

# Western Digital Reference Architecture for Scality RING on Ultrastar<sup>®</sup> Serv60+8 Hybrid Storage Servers

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## 1. Executive Summary

Businesses in every industry are getting buried under a tsunami of data. It's no secret why: in our digital age, the ability to collect and exploit data has become a decisive factor in every organization's ability to compete and thrive. However, as businesses look to collect much more information and keep it longer, they face a new problem: finding a cost-effective way to store vast, continually growing volumes of data.

The problem is compounded by the huge increase in unstructured data that businesses now collect—data that legacy storage infrastructures struggle to accommodate. To extract the insights and value they need, organizations must find a way to balance sustained performance with predictable costs and manageability as the amount of data grows.

One potential solution to accommodate larger data-sets is the utilization of public cloud services. For some enterprises and public sector organizations, however, public cloud is not an option. Instead, these organizations seek to adopt the same efficiencies and cost savings in their own on-premises private cloud environments. To achieve that, they are turning to disaggregated software-defined storage (SDS) providers. By decoupling software from the underlying hardware, they can utilize resources far more efficiently and cost-effectively. At the same time, they gain increased flexibility to evolve and expand their storage footprint as the business' needs change.

Organizations have many storage options, both for SDS software and the hardware it runs on. Two prominent leaders in this space, Western Digital and Scality, have now joined together to make it simple for their customers to architect, deploy and manage an on-premises private cloud. By building private cloud storage on a foundation of Scality SDS software and Western Digital Ultrastar storage servers, organizations can achieve exceptional density, performance, and reliability. At the same time, they can realize low total cost of ownership (TCO) even as their storage footprint grows to multiple petabytes.

This document describes a Western Digital-Scality object storage solution for on-premises clouds.

## 2. Meeting the Growing Storage Challenge

IT leaders have long struggled to economically keep pace with growing data storage needs, but today's exploding data volumes are pushing this challenge to the breaking point. Legacy implementations using traditional SAN/NAS/DAS infrastructure can no longer provide the scale and flexibility required in modern environments. In the past, IT could meet growing storage needs by overprovisioning hardware such as compute, storage, networking, CPU and memory. In today's world, where year-over-year generated data growth can be measured in zettabytes, this is a recipe for wasting resources and constantly scrambling to keep pace with business needs.

The problem will only get worse. According to IDC, we can expect to see 175 zettabytes of new data generated every year by 2025.<sup>1</sup>

Fortunately, a new model has emerged that can help support this massive data growth: cloud object storage architectures. Using modern object storage approaches, organizations can collect and manage unstructured data, which may arrive in a variety of formats, far more easily. They can store this new data alongside traditional structured data and manage it as the critical organizational asset it is.

To make the most of modern cloud object storage models, however, organizations must choose the right storage infrastructure. They need low-cost, high-availability solutions that are easy to manage and scale, so that they can extract value from the deluge of data instead of drowning in it.

## 3. Scalable Storage for the Zettabyte Era: Built on Western Digital, Powered by Scality

Western Digital, a pioneer in reliable, high-density industry-standard hardware for software-defined storage projects, is partnering with Scality, a global leader in SDS software, to provide verified, scalable object storage solutions for on-premises clouds. The following sections of this paper provide an overview of this unified file and object storage solution—built on Western Digital, powered by Scality.

The solution combines:

- **Western Digital Ultrastar Serv60+8:** This advanced hybrid storage server is designed and performance-optimized for software-defined storage. It combines high-density and low TCO in a scalable 4U platform—making it a perfect fit for scaling big data environments.
- **Scality RING8:** This cloud-scale distributed software solution for unstructured data enables unbounded scale-out storage for a wide range of petabyte-scale applications and use cases in modern enterprise data centers. A simple, linearly scalable object storage solution with high availability, this state-of-the-art SDS software can be deployed on hundreds of Ultrastar Serv60+8 platforms to enable petabyte-scale data storage.

By combining Scality RING software with Western Digital Ultrastar Serv60+8, organizations can realize:

- Resilient, high-availability storage for private cloud
- Low TCO
- Linear scalability as data volumes grow
- Simplified access for both file and object storage
- Easy data management

## 4. Technology Overview

The following sections provide an overview of the core technologies in the Western Digital-Scality cloud object storage solution.

