



New Generation Servers Optimized for Extreme Low-Latency Trading

The Lowest Latency Solution: Supermicro 4th Generation Hyper-Speed Technology

Low-Latency: The Key to Success

Recently, the upsurge in low-latency trading has allowed investors to achieve tremendous profitability by executing trades at blazing-fast speed. With securities transactions occurring in microseconds and approaching nanoseconds, securities firms whose trading machines are capable of rapidly capturing market data and creating orders will prosper, while slower competitors will fall behind. For this reason, extreme low-latency has become not only key to building trading infrastructures, but also critical to successful investment-banking and hedge-fund operations.

Staying Competitive

To stay competitive in the low-latency trading world, securities firms must deploy the fastest and most powerful servers. These servers, collocated in the same premises as the servers in the securities exchanges, retrieve massive market information from these exchange servers, analyze it with trading strategies, create orders for execution, and send them back to the exchange servers (Figure 1). While achieving low latency is critical, servers must also deliver consistent trading performance. Jitter in data transmission can cause orders to lag or algorithms to corrupt, leading to undesirable results and significant losses at the end of trading. Thus, careful hardware optimization is necessary to design low-latency, jitter-free servers so securities firms can gain competitive advantage.

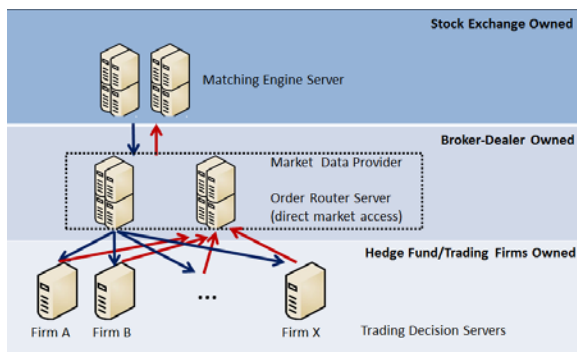


Figure 1: High Performance Trading Network Diagram

Supermicro's 4th generation Hyper-Speed & Hyper-Turbo Technologies for Extreme Low-Latency Trading

Dedicated to serving customers in the financial industry, Supermicro introduces the 4th generation Hyper-Speed and Hyper-Turbo technologies: proprietary server-board-level optimizations for extreme low-latency trading. These

technologies are made possible with the latest VRMs as well as optimized firmware to focus on flexible tuning.

With Hyper-Speed, the CPUs, memory, and PCI-E cards are pre-accelerated in lockstep mode for the most reliable performance. Coupled with Hyper-Speed, Hyper-Turbo allows server system CPUs to maintain maximum Turbo Mode frequency under intense workloads.



Figure 2: SuperServer® 1028UX-LL1/2/3-B8

Supermicro Hyper-Speed Ultra Solution

The Hyper-Speed Ultra server system is offered as a total customer solution. It consists of a SuperServer® 1028UX-LL1/2/3-B8 Ultra 1U rackmount server system, featuring three of the latest Intel® Xeon® CPUs (Table 1): E5-2643 v4 processors (TDP 135W) for the -LL1 offering, E5-2687W v4 processors (TDP 160W) for the -LL2 offering, and E5-2689 v4 (TDP 165W) for the -LL3 offering. Furthermore, the server includes 64GB of ECC DDR4-2400MHz RDIMM memory in 8 DIMM slots for the highest bandwidth, 4 PCI-E 3.0 slots that support up to 2 full-height, full-length cards for the fastest I/O throughput, SAS3 hot-swappable SSDs/HDDs, IPMI 2.0 server management over dedicated LAN with Supermicro's suite of out-of-band management software, and redundant 750W Platinum Level (95%+) Digital Switching high-efficiency power supplies.

| SKU | -LL1 | -LL2 | -LL3 |
|-----------------------------------------|------------|-------------|------------|
| CPU | E5-2643 v4 | E5-2687W v4 | E5-2689 v4 |
| Enabled Cores | 6 | 12 | 10 |
| Turbo Frequency with Hyper-Speed | 3.69GHz | 3.28 GHz | 3.79 GHz |
| AVX 2.0 Turbo Frequency | 3.69 GHz | 3.28 GHz | 3.28 GHz |

Table 1: CPU Specifications with All Cores Enabled

| SKU | -LL1 | -LL2 | -LL3 |
|-----------------------------------------|------------|-------------|------------|
| CPU | E5-2643 v4 | E5-2687W v4 | E5-2689 v4 |
| Enabled Cores | 2 | 2 | 2 |
| Turbo Frequency with Hyper-Speed | 3.79 GHz | 3.58 GHz | 3.89 GHz |
| AVX 2.0 Turbo Frequency | 3.69 GHz | 3.48 GHz | 3.48 GHz |

Table 2: CPU Specifications with 2 Cores Enabled

Enterprise-class Quality & Reliability

To enhance the quality and reliability of Hyper-Speed Ultra servers, the processors, memory, NICs, and serverboard are pre-screened during integration and each system must pass a rigorous burn-in process. Supermicro pre-accelerates CPUs and memory so customers can focus their resources on software development and tuning. This service is complimented by Supermicro's warranty terms, available onsite services, and dedicated technical support.

