SOLUTION BRIEF

Intel® Storage Builders
Enterprise Data Center Infrastructure

E8 Storage Deploys NVMe* SSDs for High-performance, High-availability Data Storage

E8 Storage delivers centralized all-flash storage based on the Intel® SSD Data Center Family with NVMe to address the replication and scalability challenges of distributed storage.

Executive Summary

A tier-1 financial institution wrestled with its Git* development repository. The existing repository was hosted across a few dozen servers and could not meet the developers' performance needs, which meant the developers had to create unprotected local clones on their individual workstations. E8 Storage has addressed this challenge by replacing local Serial ATA (SATA) solid-state drives (SSDs) with centralized storage appliances that use the Intel® SSD Data Center Family with NVM Express* (NVMe*). The centralized storage solution has dramatically improved the repository's performance. Developers can now work directly on the repository instead of making local clones. Data replication and loss have been reduced and data availability improved.

The Challenge of Maximizing Performance and Availability

Enterprise organizations can face numerous challenges in managing storage for mission-critical data stores. One such challenge is maximizing performance and availability for essential workloads. For example, data analytics and development often use storage devices that are locally available on a server node to maximize performance. But storage distributed locally on servers can be difficult—and expensive—to scale and manage. Moreover, required data replication can be slow in some deployments, which can put overall data availability and integrity in jeopardy; SSD and local device failures can result in lost data.

Distributing Storage Does Not Necessarily Increase Availability

E8 Storage used Intel® technologies to address this challenge for a tier-1 financial institution. The financial institution's IT organization had a 19 TB Git development repository using SATA SSDs distributed across a few dozen servers. This made the repository's performance so slow that developers created local clones to work on during the day instead of struggling to work on the repository directly. They then had to manually sync their clones back to the repository at night. Anything developers worked on locally was unprotected and could be lost at any time. If a developer forgot to manually sync work back to the repository, the data was left unsynchronized, which could create cascading problems throughout the codebase.

E8 Storage replaced the local SSDs in the financial institution's environment with the Intel SSD Data Center Family with NVMe. E8 Storage placed 24 Intel SSDs in a single 50 TB appliance; the company then used a pair of these appliances to deliver comparable storage performance over the network, but at far less cost than with the previous farm of local SSDs.

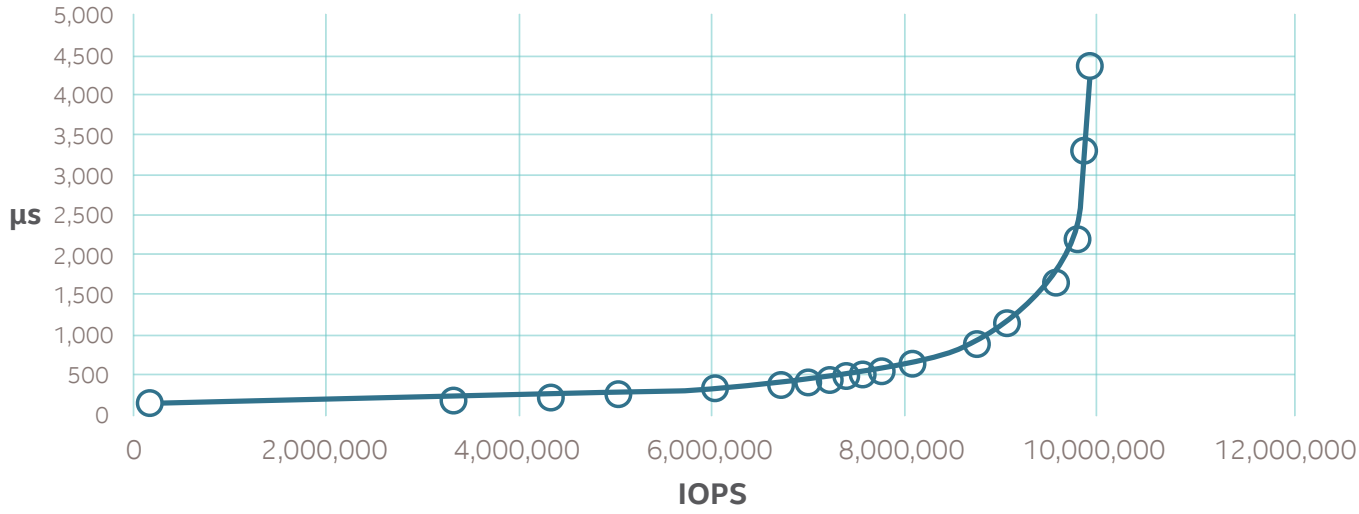

Figure 1. Read and write throughput versus number of servers connected to the E8 Storage solution as tested by the financial institution[1]

High-performance Storage Simplified with NVMe

The customer noted that the E8 Storage solution improved efficiency, storage utilization, and availability. Rather than using local clones, the customer's developers can now work directly on the development repository. Because developers don't have to spend time making the clones or manually syncing them, productivity is up. Moreover, the customer's IT organization can add E8 Storage appliances as needed for future growth. And because changes to the Git database are now made directly on the repository (rather than only once per day), the failure of a local device no longer poses a threat to data availability or the integrity of the repository.