### 4.1 Ultrastar Serv60+8 Hybrid Storage Server

The **Western Digital Ultrastar Serv60+8 hybrid storage server** provides a number of core capabilities and advantages in on-premises cloud storage environments.

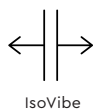


#### Flexible, High-Density Design

Ultrastar Serv60+8 uses dual high-performance Intel® Xeon® Scalable Processor-based CPUs to deliver the performance required to manage demanding workloads in SDS environments. The platform supports up to 995 terabytes (TB)<sup>2</sup> raw capacity with a combination of HDD and SSD in a 4U enclosure. The high-density platform is available configured-to-order, providing the flexibility to select CPUs, memory, NICs and drives, empowering organizations to balance performance with cost for project-specific requirements.

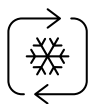
#### Advanced Cooling and Performance

Western Digital has pioneered storage enclosure innovations that deliver real-world benefits. ArcticFlow™ thermal zone cooling technology improves cooling, reduces vibration and lowers energy consumption while IsoVibe™ vibration isolation technology maintains performance by reducing the impact of vibration.



IsoVibe

**IsoVibe** reduces the performance degradation associated with traditional platforms due to vibration from busy adjacent drives and fans. Precise cuts in the baseboard provide a suspension for the drives in the chassis, isolating them from transmitted vibration. As a result, the platform can maintain consistent performance, even when all drives are working hard.



ArcticFlow

**ArcticFlow** overcomes the heat issues that plague conventional dense chassis, introducing cool air into the middle of the platform via two thermal zones in the enclosure. By introducing cool air into the center of the chassis, drives operate at lower and more consistent temperatures than in conventional systems. This results in lower fan speeds, reduced vibration, lower power consumption, quieter operation and, ultimately, higher reliability.

Both IsoVibe and ArcticFlow technologies contribute to Western Digital's proven long-term reliability, enabling its five-year limited warranty. Together these technologies have been observed to reduce field drive returns by 62% compared to previous-generation enclosures.

#### Storage Leadership Drawing on 50 Years of Innovation

Western Digital develops storage devices and platforms side-by-side, enabling unique vertical integration known as "Silicon to Systems Design." Western Digital controls all of the fundamental technologies its solutions use, including making its own heads, media and controllers, as well as fabricating its own NAND flash for use in its SSDs. With the ability to fine-tune and optimize this technology at every step in the design and production process, Western Digital delivers breakthrough performance and value.

#### A Solution Purpose-Built for Big Data and Software-Defined Storage

This new, high-capacity storage server was designed to meet the demanding storage needs of modern environments that require dense, shared HDD or hybrid storage with integrated compute. Ultrastar Serv60+8 provides an ideal SDS platform for large enterprises, original equipment manufacturers (OEMs), cloud service providers and resellers and integrators.

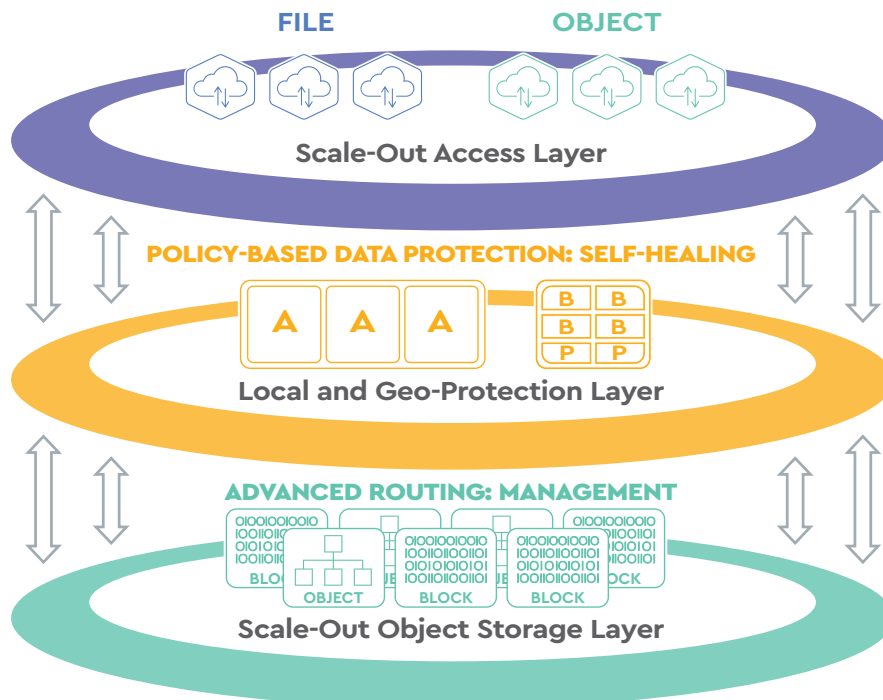
### Ultrastar Serv60+8 Hybrid Storage Server Features

