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White Paper

Accelerating Data Center Innovation with New Generation Supermicro Solutions

Supporting 2nd Generation Intel® Xeon® Scalable Processors and Delivering World Record Performance

Executive Summary

Supermicro is the leading innovator in high-performance, high-efficiency server technology. We are a premier provider of advanced Server Building Block Solutions® for Datacenter, Cloud, Embedded, HPC, and Enterprise customers worldwide. Headquartered in Silicon Valley, Supermicro has grown revenues and profits continuously for over 25 years.

Supermicro has launched the IT industry's broadest and deepest portfolio of over 100 application optimized server systems that support the new 2nd Generation Intel® Xeon® Scalable processors (codename: Cascade Lake). These latest Supermicro systems offer many competitive advantages over the previous generations. This white paper outlines the benefits Supermicro brings to our customers for these latest systems supporting Cascade Lake, the advantages of Cascade Lake processors, benchmark results comparing Supermicro systems supporting Cascade Lake vs. systems based on previous generation processors (codename: Skylake) and on earlier generation processors (codename: Broadwell), and also some success stories with Supermicro Enterprise customers.





The Supermicro Advantage

Green Computing

Supermicro is a global leader in high performance, high efficiency server and storage technologies and solutions. We develop and provide end-to-end green computing solutions to the data center, cloud computing, enterprise IT, big data, high performance computing (HPC), and embedded markets. Our solutions range from complete server, storage, blade and workstations to full racks, networking devices, server management software and technology support and services. We offer our customers a high degree of flexibility and customization by providing the industry's broadest and deepest array of server configurations, allowing them to select the optimal solution that best fits their computing needs. Our server systems, subsystems and accessories are architecturally designed to provide high levels of reliability, quality and scalability, enabling our customers to improve their compute performance, density, thermal management and power efficiency to lower the total cost of ownership (TCO) of their IT systems and data centers.



Technology Leadership

Supermicro's technology leadership is advanced by our in-house research and development, which allows us to communicate and collaborate effectively with customers, to streamline our product realization process and to reduce the time-to-market of our products. We have developed a set of design principles which allow us to aggregate individual industry standard components and materials to develop proprietary products, such as serverboards, chassis, power supplies, networking and storage devices. This building block approach allows us to provide a broad and deep range of product SKUs, enabling us to build and deliver highly differentiated, application-optimized solutions based upon customers' exact requirements. Supermicro engages proactively at a product development level with the largest, most well-known and technologically advanced electronic component suppliers to bring our customers the latest and most highly advanced server and storage architectures, technologies and products.

Global Footprint

Supermicro is well-diversified in scale and scope. Our global footprint allows us to flexibly respond to customers worldwide, to reduce our cost structure, and to minimize our business risk. We conduct our geographically diversified operations principally from our headquarters in Silicon Valley, California and subsidiaries in Taiwan and the Netherlands. We sell our server systems and server subsystems and accessories through a combination of distributors, including value added resellers and system integrators, and to a lesser extent to OEMs as well as through our direct worldwide sales force. This provides us with a large customer base spanning many industries, application verticals, and customer sizes. During fiscal year 2018, our products were purchased by a highly diverse group of over 1,000 customers in 100 countries. We commenced operations in 1993 and have been profitable every year since inception.

Industry Leading Resource-Saving Systems

Supermicro's unique Resource-Saving architecture disaggregates the CPU and memory along with other subsystems, so each resource can be refreshed independently allowing data centers to reduce refresh cycle costs and their impact to the environment by reducing e-waste. Further savings are achieved through shared power and cooling as well as free-air cooling solutions. When viewed over a three to five-year refresh cycle, Supermicro Resource-Saving servers deliver, on average, higher-performing and more-efficient servers at lower costs than traditional rip-and-replace models by allowing data centers to independently optimize adoption of new and improved technologies. The following Supermicro product lines support Resource-Saving features to not only deliver exceptional performance but also superior value: BigTwin™ with the highest performance and density in a 2U four-node design with each node supporting 24 DIMMs, six hot-swap NVMe drives and flexible networking capability; 4U FatTwin™ in a variety of I/O, memory and storage combinations for most optimized cloud, HPC and enterprise applications; and SuperBlade® systems with two-socket and four-socket Xeon blade servers supporting top-bin 205-watt processors, NVMe, 100G EDR InfiniBand switch, or 25G/10G Ethernet switches, redundant AC/DC power supplies, and Battery Backup (BBP), making them ideal for enterprise, cloud, and HPC applications.

