SUPERMICRO®

5.3x Performance and 81% Latency Improvements with Supermicro Hot-Plug NVMe

NVMe Rapid Storage

This white paper summarizes the improvements in performance and latency achieved by Supermicro SuperServer® systems supporting the latest NVMe SSD storage technology over identical systems utilizing standard SATA SSDs. The SuperServer® system selected for these tests was the 1U Ultra system. The configurations tested in this study are shown in Table 1 below:

Test Configuration

	CPU	Memory	SSD	Benchmark
1U Ultra SYS-1028U-TNRT+	Intel® Xeon® E5-2620 v3 (2.4GHz, 8 GT/s QPI, 6-Cores, 85W)	24x 8GB DDR4-2133 GT/s	Intel® NVMe SSD DC P3700 400GB	Iometer
			Intel® 6Gb/s SATA SSD DC S3500 480GB	

Table 1: Test Configuration

Stunning Performance Results

For this test Supermicro ran the IOMeter benchmarking tool on two SYS-1028U-TNRT+ Ultra 1U servers, the first with standard SATA SSDs, and the second with NVMe SSDs. As Figure 1 shows, the upgraded configuration with NVMe delivered 5.3 times the performance of the server with standard SSDs. While the base configuration delivered excellent performance, the dramatic performance improvement offered with the NVMe SSDs makes this upgrade an excellent investment for any business looking to improve its data center performance.

Figure 1: 5.3x performance increase from SATA to NVMe SSDs

SATA SSD Performance
IOPS (Average 128K Read)

NVMe SSD Performance
IOPS (Average 128K Read)

Amazing Latency Results

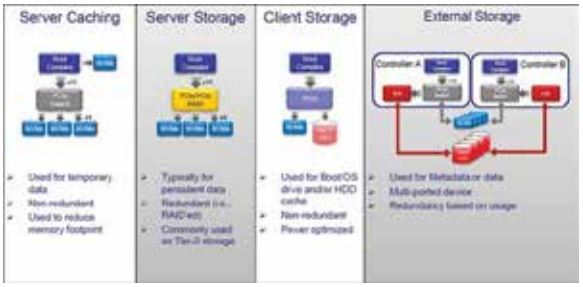
For this test Supermicro again ran the IOMeter benchmarking tool on the same two SYS-1028U-TNRT+ Ultra 1U servers as before, the first server with standard SATA SSDs and the second with NVMe PCI-E SSDs. As Figure 2 shows, the upgraded configuration with NVMe performed with 81% lower latency than the server with standard SATA SSDs. While the base configuration delivered excellent latency results the amazing improvement provided by the NVMe PCI-E SSDs makes this upgrade an excellent data center investment.

Figure 2: 81% latency improvement from SATA to NVMe SSDs

SATA SSD Latency
Response Time (Average 128K Read)

NVMe SSD Latency
Response Time (Average 128K Read)

Supermicro NVMe Server Applications



SYS-1028U-TNRT+

NVMe Advantages:

- Allows SSD to share a common backplane on Std. front end of the server (same as SATA and SAS drive)
- Scalability - Adding more density on demand
- Serviceability - Rugged form factor, no need to power
- Improved Efficiency - Higher performance
- Lower TCO - Lower cost/IOPS

NVMe Benefits

The primary benefits of NVMe with PCIe-based SSDs are reduced latency, increased Input/Output operations per second (IOPS) and lower power consumption, in comparison to SAS-based or SATA-based SSDs, through the streamlining of the I/O stack. Today's IT managers, who face insatiable performance demands from drivers such as Cloud and Big Data, increasingly look to solutions such as NVMe with the raw speed at reasonable cost to meet these challenges. The benefits of NVMe based SSDs are highlighted in Table 2:

Stunning Performance	1 GB/s per lane (PCIe Gen3 x1)
With PCIe Scalability	8 GB/s per device (PCIe Gen3 x8) or more
Lower Latency	Platform+Adapter: 10 usec down to 3 usec
Lower Power	No external SAS AOC saves 7-10 W
Lower Cost	No external SAS AOC saves ~$15
PCIe Lanes off the CPU	40 Gen3 (**80** in dual socket)

Table 2: PCIe 3.x Based SSD Benefits.

Only Supermicro has Hot-plug NVMe

Supermicro is the first to market with hot-plug capability for NVMe drives. This feature allows easy addition of storage capacity through the addition of SSDs, the replacement of existing SSDs with higher capacity units, or replacement of failed drives. Additionally, the hot-plug feature protects against surprise removals, random device failures, or operator errors. These can create big problems in data centers that require significant personnel time and expense to address. Software hardening from Supermicro on its NVMe server product line provides an excellent protection against these all too-common data center issues.

Supermicro NVMe Solutions

Supermicro offers a wide selection of SuperServers with NVMe capability to provide you with solutions that meet the demands of the most data intensive applications such as VDI, Very Large Database (VLDB) and Hyperscale Computing applications. From its 1U and 2U Ultra, 2U Data Center Optimized (DCO), and 2U EX DP 32 DIMM, Supermicro offers many NVMe enabled models (as shown in Table 3) that deliver significant IOPS and latency improvements over servers with standard SATA 6Gb/s SSDs. Many more NVMe-capable SKUs are coming soon!

Supermicro SuperServer® NVMe enabled systems offer excellent Performance and Latency, provide unmatched hot-plug capability, and are available immediately in a variety of attractive models. With outstanding Global Services, International Logistics, Server Management Utilities, and Technical Support, Supermicro is the first choice for IT customers' server and storage solutions.

Table 3: X10 SuperServers with NVMe Support, Available Now!

SKU	SYS-1028U-TNR4T+	SYS-1028U-TNRT+	SYS-6028U-TNR4T+	SYS-6028U-TNRT+
Motherboard	X10DRU-i+	X10DRU-i+	X10DRU-i+	X10DRU-i+
Platform	1U Ultra	1U Ultra	2U Ultra	2U Ultra
NVMe Support	Native	Native	Native	Native
# of 2.5" NVMe SSDs	2 (NVMe/SATA3)	2 (NVMe/SATA3)	4 (NVMe/SAS3)	4 (NVMe/SAS3)

SKU	SYS-6028R-TDWNR	SYS-2028UT-BTNRT	SYS-2028UT-BC1NRT
Motherboard	X10DDW-iN	X10DBT-T	X10DBT-T
Platform	2U DCO	2U EX DP 32 DIMM	2U EX DP 32 DIMM
NVMe Support	Native	Native	Native
# of 2.5" NVMe SSDs	4 (NVMe/SAS3)	4 (2 per Node)	4 (2 per Node)

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