Servers Optimized for Highest Performance-per-Watt

Enterprise Class SuperServers Provide Greatest Efficiency for Cloud and Hyperscale Data Centers

Supermicro Efficiency Optimized Servers

Supermicro has designed a new class of SuperServer® systems optimized to meet the latest and most stringent data center power efficiency requirements. Today's Cloud and Hyperscale operations, with many thousands of servers installed, require the highest levels of performance-per-watt to keep operating costs (OPEX) at acceptable levels without sacrificing performance. Building on its 1U Data Center Optimized and 2U Twin™ SuperServer® models, Supermicro has developed several performance-per-watt optimized SuperServer® systems to meet these stringent efficiency requirements.

This White Paper describes the configurations (Table 1) and test results (Chart 1 and Table 2) for the Supermicro 1U and 2U efficiency optimized servers compared to today's best standard 1U rackmount volume servers. The results show that data centers can substantially improve their power savings by 35 watts per node, which translates to over $5 million in savings over a 4-year period for a 10,000 node server deployment.

System	CPUs/Memory/SSDs	Fans	Power Supplies
2U Twin (Configuration #4)	CPUs: 2x Intel® Xeon® E5-2670 v3 (TDP 120W) Memory: 8x 8GB DDR4-2133 MHz SSD: 1x Intel® SSD DC P3600 2TB	PUE2 Advanced Fan Speed Control	1000W Titanium Level digital power supplies with Cold Redundancy (CR) feature
2U Twin (Configuration #3)			1000W Titanium Level digital power supplies
2U Twin (Configuration #2)		Standard Fan Speed Control	
2U Twin (Configuration #1)			1280W Platinum Level digital power supplies
DCO SuperServer® 6018R-MD		PUE2 Advanced Fan Speed Control	500W Platinum Level Multiple Output power supply
Mainstream 1U Rackmount SuperServer®		Standard Fan Speed Control	700W Platinum Level power supply
Standard 1U Rackmount Volume Server (Competitor #2)			800W Platinum Level power supply
Standard 1U Rackmount Volume Server (Competitor #1)			750W Platinum Level power supply

Table 1: Test Configurations

Test Configurations

Three standard 1U rackmount volume servers from different suppliers were used as baselines for the testing. For direct comparison, a Supermicro SYS-6018R-MD 1U Data Center Optimized (DCO) system designed for Hyperscale environments was also tested. The other four systems tested were optimized variants of the standard Supermicro 2U Twin (SYS-6028TR-DTR) SuperServer® system with 1280 watt Platinum Level (94%) digital high-efficiency power supplies (Configuration #1). Configuration #2 was a SYS-6028TR-DTR modified with high-efficiency 1000 watt Titanium Level (96%+) digital power supplies. Configuration #3 was similar to #2 but with Supermicro PUE2 advanced fan speed control enabled. Configuration #4 was similar in hardware configuration to #3, but having the Supermicro Cold Redundancy feature enabled. The configuration of all eight systems tested is outlined in Table 1. The components including CPUs, memory, and SSDs were identical. The BIOS settings and test environments were also identical except where noted.

Figure 1: Supermicro 2U Twin™

Performance and Power Measurements

All systems were run utilizing the High Performance LINPACK (HPL) Benchmark program. Power utilization was measured at the plug under identical operating conditions and configurations. Continuous power measurements at idle, average, and peak power values were recorded via power meters. Power efficiency was calculated using the following formula:

Power Efficiency (GFLOPS/W) = HPL Score / Average Power

From the High Performance LINPACK score and average power generated during the test, power efficiency in GFLOPS per Watt were calculated for each of the eight systems and graphed in Chart 1 below.