Performance improves by moving from the development host servers to a centralized storage appliance. Testing conducted by E8 Storage in this deployment demonstrates that the Intel SSDs with NVMe match the performance of the local SATA SSD storage that was replaced. As Figure 1 shows, at a latency of 500 microseconds (µs), the E8 Storage solution provided over 8,000,000 input/output (I/O) operations per second (IOPS).[1]

The solution provides database administrators (DBAs), storage managers, and application engineers with fast, highly available storage in an easy-to-manage top-of-rack form factor.

Solution Details

The E8 Storage deployment replaces local SSDs that cannot be made highly available with centralized, shared logical disks, or logical unit numbers (LUNs). The LUNs are hosted on a storage appliance with dual controllers and RAID 6 protection for the data on the appliance's SSDs. The storage appliance then exposes many small LUNs to each developer. Tables 1 and 2 and Figure 2 provide details about the solution.

Table 1. Hardware specifications for the E8 Storage and Intel deployment

ONE E8-D24 STORAGE APPLIANCE	• Intel® Xeon® processor E5-2660 v4 • 24 Intel® SSD DC D3700 Series drives (1.6 TB, Peripheral Component Interconnect Express* [PCIe*] 3.0, MLC, SSDPEDMD016T401)
TWO NETWORK SWITCHES	• 100 gigabit Ethernet (GbE) Arista 7050QX* switch
16 HOST SERVERS	Each with: • Intel Xeon processor E5-2630 v3 • 100 GbE adapter (connected at 25 GbE for performance testing)

Table 2. Software-stack details for the E8 Storage and Intel deployment

STORAGE APPLIANCE	E8 Storage operating system (based on Linux*)
HOST SERVERS	E8 Storage agent (one per host server)
PERFORMANCE-TESTING TOOL	fio* (Linux* benchmarking tool)

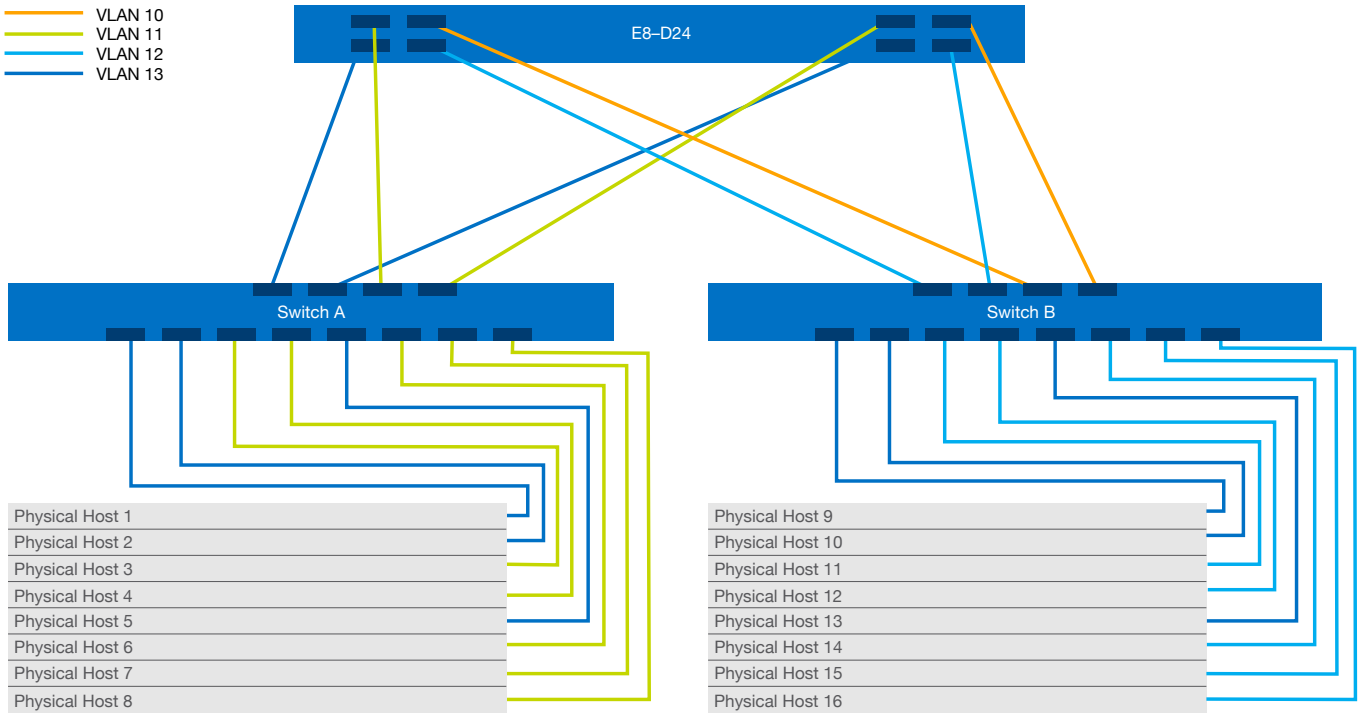

Figure 2. Architecture diagram of the E8 Storage deployment described in this solution brief

