

## Product Spotlight

# SUSE Enterprise Storage 4

Industry's 1st Software Defined Storage with CephFS



# Executive Summary



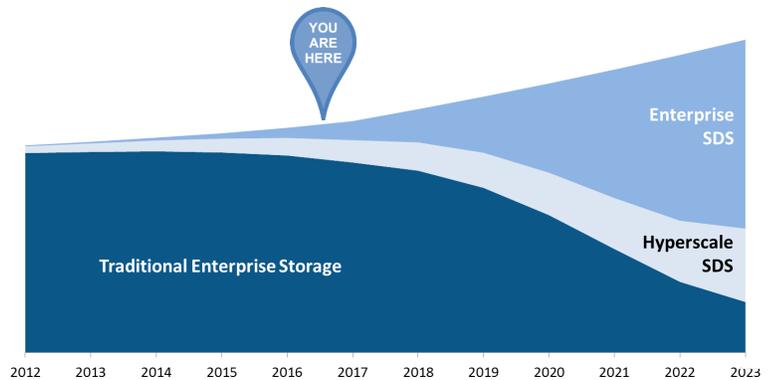
## An Epic Migration is Underway to Software Defined Storage

Hyperscale growth by Amazon, Apple, Facebook, Google, Microsoft, and others was made possible by a software defined data (SDDC) architecture.

Commercial versions of the open-source software are now available to enterprise IT, and an epic migration to software defined storage is underway. As a result, Enterprise SDS revenue will surpass traditional enterprise storage revenue by 2021.

*Using industry standard servers and software infrastructure, hyperscale SDDCs reduced costs by 40% versus proprietary hardware, enabled deployment of virtualized resources in days versus months, and delivered the ability to scale-out to millions of nodes.*

Enterprise Storage Revenue



Data centers are at the early stages of a mass migration from external controller-based storage arrays, to server-resident software defined storage.

## Best Served Cold by Linux Vendors

A good starting point for deploying SDS is cold storage. As shipments of capacity-optimized HDD storage systems increase five-fold from 2012 to 2016, demand for cold storage systems is driven by the growth of unstructured data such as mobile messages, surveillance video, and medical records. Consequently, reducing the cost of cold storage is a high priority for storage architects. SDS is an excellent solution for addressing the rising cost of cold storage. And unlike transaction-intensive storage which is mission-critical, cold storage is not frequently accessed and a less risky environment for deploying new technology.

*Private cloud architects see software defined storage under the control of a cloud operating system. Because open-source Linux is at the core of almost every cloud platform and SDS product, Linux O.S. vendors are best positioned to provide superior expertise, products and support.*

## The Future Looks like SUSE Enterprise Storage 4

Established in 1992, SUSE is the original provider of the enterprise Linux distribution and a popular platform for mission-critical computing. With a portfolio centered around SUSE Linux Enterprise, SUSE powers thousands of organizations around the world across physical, virtual and cloud environments. SUSE is now offering commercial versions of the OpenStack cloud operating system and CEPH software defined storage to Enterprise IT organizations building private clouds. With SUSE OpenStack Cloud and SUSE Enterprise Storage 4, a framework for a software defined data center delivering hyperscale-like scalability.

