Apple’s Shift towards ARM-based Processors for its Mac lineup

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In brief

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If you have been following the tech news, you will have seen that Apple has announced its plans to produce its first-ever Macs made completely with ARM processors and Apple’s in-house chips. For the past 15 years, Apple has used Intel chips on all their devices. However, in late 2020, they began transitioning from Intel-powered chips to their very own ARM processors.

So what exactly is an ARM processor? ARM stands for Advanced RISC Machine, and it is a type of microprocessor that is used in all sorts of devices. You can find ARM chips on your phones, laptops, smartwatches, tablets, and other embedded systems. The ARM processors belong to a family of CPUs (Central Processing Units) that use RISC architecture.

RISC stands for Reduced Instruction Set Computing, a specific type of computer architecture that prioritizes efficiency and optimization. RISC architecture is the fastest type of architecture available in computer systems as it uses a very small set of instructions to perform operations quickly.

ARM processors have completely changed the microprocessors field as they are becoming increasingly popular amongst devices due to their high performance and competency.

Why are ARM processors so sought after? Here are some of the top reasons why a lot of companies are implementing these microprocessors into their products:

1. Environmentally Efficient: ARM processors are known to be extremely energy efficient as they generate a very low amount of heat. They have low power consumption, which is one of the main reasons they are used in almost every device we see around us. Since they generate less heat, their battery life extends, which is a redeeming quality for any device. It also mitigates the need for large cooling systems that often cost a lot.

2. Scalability: ARM microprocessors are designed by a company based in the UK known as Arm Holdings. This company sells its designs to hardware manufacturers, which can be customized to meet specific client requirements. This makes these chips quite scalable. The manufacturers can produce an array of products that cater to different specifications while ensuring they are top quality.

3. Low cost: These microprocessors are widely used due to their low cost. The main design philosophy of ARM chips focus on energy efficiency, which means that they can keep their manufacturing process as smooth and efficient as possible, minimizing their costs. They can reduce the cost of their basic components, decreasing the chips’ overall costs.

4. High performance: ARM processors have extremely high performance because they use RISC architecture. They have high clock speeds, making them function faster and optimized for performance per watt. This ensures that while they use less power, they are functioning at their maximum capacity. This is another reason why a lot of companies are adopting ARM processors.

5. Security: Security is an important microprocessor feature. Microprocessors are widely used in smartphones, laptops, iPads, and other devices containing highly sensitive data. If microprocessors don't have a reliable security system, they cannot fend off any malicious threats or attacks, and our data could become vulnerable.

This has already been taken care of in the case of ARM processors, as the microprocessor has several built-in features that prevent such attacks. For example, they use hardware-based encryption, which is used to protect your data. In addition, ARM processors also use Data Execution Prevention (DEP) which ensures that malicious code is not executed in memory.

Due to all the reasons mentioned, Apple has decided to shift from using the Intel x86 processors to using their ARM processors. These are known as Apple Silicon. Since Apple is now controlling its products' hardware and software, they have more control over its entire platform and can deliver the latest new updates more efficiently and frequently. They are also more equipped to integrate their products' hardware and software, resulting in a more smooth and coordinated user experience.

In November 2020, Apple released their first-ever Silicon Macs from brand-new ARM microprocessors. The latest MacBook Pros all have ARM processors embedded into their systems. The fact that the ARM processors are high performing and efficient makes them ideal for devices such as Macbooks, iPhones, and iPads.

Since Macs are now more power efficient, they have longer battery life and low thermal costs. The battery life has increased to 17 hours of web browsing and 20 hours of video playback. This is the most extended battery life ever offered on Macs. Apple's ARM processor is now more powerful than the Intel chip, and the computing power has increased exponentially.

The ARM RISC architecture provides portability for Apple devices. As a result, it is much easier for developers to create applications that seamlessly transition between all of Apple's products. The graphics performance has also tremendously increased, paving a new path for Apple's user experience.

The Apple Silicon phase began in 2020, and since then, the MacBook Air, MacBook Pro, and Mac Mini all contain the M1 chips, which have ARM-based processors. In addition, apple may also use these processors in their IoT devices, such as the HomePod smart speaker and Pro Display XDR.

ARM-based processors can also have much artificial intelligence (AI) capabilities. These microprocessors are designed to support AI technologies such as machine learning, neural networking, computer vision, and natural language processing. Apple's ARM-based processors use AI to enhance the user experience and create more efficient devices. There are many ways in which AI is incorporated into the M1 Apple chips. These include:

1. Machine learning: The microprocessors have hardware acceleration for certain machine learning tasks. These include training and inference. With the help of this chip, the device can perform image and object classification more efficiently and at a faster rate.

2. Natural language processing: The ARM-based processors can perform text-to-speech and voice recognition tasks.

3. Power efficiency: The ARM processors use AI algorithms to optimize power consumption levels, ensuring a longer battery life.

4. Image processing: The microprocessors have specialized circuits that perform tasks like image recognition, scene analysis, and object recognition. This gives the devices the ability to recognize faces or objects in photos.

In general, Apple’s shift towards ARM-based processors has proven to be a step in the right direction. They can cut down costs, enhance user experience and create more powerful and innovative technologies.