SOLUTION BRIEF

Intel® Storage Builders
Storidge® ContainerIO™
Intel® Xeon® Processor Scalable Family
Intel® SSD DC Family for PCIe*/NVMe

(intel®)

Fast and Easy Persistent Storage for Docker* Containers with Storidge and Intel

Intel® Solid State Drive Data Center Family for PCIe*/NVMe and Storidge® ContainerIO™ enable high-performance containerized stateful application storage

> **Storidge provides software that makes persistent storage for Docker containers fast and easy.**

Docker Containers Forge Transformation

In the few years since its 2013 release, Docker* container technology has become critical to the livelihood of innumerable development teams around the world. By synchronizing virtual work environments with the cloud, Docker has all but eliminated dependency and resource issues, accelerating the pace of software development for its users. Through its application isolation, rapid deployment, and other powerful features, containers allow software engineers to meet the pace demanded by digital transformation, making it a staple of every software development team.

Storidge® ContainerIO™ (CIO) leverages the capabilities of containers to create portable storage of self-contained block-objects, which are then optimized for latency and portability. The result is a virtualized drive that can be created in an instant and moved to wherever its container is, providing complete statefulness, persistence, and mobility on demand.

Addressing the Challenges of Containers for Stateful Apps

While containers are transforming development, there are several challenges that prevent teams and organizations from adopting container technology for stateful applications. Intel® Solid State Drive Data Center Family (Intel® SSD DC) devices for PCIe*/NVMe and Storidge ContainerIO software are addressing these challenges.

STORIDGE

Enabling Containerized Storage with Storidge ContainerIO and Intel® SSD Data Center Family

Capability	Challenge	Solution
Performance	Without native QoS management, an application running a heavy workload can quickly consume most available resources on a node.	Intel SSD DC Family of devices for PCIe/NVMe and Storidge ContainerIO software help deliver top application performance to meet service level agreements.
Persistence	Developers want to use containers for stateful applications. Persistent data volumes are required to support stateful applications using containers.	Storidge ContainerIO software enables high-performance persistent data volumes across a standard cluster with Intel SSD DC Family of storage devices.
Data Availability	In the event of a node or instance failure, a user's data storage must be intelligent enough to provide the user with a rapid path to their data volumes.	Storidge ContainerIO software distributes the data across all high-performance Intel technology-based nodes in a cluster, and it has the intelligence to deliver high availability for stateful containerized applications.

## ContainerIO—Remaking Storage for Containers

The above challenges exist because current solutions are based on networked storage concepts that worked well for legacy applications. However, the newer, containerized applications differ in two ways:

1. They are self-contained for portability.

2. They are small in size for mobility.

These two factors, along with the performance of process virtualization, allow containerized applications to be highly agile, making a static networked storage model a poor fit.

