RED HAT®
STORAGE

redhat.

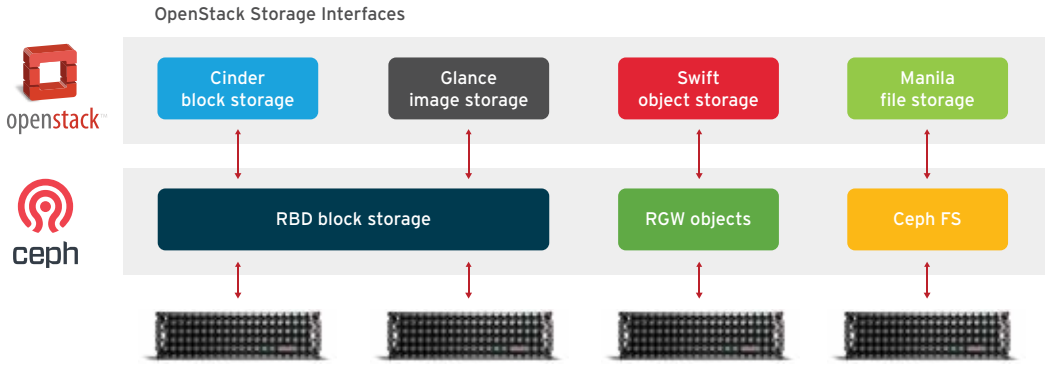
ALL-FLASH STORAGE SYSTEM FOR CEPH AND OPENSTACK

TECHNOLOGY BRIEF

INTRODUCTION

With the growth of mobile, social, big data, and the Internet of Things (IoT), the quantity and variety of data has skyrocketed. SanDisk's InfiniFlash™ System IF150, along with Red Hat® Ceph Storage software, delivers a massive scale-out, high-performance, all-flash storage system that provides boundless scale, efficiency, and resiliency for Ceph and OpenStack environments.

One Storage Platform for all OpenStack Storage



TECHNOLOGY

INFINIFLASH

The InfiniFlash™ System IF150 provides petabyte-scale capacity, high density and performance for OpenStack® and Ceph environments, and delivers dramatic cost advantages for customers with big data storage requirements. The IF150 delivers the performance of an all-flash array with the economics of an HDD-based system. It is the ideal storage choice for medium to large OpenStack deployments, providing very low latency, extreme IOPS, and sustained throughput.

Each system can be configured with up to 64 hot-swappable cards, delivering up to half a petabyte (512TB[1]) of raw flash storage in a 3U enclosure and up to 6PB in a single rack. The IF150 scales easily as each unit may connect up to eight servers. The Ceph cluster software provides high availability, load balancing, data replication and storage services required by OpenStack solutions.

1 490TB usable capacity

RED HAT CEPH STORAGE

Red Hat Ceph Storage is a massively scalable storage platform that uses Red Hat Enterprise Linux® as its underlying operating system. Red Hat Ceph Storage helps businesses to automatically and cost-effectively manage their storage needs, allowing enterprises to focus on data availability. It scales across physical, virtual, and cloud resources, and allows organizations to add capacity as needed without sacrificing performance or necessitating vendor lock-in.

Red Hat Ceph Storage is offered on the IF150—the latest InfiniFlash storage system. Together, SanDisk and Red Hat have worked to bring Ceph storage with unsurpassed performance, providing over a million Inputs/Outputs per second (IOPS).

FEATURES AND CAPABILITIES

- OpenStack integration
- Red Hat Ceph Storage tuned for maximum performance with InfiniFlash
- Modular architecture enabling non-disruptive expansion beginning at 64TB up through 512TB in one chassis, and up to 6PB in one rack
- Low power consumption—only 450 watts typical for 512TB
- Automatic failover prevents server or module failures from impacting data integrity, availability or performance
- Striping, erasure coding, and replication across nodes enables data durability, high availability and high performance
- Achieve ultra-low Recovery Point Objectives (RPO) and Recovery Time Objectives (RTO) with all-flash storage modules
- Storage policies can be configured to meet service level agreements (SLAs), performance requirements and failure domains
- Snapshots, thin provisioning and incremental backups
- Automatic rebalancing using a peer-to-peer architecture, adds instant capacity with minimal operational effort
- Hot software upgrades
- Upgrade clusters in phases—adding or replacing cards online—with minimal or no downtime
- RESTful interface, S3 and SWIFT support

BENEFITS

- High-performance storage for OpenStack and Ceph environments
- Petabyte-scale capacity and high density for OpenStack
- Cost-effective flash storage that can equal the performance of HDD based systems and public-cloud storage
- Industry-leading density, yielding rackspace savings from 64TB to 512TB per 3U module
- Significantly less power consumption than equivalent capacity HDD arrays[2]
- More than 10x the reliability (AFR) of HDD arrays[3]
- Independent scaling for compute and storage nodes
- Seamless integration with OpenStack
- Advanced block and object storage capabilities
- On-demand, scale-out architecture

RED HAT CEPH STORAGE SOFTWARE SPECIFICATIONS

SCALABILITY

Per cluster or namespace	10s-100s of nodes
Maximum unique objects (per cluster or namespace)	1B per device group; no limits on device groups
Maximum replicas	10 per unique object
Total cluster maximum	15PB

SERVICES AND PROTOCOLS

Cloud protocol access	RESTful API, Swift, S3 API
Block access	Ceph RBD & OpenStack Cinder
Snapshots	256
Data protection	Snapshots, configurable replicas, erasure coding
Disaster recovery	Geographic, asynchronous object replication
Management	CLI, RESTful HTTP
Maximum storage zones (for protection)	64,000 per cluster or namespace

