

Abstract geometric shapes in the top right corner, including several thin blue outlines of rounded rectangles and one circle, with two of the rounded rectangles filled with a solid blue color.

AHEAD

ARM-Based Processors are the Future

Delivering High Performance,
Low Cost, Sustainable
Computing Solutions

How Ampere, Supermicro, and AHEAD are Streamlining the Adoption of ARM-based Solutions

ARM-based processors have been widely used in the majority of smartphones for a long time, handling specialized workloads with lower power consumption than x86-powered alternatives. Now companies like Ampere and Supermicro have developed technologies to expand these benefits to broader use cases, and AHEAD is designing hardware platforms using ARM technology for enterprise and cloud technology developers interested in exploring the benefits of ARM architecture for their solution.

Ampere has designed an ARM-based CPU family for modern enterprise and cloud workloads, which achieves a greater performance per watt than alternative processors. Major IT solution providers like Supermicro have also released server platforms powered by Ampere's processors delivering more density for scale-out architecture than previously available. This is promoting the adoption of ARM-based solutions for complex or large-scale computing situations where companies previously opted for x86 architectures.

In this whitepaper, we'll cover the advantages of ARM-based processors and the best use cases for cloud and enterprise applications. We'll also discuss how AHEAD is streamlining the adoption of ARM-based solutions built with Ampere and Supermicro technologies.

The Advantages of ARM over x86 Architecture

There are three companies offering data center processors today: Ampere, AMD, and Intel. Ampere processors are based on the Aarch64 architecture whereas AMD and Intel are based on the x86 architecture.

X86 processors have a much longer history of incremental improvements and patches to its instruction set architecture (ISA), and decoding these growing instruction sets has a high energy cost. That's one of the reasons why Intel and AMD add larger micro-operation caches from one generation to the next, in order to bypass the decoder for certain instructions and thus overcome this bottleneck.

Since ARM processors have fixed-size instruction sets, there's no need for these micro-operation caches or lengthy pipelines. This results in ARM's much improved efficiency when handling certain instructions, which can reduce the power usage and footprint required to achieve similar performance to x86 alternatives.

Ampere leverages ARM technology to deliver datacenter grade processors for high-performance edge applications, cloud services providers and digital-first enterprises.



Here are some of the advantages of Ampere's ARM-based processors:



Greater Performance:

Many ARM processors have a greater performance-per-watt than AMD and Intel alternatives. This reduces the number of CPUs and servers required to achieve the same performance as an x86 solution. Ampere® Altra® Max achieves up to 2.5x greater performance per rack — decreasing the number of racks required for large-scale computing workloads.



Smaller Footprint:

Since ARM processors deliver more performance per rack than x86, this also reduces datacenter footprint in terms of racks, switches, and real estate. Ampere® Altra® Max can lead to a 3x smaller data center footprint.



Lower Total Cost of Ownership (TCO):

The greater performance and energy efficiency of ARM processors reduces TCO, especially for large-scale and long-running computing workloads. High-performance becomes more scalable when TCO is lower because it's not just about the initial cost of the hardware, but the long-term indirect costs of usage in terms of electricity and physical datacenter space.



Reduced Energy Consumption:

ARM processors have significantly reduced energy consumption without sacrificing performance -- servers and other solutions that are constantly running can see enormous energy savings long term. Ampere® Altra® Max achieves up to a 2.8x reduction in energy consumption.



More Sustainable:

Environmentally-conscious customers can also adopt ARM to greatly reduce their carbon footprint by producing less heat and consuming less energy for cooling than similar x86 alternatives.

In short, companies adopting ARM processors can gain a competitive advantage over those that still rely on x86. Technology developers and service providers that leverage ARM processors can pass the cost savings through to end-customers to differentiate themselves.

Use Cases for ARM-Based Solutions

Industry leaders are already recognizing ARM processors as the future for complex computing workloads. In fact, Netflix has been testing ARM processors for its video servers and saw similar performance with lower energy consumption. Mobile devices and IoT aside, the most ideal use cases for ARM-based solutions are long-running, large-scale workloads that require predictable performance.



