

PROZETA Offers High-Performance SDS for CSPs Using Open Source

PROZETA, a European cloud service provider (CSP), optimizes the open source stack for software-defined storage (SDS) solutions built on Intel® Optane™ technology.



As new generations of Intel® storage technologies arrive to meet increasing requirements for speed and scalability, opportunities arise in the open source software ecosystem to create new high performing software-defined storage (SDS) solutions. This was the situation for PROZETA, a Prague-based provider of cloud services across Europe and the Middle East. PROZETA decided the best way to improve performance and meet strong service-level agreements (SLAs) with customers was to create its own SDS solution using the best available open source components combined with some custom PROZETA-built elements. The result is an SDS solution, BlackStor*, which is now available for use by other CSPs and enterprises with similar requirements.

PROZETA has significant OpenStack* expertise based on years of offering OpenStack cloud services to its customers and building its own cloud infrastructure solution, Tier 5*, based on its first-class OpenStack distribution. BlackStor originated from PROZETA's need for a higher performing SDS solution for its own OpenStack cloud services, and the solution is now being made available to other CSPs. The roadmap for BlackStor is to open core parts to the public as open source code.

PROZETA's goal was to develop the kind of reliable and high-performing SDS solution that was available commercially, but at a price point that is attractive to the open source community.

PROZETA Builds Its Own SDS Solution

The vision behind BlackStor was to build a truly commercial-grade, high-performance storage solution within the familiar and cost-effective OpenStack ecosystem. PROZETA began building an SDS solution of its own using a Linux* kernel and two key open source technologies that are well-established and proven:

- Zettabyte File System* (ZFS*) file system and volume manager for scalability and flexibility, which is well suited for hyper-converged compute and storage system and volume manager for scalability and flexibility, which is well suited for hyper-converged compute and storage
- Distributed Replicated Block Device* (DRBD*) for proven reliable replication and high availability (HA), which is fast because it's a native Linux block device, not an emulation

Starting with these key high-performance technologies, PROZETA built out BlackStor to include a number of other system components including interfaces, integrations, APIs, and more, as shown in Figure 1.

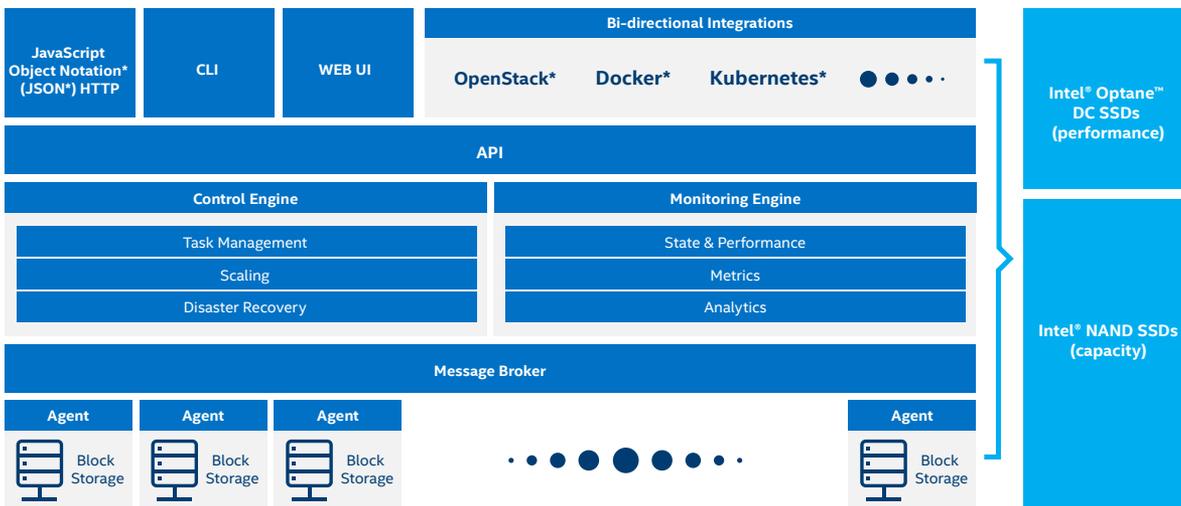


Figure 1. PROZETA BlackStor* architecture diagram

There are options for structuring the disc storage, which can use high-performance Intel® Optane™ DC Solid State Drives (SSDs), lower-cost NAND SSDs, or a combination of the two with Intel Optane DC SSDs for caching. A single storage server can have multiple pools with totally different configurations in terms of hardware, caching configuration, and other elements.