The Industry's Broadest and Deepest Product Portfolio

Supermicro offers the broadest and deepest portfolio of advanced technology server and storage systems in the IT industry. This offers several advantages to our customers. First, customers can readily select the most optimized solutions to satisfy their business requirements, helping them to reduce their costs and improve the quality and time-to-market (TTM) of their offerings. Additionally, the breadth and depth of Supermicro's product line provides the efficiency, cost, and reduced complexity advantages of one-stop shopping. Supermicro's portfolio of over 100 application optimized systems includes:

No-Compromise 1U & 2U Enterprise Systems

Supermicro 1U and 2U Ultra SuperServers offer best-in-class enterprise level performance while delivering unparalleled value, flexibility, scalability and serviceability. Depending on configuration, systems feature dual 2nd Generation Intel Xeon Scalable processors (up to 28 cores, 205W TDP per CPU), 24 DIMMs of DDR4-2933MHz Reg. ECC memory, up to 24 hot-swap NVMe (up to 16 million IOPS) or SAS3/SATA3 drives, up to eight PCI-E 3.0 expansion slots, dual or quad-port 1G, 10GBase-T, 10G SFP+, or 25G SFP28 Ethernet, and redundant 750W/1000W/1600W Titanium Level (96%+) digital power supplies.



1U Petascale All-Flash NVMe Storage Systems

Supermicro's new Petascale line of all-flash NVMe™ 1U storage servers support all of the next-generation flash technologies with up to 52GB/second data bandwidth out of the box, best IOPS performance, NVMe over Fabrics support and ease of maintenance. With these 1U systems supporting up to 1PB of fast low-latency storage with 32 front hot-swap U.2, EDSFF and NF1 form factor SSDs, Supermicro offers unprecedented flexibility and choice for high-capacity networked storage applications that require the best latency performance. These systems provide a real time-to-value advantage for data centers running data-intensive workloads.



Advanced AI Systems

Supermicro offers the industry's broadest selection of servers optimized with GPUs for AI, Deep Learning, and HPC workloads. With a full line of systems from 1U up to 10U supporting a single GPU up to 20 GPUs, Supermicro has specialized systems for the specific AI workload, including optimized system models for the highest performance of Deep Learning Training and for maximum throughput of Deep Learning Inference.



Powerful Multi-Processor (MP) Systems

Supermicro's latest 4-socket and 8-socket servers combined with the new DC Persistent Memory offer high memory capacity and speed making them ideal for large memory applications like in-memory databases and real-time analytics. With four 2nd Generation Intel® Xeon® Scalable processors, Supermicro 4-socket servers can support up to 112 compute cores and up to 18 terabytes of memory.



Server Management

Supermicro's product portfolio is supported by the latest Redfish based server management utilities that assist data center system administrators to manage hardware issues such as server availability and firmware upgrades to reduce server downtime. Supermicro's multifunction suite of tools, designed for easy automation with existing management infrastructure, perform health monitoring, power management and firmware maintenance to help deploy and maintain servers in data centers.



Global Services

Supermicro Hardware Maintenance provides flexible and customizable Service Level Agreements for remote help desk and rapid onsite support to cover Supermicro hardware solutions. Our Onsite Service Programs offer a 4-hour Onsite Response time option for mission-critical uptime or any tailored solution that will meet your specific business requirements.

Global SKUs

Supermicro's Global SKU Program offers streamlined fulfillment and support services for our premier lines of advanced server, storage and networking solutions for Data Center, Cloud Computing, Enterprise IT, Hadoop/Big Data, HPC and Embedded applications. As the one-stop-shop for all customer system building needs, Supermicro is committed to providing maximum flexibility to design and deploy highly-efficient, high-performance computing solutions for any scale customer requirement to any location around the globe.

Rack Scale Design

Supermicro RSD, a rack-scale total solution, empowers cloud service providers, telecoms, and Fortune 500 companies to build their own agile, efficient, software-defined data centers. Built on industry-standard, RESTful Redfish APIs from Distributed Management Task Force (DMTF) and open-source Intel® Rack Scale Design software framework, Supermicro RSD integrated rack solution can be flexibly configured using Supermicro's broad and optimized server, storage and switch hardware products. Supermicro RSD total solution accelerates large scale data center deployments by elevating provisioning and management to the rack level and maximizes resource utilization through disaggregating compute, network and storage resources distributed within a rack or across multiple racks.

