

Energy Efficient Servers

The Gartner Group, a technology research firm, estimates that in the near-term data centers will have to support up to 300% increased workload. As large enterprise data center utility bills exceed \$10+ million per month, the potential savings opportunities are significant with ROI payback periods of less than two years. Data centers are estimated to consume 2% of the U.S. electrical grid capacity resulting in \$2 billion per month in utility bills. The cost of energy for these power-hungry IT systems has become a major concern, and governments and private industry agree they must find ways to control and reduce energy demand while improving performance.

With these huge utility bills it is critical that IT providers address a growing concern to:

1. Develop beneficial solutions that result in significant power savings and increased efficiency.
2. Maximize user ROI – making it worthwhile to implement.

Addressing the above means OpEx (operating expense) will be reduced, thus positively impacting ROI. A winning strategy is for the IT developer to not only develop a power efficient (Green) product line, but also add features and capabilities to its architecture that significantly boost overall performance and throughput for the HPC user.

The Missing Link

A final piece of the data center green revolution is industry standardization, the missing link. Even though data centers around the world have integrated many sustainable best practices into their facilities, industry-wide standards and measurement tools are necessary to regulate and improve efficiency.

Today the Power Usage Effectiveness (PUE) ratio is the most widely accepted data center energy-efficiency metric. The Green Grid developed PUE, in conjunction with governments and private industry. PUE is designed to quantify the ratio between the overall energy used divided by the IT energy used.

PUE is a way to measure the power delivered to IT equipment in a ratio against total

power consumption in the data center. $PUE = \text{Total Facility Power} / \text{IT Equipment Power}$ (where Total Facility Power is the power measured at the utility meter. The IT Equipment Power is the actual load associated with all of the IT equipment including computing, storage and networking equipment).



Source: Green Grid

One company that has taken green IT to heart is Supermicro. Charles Liang, President and CEO of Supermicro, had this to say about the Company's Research and Development ... "Today, engineers are not just developing products that please customers, they're also crafting systems that reduce the earth's carbon dioxide levels along with saving customers money. Our engineers enjoy the challenge. They are doing something that will help customers save money, and help our Earth—they are very proud of this".



Charles Liang

Green IT has been a core value and competency of Supermicro with all products designed and engineered to lower power consumption, improve efficiency and ROI.

Supermicro – The Leader in High Efficiency Green Computing

Supermicro is a global leader in high-performance, high-efficiency server technology and green computing innovation. The Company develops and provides end-to-end green computing solutions for Data Center, Cloud Computing, Enterprise IT, HPC, Ha-

doop/Big Data and Embedded Systems worldwide. Solutions include a range of complete rackmount, workstation, blade, storage, graphic processing unit systems, networking devices and full rack solutions, as well as subsystems, accessories, and management software.

The server systems, subsystems and accessories are architected to provide the highest levels of reliability, quality and scalability, thereby enabling benefits in the areas of performance, thermal management, power efficiency and total cost of ownership. Solutions are based on open standard components, such as Intel processors and Xeon Phi coprocessors, AMD processors, and GPGPUs from NVIDIA that are compatible with both the Linux and Windows operating systems.

Supermicro has developed the broadest family of energy efficient servers and associated products. All



products are developed with Green IT to reduce operational costs through effective energy use with improved ROI, and a smaller carbon footprint.

A History of Award Winning Green Servers

As an industry leader in power saving technology Supermicro utilizes in-house advanced system design expertise to reduce the power consumption of server systems. For example...

- **2006** Supermicro introduces the 1U Twin™ servers featuring two DP nodes in a 1U form factor with 89% power efficiency.
- **2007** The SuperBlade® system built on the 1U Twin technology to develop 93% power efficiency.

- **2008** Supermicro's Datacenter-Blade™ won Blade System Insight's "Best Green Data Center Solution" award for 93%+ power supply efficiency.
- **2009** Supermicro announces the innovative 2U Twin²™ server architecture with 4 hot-plug DP nodes in 2U
- **2010** TwinBlade™ won Blade Systems Insight's prestigious "Best Blade-Based Solution" award in for the highest-performance/density Blade solution with 94%+ power supply efficiency.
- **2011** New servers and technologies for the HPC market were introduced, all delivering superior performance and improved ROI. This included a new cluster solution for Big Data and HPC (GPU) with the TwinBlade® and GPU SuperBlade® products.
- **2012** The product line was refreshed with the X9 Server Solutions supporting Intel® Xeon® processor E5-2600/1600 together with new platinum, high efficiency (up to 95%+) digital switching power supplies. PUE optimized servers were launched that same year together with the FatTwin™ and new SuperServers and SuperBlade solutions supporting 16 core AMD Opteron processors.
- **2013** New Hadoop-optimized 1U, 2U Twin and 4U FatTwin™ servers and server solutions supporting Intel's new Xeon Phi coprocessors were introduced that cost-effectively accelerate performance of engineering, scientific and research applications.