Data centers and hyperscalers

with hundreds or thousands of servers constantly running can see enormous long-term cost savings from adopting efficient ARM-based servers. Even small improvements in energy usage on a large scale can add up to substantial cost savings over the useful life of an ARM-based server. These use cases include data centers that leverage software-defined networking and hyperconvergence to achieve massive scales.



Edge computing

with ARM-based processors is much more affordable and easier to deploy when there's reduced energy consumption requirements. ARM-based processors are well-suited for edge computing with heavy workloads and applications demanding high core counts, flexible storage, and peak memory. These use cases include content delivery networks (CDNs) with large networks of proxy servers and IoT devices that implement edge AI inferencing.

Video Streaming Using Ampere Processors

Video streaming requires a lot of computational power in both data centers and at the edge to deliver high quality video without any buffering or lagging. Today's consumers expect a seamless streaming experience on any device whenever they want, forcing video publishers to build complex infrastructure for content delivery networks, adaptive bitrate streaming, and more.

Ampere processors are ideal for video **streaming workloads** because they can increase throughput, reduce latency, and scale linearly up to 128 cores to maximize video server performance. Ampere® Altra® Max processors achieve an **aggregate throughput 209% higher than legacy x86 platforms** in terms of total FPS for video transcoding. The processor also delivers **70% greater performance per watt** for **x265 workloads** and is **29% more energy efficient** for **x264 workloads**.

In short, Ampere processors bring efficiency to data centers and enable deployment to power-sensitive edge locations. This allows video publishers to control costs while delivering a better streaming experience to consumers.



Streamline ARM Adoption with Supermicro Platforms

Supermicro is an IT solution provider that has designed Ampere-based servers as part of its MegaDC portfolio. This includes the Mt. Hamilton platform, which brings Ampere's efficient processors to a broad set of computing use cases

The Mt. Hamilton platform is built a top Ampere® Altra® and Ampere® Altra® Max processors, with a modular design and six different chassis options for specific use cases. This makes the platform optimal for cloud gaming, video streaming, content delivery networks, databases, object storage, and many other solutions.

In addition, Mt. Hamilton offers similar capabilities to x86-based servers, such as networking, remote management, and security features. The ease-of-use of Supermicro's platforms, combined with the predictable performance and energy efficiency of Ampere's processors, make ARM-based solutions a viable option for future computing use cases.

Diving Deeper into Ampere Processors & Supermicro's Mt. Hamilton Platform for Software Defined Storage

Ceph is an open source storage platform that offers high performance, scalability, and fault tolerance for use cases that require vast amounts of data. The distributed storage architecture is organized into clusters, which contain storage nodes that interact with the underlying hardware. Ceph can support block, file, and object storage within a single cluster, eliminating the need for multiple storage solutions or specialized hardware.

Ampere conducted several tests with Ceph on its Ampere® Altra® processors and the Supermicro Mt. Hamilton platform. The results showed that running Ceph on a multi-node cluster with the Ampere-based servers delivered good performance and exceptional power savings. While an AMD node consumed approximately 350 watts of power, each server featuring the Ampere® Altra® processor consumed around 225 watts.

In addition, the tests found that the Ampere and AMD x86 processors are interoperable within a single Ceph cluster. This means that customers can transition existing Ceph clusters running on x86 systems to Ampere-based systems without encountering any major downtime disruptions.