Now Available: BlackStor* for CSPs and Enterprises

PROZETA originally started the BlackStor project to overcome reliability and performance obstacles in its own CSP business. Now, the same solution is available for other CSPs and enterprises whose substantial cloud infrastructure requires scalable, high performance, and highly available storage at a cost-effective price.

BlackStor represents one of the first truly commercial-grade SDS options in the OpenStack and open source ecosystem. It fills a gap between expensive and high performing proprietary solutions on one hand, and, on the other hand, open source alternatives that might not meet the performance and reliability requirements of strong SLAs. PROZETA plans to make much of BlackStor available to the public as open source, including the API and command-line interface (CLI), while offering fee-based support and advanced enterprise packages.

BlackStor offers significant benefits to infrastructure-heavy companies such as CSPs and enterprises using OpenStack, Kubernetes*, and other cloud technologies, including:

- **High performance and low latency:** Take full advantage of the latest storage technologies including Intel Optane technology
- **Zero-downtime planning:** Run up to 32 fully synchronous replicas of the same data on the same infrastructure for fully automatic HA, based on underlying replication technology proven by more than 15 years of development
- **Multi-tenant and multi-cloud:** Connect multiple clouds and multiple isolated accounts into a single storage stack

- **Deterministic performance:** Scale out and scale up in a linear and predictable way; also get completely deterministic performance in terms of maintenance and disaster recovery
- **Integrated monitoring and deep statistics insight on all layers (from block devices to provided connected virtual machines [VMs]):** Easily find the root cause of an issue or predict needs for scaling
- **Integrated advanced security features:** Better protect customers and comply with regulations like the General Data Protection Regulation (GDPR) with integrated security technologies including Advanced Encryption Standard 256 (AES-256), Intel® Trusted Execution Technology (Intel® TXT), Trusted Platform Modules (TPMs), and TCG Opal 2.0*
- **Multiple management interfaces:** Use the API or the graphical user interface (GUI) or CLI, as needed
- **Full support:** Assistance is available 24/7 from the storage professionals at PROZETA and its partners

Intel® Optane™ Technology: Revolutionizing Memory and Storage

Intel Optane technology is a unique combination of Intel® 3D XPoint™ Memory Media with Intel-built advanced system memory controller, interface hardware, and software IP. Together, these building blocks deliver a game-changing technology that presents new computer architecture opportunities and computing possibilities for a breadth of markets.

Intel Optane technology provides an unparalleled combination of high throughput, low latency, high quality of service (QoS), and high endurance to unleash vast system performance potential in a range of products.¹

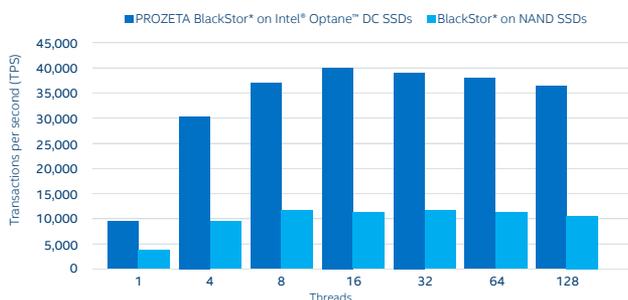


Figure 2. SysBench* TPS test results (higher is better)

With no vendor lock-in, BlackStor provides a simple upgrade path to new feature integration. It is easy to manage and repair, and it is extensible with features like compression and deduplication. The entire solution is also auditable on all layers, from source code to data—which is important in certain industries and geographies, such as the Middle East. On top of this, BlackStor continuously improves its performance with new higher performing versions of underlying open source technologies.

Performance Testing

PROZETA tested to compare the performance of its solution on a system with NAND-based SSDs to its performance on a system with Intel Optane DC SSDs.² The goal was to use tests that would closely resemble real-world application scenarios. Therefore, PROZETA used Phoronix* and SysBench* test suites running in 32 parallel VMs against distribution MySQL 5.7* on Ubuntu Bionic* with a defined number of threads. See the results in Figures 2 and 3.