Supermicro Total Solutions

Supermicro offers a variety of Total Solutions designed to provide customers with the ultimate in convenience for Data Management, Cloud, Kubernetes, Software Defined Storage, SAP, Big Data, HPC, and Virtual GPU. With our Total Solution advantage, Supermicro offers full integration, validation, deployment, service, and support worldwide.

The Supermicro Advantage: Summary

These product and technology advantages have helped Supermicro establish itself as a true leader in server innovation. The full range of Supermicro products stand above the competition by delivering industry-leading performance and efficiency at competitive prices. With the most extensive product line in the industry to meet the widest range of customer needs, Supermicro has proven itself to be a world leader in server design and manufacturing.

Cascade Lake Based System Benefits

2nd Generation Intel® Xeon® Scalable processors with faster cores, more memory bandwidth, faster I/O and advanced acceleration features redefine the IT infrastructure to run workloads faster. Customers can efficiently run complex workloads in Big Data Analytics and High Performance Computing (HPC) environment.

2nd Generation Intel® Xeon® Scalable processors enable HPC workloads run up to 1.63x faster, data protection up to 2X faster and Cryptographic Hashing Performance 3.1x faster. Higher memory capacity enables cost-efficient, scalable and optimized solution for Content Delivery Network.

With higher compute and memory, customers can run in-memory databases and speed up the Content delivery of ever expanding content. This advancement opens opportunities to new edge services, drive new business, differentiated user experience.

High-memory capacity and speed also enables virtualization and cloud adoption. With wealth of raw compute, screaming high performance and high-memory capacity, customers can scale-up the IT infrastructure, instead of scale out. Scale-out adds cost. With Higher compute and DCPMM, add 3x more VMs to cloud and increase availability.

2nd Generation Intel® Xeon® Scalable processors offer a 7x to 9x performance advantage over the previous generation, lower TCO, lower latency, faster reboot times, minimized operational downtime and simplified architecture.

Supermicro has optimized our X11 portfolio to fully leverage the advantages and improvements of the new Cascade Lake processors. These advantages include performance, density, efficiency, and cost.

Processor Price, Performance, and Memory Capacity vs. Previous Generation

Cascade Lake processors are designed to deliver up to 35% better performance than the previous generation processors (codenamed Skylake). Performance improvement goes up to 50% for multi-generation upgrades. Customers can elect to choose similarly priced processors and achieve better performance, or get same performance with better price. Cascade Lake processors also support twice the system memory capacity, up to 4.5TB memory per CPU socket with up to 2933 MT/s DDR4 memory speed, 10% faster than previous generation Skylake. Cascade Lake processors offer SKUs with reduced power consumption, delivering enhanced performance at lower power.

Data Center Persistent Memory Module (DCPMM) / Storage Class Memory (SCM)

Cascade Lake processors support Intel® Optane™ DCPMM persistent and affordable large capacity memory modules with the performance of fast memory. DCPMM can move, store and process significantly larger data sets closer to the processor, much more cost effectively, than previously possible. This allows for unmatched application level performance, speed of data replication, and workload acceleration. Private and public clouds can benefit from the larger memory footprint. With more VMs and higher container density TCO can be reduced and serviceability improved.

Intel Speed Select Technology

Speed Select allows selected Cascade Lake CPUs to be run at 3 distinct operating points. This feature supports key use cases such as virtualized infrastructure that requires multiple CPU personalities based on workload/VM needs, improved server utilization in data centers through CPU consolidation, and improved guaranteed per-core performance Service Level Agreements (SLAs). The key benefit to customers is improved overall performance by boosting the base frequency on critical CPU cores.

Vector Neural Net Instructions (VNNI)

VNNI delivers significantly more efficient inference acceleration for Deep Learning workloads such as image and speech recognition, language translation, and object detection. This feature addresses the needs of rapidly growing market verticals such as Cloud Services Providers, Enterprise and Communications Services Providers. VNNI delivers up to 11X faster AI processing without the need for add-on cards by moving data more quickly and utilizing less power to maximize compute resources.



New Supermicro Resource Savings Systems Deliver World Record Performance

Supermicro systems achieved world record performance results for new Resource Saving Systems that support the new Cascade Lake processors. Supermicro achieved a world record benchmark for the new systems and also produced superior overall results as the clear number one in performance versus legacy vendors. Of critical importance to users, the Supermicro systems showed average performance gains of up to 27% versus previous generation Skylake based systems and up to 117% compared to earlier generation Broadwell based systems. Based on these results customers on a 3-5 year refresh cycle could see significant performance gains versus their current systems. By upgrading or refreshing their current server systems these customers could realize significant product life cycle savings and reduced TCO (Total Cost of Ownership) for their data centers.