- Dual high-performance Intel Xeon scalable processor-based server with support for up to sixty (60) HDDs plus up to eight (8) SSDs connected via SAS or SATA
- Hybrid support for up to 32 SSDs to create a data acceleration tier
- Innovative IsoVibe technology to ensure maximum performance even for heavy workloads
- Enterprise-grade redundant and hot-swappable PSUs and fans
- Improved cooling from innovative ArcticFlow technology
- Rack-mounted top cover for quick and easy service
- Raw capacity over 960TB per 4U enclosure with 14TB HDDs and 15.36TB SSDs



### 4.2 Scality RING Overview and Architecture

Scality RING8 is a cloud-scale, distributed software solution optimized for mass-scale unstructured data storage. It is designed to create unbounded scale-out storage systems for the many petabyte-scale applications and use cases, both object and file, now being deployed in enterprise data centers.



## Innovative SDS Design

RING is a fully distributed system deployed on industry-standard hardware, starting with a minimum of three (3) storage servers. To maintain performance as capacity grows, RING can also independently scale-out its access layer of protocol "connectors", allowing the solution to match aggregate performance with the application load.

Fundamentally, RING is built on a scale-out object-storage layer that employs a second-generation peer-to-peer architecture. To support file and object data storage in the same system, it integrates a virtual file system layer through an internal NoSQL scale-out database system. This provides POSIX-based access semantics using standard NFS, SMB and FUSE protocols, with shared access to the files as objects using the REST protocol. RING incorporates these design principles at multiple levels, to deliver the highest levels of data durability, at the highest levels of scale, for the most optimal economics.

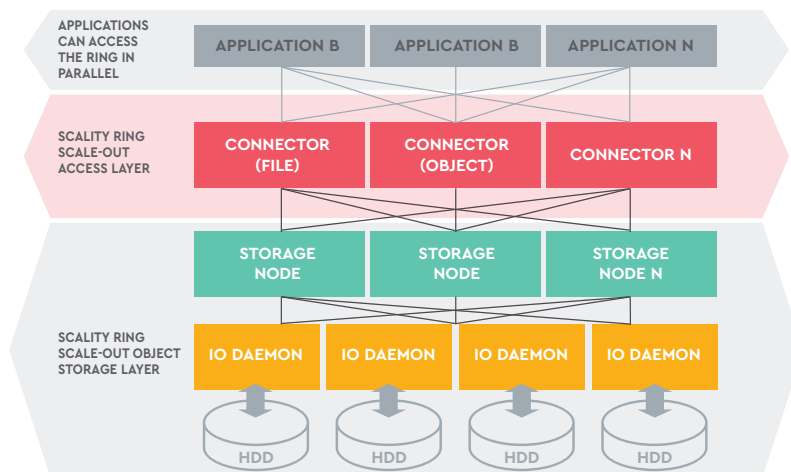
## Architecture Optimized for Scale

To enable massive scalability of both storage capacity and performance, Scality RING software is designed as a distributed, parallel, scale-out architecture with a set of intelligent services for data access and presentation, data protection and systems management. To implement these capabilities, RING provides a set of fully abstracted software services including a top layer of scalable access services (connectors) that provide storage protocols for applications. The solution's middle layers comprise a distributed virtual file system layer, a set of data protection mechanisms to ensure data durability and integrity, self-healing processes and a set of systems management and monitoring services. At the bottom of the stack, the system is built on a distributed storage layer comprised of virtual storage nodes and underlying I/O daemons that abstract the physical storage servers and disk drive interfaces.

RING software is composed of the following key components:

- RING connectors
- Distributed internal NoSQL database, MESA
- RING storage nodes and IO daemons
- Supervisor web-based management portal

The MESA database provides object indexing as well as the integral scale-out-file-system (SOFS) abstraction layer, and the underlying core routing protocol and keyspace mechanisms.



