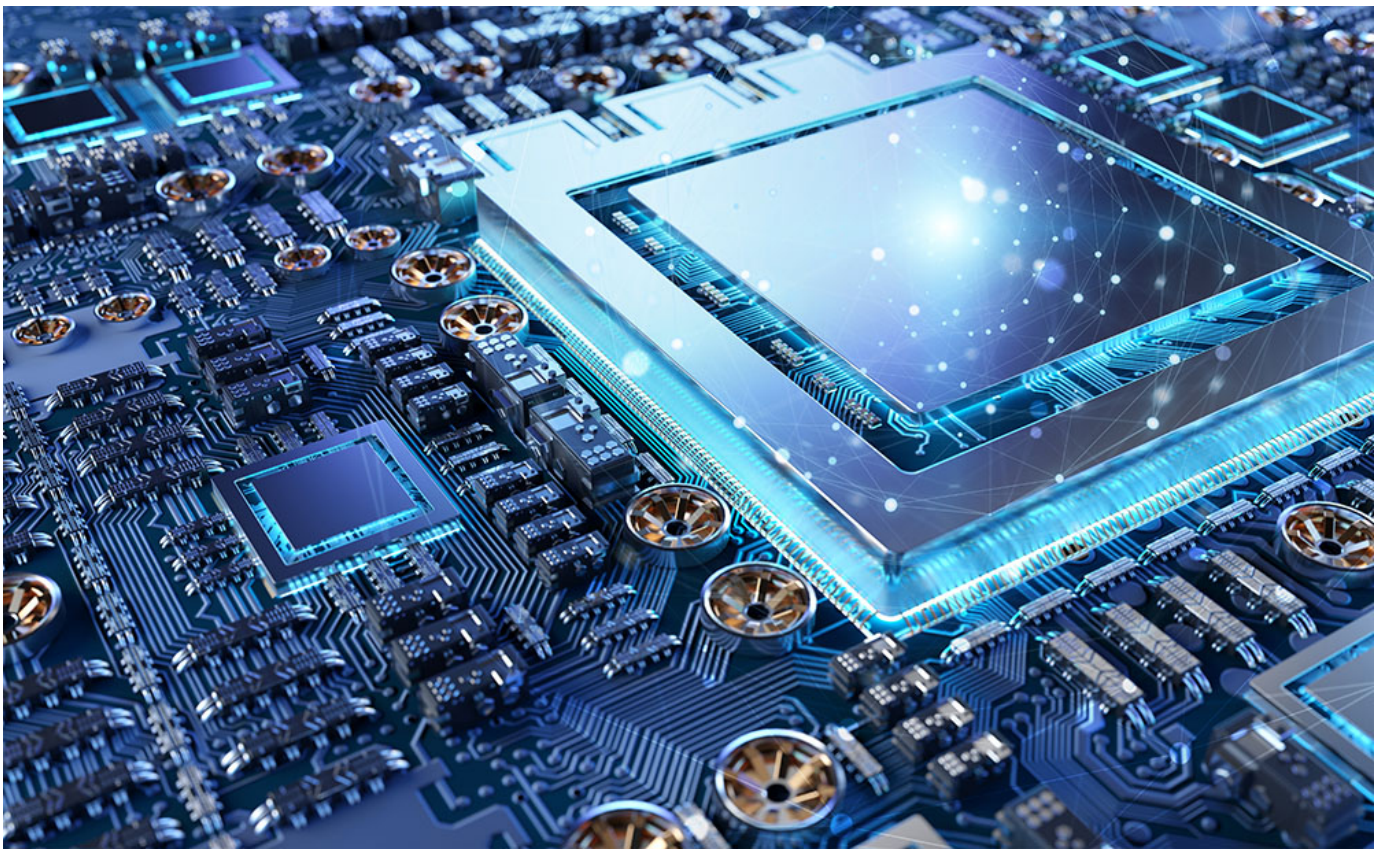
GPU and CPU Selection for Gaming



GPU and CPU Selection Overview

It's been a tough two years for gamers who love building or using their own personal computer (PC) gaming hardware. Production and supply chain issues exacerbated by the ongoing pandemic have made it difficult

to meet gamer demand. As a result, prices have spiked and it can be challenging to find parts to finish customized builds. Shortages exist even for pre-built or original equipment manufacturer (OEM) machines as built by, for example, major manufacturers like Dell's Alienware. This goes for both the desktop and laptop platforms.

Nevertheless, innovation continues as the major players – AMD, NVIDIA, and Intel – work to bring new products to market, promising better performance with higher efficiency and novel technologies to make high-end graphics more accessible. This is in addition to growth in the console and game streaming markets. The discrete graphics processing unit (GPU) market is also about to have more competition with Intel's inevitable entrance. For gamers, there's a lot to look forward to, even if it means being patient a while longer.

