Raising the Storage Performance Bar—Again

Micron® 9300 SSDs Tackle Enterprise Storage Challenges of Capacity and Speed

Micron® 9300 Series of SSDs with NVMe™

Performance
IOPS and GB/s for workloads that must work loads[3]

High Capacity
3.2TB to 15TB U.2 form factor, factory tuned

Simplicity
NVMe value, multiple namespaces and applications, one SSD

SSD Evolution Embraces Your Data Revolution

NVMe™ SSDs have brought the true potential of flash-based storage to mainstream IT with IOPS and GB/s capabilities previously unimagined[1].

Historically, these capabilities came at a price: A single NVMe SSD was initially small in capacity and didn't have broad platform support, hindering their broad adoption. This limited their use—reserving them for small portions of only the most mission-critical workloads to accelerate small slivers of the enterprise. (As an example, our first NVMe SSD, the 9100-series, launched in 2016 with a maximum capacity of 3.2TB.)

In 2017 we introduced our second generation NVMe SSD: the 9200 series. It brought higher capacity storage devices (up to 11TB) into the performance storage market with pervasive business benefits.

Our 2019 introduction of the 9300 PRO and 9300 MAX NVMe SSDs extends this tradition by offering new capabilities to a broadening range of workloads, applications and deployments.

Store and Accelerate: Store and accelerate entire data set I/O instead of just small slivers with a single 9300 SSD— capacities reach 15TB.

Consolidate and Simplify: Turn sprawling racks and huge, growing clusters of slow storage into yesterday's infrastructure—store more data on fewer devices and lower power and cooling costs. Tame complexity with fewer platforms for easier management[2].

Built for Efficiency: Embrace efficient sharing and multi-host tenancy with up to 32 namespaces.

1. *Micron Accelerates Datacenter Storage with New NVMe PCIe SSD Portfolio*, Micron Technology, Inc; press release, April 12, 2016.
2. Analysis based on estimates and calculations; your results will vary (not a performance or manageability guarantee).
3. Performance defined as IOPS or GB/s, read or write as per product datasheets.

We Are In the Middle of a Data Generation and Demand Revolution

In a May 2016 blog post, Northeastern University stated that 2.5 exabytes of data are produced every day[4] — an amount equivalent to 90 years of HD video or a quarter million Libraries of Congress.

In November 2018, Seagate published the IDC paper "Data Age 2025: The Digitization of the World,"[5] in which IDC forecasts that "by 2025 the global datasphere will grow to 163 zettabytes." This incoming deluge of data is on the horizon for certain, but if IDC is correct—the horizon is close, and getting closer.

Figure 1 shows the anticipated size of the global datasphere (from the IDC report).

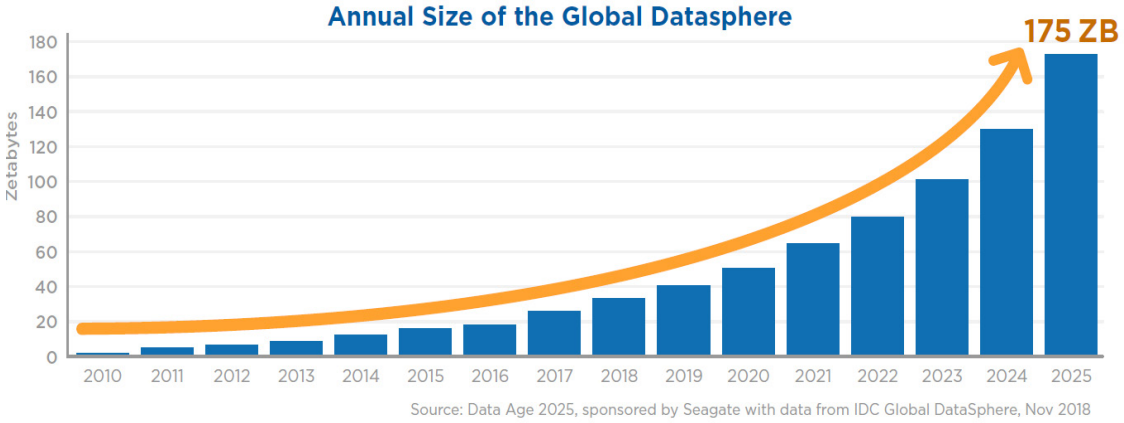

Figure 1: Annual Size of the Global Datasphere (Source: IDC)

We all know data growth is accelerating; however, the drivers behind the growth are changing. The drivers used to be databases, image repositories, and data lakes stored for analysis. While these will continue to grow, some of the new drivers will require not only large storage but also fast data access. New drivers like AI, machine learning, and the 5G infrastructure will drive edge computing and influence where data and compute lives—beyond the datacenter.