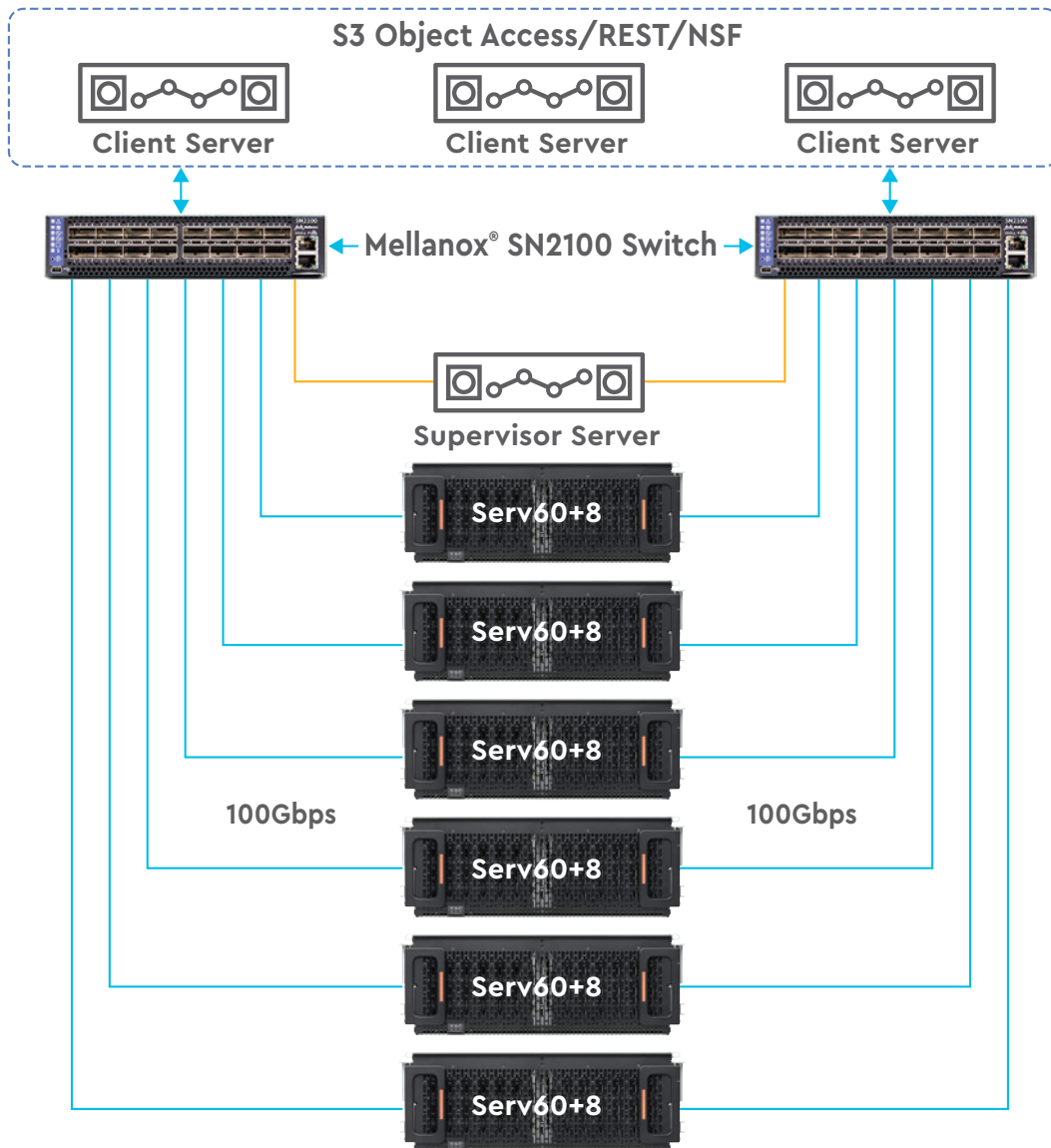
## Scality RING8 Features

- Unbounded scalability
- Purely software-defined
- High availability
- Core object interface
- Extreme data durability
- Ease of use
- Low TCO
- Support for multiple protocols

### 5. Solution Architecture: Scality RING with Ultrastar Serv60+8

RING software is designed to create a scale-out storage system, which can be deployed as a distributed system on a cluster of Ultrastar Serv60+8 storage servers. A cluster can be seamlessly expanded with further physical storage servers, and clusters, as storage capacity requirements grow. RING software requires no kernel modifications, eliminating the need to maintain hardware compatibility lists beyond the constraints imposed by the specific Linux distributions running on the server.