Intel's Role

In the E8 Storage deployment, Intel technology boosted the performance for storage and compute, particularly due to the Intel SSDs with NVMe (see Table 3).

Table 3. Intel® technologies' benefits for the E8 Storage deployment

STORAGE	COMPUTE	STORAGE LIBRARIES
HHHL (CEM2.0) Intel® SSD DC D3700 Series, 1.6 TB (SSDPE2MD400G401) • Provides enterprise-grade reliability • Helps lower IT costs and provide greater responsiveness	Intel® Xeon® processor E5-2660 v4, 2.0 GHz (CM8066002030908) • Designed for architecting next-generation data centers running on software-defined infrastructure (SDI) • Supports increased scalability, automation, and orchestration capabilities across compute, storage, and networking workloads • Meets performance and cost requirements for the required server configuration	Intel® Intelligent Storage Acceleration Library (Intel® ISA-L) • The E8 Storage deployment uses the RAID and erasure code functions • Accelerates parity computation and erasure coding • Uses the Intel® Streaming SIMD Extensions (Intel® SSE) and Intel® Advanced Vector Extensions 2 (Intel® AVX2) instruction sets on Intel Xeon processors to speed up computation of storage functions

Exceptional Flash Storage Performance with NVMe

By using Intel SSDs with NVMe, E8 Storage was able to provide centralized storage to the financial-services organization with speed equal to local SATA SSDs but at lower cost and with easier scalability. The E8 Storage solution has significantly improved SSD capacity utilization at the financial-services organization, which is expected to increase the company's return on investment in the long run. The solution has also resulted in a simplified infrastructure, along with improved productivity and increased efficiency for the company's developers, by eliminating the overhead and logistical issues involved in synchronizing locally hosted Git clones. The E8 Storage solution has proven so successful for the customer that the customer is now expanding its use of E8 Storage solutions into its analytics arena.

About E8 Storage

E8 Storage provides the industry's first-ever centralized NVMe storage solution, delivering simple, centralized storage management at the speed of local SSDs. E8 Storage's rack-scale, all-flash arrays are ideally suited for the most demanding mission critical workloads needing performance without compromise, including real-time analytics, financial/trading applications, and transactional processing. E8 Storage's next-generation, high-performance flash storage delivers 10 times the performance at half the cost of existing storage products and enables consolidation to increase SSD utilization to over 90 percent. With E8 Storage, data centers can enjoy unprecedented storage performance, density, and scale, delivering NVMe performance without compromising on reliability and availability.[2]

Learn More

To learn more about how Intel SSDs with NVMe can increase storage performance and utilization for your business while simultaneously helping to lower IT costs, visit **intel.com/nvme**. For more information about how Intel software can accelerate storage performance, visit **https://software.intel.com/en-us/storage/ISA-L**. To explore more of the broad collaborative communities targeted at all aspects of the data center ecosystem, follow **#IntelBuilders** on Twitter.

The Solutions Library on the Intel® Builders home page can help you find reference architectures, white papers, and solution briefs like this one that can help you build and enhance your data center infrastructure: **https://builders.intel.com/solutionslibrary**

To learn more about cost-efficient software-defined storage (SDS) solutions with unprecedented storage performance, density, and scale, visit the E8 Storage web page at **https://e8storage.com**, or contact E8 Storage Sales at **info@e8storage.com** to arrange a demo.

[1] Based on testing conducted in February 2017 by E8 Storage. Configuration: one E8-D24 storage appliance: Intel® Xeon® processor E5-2660 v4; 24 Intel® SSD DC D3700 Series drives (1.6 TB, PCIe* 3.0, MLC, SSDPEDMD016T401), RAID-6; and E8 Storage operating system (based on Linux*). Two network switches: 100 GbE Cisco 3232c*, RDMA-capable. 10 host servers: Intel Xeon processor E5-2630 v3; 100 GbE adapter (connected at 25 GbE for performance testing); CentOS 7.2*; E8 Storage agent (one per host server). Performance-testing tool: fio* (Linux* benchmarking tool).

[2] E8 Storage. "About E8 Storage." https://e8storage.com/#about.

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