### Containerized, Persistent, and Stateful Storage

Storidge ContainerIO software solves this problem by abstracting storage across multiple nodes in a cluster to create a single pool of storage, providing persistent data for a container cloud. From this pool, ContainerIO creates data containers or volumes that are self-contained block-objects, which are then optimized for latency and portability—just like containers. The result is a virtualized drive that can be created in an instant and moved to wherever its container is, providing complete statefulness, persistence, and mobility on demand.
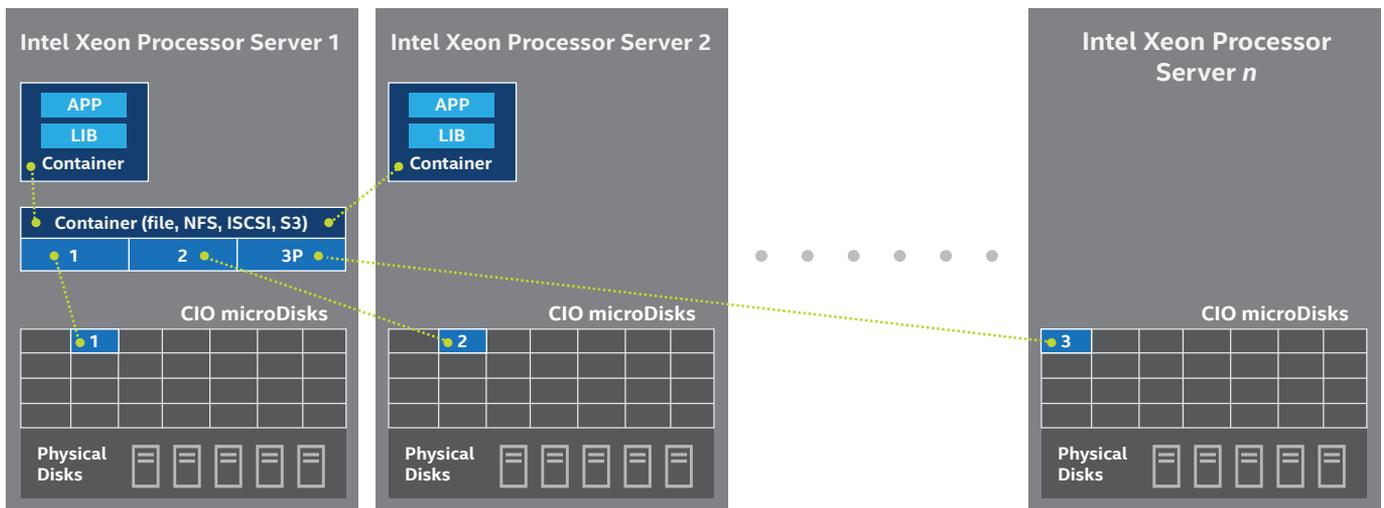
Seamless Orchestration of High Availability and Persistent Storage

Automated Storage Management

In addition to high mobility, Storidge's "shared pool" approach to volumes opens the door for automated storage management based on application intent. Software intelligence translates that application intent into provisioned storage, meeting an application's precise requirements.
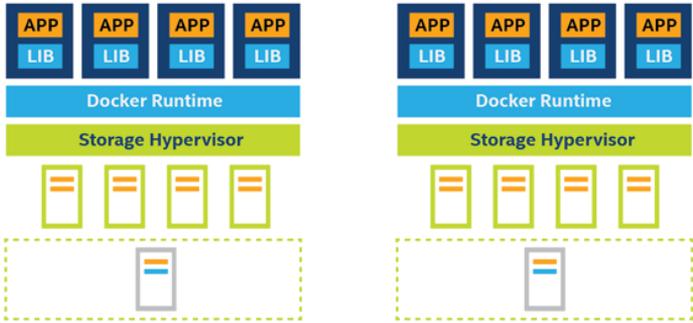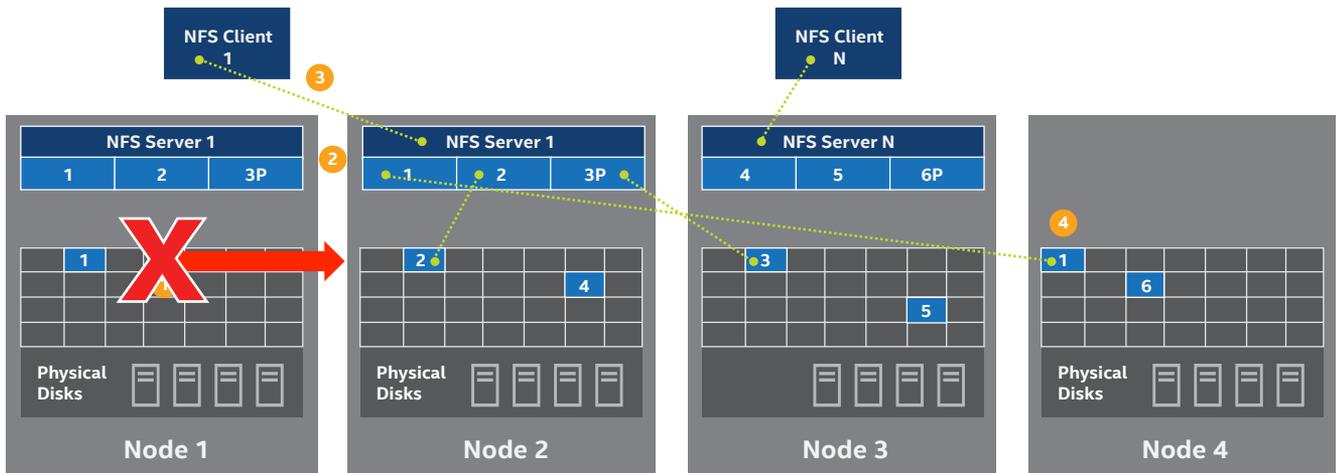