architects have cost, agility, and



*The remainder of this report is a review of SUSE Enterprise Storage 4.*

# Enterprise Storage Requirements

## Driven by Growth of Large Data

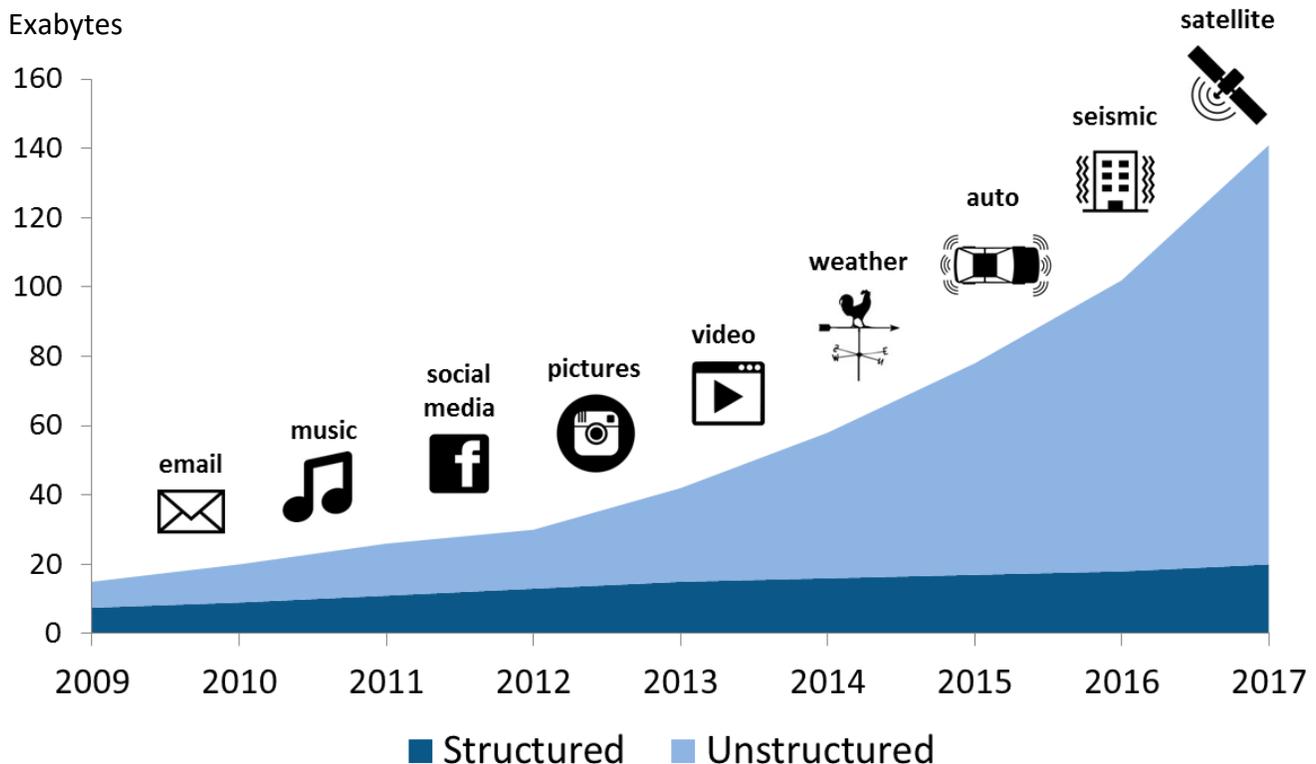
Unstructured data refers to information that typically doesn't reside in a traditional row-column database. Examples include e-mail messages, word processing documents, videos, photos, audio, web pages, weather/auto/seismic sensor data, and streaming satellite data. Unstructured data is often referred to as "Large Data" because files such as 8K video are huge, and there are large numbers of the files.

Hyperscale cloud service providers were driven to server-based object storage because it's the most cost-effective technology for massive quantities of unstructured data which has been growing at up to 80% per year.

Enterprise storage architects are facing the same growth of unstructured data, and are moving quickly to adopt software defined object storage solutions which are now commercially available.

To protect their investments and enable a graceful migration to SDS, IT organizations need SDS vendors to present file and block storage gateways to object storage which are familiar to multiple popular operating systems.

**Growth of Large (Unstructured) Data**



By 2017, 85% of data will be unstructured data, most of which is infrequently accessed. The result is one of the biggest challenges for enterprise storage architects is migrating from proprietary, transaction-oriented disk arrays which are expensive. The destination is more cost-effective software defined storage which leverages open-source software and industry standard server hardware.

# Software Defined Storage



## Comprehensive SDS Addresses File, Block & Object Storage

SUSE Enterprise Storage is an example of a best-in-class solution in a new product category called “Software Defined Storage.” Best-in-class private cloud infrastructure lowers storage costs through a high degree of automation and efficiency. That’s made possible with a comprehensive and unified SDS environment which addresses file, block, and object storage in a single unified platform.