The figure below illustrates a verified Scality RING deployment topology with six Ultrastar Serv60+8 storage servers.



## 5.1 Scality RING Verification

A functional verification of Scality RING8 was undertaken by Western Digital. Six high-density Ultrastar Serv60+8-24 (1ES1364) servers were configured in a cluster. All six Ultrastar storage servers acted as storage nodes, with one server also acting as a connector node to test load.

- **Host operating system:** CentOS Linux® release 7.4.1708 (Core)
- **Kernel:** 3.10.0-693.el7.x86\_64
- **Scality Software Version:** RING 8.0.0.2 Release R191129
- **Chassis**
  - Ultrastar Serv60+8 is a 4U storage server with 60 x HDD/SSD drive bays plus 8 x dedicated SSD bays. Up to 24 of the 3.5" drive bays may be configured with SSDs.
  - Dual 2000W AC redundant power supplies.
  - The chassis installed rack depth is 1177mm (46.34") with cable management arm (CMA).
  - Fully populated with drives the chassis weighs 95.25kg.
- **Storage**
  - M.2 boot drive: 120GB to 2TB (SATA/PCIe) is supported.
  - (1ES1364) is bundled with 14TB Ultrastar DC HC530 data center HDDs as standard. 20 drives were used for testing purposes. This base configuration had one third of available drive slots populated leaving plenty of headroom for future in-box expansion. This presented a total capacity of ~1.59PB for data (120 x HDDs across six servers), scalable up to 4.5PB (360 x 14TB HDDs).
  - 2 x (1EX1948) 15.36TB Ultrastar DC SS530 data center SSDs were configured in each server for metadata. This presented a total capacity of ~183TB for metadata (12 x SSDs across six servers) scalable up to 0.72PB when all SSD bays are populated.
  - 1 x (1EX1796) Broadcom® 9361-16i- RAID host bus adapter (HBA) was selected and connected to the 20 x HDDs.
  - 1 x (1EX1797) Broadcom 9361-8i (w/cache) host bus adapter (HBA) was selected and connected to the SSDs.
- **Processor**
  - Each server was specified with 2 x (1EX1981) Intel Xeon Silver 4114 Scalable Processors and hyperthreading was enabled.
- **Memory**
  - Each server had 8 x (1EX1409) 32GiB<sup>3</sup> RDIMM installed = 256GiB RAM total.
- **Networking**
  - 1 x (1EX2107) Mellanox ConnectX®-5 EN MCX516A-CCAT 100GbE network interface card was installed in each server. All six server nodes connected to a Mellanox top-of-rack switch with 100GbE interfaces to provide end-to-end 100Gb link speed.
- **Supervisor server**
  - An industry-standard x86 server with Intel Xeon Gold 6130 CPU @ 2.10 GHz with 256GB RAM was used as a supervisor server.

This configuration represented a base cluster providing petabyte-scale data storage, and an ideal solution for the modern software-defined data center (SDDC), enabling scaling to many petabytes. Other combinations of hardware are expected to function but were not evaluated. Ultrastar Serv60+8 is available configured-to-order, providing the flexibility to select CPUs, memory, NICs and drives. Please consult the [compatibility matrix](#) for a full list of qualified hardware and work with your local Scality and Western Digital sales teams.

Three COSBench drivers generated an object workload. The test observed S3 read and write performance for various configurations and it would be expected that approximately 5.5GBps for reads and writes would be achieved in a fully populated six-node configuration. Performance will linearly increase as more HDDs and connector and storage nodes are added to a cluster.



## 5.2 Bill of Materials (BOM) for Ultrastar Serv60+8 Verification

This table details the hardware configuration for each storage server in the verified RING cluster.