FatTwin Server Solution - Best TCO with Highest Performance-per-Watt/per-Dollar

The FatTwin is the latest addition to Supermicro's evolving line of Twin Architecture SuperServer® solutions.



FatTwin with 8 DP Nodes with Front I/O

The 4U FatTwin greatly expands compute and storage capacities to achieve increased performance with lower power consumption. By virtue of its shared components the FatTwin improves cost-effectiveness and reliability, while its modular architecture makes it flexible to configure and easy to maintain.

The FatTwin's high efficiency, highly effective shared cooling architecture allows it to operate in high-temperature, free-air cooled environments up to 47°C and up to 16% power savings, providing considerable cost savings and improved TCO.

Versatile configurations allow the FatTwin to be optimized for many different environments including Data Center, Cloud Computing, HPC, Engineering, Research, and GPU projects/ Xeon Phi, File and Storage Server deployments, General Server and Enterprise Server applications.

FatTwin provides the highest levels of energy efficiency and performance representing a revolution in green computing designed to support customers' critical applications with reduced Data Center TCO. The FatTwin is capable of achieving industry leading PUE of less than 1.1. This power saving represents a \$500 over the life of the product. If you have a 1,000 servers that is a whopping \$500,000, an impressive ROI.

Additional HPC ROI Options with FatTwin

For HPC users the improved ROI doesn't end with power savings and improved efficiency. The 4-node FatTwin platform can support up to 3 Intel Xeon Phi Coprocessor cards per U for a total of 12 coprocessors in 4U. With



GPU/Xeon Phi™ FatTwin with 4 DP Nodes

dual Intel® Xeon® processor E5-2600 and up to 512GB of memory support per node this hybrid SuperServer offers an amazing amount of parallel processing power to accelerate research while simplifying development of highly-parallel applications. HPC users that adopt this hybrid platform will realize savings from power efficiency while accelerating engineering, enhancing scientific discovery, and bringing new products to market sooner. Properly utilized FatTwin can boost performance at 1/10th cost and 1/20th the power consumption, thus maximizing server ROI.

We Keep IT Green®

Supermicro leverages advanced technology and system design expertise to reduce the power consumption of their server, blade, workstation and storage systems. Over many years of experience, they have become an industry leader in power saving technology and green IT.

- **Optimized System Architecture** created to take advantage of power saving technology to produce optimal cooling at all application levels
- **Motherboards Designed With Leading-Edge Technology and High-End Components** to re-

duce energy consumption

- **High-Efficiency Power Supplies** designed to run at significantly higher efficiencies of up to 95%+, greatly reducing energy losses
- **Cooling Subsystems** architected for the most effective cooling of all system components
- **Battery Backup Power (BBP®) Modules.** Hot-swappable battery modules for integrated server power backup in case of unexpected power outages. Eliminates need for costly traditional UPS systems

Supermicro at Work

The following are case studies of ongoing and successfully completed deployments of Supermicro server solutions:

Lawrence Livermore National Laboratory (LLNL) Scientific Research Center (USA): Large scientific research organizations such as LLNL require highly optimized CPU and memory performance capabilities architected as supercomputing clusters. LLNL required both cost-effective and highly efficient computing power for their user community. Supermicro server building blocks (serverboards, chassis, power supplies) were selected for their feature rich optimization, reliability, power efficiency and price-to-performance.

CERN (Switzerland): CERN is one of the world's largest research labs. CERN chose Supermicro SuperBlade servers as part of a significant upgrade for the new LHC (Large Hadron Collider) project in Geneva. High computational performance, excellent scalability, superior energy efficiency

and a competitive price/performance ratio were key factors in the selection process. CERN has gained a significant increase in computational power while reducing the operational costs.

SoftLayer: An IBM company, is the cloud infrastructure provider of choice for companies building for Internet Scale. Softlayer provides global, on-demand data center and hosting services from world-class data centers in Amsterdam, Dallas, Houston, San Jose, Seattle, Singapore, and Washington D.C., with network Points of Presence nationwide.

Dawning (China): Dawning is one of the largest local China server OEMs. Dawning required high reliability, high performance and energy efficient server building block solutions to address the growing Chinese market. Dawning selected the Supermicro dual processor server solutions with the highly efficient power supplies coupled with best price-to-performance to differentiate their product offerings in the Chinese market. The result was that Dawning was able to win large server projects in China's rapidly growing telecom industry.

Siemens (USA/Germany): Siemens' medical imaging systems division needed a server solution that minimized the amount of time between image capture and transmission for CT, MRI and PET scan systems. Siemens selected Supermicro to implement a custom serverboard architecture that enabled the highest available I/O expansion and system bandwidth capabilities for dual processor systems. This enabled Siemens to achieve maximum communications throughput for their medical imaging products and a competitive advantage in their market. ■