Revolution Drives Forward

From our first-generation NVMe SSD in 2016 through our 9300 series announcement, we've seen amazing growth in SSD performance and capacity. Over the span of three generations of high-performance SSDs, capacity per SSD grew from just 3.2TB in 2016, to 11TB in 2017, and now to 15TB in 2019.

The U.2 form factor is now ubiquitous, with numerous server OEMs offering extensive support across broad product lines and configurations (commonly available 2U servers accommodate up to 24 U.2 form factor SSDs[6]).

With Micron's introduction of our 9300 series of NVMe SSDs, the ability to deploy speed and density in a small package is here.

4. "How Much Data is Produced Every Day," Northeastern University
5. IDC Whitepaper, Sponsored by Seagate, Data Age 2025, November 2018
6. Based on comparison of publicly advertised models from different vendors

NVMe SSD Capacity: Evolution Drives A Data Revolution

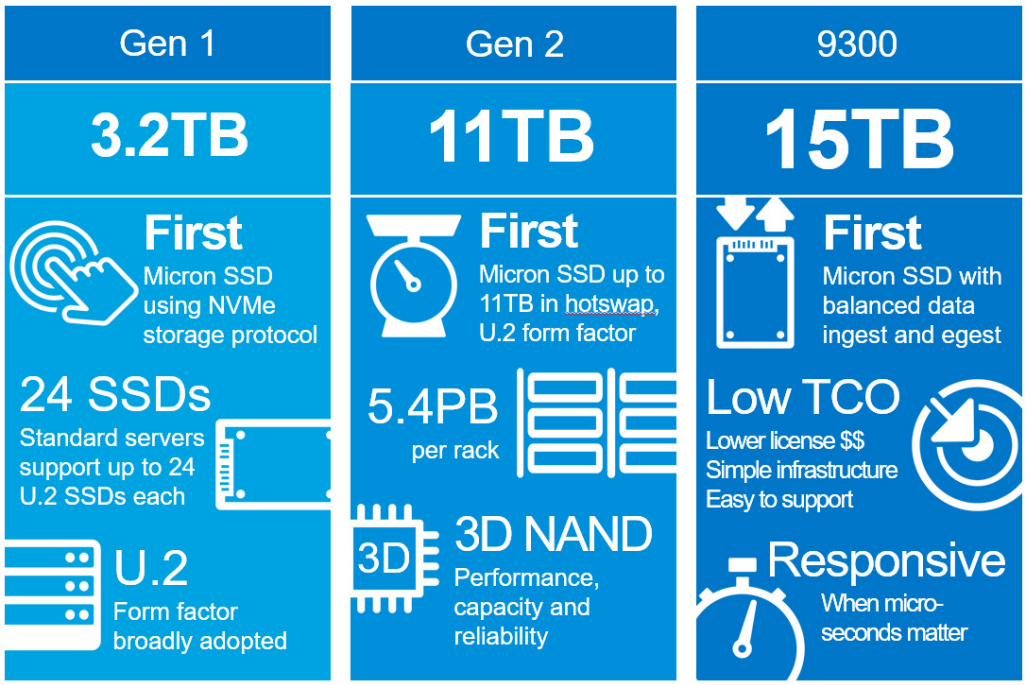

Figure 2: Speed and Density Revolution

Real Benefits

A single NVMe U.2 SSD that can store 15TB is impressive, but what can that mean in our datacenters today? Tomorrow?

Large NVMe SSDs like the 15TB 9300 build amazing per-rack density, enabling you to store more data in less space: smaller, simpler, easier.

As an example of how the 9300 series can reduce datacenter footprints, suppose you have a very large data set, say 50PB. Suppose you want to store it and access it very quickly (which means high-density archive-class storage may not be optimal). How could the 9300 series SSDs help? Through **footprint reduction** (the number of standard racks one would have to use to store the data) and **power savings** (yearly cost to power and cool the systems housing the data).

