A Proposed Comparison for Architecture of AMD Ryzen 9 3950x and Intel Core i9-9900K

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***Abstract*—Microprocessor is a very basic and integral part of a computer system. Our comparison for Architecture of AMD Ryzen 9 3950x and Intel Core i9-9900K is based on online research and the architecture of these microprocessors. Our method of research includes, breaking down their architecture, comparing them based on clock speed, CPU, Memory and various other things. At the end, we came to a conclusion.**

***Index Terms*—AMD Ryzen 9 3950x, Intel Core i9-9900K**

AMD Ryzen 9 3950x:

This microprocessor is a release of year 2019. Few good features have been added to this version than the previous one.
The AMD Ryzen 9 3950X is a high-end desktop processor with 16 cores based on the Zen 2 architecture. At launch in November 2019 it is the fastest CPU of the Matisse series. The 3950X clocks from 3.5 GHz (base) up to 4.7 GHz (Turbo for a single core). All sixteen cores can reach up to 4.1 GHz. Thanks to the 16 cores and 32 threads, the 3950X offers excellent application performance - if the number of cores can be used. Thanks to the relatively high Turbo, the single core performance is also situated in the high end. For games however, there are faster CPUs, like the Core i9-10900K.
The Ryzen 9 3950X is manufactured in 7nm (the four CCX-cluster with the cores) at TSMC and 12 nm (I/O die) at Global foundries. The TDP is rated at 250 Watt and therefore the CPU needs a very powerful cooling system.

Intel Core i9-9900K:

Core i9-9900K is a 64-bit octa-core high-end performance x86 desktop microprocessor introduced by Intel in late 2018. This processor which is based on the Coffee Lake micro architecture, is manufactured on Intel's 3rd generation enhanced 14nm++ process.
This latest processor has the DirectX 12 and OpenGL 4.5 facility supporting 4K resolution at 60Hz and maximum number of supported displays would be three. Furthermore, its maximum HDMI supported resolution is 4096x2304@24Hz and 4096x2304@60Hz is for DP and eDP. Purchase this Hyper-Threading gaming friendly processor at best price. Enjoy 03 years of warranty facility from Star Tech.
This processor is the ultimate solution for gaming that retakes the multi-core lead from AMD with record setting processing power. It has dominating hyper-threading capability keeping significantly cool with low energy consumption.

I. Literature Review

There have been few studies on the architecture of both AMD Ryzen 9 3950x and Intel Core i9-9900K.

Paul Alcorn says that the Ryzen 9 3950X lets you jam highly threaded horsepower into an affordable motherboard, creating a new CPU class all its own. Its 16 cores and 32 threads redefine what's possible for the mainstream, and its comparatively affordable price-per-core is a great value. He emphasized on number of cores and threads, Power efficiency, high boost frequencies and reasonable price per core.

Mark Knapp on his review of AMD Ryzen 9 3950x said, "The AMD Ryzen 9 3950X is the processor to pick for heavily threaded computer work. It blasts through processing tasks, and can handle high-end gaming, but cheaper Ryzen chips handle gaming just as well." But he found himself amused by the fact that In his testing, the Ryzen 9 3950X's power draw maxed out just below 144.3 watts.

Paul Acorn in his research of Intel Core i9-9900K found that this one shows good performance in both single- and multi-threaded workloads but heavy power consumption under heavy load.

Kevin Lee finds Intel Core i9-9900K's high clock speed

boosting (up to 5.0GHz) very satisfying. But this one will not make a good gaming pc and also a little bit expensive.

II. Proposed Methodology

Comparing these two models by their architecture will help us understand the lacks in today's parallel processing and whether there is room for improvement or not.

Is parallel processing and distributed system is properly incorporated in AMD Ryzen 9 3950x and Intel Core i99900K?

Comparison on which measure:
1 Clock speed
2 Instruction Set
3 Word size
4 CPU
5 Memory

Scopes:
1 We can find out which one is more efficient.
2 We can detect the area of improvement.

So Which one is better?

AMD's Ryzen 9 3950X has a clear performance advantage over Intel's Core i9-9900K in many use cases, but that doesn't necessarily mean that it's a better value for all users. The price difference between these two processors is quite significant, and worth some serious consideration.

AMD vs Intel: Price

In the past, if you were looking for a decent CPU with a budget-friendly price, your go-to choice was AMD. However, with their newest generation of Ryzen CPUs, AMD has been on par or even surpassed Intel components on price. The AMD Ryzen 9 3950X, for instance, is easily the brand's most expensive unit, retailing for around 750 dollar (580 euro, 1130 Australian dollar). However, the sticker shock you feel backs up some impressive technology.

The Ryzen 9 3950X boasts 16 cores and 32 threads, exceeding the previous flagship, the Ryzen 9 3900X. And it doesn't just have more cores and threads than its predecessor, the Ryzen 9 3950X has more cache memory and faster processing speeds. It also has the ability to store up to four different profiles for different performance and overclocking settings, so no matter if you're a casual or hardcore gamer or hobbyist artist and animator, you'll always have the best performance you can get out of your CPU.

III. Conclusion

The AMD vs Intel battle still persists, with no one manufacturer coming out the one true winner. That's great news for us consumers. This intense rivalry continues to gift us the best processor for gaming, creative workloads, and casual use, giving us a whole lot more options to choose from at every price point.

This also means, however, that choosing between AMD and Intel is much harder. Luckily, you don't necessarily have to choose one over the other. Both have their own strengths and weaknesses, as well as excellent CPUs on offer catering to every need and budget. Still, as this is strictly an Intel vs AMD faceoff, it's important to know where each manufacturer's strengths lie, especially in terms of price, overclocking abilities, graphics, and component variety. That way, you can choose wisely.

AMD has had a massively successful past few years with their Ryzen and Threadripper lines of CPUs. With twice the number of cores and threads as their counterparts, they've given Intel something to worry about and proven their worth as a reliable choice for PC components. Intel, on the other hand, has seen some embarrassing failures such as their lackluster release (or lack thereof) of Cannon Lake. However, they seem to have taken their knocks and learned a few lessons to apply to future releases.

IV. Future Work

Intel has announced plans for future releases of their Tiger Lake and Comet Lake-S lines of processors for laptops and desktops, respectively. The new CPU line will most likely try to stay abreast of AMD's Ryzen and Threadripper products. However, it's unlikely that Intel will be able to top AMD any time soon, as even Intel CFO George Davis has admitted that Team Blue won't reach parity with AMD's 7nm manufacturing process until 2021.

Future generations of AMD's Ryzen processors will most likely continue to give you more cores and threads for faster and more efficient multitasking. Whenever AMD Ryzen 4000 processors for desktop make their way to market - which should be some time this year - the shift to a more efficient 7nm+ manufacturing process should see further boosts to IPC (instructions per clock) performance along with power efficiency. Threadripper's future seems to stay on track to offer powerful CPU options to industry professionals for 3D modeling and animation or data science work.

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