- Manage intelligent application profiles, not storage
- Meet unique requirements of each application
- Respond to application changes in real time

Intelligent Storage Engine

Fast, Complete Data Restoration

Because data is spread across the pool, volumes can be quickly rebuilt and brought back to full capacity with all of the data intact.

1 Node 1 fails

2 NFS server and volume failover in seconds

3 Same IP address, so no client reconfiguration

4 microDisk 1 rebuilds instantly on new node

Transparent Failover to NFS Clients using Storidge's NFS Container

Self-Orchestration Follows the Application

Storidge ContainerIO software also features built-in storage self-orchestration, so that storage automatically stays attached as containers are re-scheduled within a cluster. This self-orchestration greatly simplifies the management of stateful applications without sacrificing performance, which fills a critical gap for enterprises deploying container technology today.

Flexible Deployment Models

Finally, Storidge CIO software is deployable on both bare metal servers and on the public cloud. Since the technology was architected to optimize user experience, the software enables organizations to bring their own standard servers and storage components and easily deploy a container-as-a-service cluster in a matter of minutes. ContainerIO also runs on virtualized infrastructure in public or private clouds. Images with the software already installed are available for cloud-based workloads.

Performance Isolation is Critical for Multi-tenant Environments

Storidge's ContainerIO software has been architected to provide not only logical isolation but performance isolation. Storidge's kernel based solution eliminates storage layers to deliver performance and low latency for primary applications. ContainerIO enables Administrators to run multiple workloads on powerful Intel® Architecture and meet service level agreements to the applications/users. Storage administrators are now able to consistently provision I/O performance in real-time and provide guaranteed performance (IOP's or GB/sec.) without impacting adjacent applications in a multi-tenant environment.

In a recent test in the Intel Builders Construction Zone, a 4 Node Intel® Xeon® Gold 6132 Processor at 3.70 GHz (56 Cores/node) with 3 NVMe PCIe Disks/Node (2 x 2000 GB Intel® SSD DC P4500 and 1 x 1600 GB Intel® SSD DC P4600 Series) yielded >3M IOPs or 14.5 GB/Sec available (50% budgeted overhead).
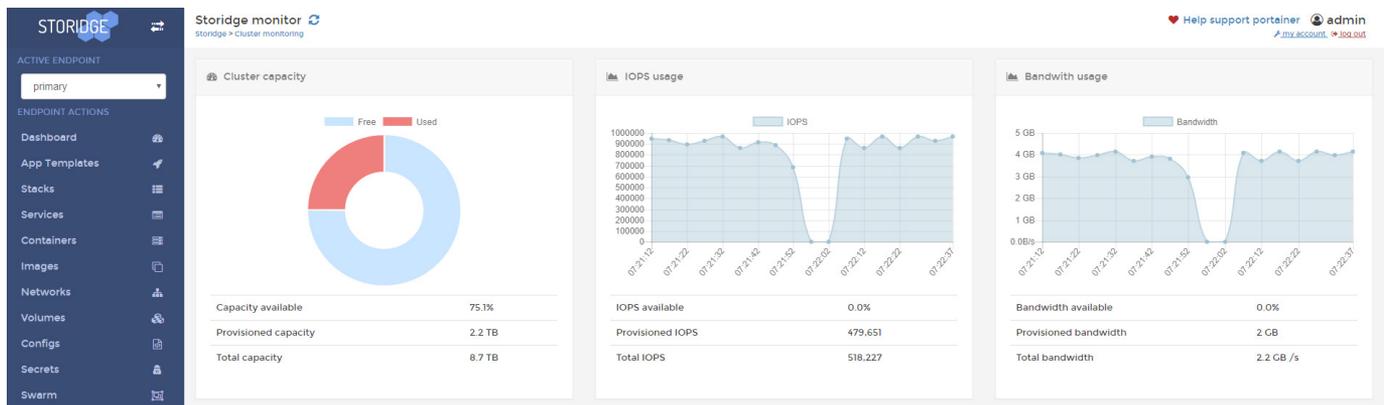
Exact Storidge Configuration Set Up:

- 2 X Intel® Xeon® Gold 6132 Processor, 14 cores/19.25M Cache/2.60 GHz

- 2 X Intel® SSD DC P4500 Series 2 TB NVMe drives

- 2 X Intel® Optane™ SSD DC P4800X Series 375 GB NVMe drives

- 1 X Intel® SSD DC P4600 Series 1.6 TB NVMe drives.

Intel Building Blocks for High-Performance Containers

Whether in the cloud or in the data center, Intel® Xeon® Scalable processors and Intel SSD Data Center Family for PCIe/NVMe devices provide the architecture that enables hyper-converged solutions based on Storidge ContainerIO.

Intel® Xeon® Gold processors deliver high performance, advanced reliability, and hardware-enhanced security. Built on Intel's 14 nm process technology, the Intel® Xeon® Gold 6000 processor family offers up to 22 cores/44 threads per socket for increased performance to accelerate Storidge CIO software-defined storage. These processors deliver improved performance, with affordable advanced reliability, and hardware-enhanced security. They are optimized for today's demanding mainstream data center, multi-cloud compute, and network and storage workloads. With up to four-socket scalability, the Intel Xeon Gold 6000 processor family is suitable for an expanded range of workloads.

Intel SSD Data Center Family storage devices for PCIe/NVMe, including the Intel® SSD DC P3000 Series for PCIe/NVMe, provide low-latency, high-bandwidth, read-write access to data, without the performance overhead associated with seek times on mechanical disks or latencies introduced for protocols, including SATA and SAS. Systems equipped with Intel SSD DC Family of devices also help simplify operations with worry-free manageability and predictable performance that help reduce operational costs.

Conclusion

Data centers need a storage infrastructure than can provide data management services to both legacy and modern applications across multiple stacks, and for private and public clouds. Storidge ContainerIO technology allows IT operations to use their own available hardware, keeping costs down and permitting standardization on high-performance flash media, such as Intel SSD DC P3000 Series devices for PCIe/NVMe. The scale-out storage capabilities of Storidge's software make it an ideal solution to replace existing storage silos and the storage-per-use-case model, and it enables operations to support the next generation of applications.

Storidge ContainerIO capabilities

- Purpose-built for containers and tightly integrated with schedulers
- Data persistence for stateful applications, such as databases and key-value stores
- Embedded storage orchestration that moves volumes to container, simplifying operations
- Enterprise availability with failover in seconds for application or node failures
- Capable of supporting stateless and stateful applications on the same infrastructure
- Declare application requirements for storage through profiles
- Consistently deploy storage using profiles for applications, service levels, frameworks, etc.
- Storage as a service, including shared storage with NFS interfaces
- Simple for any developer to set up their own distributed storage for persistent data
- Deploys on-demand within seconds
- Low latency and high performance for databases
- Performance isolation to eliminate noisy neighbors in multi-tenant environments
- Quality of Service guarantees with min/max IOPS settings
- A single solution that supports on-premises and in the cloud
- Seamless movement of volumes and applications between clouds avoids lock-in
- Operational agility enabled by easy cloud bursting
- Scales to thousands of volumes per server
- Encryption can be enabled individually for each volume
- Multiple encryption keys per volume
- Enables high performance from commodity servers and storage components
- Scale up or down based on demand
- Supports native apps, VMs, and containers, eliminating the need for duplicate infrastructure
- Runs on Intel®-based servers