Benchmarks

SPEC CPU™ 2006 is an industry-standard benchmark that stresses CPU, memory, and compiler. The Hyper-Speed Ultra server currently holds the world record (Table 3) for E5-2643 v4, E5-2687W v4 and E5-2689 v4 processors, achieving 3% to 4% better performance than the next-best comparable competitive systems.

| SKU | -LL1 | -LL2 | -LL3 |
|--------------------------------|------------|-------------|------------|
| CPU | E5-2643 v4 | E5-2687W v4 | E5-2689 v4 |
| SPEC_{int_base} | 70.2 | 69.6 | 70.7 |
| SPEC_{int} | 73.7 | 72.8 | 73.7 |
| SPEC_{fp_base} | 119 | 124 | 119 |
| SPEC_{fp} | 123 | 129 | 125 |

Table 3: Hyper-Speed Ultra SPEC Results

LINPACK is a benchmark that measures a system's floating point computing power. The Hyper-Speed Ultra server is able to achieve higher benchmark scores with Broadwell CPUs. With additional 2 CPU cores and higher AVX-2.0 turbo frequency running at 12 cores, 2687W v4 shows a 35% performance boost over 2687W v3 (Table 4).

| SKU | -LL1 | -LL2 |
|---------------|------------|-------------|
| CPU | E5-2643 v3 | E5-2687W v3 |
| GFLOPS | 577.36 | 873.59 |

Table 4: Hyper-Speed Ultra Gen-3 LINPACK Results

| SKU | -LL1 | -LL2 | -LL3 |
|---------------|------------|-------------|------------|
| CPU | E5-2643 v4 | E5-2687W v4 | E5-2689 v4 |
| GFLOPS | 586.46 | 1175.21 | 985.53 |

Table 5: Hyper-Speed Ultra Gen-4 LINPACK Results

Sockperf is a network testing tool that measures network latency and network latency spikes. UDP 64-byte packets were ping-ponged at 600K messages per second between two Broadwell Hyper-Speed Ultra -LL1 servers via Mellanox MCX354A. The new Supermicro Hyper-Speed Ultra server has improved significantly in jitter (difference of median latency and 99.9% latency) reduction by nearly 30% from its previous generation (Figure 2).

| | |
|-----------------------------------|-------|
| sockperf: ---> percentile 99.99 = | 2.314 |
| sockperf: ---> percentile 99.90 = | 1.844 |
| sockperf: ---> percentile 99.50 = | 1.528 |
| sockperf: ---> percentile 99.00 = | 1.508 |
| sockperf: ---> percentile 95.00 = | 1.174 |
| sockperf: ---> percentile 90.00 = | 1.088 |
| sockperf: ---> percentile 75.00 = | 1.066 |
| sockperf: ---> percentile 50.00 = | 1.056 |
| sockperf: ---> percentile 25.00 = | 1.048 |

Figure 2: 1028UX-LL1-B8 Sockperf Results

STAC-N1 is a benchmark developed by STAC (Securities Technology Analysis Center) that tests network solutions under financial workloads. The Ultra server once again exhibits in this test its low-latency capability (Figure 3).

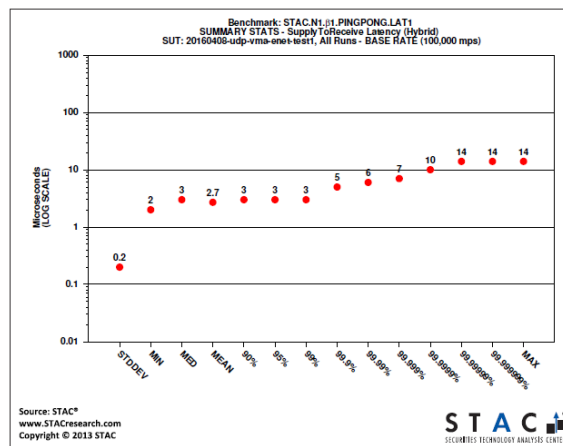


Figure 3: 1028UX-LL1-B8 STAC-N1 Results

Hyper-Speed Ultra Benefits Review

In addition to providing a reliable server solution with the lowest latency, the least jitter, and the best performance, Supermicro continues its mission to help its customers to lower costs as well as maximize revenues.

The Hyper-Speed Ultra architecture supports the most powerful Xeon 165W CPUs in a dense 1U form factor. Hyper-Speed Ultra also houses 2 full-height, full-length cards, 1 low-profile card, and an integrated SAS3 card. This expandability is further backed by efficient air-cooling to maintain optimal system performance and stability.

Designed as a turnkey system, the Hyper-Speed Ultra server saves customers time and manpower needed for integration, tuning, and testing. Supermicro has also pre-qualified NIC cards and pre-screened components before factory installation. Supermicro's extensive system testing and tuning ensure that every Hyper-Speed Ultra will operate flawlessly out-of-the-box.

Since securities firms often have limited access to their collocated servers, Supermicro supports remote management in the Hyper-Speed Ultra servers. Integrated with IPMI 2.0, the Hyper-Speed Ultra server includes a dedicated IPMI LAN port and a suite of enterprise-class management utilities: standard features which enable users to control, monitor, and automate updates to their servers in remote and effortless fashion.

Having access to the most advanced hardware with planned refresh cycles allows securities firms to outpace their opponents in low-latency trading. As an industry-leading server supplier, Supermicro is committed to providing the latest technology and will continue to build on its reputation with the Hyper-Speed Ultra platform.

For more information, visit www.supermicro.com/Hyper-Speed