These results show clearly the superior performance of Intel Optane DC SSDs compared to NAND SSDs when running BlackStor in a real world-style test environment with triplicated data. BlackStor is able to utilize assigned resources extremely effectively because there is little overhead on resources. Intel Optane DC SSDs offer consistent low latency across read/write workloads, so they don't suffer the performance degradation exhibited by NAND SSDs under load. They deliver unrivaled quality of service (QoS) thanks to the predictable and fast responses for mixed workloads. And not only do Intel Optane DC SSDs perform substantially faster, but they also have a much higher resilience than NAND SSDs with a disc write per day (DWPD) rating of 60 compared to 3 DWPD for a typical NAND-based SSD.³



32 seconds
PROZETA BlackStor* on NAND SSDs

17 seconds
PROZETA BlackStor* on Intel® Optane™ DC SSDs

Figure 3. Phoronix* completion time test results (lower is better)

These performance tests, it should be noted, only compare the scenarios of all Intel Optane DC SSD-based configurations against all NAND-based configurations. They do not test the scenario of mixing both types of storage, such as Intel Optane DC SSDs for performance and NAND SSDs for affordable capacity, which would be a likely configuration for real-world customers beginning to gain the performance benefits of Intel Optane technology.

Accelerate Software-Defined Storage

PROZETA has created a commercial-grade SDS, BlackStor, that is well suited to providing cloud services in an open source ecosystem. Originally created to meet internal requirements for strong SLAs, BlackStor is now available to all CSPs and other enterprises facing similar performance requirements in their data centers. Built on proven open source technologies and custom PROZETA engineering, BlackStor represents a new open alternative to the proprietary black-box SDS solutions currently available in the market.

BlackStor performs best on Intel Optane technology, as shown in tests using the Intel Optane SSD DC P4800X. The Intel Optane SSD DC P4800X is designed to deliver 5–8x faster performance at low queue depth workloads, exhibiting extremely high throughput for single accesses and super low latency.⁴ This new technology is well suited to accelerate CSP offerings to new, breakthrough levels of performance.

Learn More

Find reference architectures, white papers, and solution briefs that can help you build and enhance your data infrastructure in the solutions library on the Intel® Builders home page at <https://builders.intel.com/solutionslibrary>.

For more details about PROZETA BlackStor and detailed benchmark results, visit <https://blackstor.io> and <https://blackstor.io/ibench>.

Learn more about Intel Optane technology at intel.com/optane.

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- ¹ Intel® technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer or learn more at [intel.com](https://www.intel.com).
- ² Performance results are based on testing as of October 2018 and may not reflect all publicly available security updates. No product can be absolutely secure. Tests compared performance on the Intel® Optane™ SSD DC P4800X with NVMe Express* (NVMe*) vs. the Intel® SSD DC P4510 with NVMe. SysBench* results are transactions per second (TPS) across all VMs. Phoronix* results are averages over three test passes. The test-lab setup included three storage servers, each with 2 x Intel® Xeon® Platinum 8170 processors, 384 GB RAM, 2 x 4 TB Intel SSD DC S4500, 2 x 2 TB Intel SSD DC P4510 with NVMe, 2 x 375 GB Intel Optane SSD DC P4800X with NVMe, 2 x 800 GB Intel SSD DC S3710 Serial ATA (SATA) boot drives, 2 x 800 GB Intel SSD DC S3520 SATA drives, and BlackStor 1.1.0*. The test-lab setup also included four hypervisors and one controller with: 2 x Intel Xeon Gold 6138 processors, 384 GB RAM, 1 x 4 TB Intel SSD DC P4500, 1 x 375 GB Intel Optane SSD DC P4800X with NVMe, 1 x 960 GB Intel SSD DC S3520 SATA drives, 40 gigabit per second (Gbps) connection, Ubuntu Bionic LTS* + KVM/QEMU*, QEMU 2.11+dfsg-1ubuntu7~cloud0.
- ³ Rob Crooke. "Re-architecting the Data Center for the Information Enlightenment Era." Intel IT Peer Network. August 2018. <https://itpeernetwork.intel.com/data-information-enlightenment/>.
- ⁴ Common Configuration: Intel® 2U Server System, CentOS 7.2*, kernel 3.10.0-327.el7.x86_64, 2 x Intel® Xeon® processor E5-2699 v4 at 2.20 GHz (22 cores), 396 GB DDR RAM at 2,133 MHz. Configuration: 375 GB Intel® Optane™ SSD DC P4800X and 1,600 GB Intel® SSD DC P3700. Performance measured under 4K 70–30 workload at queue depth 1–16 using FIO 2.15*. Source: Intel. "Product Brief: Intel® Optane™ SSD DC P4800X Series." [intel.com/content/www/us/en/solid-state-drives/optane-ssd-dc-p4800x-brief.html](https://www.intel.com/content/www/us/en/solid-state-drives/optane-ssd-dc-p4800x-brief.html).

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Printed in USA

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