Software Defined Storage	File	Block	Object
How data is organized	By a file system residing in a single host or controller, or distributed and shared between multiple hosts.	In blocks and presented as logical unit numbers with SCSI addresses.	In containers, instead of a tree-based file system. Replaces RAID and replication with erasure coding for data redundancy.
Underlying software	vSphere, Xen or KVM		
Underlying hardware	Industry-standard x86 server		
How you buy it	Software app-only or appliance (with server, hypervisor, and storage app)		
Comparable HW product	NAS system	SAN RAID system	Object storage appliance

## CEPH Covers All Three

SUSE Enterprise Storage is based on Ceph, an open-source platform designed to provide storage from a highly-scalable, high-availability, cluster environment.

Ceph storage clusters are designed to run on white box servers, using the Controlled Replication Under Scalable Hashing (CRUSH) algorithm to distribute data evenly across the cluster. Cluster nodes are then able to access data quickly without the type of bottlenecks found when scaling centralized storage architectures.

For cloud environments, Ceph object storage is accessible through Amazon S3 and OpenStack Swift REST APIs, as well as a native API which can be used to integrate infrastructure or business applications. Ceph file storage (Ceph FS) is a POSIX-compliant file system which uses the same cluster as Ceph block storage and Ceph object storage. Ceph block storage makes use of a Ceph Block Device, which is a virtual disk that can be attached to bare-metal Linux-based servers or to virtual machines (VMs). Ceph RADOS provides block storage services such as snapshots and replication. The RADOS Block Device (RBD) is also integrated with OpenStack Block Storage.



JEWEL

In 2016 the Ceph development team released Jewel, the tenth major version of Ceph. The Jewel release of Ceph provides significant new functionality, including support for CephFS. The availability of CephFS is the last building block needed for Ceph to fulfill the promise of delivering a universal solution for enterprise-class object, storage and file storage.

# SUSE Enterprise Storage



## Overview

SUSE Enterprise Storage is a fully featured, self-healing, self-managing, distributed SDS solution which enables enterprise IT organizations to use commodity off-the-shelf servers and disk drives to build cost-efficient pools of enterprise-class storage.

Based on Ceph, SUSE Enterprise Storage scales from a single-app storage system to a multi-petabyte storage environment serving files, block and object storage to an entire enterprise.

Backed by expert SUSE Linux engineering and support, SUSE Software Based Storage provides enterprise IT with the resources needed to ensure a successful migration to open-source-based software defined storage.

## Anatomy of SUSE Enterprise Storage

The unified architecture of SUSE Enterprise Storage allows IT organizations to build a high-availability and highly scalable storage cluster environment. The unified storage architecture can simultaneously deliver object, block and file storage to cloud apps, virtual machines and custom clients developed in-house.