Reduced Footprint

Using a 50PB example data set, we can calculate how many 42U racks we'd need for storage based on drive capacity and common server designs by timeframe.

Because all three of our SSD generations shipped in U.2 form factor, we'll assume a standard 2U server that accommodates 24 U.2 form factor SSDs for each generation. We'll base our calculations on a 42U rack and assume we can devote the entire rack to servers and SSDs.

Figure 2 shows about how many racks we'd need to store 50PB for the largest capacity Gen 1, Gen 2 and 9300 series SSDs.

The main factor driving the enormous rack count reduction from Gen 1 through the 9300 is the improvement in per-SSD maximum capacity.

All three generations saw multiple OEMs offering standard systems that supported 24 U.2 SSDs in a standard 2U server. Figure 3 reflects this.

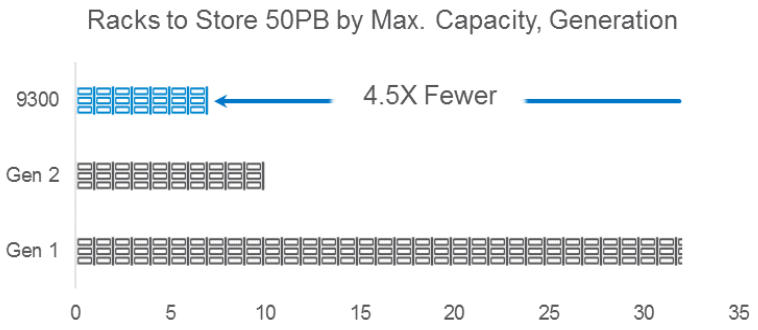

Figure 3: Rack Footprint Reduction

Reduced Power

Because we need far fewer 9300 SSDs to store 50PB, we also need less power to drive them[7]. We can estimate power consumption for the storage components using product datasheets from each era. Figure 4 shows calculated power (in kW) needed to store and access 50PB using the maximum capacity SSD from each generation.

The main factor driving the enormous reduction in power from Gen 1 through the 9300 is the improvement in per-SSD maximum capacity.

Figure 4 does not include additional power reduction due to fewer systems. If we factor that in, the *potential* reduction could be even greater.

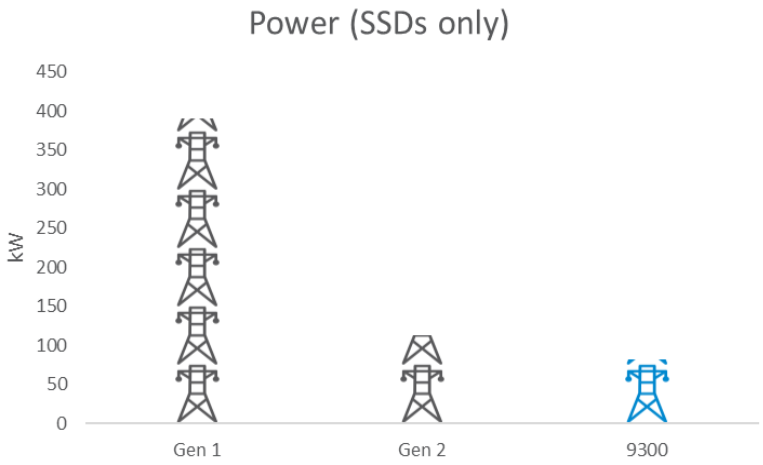

Figure 4: Power (kW) Needed to Store 50PB of Data

Store and Accelerate to Modernize Legacy IT

When large enterprise organizations, public institutions and cloud service providers look to modernize their traditional IT using racks and racks of 10K and 15K HDDs, they often accelerate workloads using small caches (caching memory is expensive, so its use may be limited). Our 9300 series of NVMe SSDs provide a future-focused platform to meet the combined demands of data growth and real-time access with enterprise-class reliability.

Growing workload diversity, data set complexity and datacenter demand have pushed IT to look beyond accelerating small slivers of data through traditional caching. The 9300's high capacity, real-time performance and ability to process entire data sets should help datacenter managers find positive ROI quickly for fast storage investment.