Qty.	Product	Description
1	1ES1364	Ultrastar Serv60+8-24 Foundation 336TB nTAA SAS 512E SE
2	1EX1948	Ultrastar Serv60+8 BBLK Drive w/Carrier SS530 15.36TB SAS RI-1DW/D SE
2	1EX1981	Ultrastar Serv60+8 BBLK CPU Xeon Silver 4114 10C 2.20GHz 13.75MiB 85W
8	1EX1409	Ultrastar Serv60+8 BBLK Memory SS 32GiB RDIMM DDR4 2R 2Gx4
1	1EX2107	Ultrastar Serv60+8 BBLK NIC Mellanox ConnectX-5 EN MCX516A-CCAT
1	1EX1796	Ultrastar Serv60+8 BBLK RAID Broadcom 9361-16i (w/Cache)
1	1EX1797	Ultrastar Serv60+8 BBLK RAID Broadcom 9361-8i (w/Cache)
6	1EX1458	Ultrastar Serv60+8 BBLK Drive Carrier SFF Blank

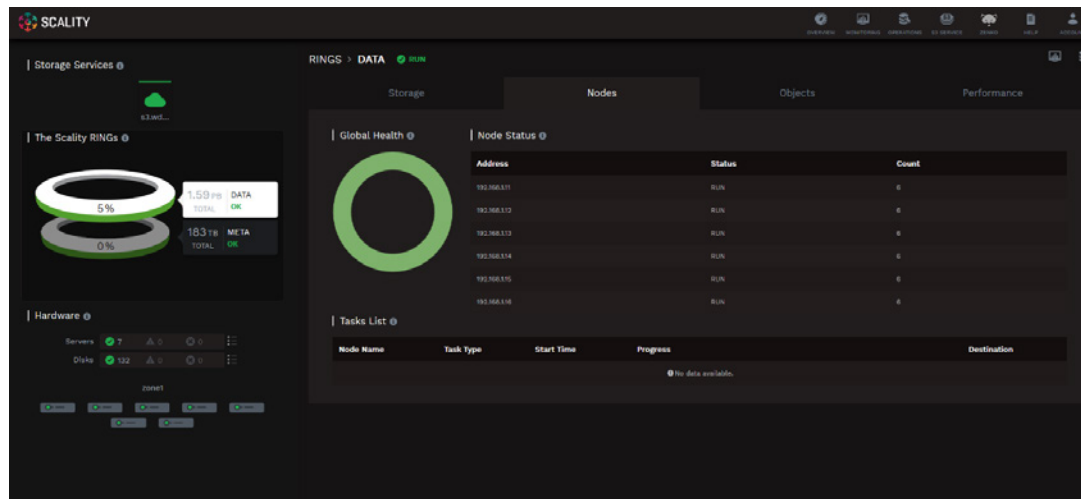
## 6. RING Management for Ultrastar Storage Server

Scality provides a comprehensive suite of user tools to manage and monitor RING deployments. These tools are built on top of RESTful interfaces that Scality calls the "Supervisor API" (SupAPI). The SupAPI provides API-based management that can be accessed via scripts, tools and frameworks. This allows organizations using the solution to gather statistics, metrics, health check probes and alerts, and to provision new services with RING.

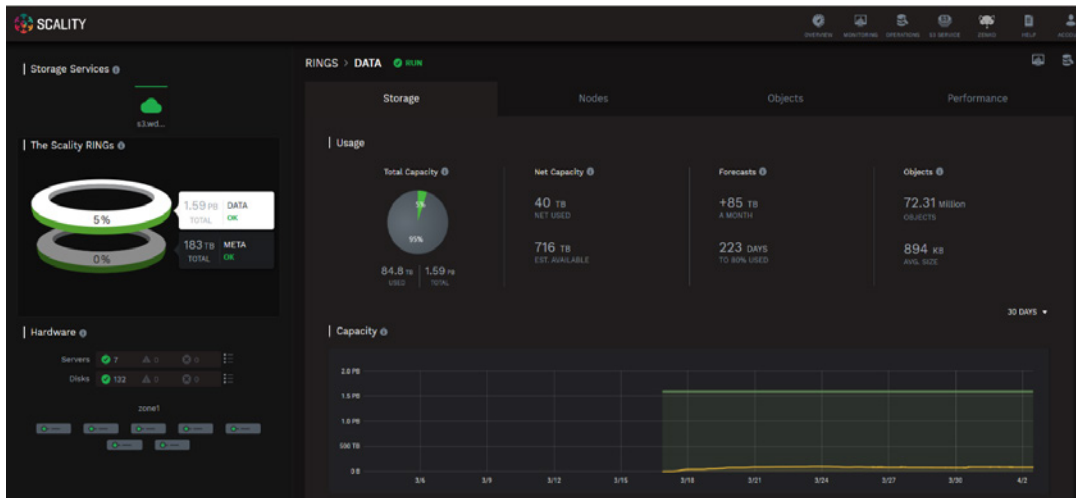
The SupAPI also features role-based access control (RBAC). An administrator can configure access control privileges for Super-Admin and Monitor-Admin user roles.