**RADOSGW**—A bucket-based REST gateway compatible with Amazon S3 and OpenStack Swift.

**LIBRADOS**—A library allowing apps to directly access RADOS.

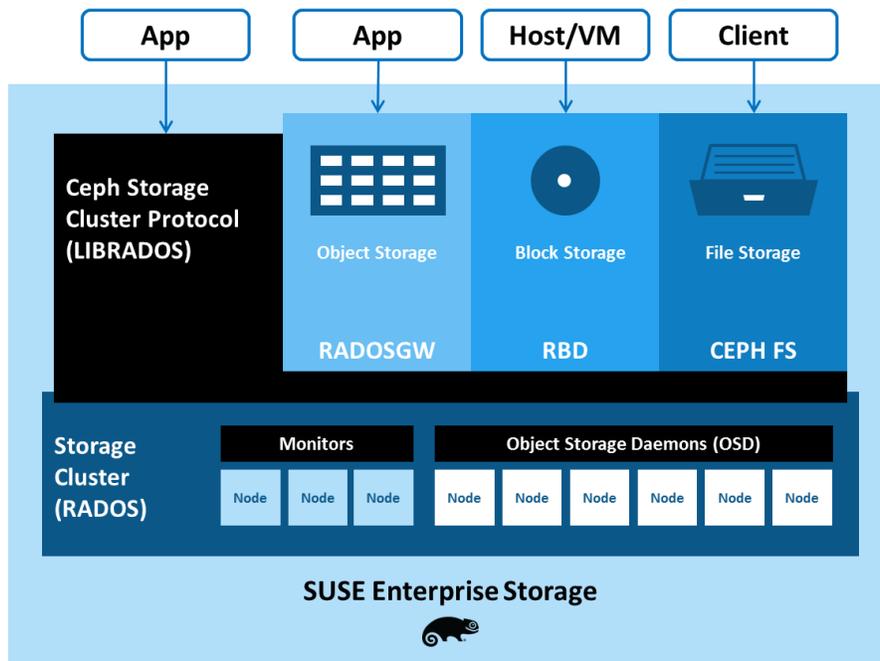
**RADOS**—An object store comprised of self-healing, intelligent storage nodes.

**RBD ( Raw Block Device )**—A distributed block device with a Linux kernel client, QEMU/KVM driver, and, enterprise features like snapshot , thin provisioning and compression.

**CephFS**—POSIX-compliant file system with a Linux kernel client and support for FUSE will be available in the future.

**OSD**—An object storage device is a physical or logical storage unit (e.g., LUN).

An OSD Daemon is the OSD software which interacts with a logical disk.



**Monitors**—A monitor maintains a master copy of the cluster map. A cluster of monitors ensures high availability should a monitor fail.

**Storing Data**—The Ceph Storage Cluster receives data from Ceph clients (block device, object storage, file system or a custom client you create using LIBRADOS) and it stores the data as objects. Each object corresponds to a file in a file system which is stored on an object storage device (OSD). Ceph OSD Daemons then handle the read/write operations on the disks.

# SUSE Enterprise Storage 4



## Best Suited for Large Data at Scale

SUSE's newest version of software defined storage—SUSE Enterprise Storage 4—is a comprehensive storage solution best suited for “Large Data.” Its scale-out architecture allows customers to simplify their environment while providing limitless storage capacity for large data file applications such as video surveillance, CCTV, online presence, streaming media, medical ( x-rays, mammography, CT, MRI), seismic processing, genomic mapping, CAD and backup datasets.

The following are a few key features of SUSE Enterprise Storage 4.

## First with CephFS & Unified Storage

SUSE Enterprise Storage 4 includes the industry's first production-ready version of CephFS. By adding much-anticipated native filesystem access, SES 4 allow customers to deploy a unified block, object and file storage environment to reduce the capital and operational costs of their storage infrastructure.



## First with iSCSI Storage for Ceph



The industry's 1st support for Ceph iSCSI in production deployments was introduced with SES 2 and remains a key feature in SES 4. The iSCSI implementation leverages LIO, as well as the established Ceph RBD infrastructure, and binds them together using lrbld. This provides a way to build, distribute and update the iSCSI configuration across multiple lrbld nodes without having to touch individual configuration files on each...a valuable feature for storage administrators looking to deploy iSCSI storage quickly.

## openATTIC Extends Capabilities of Ceph

The powerful web-based storage management framework is now available to front-end SUSE Enterprise Storage. Storage admins will like the ways open source openATTIC software can extend the capability of Ceph. For example, openATTIC can be used to manage one or multiple servers, to facilitate storage services via CIFS or NFS, as well as iSCSI or Fibre Channel. The software supports a wide range of file systems including Btrfs and ZFS for creating snapshots and other features. In addition, redundancy can be provided by enabling mirroring of selected volumes using the DRBD® replicated storage system.

## SDS Servers with ARM Processors for Lower Power & Cost

ARM 64 bit support gives enterprise and hyper-scale customers a choice of processor platform for software-defined storage. Previously, SUSE announced it is collaborating with multiple partners to bring Ceph solutions on ARM hardware which promise to lower power consumption and server processor costs.