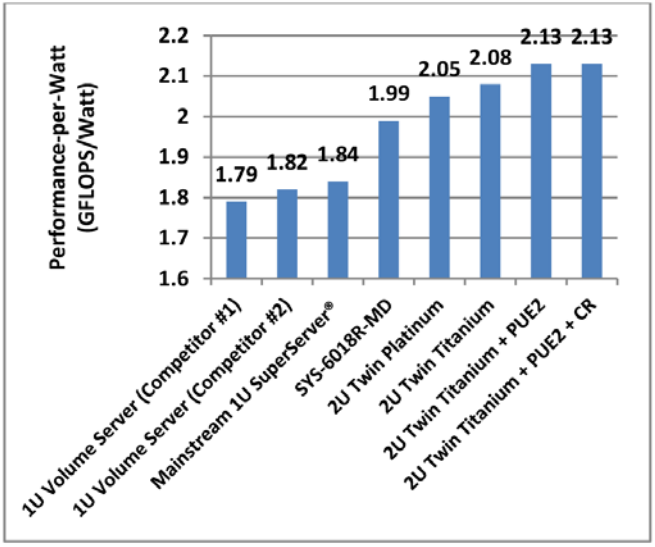

Chart 1: Test Results

Test Results

The Supermicro optimizations resulted in significant improvements in the performance-per-watt of the 2U Twin, to 19% over that of the standard 1U rackmount volume server (Competitor #1) as indicated in Chart 1. Further details are provided in the discussion below.

The best testing result, 2.13 GFLOPS/Watt, was generated by the most optimized 2U Twin system. The lowest testing result, 1.79 GFLOPS/Watt, was produced by a standard 1U rackmount volume server (Competitor #1). The difference in performance-per-watt between these two servers was 19%. The other five systems/configurations provided results that were intermediate between these two values.

Performance-per-Watt Optimizations

The SuperServer® 6018R-MD 1U DCO server was superior to the standard 1U volume servers due to side-by-side CPUs for non-shadowed cooling, more efficient power supply, optimized serverboard, and short-depth chassis for more efficient air flow.

The standard model Supermicro 2U Twin (SYS-6028TR-DTR), with two server nodes in a 2U chassis, is more power efficient than a pair of 1U rackmount servers because it is designed with larger customized heat sinks and larger fans to provide improved cooling.

The Supermicro 2U Twin configured with Titanium Level power supplies consumed less power than an identical 2U Twin system configured with Platinum Level power supplies due to its improved power efficiency, thus improving performance-per-watt. The PUE2 advanced fan speed control, which tunes fan speed to CPU power, provided an additional level of performance-per-watt improvement to the Supermicro 2U Twin. A final level of optimization was achieved with the Cold Redundancy feature available with the Supermicro 2U Twin. This allows the system's power supplies to operate at higher more efficient loading levels, especially at lower server loads.

See Table 2 for details on the power consumption results with this feature enabled for 2U Twin systems at idle.

System	Idle Power (W)
2U Twin with Titanium Power Supplies + PUE2 + CR	114
2U Twin with Titanium Power Supplies + PUE2	120
2U Twin with Titanium Power Supplies	122

Table 2: Power Consumption at Idle

Analysis

The average power levels of each system were compared under maximum LINPACK loading. These power levels were then converted to TCO savings by using a conversion factor of $15 per watt saved over a 4-year period (see http://www.supermicro.com/white_paper/white_paper_DCO_calculations.pdf for calculation). The optimizations resulted in significant improvements in the performance-per-watt of the 2U Twin, to 19% over that of the standard 1U rackmount volume server used as the baseline. The power and cost savings are summarized in Table 3.

Per Node	Standard 1U Volume Server (Competitor #1)	DCO SuperServer® 6018R-MD	2U Twin + Titanium Power + PUE2
Average Power (Watt)	372	345.1	337.5
Power Savings (Watt)	0	26.9	34.5
TCO $ Savings (4 Years)	$0	$404	$517

Table 3: Supermicro Power and TCO $ savings per Node over 4 years

Conclusions

Designed to satisfy the critical performance and power requirements of the rapidly growing Cloud and Hyperscale industry, Supermicro servers optimized for performance-per-watt demonstrate superior results when compared to standard 1U rackmount volume servers. The most optimized Supermicro 2U Twin with Titanium Level digital power supplies and PUE2 advanced fan speed control achieved a $517 savings per node over a standard 1U rackmount volume server. For a 10,000 node data center, this savings translates to over $5 million in TCO savings over 4 years.

Cloud and Hyperscale operations seeking a critical competitive advantage should consider these optimized Supermicro SuperServer® solutions as part of their business strategies. Supermicro is committed to a long term roadmap of efficiency optimized solutions with the most advanced technologies and best TTM.

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