### 6.1 RING Management in Action

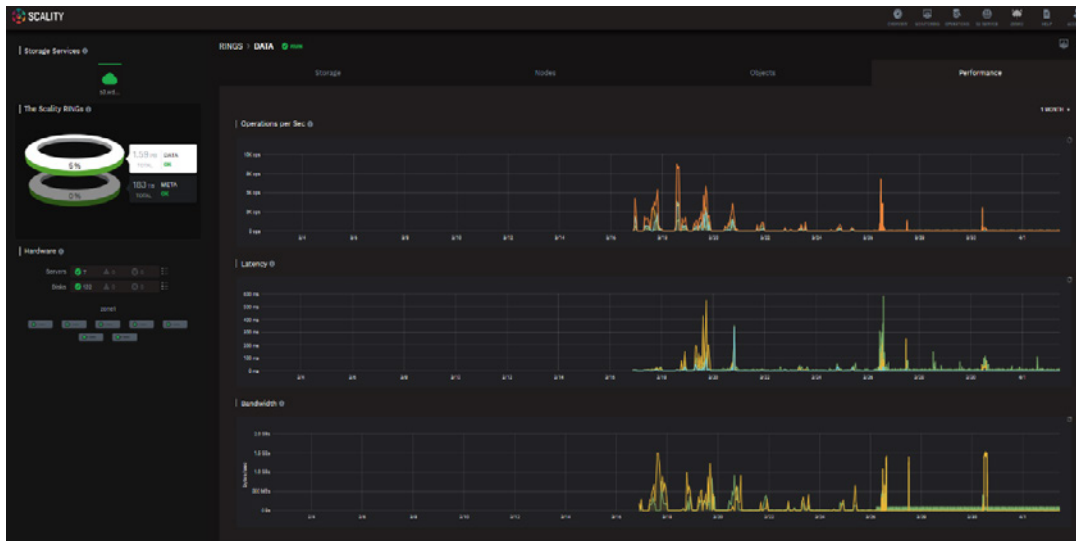
The following figures show Ultrastar storage server details in a RING deployment



Component panel and information screen



Storage capacity detail view



Performance monitoring screen

## 7. Use Cases and Applications/Workloads

The combined Western Digital Ultrastar + Scality RING solution supports a wide range of use cases and environments, including:

- Private cloud deployments
- Media workflows
- Medical imaging
- Big Data analytics
- Data tier for service providers
- Data lakes for artificial intelligence (AI), machine learning (ML) and deep learning (DL) application deployments
- Data repositories and archives

## 8. Build a More Scalable and Efficient Storage Foundation

The amount of unstructured data that organizations collect will continue to grow. As data volumes reach petabyte-scale, the manageability and economics of yesterday's storage solutions simply cannot keep up. Fortunately, modern cloud object storage solutions can.

Western Digital's Ultrastar Serv60+8 hybrid storage server provides an ideal platform for modern SDS environments, combining the performance of dual Intel® Xeon Scalable Processor-based CPUs with high reliability and low TCO. By combining Ultrastar platforms with Scality RING8 SDS software, organizations can create a powerful, flexible solution for handling the most demanding modern workloads at petabyte-scale.

### Learn More

**Western Digital Ultrastar® Serv60+8:**

<https://www.westerndigital.com/products/storage-platforms/ultrastar-serv60-8-hybrid-server>

**More about Western Digital and Scality:** <https://www.scality.com/partners/westerndigital/>

**Scality RING:** <https://www.scality.com/products/ring/>

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<sup>1</sup> IDC, Data Age 2025, 2018

<sup>2</sup> One GB is equal to one thousand megabytes; one TB is equal to one thousand gigabytes, one PB is equal to one thousand terabytes and one ZB equals one thousand PB (one trillion gigabytes). Actual user capacity may be less due to operating environment.

<sup>3</sup> Western Digital uses the IEC binary prefix gibi (meaning 2<sup>30</sup>) when referring to computer memory. One gibibyte (GiB) is equal to 1,073,741,824 bytes and 1,024 mebibytes."

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## Western Digital

5601 Great Oaks Parkway  
San Jose, CA 95119, USA  
[www.westerndigital.com/support](http://www.westerndigital.com/support)

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