Sean Blanchard

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Powerhouses: Intel vs AMD

People always have many questions when buying a new personal computer. What are these different specifications we always see? Which is the best? What is the most bang for your buck? These are great questions that I have always had. The main specification that we look at is the Central Processing Unit or better known as the CPU. There are two powerhouses in the market, those being Intel and AMD. Both AMD and Intel create CPU chips for the personal computer. These two companies have been competing in the same market for technological changes.

AMD or Advanced Micro Devices is a company that has been creating CPU chips and other types of computer equipment for the last 40 years. Intel, or the Intel Corporation, was founded a year earlier in 1968. Both companies were started in the Silicone Valley in California. Both chips have an extensive history in microprocessors. Intel is known as the “King”, and their products are used in every country where PC’s are used. AMD is said to offer the same basic product at a cheaper price than Intel. [1]

These two companies seem like they make the same chips, as to us as users, we notice little to no differences because both Intel and AMD chips carry out the same work to the human eye. But this is only half of the story. Everything is different at the microarchitectural level, because they do the same thing in different ways, you just can’t see it directly in the software [2]. The microarchitecture is all the electronics inside, which is made to have the processor obey a certain set of instructions. Several different microarchitectures can be invented to obey the same instruction sets. The greatest example of this is AMD vs Intel. Some of the main differences to the human eye would be that each different chip may run faster than the other, also they may require different amount of energy to run.

After doing my own comparison of some of the most expensive processors from both companies in the same price range. Comparing the Intel Core i9-9980XE Extreme Edition Processor priced at 1,799.99[3] to the AMD Ryzen Threadripper 2990WX Processor priced at 1,699.99. [4] The AMD processor is famous for being the “worlds first 32-core, 64-thread desktop processor”. The Intel processor offers 18 cores and 36 threads. Long story short, this means that the AMD has 14 more “cores” which represents the actual physical subset of a processor that can handle processing. Having more cores dramatically improve performance while keeping the physical CPU unit small so it fits in single sockets. More cores equal more performance per frequency, as more threads per core equal more efficiency per core. Both base clocks are outputting 3GHz, but the AMD chip maxes at 4.2GHz, where as the Intel chip maxes at 4.8GHz. The Base clock is the absolute minimum frequency the device will run at. The Boost Clock is the frequency that the card will “boost” up to when it is running at a suitable temperature. We usually refer this to overclocking. This is the number of clock cycles a processor can complete in one second; In billions.[5]

After doing intense research, Intel runs away with benchmarks and power-to-performance ratios at the higher end. AMD is the king of budget processors. There are a few differences between each chip. Traditionally, Intel likes to follow an approach of creating a speedy single thread at very high-power efficiency. AMD approach is to create a design which have a high multicore performance. Single thread Intel CPU offers better performance but when going multi thread AMD has the advantage.[6] A good example where having a higher single thread is better would be for gaming, as they don’t fully take advantage of multi-threading. The more multi-thread power would help in an office environment when you have many different programs running at one time. The trends seem to be evening out as advances in technology has AMD and Intel very close in in all specifications of chips.

Both chips use different amount of power consumption. The Intel processors on average consume far less electrical power than their counterpart AMD. Intel architecture is based upon 14nm technology and AMD on 24nm, Intel’s chips use lower wattage on a chip by chip basis. This overall means that the chips and computer will run cooler. It might also save on your power bill. When looking at the Power Consumption Comparison, it shows that the Intel Core i7-8700K @ 4.0GHz uses almost 30 less watts then the AMD Ryzen 7 2700X @ 4.0GHz.[7]

In conclusion, the answer to which chip is better, there is no “best” when it comes to answering this question. AMD or Intel? Both has its strengths and weaknesses. It is possible to find one that better suits your individual needs by comparing and contrasting what it is you are looking for in your personal computer. As time moves on, AMD and Intel grow closer in comparison, and closer in price. A good thing to understand and what I found most interesting is the microarchitectural design of both chips are different, but ultimately display the same information to the user.

Citations:

[1] - <https://www.diffen.com/difference/AMD_vs_Intel>

[2] - <https://www.quora.com/What-are-the-differences-in-Intel-and-AMD-processors>

[3] - <https://www.intel.com/content/www/us/en/products/processors/core/x-series/i9-9980xe.html>

[4] - <https://www.amd.com/en/products/cpu/amd-ryzen-threadripper-2990wx>

[5] - <https://www.bhphotovideo.com/explora/computers/tips-and-solutions/boost-processors>

[6] - <https://www.maketecheasier.com/amd-vs-intel-cpus/>

[7] - <https://www.techspot.com/article/1616-4ghz-ryzen-2nd-gen-vs-core-8th-gen/page4.html>