



Servers Optimized for Highest Performance and Energy Efficiency

Ultra SuperServers Achieve Highest Performance-per-Watt to Maximize TCO Without Sacrificing Performance

Ultra SuperServer® Solves #1 Data Center Problem

With tens of thousands of servers installed, today's Cloud, Hyperscale, and Enterprise data centers require the highest levels of performance-per-watt to keep operating costs (OPEX) and Total Cost of Ownership (TCO) at acceptable levels, and without sacrificing performance. The Ultra SuperServer® systems from Supermicro were designed to meet these stringent data center challenges. Supermicro optimized the Ultra SuperServer® systems for highest performance and performance-per-watt simultaneously to meet these customer needs.

To demonstrate the advanced capabilities of Ultra, this White Paper outlines performance and performance-per-watt tests for two Supermicro 1U Ultra systems versus two competitive systems. The results demonstrate that Ultra can save up to 32 watts per node, or almost \$5 million in TCO savings, over a 4-year period, for a 10,000-node Cloud, Hyperscale, or Enterprise data center.

(94%+) or 1000 watt Titanium Level (96%+) digital high-efficiency power supplies. For comparison two 1U high-performance rackmount servers from top-tier competitive suppliers were also tested. All four servers support the latest Intel® Xeon® Processor E5-2600 v3 product family, 24 DIMMs of memory, and 8x to 10x 2.5" drive bays. The configurations of the systems tested are outlined in Table 1. Identical CPUs, memory, and SSDs were used for the testing. BIOS settings and test environments were also identical except as noted.

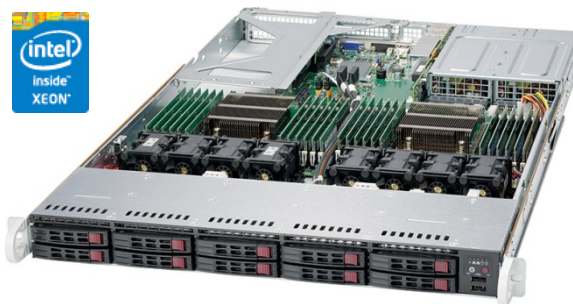


Figure 1: Supermicro 1U Ultra (SYS-1028U-TR4+)

System	CPUs/Memory/SSDs	Power Supplies
Supermicro 1U Ultra SYS-1028U-TR4+	CPUs: 2x Intel® Xeon® Processor E5-2699 v3 (TDP 145W) Memory: 16x 8GB DDR4-2133 MHz SSD: 1x Intel® SSD DC P3500 200GB	1000W Redundant Titanium Level Digital power supplies with Cold Redundancy feature
Supermicro 1U Ultra SYS-1028U-TR4+		750W Redundant Platinum Level power supplies with Cold Redundancy feature
1U Rackmount Server (Competitor #1)		750W Redundant Platinum Level power supplies
1U Rackmount Server (Competitor #2)		750W Platinum Level power supply

Table 1: Test Configurations

Test Configurations

The Supermicro system selected for the testing was a 1U Ultra SuperServer® SYS-1028U-TR4+ (Figure 1), configured with either 750 watt Platinum Level

Performance and Power Measurements

All systems ran 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 values were recorded via power meters. Power efficiency was calculated using the following formula and displayed in Table 2.

$$\text{Power Efficiency (GFLOPS/W)} = \text{HPL Score} / \text{Average Power}$$

Per Node	1U Ultra Titanium	1U Ultra Platinum	1U Server (Comp #1)	1U Server (Comp #2)
HPL Benchmark Score (GFLOPS)	1065	1063	1055	1056
Power Consumption (Watt)	445	454	466	477
Power Efficiency (GFLOPS/W)	2.39	2.34	2.26	2.21

Table 2: Test Results

Test Results

The Supermicro Ultra system with Titanium Level power supplies exhibited the best performance, power consumption, and power efficiency in the tests as shown in Table 2. The Ultra Titanium system HPL performance of 1065 was the highest of all the systems tested, and at 445 watts its power consumption was the lowest. The Ultra Titanium system at 2.39 GFLOPS per watt was 2% more energy efficient than the Ultra Platinum system, 6% more efficient than Competitor #1, and 8% more efficient than Competitor #2 as outlined in Chart 1.