Supermicro World Record SPEC Benchmark

A Supermicro server supporting Cascade Lake Processors delivered world record performance, demonstrating a 13% performance improvement as measured by a critical SPEC* benchmark that provides an important measure of server performance. This world record result was achieved on a Supermicro 1U Ultra server, using two Intel Xeon Gold 6244 processors, running the SPEC CPU2017 integer speed benchmark.

Supermicro Achieves Top SPEC Benchmark Results

Supermicro servers achieved superior results for all the four dual processor SPEC CPU2017 benchmark results submitted (integer speed, floating point speed, integer rate, and floating point rate). The four benchmarks test the processing power of integer and floating point computing operations, and measure the ability of a server system to deliver maximum performance to customer workloads and applications. The Supermicro servers that were tested encompassed a diverse set of products including Ultra, TwinPro™, BigTwin™, and GPU family servers, demonstrating the extreme breadth and depth of product offerings that Supermicro makes available to customers.

Improvement over Earlier-Generation Broadwell Systems

The latest Supermicro systems supporting Cascade Lake achieved 95% to 117% improvements in SPEC CPU2017 benchmarks over earlier generation legacy systems. The comparative earlier generation systems used the Intel Xeon E5 v4 Broadwell processors. The performance improvements in dual processor SPEC CPU2017 benchmarks (see Figure 1 below) were due to more CPU cores, higher CPU frequencies, and greater memory bandwidth.

* SPEC, the Standard Performance Evaluation Corporation, creates and administers a standard set of performance benchmarks for computers (see <https://spec.org>).

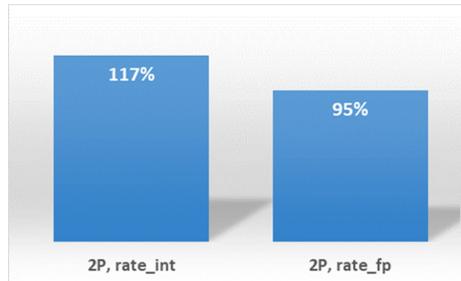


Figure 1. Dual Processor SPEC CPU2017 Performance Improvement (servers supporting Cascade Lake vs. Broadwell)

Improvement over Previous-Generation Skylake Systems

The latest Supermicro dual processor systems supporting Cascade Lake achieved 18% to 27% performance improvements in SPEC CPU2017 benchmarks over previous generation systems running Skylake processors (see Figure 2 below). The performance improvements were due primarily to increases in the CPU frequency and memory bandwidth for the Cascade Lake systems. Since the processors in both generations are priced similarly, there is a significant Performance-per-Dollar benefit for customers to upgrade to systems supporting Cascade Lake.

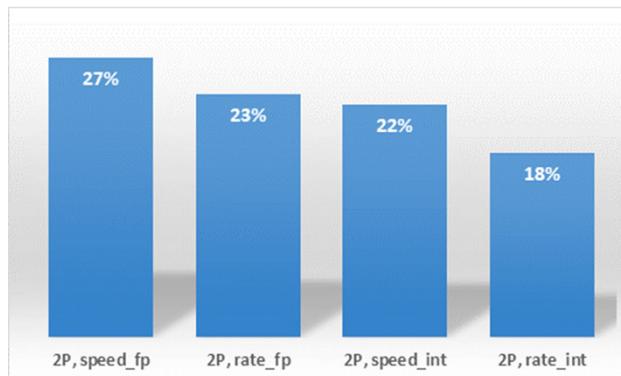


Figure 2. Dual Processor SPEC CPU2017 Performance Improvement (servers supporting Cascade Lake vs. Skylake)

In summary Supermicro server systems delivered an outstanding world performance benchmark record and superior dual processor results, while significantly outpacing the performance of previous-generation and earlier-generations server systems. These results demonstrate that Supermicro servers can provide customers with significant Performance-per-Dollar advantages over their currently-deployed server systems, and can easily justify upgrades and server refresh to reduce data center TCO (Total Cost of Ownership).

Supermicro Success Stories

“The disaggregated server architecture is a perfect fit for our data centers, just like when a homeowner upgrades lighting, they will only replace the bulbs with the most energy efficient ones without replacing the entire lighting fixture, Intel IT prefers to upgrade just the compute modules with the latest technologies without replacing the entire server infrastructure.”