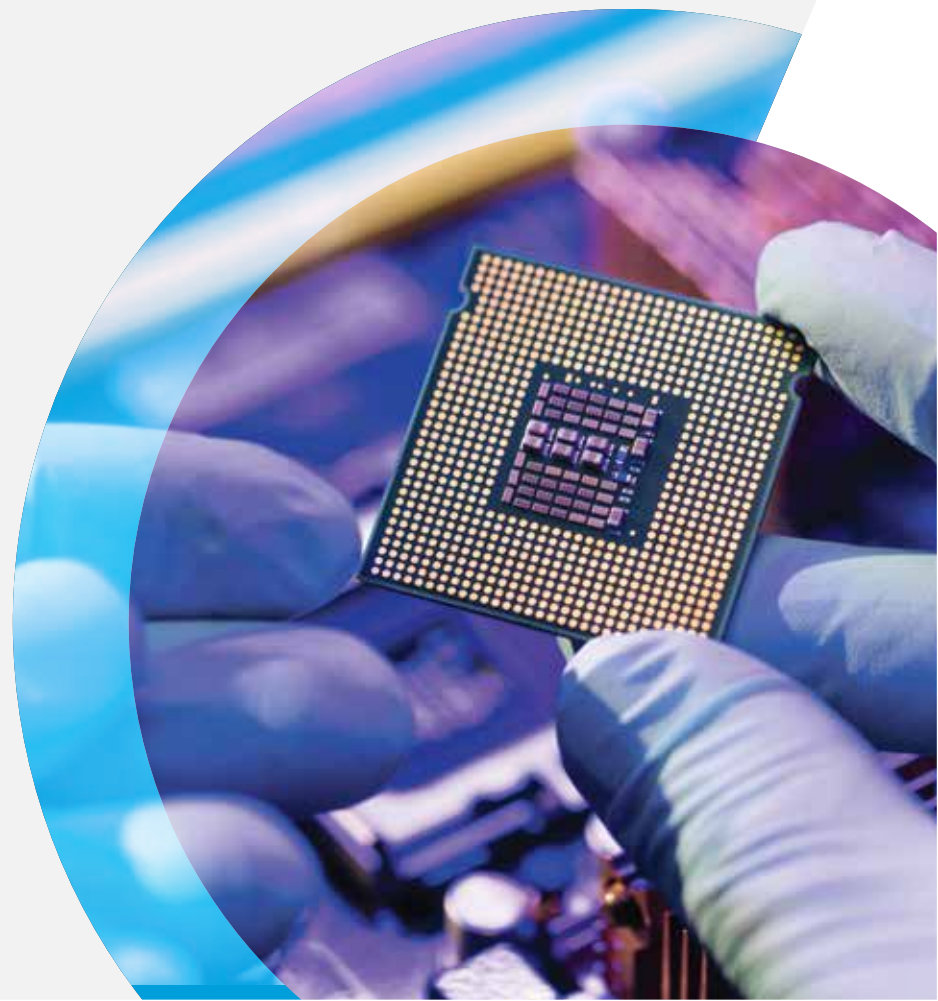
Similarly, Ampere tested its Ampere® Altra® Max processors with LINBIT SDS, which is a platform for fast and resilient block storage. The benchmarking demonstrated that the small footprint in terms of physical cluster size and power consumption required with Ampere processors delivers a high performance to rack unit ratio. Over the long term, reducing server count and power consumption while increasing performance leads to a lower total cost of ownership (TCO) for new ARM-based software defined storage solutions.

AHEAD can Help Deliver ARM-Based Solutions with Supermicro and Ampere Technologies

Ampere, Supermicro, and AHEAD are providing a third competitive computing option (Ampere processors) where there were only two for so long (AMD and Intel). This new era of ARM-based processors can help companies deliver high performance, low cost, and sustainable computing solutions that may not have been possible in the past.

Supermicro has developed ARM-based platforms powered by Ampere® Altra® and Ampere® Altra® Max processors to deliver a high performance per watt when running real-world applications. Mt. Hamilton also makes it easy for partners to leverage the same platform for multiple use cases without a lot of extra work to validate them.

AHEAD is a hardware specialist that can help you adopt Ampere and Supermicro ARM-based technologies. AHEAD engineers can help you architect ARM-based edge devices, appliances and cloud servers with improved power consumption and reduced costs to achieve a competitive advantage. In addition, AHEAD offers rack integration services to help hyperscalers, CDN companies, and others computing customers deploy servers that meet specific data center requirements.



Contact us and let us help you deliver ARM-based solutions with Ampere and Supermicro technologies.

About AHEAD

Combining cloud-native capabilities in software and data engineering with an unparalleled track record of modernizing infrastructure, we're uniquely positioned to help accelerate the promise of digital transformation.

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