7. Power consumption estimated based on SSDs alone for the example 50PB data set. Total power values calculated from datasheet power values and total number of SSDs used. Chassis power varies widely and is not factored.

Figure 5: 9300 NVMe SSDs Accelerate Data Sets

The Micron 9300 series of NVMe SSDs have the capacity and speed to transform data into value. Accelerating applications and data delivery builds a better bottom line.

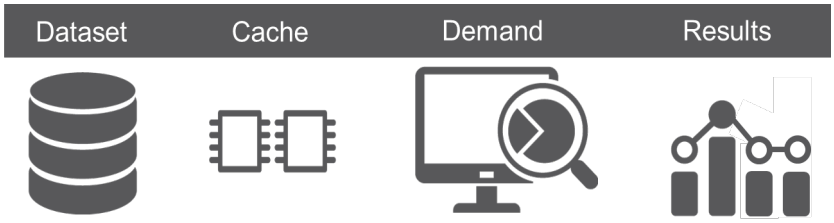

Figure 6: Traditional Caching Accelerates Small Slivers of Data

Traditional caching (placing small capacity, higher speed DRAM in front of massive data sets) can improve results with a cache hit; cache misses do not. Cache hit rate depends on access patterns.

Add Multi-Application and Multi-Tenancy to Your In-Server Storage

With up to 32 namespaces, the 9300 series can easily handle multi-tenancy deployments, hyperscale datacenters and cloud infrastructures.

Improve elasticity and utilization for a broad range of applications with the 9300's ability to share volume-tuned portions of its capacity among multiple applications.

Easily match applications with NVMe performance and capacity with your needs utilizing the NVMe protocol's efficiency to bring the data in those namespaces closer to your CPUs.

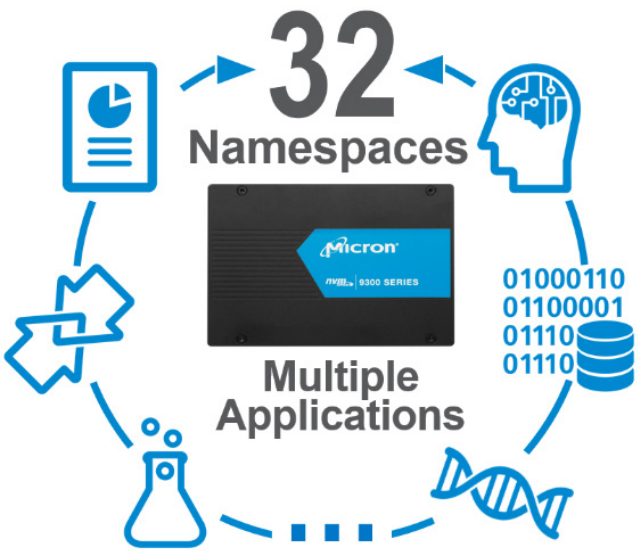

Figure 7: Simplify and consolidate Disaggregated Storage

Disaggregate storage with fewer tiles and platforms.

Simplify deployments to free IT resources and focus on growth.

Conclusion

Adopting fast storage across three generations of NVMe SSDs has relieved some of IT's performance pressure, but capacity limitations for early adopters kept fast NVMe storage out of the mainstream, relegating it to caching slivers of large data sets. IT had to carefully pick and choose where they used fast storage. It simply wasn't large enough for mainstream use.

Now, that's changed.

Micron's 9300 series of SSDs helps application and workload capability climb. At up to 15TB per U.2, our 9300 family has the capability, configurability and capacity to store and accelerate more data in high-performance storage, enabling you to consolidate and simplify disaggregated storage or distribute NVMe for efficiency and scale.

We used to build data lakes. Now we are filling data oceans. We create enormous amounts of data every day. These data oceans represent business solutions, concrete actions and valuable content — if we can get to it fast enough.

The Micron 9300 series of NVMe SSDs store and accelerate more data, modernizing legacy IT, consolidating and simplifying in-server storage and enabling NVMe capacity and IOPS to be distributed across multiple applications and workloads for smaller footprints and lower power consumption.

Learn More

Visit www.micron.com to learn more about the 9300 series of SSDs with NVMe™. Contact our Samples Center to evaluate the 9300 in your environment.

micron.com