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Modern motherboards offer a variety of hardware and software depending on consumer needs. In general motherboards are made up of printed circuit boards (PCB) and can vary in size depending on the form factor of the board itself. For example, most gaming computers utilize the ATX form factor, unless the user is going for a lower profile computer then they may choose to use a micro-ATX form factor.

The basic components of a typical motherboard usually consist of power inputs, PCI slots, PCIe slots, DIMM slot or more commonly called RAM slots, I/O rear panel, SATA ports, a chipset, and a CPU slot. The motherboard takes all these components and connects them together. Modern-day motherboards also have a BIOS which allows initialization of hardware, and setup settings. Previously, BIOS could only be controlled with keyboard but now a lot of motherboards come with BIOS that can be controlled with a mouse or keyboard. PCIe slots are typically used as a graphics card slot, while PCI slots are used for things like sound controllers or WIFI receivers. A lot of the time motherboard manufacturers implement soundcards and WIFI receivers into the motherboard itself, eliminating the need for secondary components. SATA ports are used by mostly used as hard drive connections. The chipset houses the software for the BIOS. RAM slots on motherboards have pre-determined clock speeds and also need to house the correct RAM type, which is typically DDR4. The RAM slots can only support a pre-determined amount which is typically 128gb depending on the board. The rear panel houses I/O devices such as USB 2.0 and USB 3.0, HDMI, older optical mouse and keyboard inputs, and other types of I/O devices.

Intel and AMD have been battling over producing the best CPU, using different architectures and sizes. This has caused motherboard production companies to create a vast number of different boards. The only thing that differs in current Intel and AMD motherboards is the CPU socket. A motherboard will only be able to utilize one type of CPU. Intel motherboards usually have a socket size that starts with LG, while AMD socket size starts with AM. Motherboards can sometimes also be used for different generations of CPU’s depending on if the architecture and size has changed.

There are a lot of additional features in motherboards, one of which is called overclocking. What overclocking allows motherboards to increase the operating speed of a given component. This in turn allows faster performance than the components manufactured speed but not without its downfalls; Overclocking increases power consumption/heat which in turn causes larger fan noise for cooling, and shortened lifespan for the targeted components.

Another common additional feature in motherboards are integrated graphics cards and/or integrated Wi-Fi. As the name implies, the motherboard will have the integrated graphics card or Wi-Fi components built into the motherboard. This in turn allows the system to need dedicated components to utilize those system. Although, it can be convenient for integrated graphics and/or Wi-fi it is not without it’s cons. For integrated graphics card, most motherboard do not have a strong performing GPU, this mean that even with integrated graphic card, if the user intend to heavily graphically activities in their system such as gaming or video engineering than it’s still worth while to get a dedicated CPU instead of relying on integrated graphics. Otherwise, integrated graphics cards may be worthwhile if a user does not utilize heavily graphically activities. On the other hand, for integrated Wi-Fi allows for the motherboard to be much smaller in sacrificed for PCI-E slot. The downside to this is that most motherboard with integrated Wi-Fi are typically far more expensive than a motherboard without one. Furthermore, if you intend to upgrade a user intends to upgrade their system then they would need to gain another motherboard with integrated Wi-Fi or having to buy a dedicated Wi-Fi card. This means that buying a separate Wi-Fi card allows for more modularity in comparison to integrated Wi-Fi in sacrifice for a larger motherboard.

M.2 NVME support is an additional feature that can be included into a system. What M.2 NVME support allows the use of M.2 NVME instead of traditional SATA port connection such as SSD and HDD. NVME In comparison to SSD and HDD is not connected through a SATA cable but instead is connected directly into the motherboard. This has a few benefits over other storage system. For one, in terms of performance are like SSD, the major difference is the form factor. Unlike SSD which is connected through SATA cables they M.2 NVME sit flush with the motherboard, allowing for better air flow in the system and using far less space in comparison. The two major downside of M.2 NVME is the price in comparison to SSD and HDD and the M.2 NVME not offer any tangible increase in workload performance vs a SATA drive.

Another feature that is included in modern motherboards are PCIE Slots x1, or x16. These slots allowing the inclusion of other components into the motherboards such as GPU and Wi-Fi. Although they are cost effective, they tend to take up a lot of space in a motherboard so a lot of the smaller form factor motherboards tend to remove one or two of the PCIE Slots to make more room.

Three major criteria in determining what kind of motherboard a user should get is based on: the platform aka the CPU socket (Intel or AMD), form factor (the size of the motherboard), and the Back I/O Ports. The two motherboard we are ASUS ROG Strix B550-I Gaming and ASUS ROG Maximus XIII Hero (WiFi 6E). Firstly, is the ASUS ROG Strix B550-I Gaming which supports AMD B550 chipset. This compatible with AMD CPU such as Ryzen 9, Ryzen 7, and Ryzen 5. Furthermore, the form factor for ASUS ROG Strix B550-I Gaming Mini ITX which is the smallest form factor. ASUS ROG Strix B550-I Gaming Back I/O ports contain four USB 3.2 Gen 2 ports (3 x Type-A + 1 x USB Type-C), one USB 2.0 port, one USB 2.0 port (1 x audio USB Type-C), one DisplayPort, one HDMI port, one ASUS Wi-Fi Module, one BIOS FlashBack button, one Intel I225-V 2.5Gb Ethernet, and three LED-illuminated audio jacks. Furthermore, it has 6th generation Wi-Fi, one PCIex16 slot, four SATA 6 GPSs ports and two M.2 ports, two RAM slots with a maximum 64GB DDR4 supported RAM.

The other motherboard ASUS ROG Maximus XIII Hero (WiFi 6E) Back I/O Ports which supports Intel Z590 chipset. Intel Z590 is compatible with Intel I9, Intel I7, and Intel I5 CPUs. The ASUS ROG Maximus XIII Hero (WiFi 6E) is in the form factor of ATX which is one of the larger form factors. The ASUS ROG Maximus XIII Hero (WiFi 6E) Back I/O Ports has two Thunderbolt four USB Type-C port(s), six USB 3.2 Gen 2 port(s) (6 x Type-A), two USB 2.0 port(s) (2 x Type-A), one HDMI port, one ASUS Wi-Fi Module, two Intel I225-V 2.5Gb Ethernet, five Gold-plated audio jacks, one Optical S/PDIF out port, one BIOS FlashBack button, and one Clear CMOS button. ASUS ROG Maximus XIII Hero (WiFi 6E) also has 6th Generation Wi-Fi, three PCIE x16 slots and one PCIE x1 slot, six SATA 6 GBPS ports and four M.2 ports, four RAM slots with maximum of 125GB DDR4 RAM

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