2 Results available upon request from SanDisk. Email: RedHat@SanDisk.com.

3 InfiniFlash AFR based on internal testing. Results available upon request to SanDisk. Email: RedHat@SanDisk.com.

RED HAT CEPH STORAGE AND IF100 SERVER NODE GUIDELINES

	ENTRY-LEVEL SOLUTION	MID-LEVEL SOLUTION	HIGH-LEVEL SOLUTION
IF500 capacity	64TB to 128TB	256TB	512TB
CPU	2 x socket Intel Xeon E5-2690 12C 2.6GHz	2 x socket Intel Xeon E5-2695 14C 2.3GHz	2 x socket Intel Xeon E5-2698 16C 2.8GHz
Memory	64	64	128
Network	1 x Mellanox X3 Dual 40GbE	2 x Mellanox X3 Dual 40GbE	3 x Mellanox X3 dual 40GbE
Network	2 x LSI 9300-8e HBA SAS cables x 8	3 x LSI 9300-8e HBA SAS cables x 9 2 x PCI Express slot for non-volatile random-access memory NVRAM	4 x LSI 9300-8e HBA SAS cables x 10 3 x PCI Express slot for non-volatile random-access memory NVRAM

INFINIFLASH SYSTEM PRODUCT SPECIFICATIONS

CAPACITY

Maximum raw capacity	512TB[4] in 3U

PERFORMANCE[5]

IOPS	> 780,000 IOPS
Throughput	7GB/s

4 490TB usable capacity

5 Results and performance may vary according to system adoption, configuration, and broader architecture.

POWER AND CONNECTIVITY

Input voltage	90-264 VAC
Input frequency	47-63 Hz
Input current	12 amps maximum
Power cords	2x IEC C14
Power per node	active: 750W, idle: 250W
Connectivity: SAS 2.0–6Gb/s	8 SFF-8088 connectors; Future zero-downtime upgrade to SAS 3.0 - 12Gb/s

PHYSICAL

Flash expansion slots	64, 8TB flash card each
Height (3U) x width x length	5.2" (132 mm) x 17.72" (444.5 mm) x 31.5" (800 mm)
Fully populated weight	100 pounds (45kg)

ENVIRONMENTAL CONDITIONS

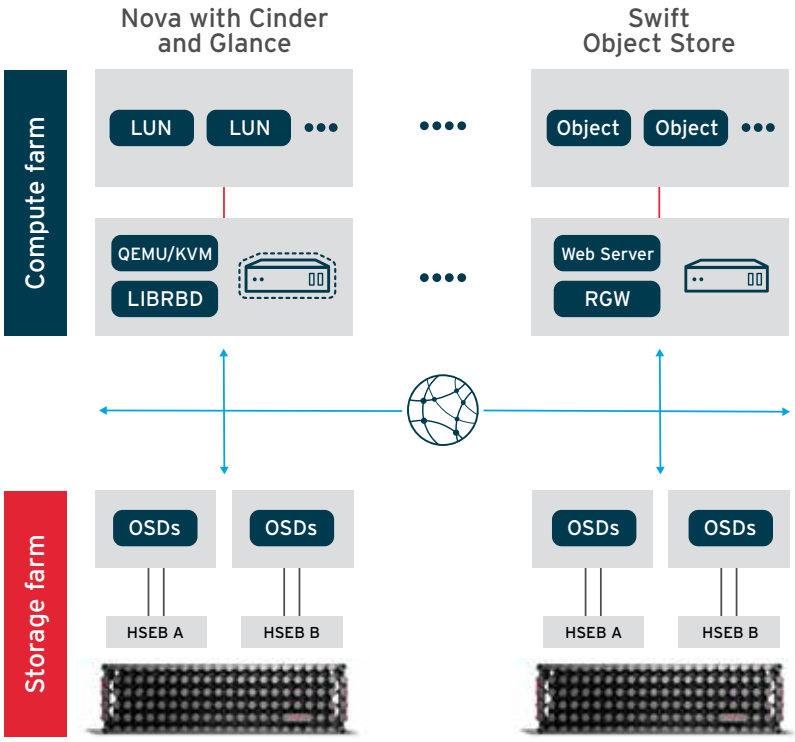
Operating Ambient conditions	5 to 40˚C, 10% to 90% humidity non-condensing, 10,000 feet; derate 1˚C per 1,000 feet
Non-operating Ambient conditions	-40 to 70˚C, 5% to 95% humidity, 10,000 feet; User data retention not guaranteed
Transportation temperature (short term)	-55 to 85˚C, 5% to 95% humidity, 40,000 feet; User data retention not guaranteed

RELIABILITY, AVAILABILITY, AND SERVICEABILITY

Mean time between failures (MTBF)	1.5 million hours
Hot-swappable hardware	Expanders, fans, power supplies, flash cards
Fans	N+2 (sustain any two fan failures)
Power supplies	N+1 (sustain any one power supply failure)
Expanders	N+1 (sustain any one expander failure)

SHOCK AND VIBE

Certifications and materials	Waste Electrical and Electronic Equipment (WEEE), Restriction of Hazardous Substances (RoHS), and REACH regulations



ABOUT RED HAT

Red Hat is the world's leading provider of open source software solutions, using a community-powered approach to reliable and high-performing cloud, Linux, middleware, storage, and virtualization technologies. Red Hat also offers award-winning support, training, and consulting services. As a connective hub in a global network of enterprises, partners, and open source communities, Red Hat helps create relevant, innovative technologies that liberate resources for growth and prepare customers for the future of IT.

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