GPUs: AMD, NVIDIA, and Intel

AMD and NVIDIA have most recently innovated with massive raytracing gains, including on consoles, a trend which inevitably will continue. Raytracing offers improved lighting, shadows, reflections, and more, introduced by NVIDIA through their RTX technology. RTX will in the future be expanded to RTX I/O for use with DirectStorage, even as current-gen consoles from Microsoft and Sony already leverage asset streaming from PCIe® solid state drives. Raytracing, for its part, promises to improve immersion, while virtual reality (VR) hardware like the Oculus Quest 2 has reached new heights in accessibility.

Graphical improvements are also coming from NVIDIA's Tensor cores thanks to deep learning, a form of artificial intelligence and machine learning, which includes features like DLSS, DLAA, and DLDSR. These can, for example, improve performance enough to make raytracing viable. AMD, for their part, has the competing FidelityFX Super Resolution (FSR), and has long supported the Vulkan low-level application programming interface (API). Both companies are opening up their technology, allowing developers to use these features freely. Moving forward these types of technologies will reduce bottlenecks while increasing both graphical fidelity and processing efficiency; specialized cores and technologies offer pathways to a better user experience.

AMD is headed towards the RDNA2-powered RX 6000 series for the desktop, with what is known as a "refresh" of an existing architecture, while NVIDIA is looking at an upcoming RTX 4000 series. Due to industry shortages, refreshes are more common and even reusing old technology has become viable – this is most obvious with NVIDIA reintroducing RTX 2000 series cards and even cards from their older 1000 series. The more exciting expectations are for Intel's first discrete GPU product line with their Iris Xe, made for desktops, which should shake up the all-important entry- and mid-level gaming markets.

Of course, AMD and Intel are no strangers to the entry-level market, utilizing embedded graphics cores in their CPUs with for example accelerated processing units (APUs). Often such hardware is sufficient for eSports titles that are less demanding, or for use in media machines (HTPCs). However, AMD and NVIDIA are also focused on discrete GPUs for the mobile platform, and we are seeing AMD's RX 6000 series here as well. Efficiency is all-important on laptops in order to maintain battery life, not to mention powerful GPUs can put out a lot of heat which is often a secondary issue for users. Improvements in hardware also promise new heights for portable gaming – including with all-in-one designs like Valve's Steam Deck.

CPUs: AMD and Intel

The CPU market looks to be more exciting in terms of new hardware, even if in general it is less impactful on game performance. Having a fast CPU is necessary for the newest games and particularly to hit higher framerates (FPS), however. Currently, AMD's 5000 series CPUs are being refreshed with more cache, utilizing a "3D" structure known as V-Cache to specifically improve gaming performance. This is being used to bridge the gap between AM4 and AMD's next platform, AM5, which will host the 6000 series of CPUs with DDR5 and PCIe® 5.0 support. AMD is also introducing new 6000 series mobile CPUs and APUs built off their existing Zen 3 architecture.

AMD is utilizing these stopgaps solutions in response to Intel's Alder Lake, which has both desktop and laptop variants (read our Alder Lake blog). This new hybrid design from Intel supports both DDR4 and DDR5, along with PCIe® 4.0 and 5.0, with a focus on efficiency. Combined with Intel's legacy of embedded graphics

cores and future discrete GPUs, the competition is real. Intel's platforms still tend to be costlier, but the overall price of computing performance has steadily declined; it's now possible to have both a powerful and efficient machine, all with a platform having strong storage support.

Summary

Gamers who want to own and maintain their new hardware have had a difficult time recently, but new and exciting technology is still arriving. AMD and NVIDIA both promise refinements in their GPUs that will make high-end graphics more accessible, including in VR, through AI and other techniques, bolstered by higher-efficiency hardware. This includes support for Microsoft's DirectStorage which promises to improve loading times and open-world asset streaming among other things. The ability to scale image quality, even on the fly, ensures a steady framerate and seamless user experience in games; this consideration is becoming more important over time.

The new platforms, along with the respective new CPUs, promise lots of bandwidth for DirectStorage while also allowing for faster GPUs. New CPUs with more cores, more threads, and higher clock speeds – especially through boosting or turbo – offer a better balance for gaming through APIs like Vulkan, all while being more power-efficient. This is especially important for the mobile platform, and embedded GPUs through APUs are becoming more capable as well. Meanwhile, Intel is shaking up both markets with their own discrete GPU and a hybrid CPU design that mimics ARM; AMD has responded with more cache for gaming. At the end of the day, this promises a better experience for the dedicated gamer, regardless of hardware choice.

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