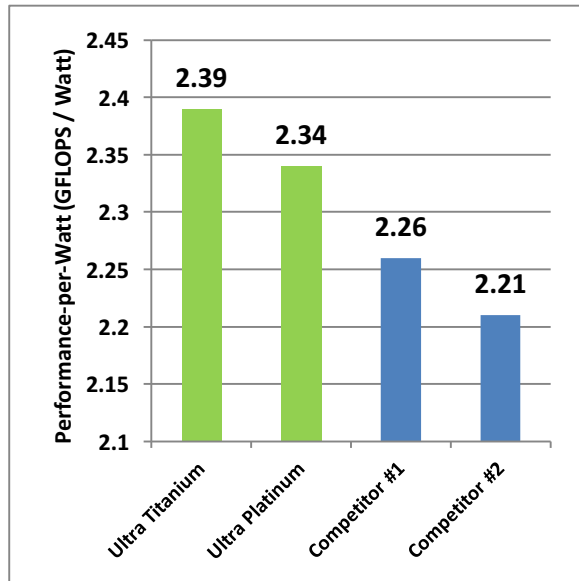


Chart 1: Performance-per-Watt Results

Optimized Ultra Architecture

The Supermicro Ultra SuperServer® 1028U-TR4+ is superior to the competitive high-performance 1U servers tested due to its highly optimized architecture. These optimizations include high-efficiency Titanium/Platinum Level redundant power supplies, power supply **Cold Redundancy** feature to boost power supply efficiency at lower power output loadings, and optimized Supermicro server board. Ultra models, configured with onboard NVMe, will have an even greater power advantage.

Analysis

As noted above, the Supermicro Ultra system with Titanium Level power supplies was the most power efficient server of those tested, with the Ultra Platinum system the next closest in power savings. The power savings of the Ultra Titanium server compared to the other servers was calculated and converted to TCO savings by using a conversion

factor of \$15 in TCO saved per watt saved over a 4-year period*, and summarized in Table 3.

Per Node	1U Ultra Titanium	1U Ultra Platinum	1U Server (Comp #1)	1U Server (Comp #2)
Power Consumption (Watt)	445	454	466	477
Power Saved by using 1U Ultra Titanium (Watt)	0	9	21	32
TCO Saved over 4 years by using one 1U Ultra Titanium (\$)	\$0	\$135	\$315	\$480
TCO Saved per 10,000 Ultra servers (\$M)	-	\$1.4M	\$3.2M	\$4.8M

Table 3: Ultra Titanium System Power and TCO Savings

Conclusions

Supermicro Ultra SuperServers are designed to satisfy the critical performance and power requirements of rapidly growing Cloud, Hyperscale, and Enterprise data centers. The most optimized Ultra SuperServer® with Titanium Level digital power supplies and **Cold Redundancy** achieved substantial power savings per node over competitive 1U servers while demonstrating superior performance. For a 10,000 node data center, this translates up to nearly \$5 million in TCO savings over 4 years, per Table 3.

Supermicro Ultra servers achieved large TCO savings while also demonstrating highest performance as measured by HPL. Thus, with the results reported in this White Paper, customers can feel confident that their mission-critical workloads will run at highest performance levels while consuming the least amounts of electrical power. For this reason Cloud, Hyperscale, and Enterprise data center customers seeking a critical competitive advantage should carefully consider Supermicro Ultra SuperServers.

Supermicro is committed to a long term roadmap of efficiency optimized total server, storage, and networking solutions with the most advanced technologies and best TTM. Supermicro's enhanced warranty terms, onsite service options, and dedicated global support team reduce customers' personnel expenses, inventory, and training costs.

*See [Power Savings White Paper](#) for calculation.

For more information visit: www.supermicro.com