Shesha Krishnapura
Intel Fellow and Intel IT CTO

A Fortune 100 Silicon Valley Technology Firm

A Fortune 100 Silicon Valley company, has deployed over 100,000 Resource-Saving Supermicro™ MicroBlade™ disaggregated servers at its Silicon Valley data center, one of the world's most energy efficient, while also expanding deployments globally to support its rapidly growing compute needs. Compared to a traditional data center, the new Silicon Valley data center achieves 88% improvement in infrastructure energy efficiency. When the build out is complete, the company is targeting \$13.18M in savings per year in total energy costs across the entire data center.

The Resource Saving Architecture conserves resources by reducing consumption, reusing versus replacing and refreshing server resources sooner. The resource savings contribute to both a greener and more efficient datacenter and delivers double-digit savings in operating costs and 45%–65% reduction in acquisition costs.

Global Cloud Services Provider

One of the world's largest Cloud Services Providers offers global, on-demand data center and hosting services from facilities across the world, utilizing Ultra servers from Supermicro. This Cloud Services Provider leverages best-in-class connectivity and technology to innovate industry leading, fully automated solutions that empower enterprises with complete access, control, security, and scalability.

The Cloud Services Provider operates a global cloud infrastructure platform built for Internet scale. With hundreds of thousands of devices, 13 data centers in the United States, Asia, and Europe and a global footprint of network points of presence, this provider offers Infrastructure-as-a-Service to leading-edge customers ranging from Web startups to global enterprises. The Cloud Services Provider's modular architecture utilizing Ultra provides unparalleled performance and control, with a full-featured API and sophisticated automation controlling a flexible unified platform that seamlessly spans physical and virtual devices, and a worldwide network for secure, low-latency communications.

Hyper-converged Infrastructure OEMs

Hyper-converged (HCI) solutions aim to simplify and drive down the costs of managing IT infrastructure. This is achieved through software capabilities that are able to consolidate compute, storage and network layers into a single tier HCI solutions are typically implemented on a hardware appliance that has powerful software capabilities enabled for virtualization and orchestration for data center agility. Because a hyper-converged appliance is a single component, there is local storage for each server, which can be shared across a whole hyper-converged cluster, improving performance and reliability. The value of HCI solutions is a reduction in the number of components that need to be managed within a data center.

For More Information

- X11 Resources Page
<https://www.supermicro.com/en/products/x11>
- X11 Mission Critical Server Solutions Brochure
<https://www.supermicro.com/manuals/brochure/brochureSuperServer.pdf>
- X11 Building Block Solutions Brochure
<https://www.supermicro.com/manuals/brochure/BrochureMB.pdf>

Supermicro expects to maintain momentum in the market with Cascade Lake as we continue to supply a large volume of Twin Architecture products to the Enterprise HCI appliance market, working through the world's top HCI infrastructure suppliers. With a distributed file system and key-value database, virtualization management, container and orchestration services built into an appliance, the 4-Node BigTwin™ becomes a very powerful, yet resilient general-purpose IT solution. Each node supports up to 205W CPUs, 24 DIMMs, two PCI-E 3.0 x16 slots and one SIO network card. With such a dense scalable building block, one wouldn't expect much modularity and flexibility. However, through innovative HW and FW design, HCI partners have been able to develop a dynamic data tiering solution with SSDs for hot storage and HDDs for cold storage, while caching key-value stores with NVMe drives. With 2-Node BigTwin, HCI partners are able to offer the same capabilities, but with more storage capacity with HDDs while delivering game changing performance with Intel Optane DC Persistent Memory in App Direct Mode.

HCI partners and their end-users can have peace of mind for SW compatibility as the Hybrid BigTwin™ systems come with the same Motherboard (X11DPT-B) and IO Controller (SAS3008). Alongside of Cascade Lake, HCI partners are also now able to offer OS redundancy via an optional Carrier Card, which supports HW RAID 1 for M.2 drives.

Conclusion

Supermicro is a global leader in high performance, high efficiency server, storage, and networking technologies and solutions. We offer the IT industry's broadest and deepest product-technology portfolio. Supermicro's business is solid, and well positioned in the marketplace with a diverse base of global customers. Our competitive position is strong. The Supermicro advantage is a robust business proposition for our customers. Please come and talk to us.

About Super Micro Computer, Inc.

Supermicro®, the leading innovator in high-performance, high-efficiency server technology is a premier provider of advanced server Building Block Solutions® for Data Center, Cloud Computing, Enterprise IT, Hadoop/Big Data, HPC and Embedded Systems worldwide. Supermicro is committed to protecting the environment through its “We Keep IT Green™” initiative and provides customers with the most energy-efficient, environmentally-friendly solutions available on the market.

Learn more at www.supermicro.com

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