen 3 3200G packs four x86 cores, and features Radeon Vega 8 integrated graphics module. The CPU cores have a base clock of 3.6 GHz, and can reach 4,0 GHz in Turbo mode. The stock Wraith Stealth cooler can easily cope with its factory and or with possible overclocking settings.

**CPU Cooling:**

**be quiet! Pure Rock Slim 35.14 CFM CPU Cooler**

be quiet! Pure Rock Slim 2 is particularly applicable to compact and quiet multimedia systems. We chose to use an aftermarket cooling system for a better performance overall with a quieter environment and better performance for possible overclocking. It is because of its compact construction that makes it the perfect choice for PC cases that have limited space and for people with a limited budget given its features.

**Motherboard:**

**ASRock B450M PRO4 Micro ATX AM4 Motherboard**

The motherboard supports AMD AM4 Socket with Ryzen 2000, 3000 and 5000 Series Desktop Processors along with DDR4 3200 RAM. It has 3 PCIe slots (1 PCIe 3.0 x16, 1 PCIe 2.0 x16, 1 PCIe 2.0 x1). Its graphics output are HDMI, DVI-D, D-Sub. It also has a built-in audio integration 7.1 CH HD Audio (Realtek ALC892 Audio Codec), ELNA Audio Caps. For storage, we are capable of 4 SATA, 1.Ultra M.2, and 1 M.2. Last but not the least we have 6 usb ports, two in the front and 4 in the rear. It is thus a budget motherboard that performs the basic needs for the CPU.

**RAM:**

**G.SKILL Ripjaws V Series 8GB 2x4GB DDR4 3200**

Luckily enough, RAM memory nowadays is very affordable. In that sense, G.SKILL’s Ripjaws V Series is a great choice, it has a speed of 3.200 MHz DDR4 memory with CAS 16-18-18-35 latency within a budget. These memory modules will work perfectly with Ryzen 3 3200G due to the latest optimization of AMD products. Since Ryzen’s Vega integrated graphics can dedicate self integrated graphics, investing in a good quality memory modules is a priority.

**Storage:**

**Western Digital Blue SN550 250 GB M.2-2280 NVME Solid State Drive**

Since the build has limited graphics capabilities, Triple A title games won’t be installed. Therefore, it is possible to buy less storage. Luckily, the prices of NVMe SSDs nowadays are similar to SATA Hard Drives. The storage stick offers fast speeds and consumes a small amount of power.

**Seagate Barracuda Compute 2 TB 3.5" 7200RPM Internal Hard Drive**

Along with Western Digital, Seagate has affordable and budget friendly options for storage. We chose to add an additional 2 TB 3.5 7200 RPM Internal Hard Drive because the build is very limited in resources. If needed, we can download movies, videos, and other forms of media in this drive.

**Power Supply:**

**EVGA SuperNOVA GM 450 W 80+ Gold Certified Fully Modular SFX Power Supply**

The PSU is a small but performant PSU, great for small builds and limited money. With 450 Wattage, it is enough to power all the components. It features an 80+ Gold efficiency which is extremely reliable for the price. It also features a fully modular design, which is nice to only use the cables we need, to reduce the cable clutter and improve airflow in the small HTPC build.

**Case:**

**Silverstone GD09B HTPC Case**

It is the smallest PC micro ITX case made for home theatre builds. There is SilverStone GD09. This case fits the ideal HTPC case. It fits like a console, very space accommodating and offers plenty of room for a small Micro-ATX motherboard. For the price, it is good for the power and storage quality which can provide a beautiful and quit home theatre environment.

**Keyboard/Mouse:**

**Logitech K400 Plus Wireless Mini Keyboard With Touchpad**

Logitech is one of the leading brands for peripherals due to its reliability. We chose their Logitech K400 Plus Wireless Mini Keyboard With Touchpad, great for a mouse compromis to be in control from your seat to the TV. It gives easy navigation with the all in one keyboard and touchpad. Effortless and comfortable.

SOURCES

Research:

<https://www.intel.ca/content/www/ca/en/gaming/resources/how-to-build-a-gaming-pc.html>

<https://www.scan.co.uk/3xs/custom/gaming/pages/gaming-pc-peripherals>

<https://www.wepc.com/tips/liquid-vs-air-cooling/>

<https://www.gamingscan.com/ssd-vs-hdd-gaming/>

<https://www.logicalincrements.com/articles/build-pc-home-theater>

<https://www.informit.com/articles/article.aspx?p=1692557&seqNum=3>

PC Build Parts:

CPU:

<https://www.shoprbc.com/ca/shop/product_details.php?pid=52679224>

RAM:

<https://www.memoryexpress.com/Products/MX59299>

MOTHERBOARD:

<https://www.canadacomputers.com/product_info.php?cPath=26_1832_1833&item_id=123862&language=en>

SYSTEM COOLING:

<https://www.canadacomputers.com/product_info.php?cPath=8_129&item_id=137827&language=en>

POWER SUPPLY:

<https://www.canadacomputers.com/product_info.php?cPath=33_1938&item_id=134874&language=en>

STORAGE:

SSD: <https://www.canadacomputers.com/product_info.php?cPath=179_1296&item_id=164132>

HDD:

<https://www.memoryexpress.com/Products/MX76126>

PC CASE:

<https://www.canadacomputers.com/product_info.php?cPath=6_1937&item_id=081334>

PC PERIPHERALS:

[https://www.vuugo.com/logitech-keyboards-920-007121.html?filter\_name=cooler%20master%20sleeve%20bearing%20120mm%20blue%20led%20silent%20fan%20-%202%20in%201%20value%20pack%20-%201200±10%%20rpm%20-%2039.77cfm%20-%2019.3%20db-a%20(r4-l2s-122b-gp)&page=183](https://www.vuugo.com/logitech-keyboards-920-007121.html?filter_name=cooler%20master%20sleeve%20bearing%20120mm%20blue%20led%20silent%20fan%20-%202%20in%201%20value%20pack%20-%201200%C2%B110%25%20rpm%20-%2039.77cfm%20-%2019.3%20db-a%20(r4-l2s-122b-gp)&page=183)