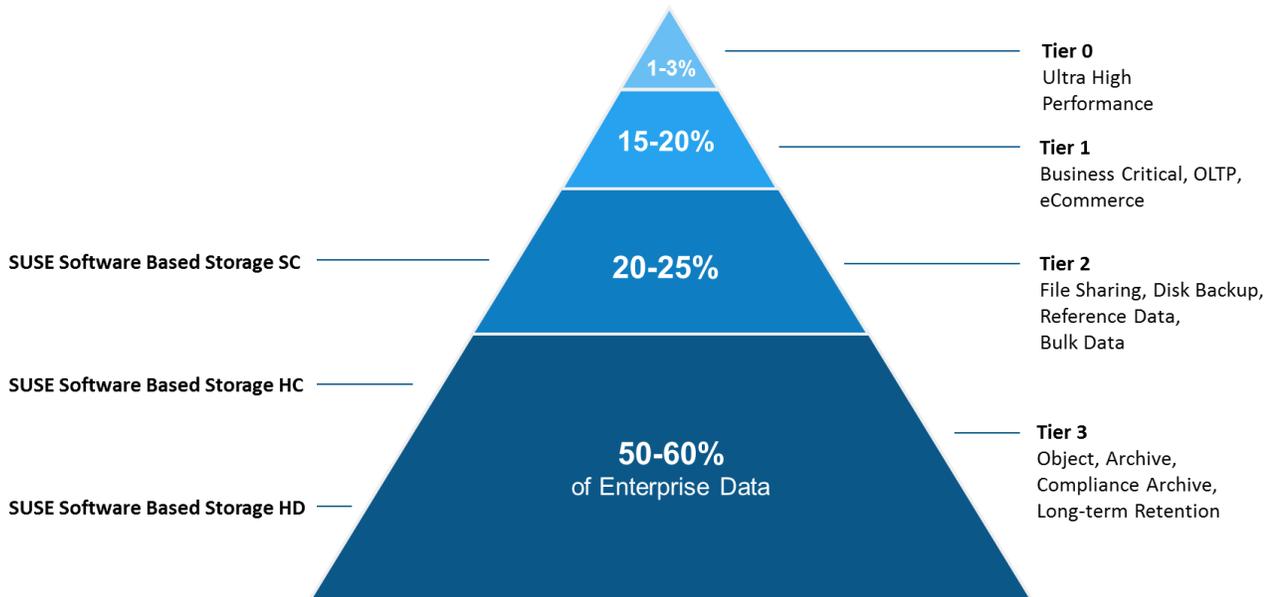
# Small, Medium or Large



## Capacity Products Today, Performance Products Tomorrow

SUSE Enterprise Storage 4 is positioned as three levels —all targeting Tier 2 and Tier 3 applications for high capacity storage. In the future, the company will be introducing functionality to address Tier 0 and Tier 1 transaction-oriented applications and high-performance storage.

### Applications for SUSE Enterprise Storage 4



### SUSE Enterprise Storage 4 Products

SUSE Enterprise Storage	Standard Capacity (SC)	High Capacity (HC)	High Density (HD)
<b>Enterprise Storage Application</b>	File sharing, bulk storage, disk-to-disk backup, active archive, disaster recovery.	Bulk storage such as cloud, backup, and archive storage.	Cold storage which must be accessible online, such as archiving emails and records for compliance.
<b>Optimized for</b>	Bandwidth performance.	Quick data recovery.	Low-cost, online access to a large pool of data.
<b>Key Features &amp; Benefits</b>	Replicated copies for redundancy. Journal & OS disk on SSD for performance. Disk-level encryption for data security.	Erasur coding for redundancy. Snapshots for rolling back copies. Journal & OS disk on SSD for performance. Disk-level encryption for security.	Erasur coding for redundancy. Low-cost HDDs for journal and OS disks. Disk-level encryption for security.
<b>Key Options</b>	SSD cache tier.	SSD cache tier.	Data tampering software.

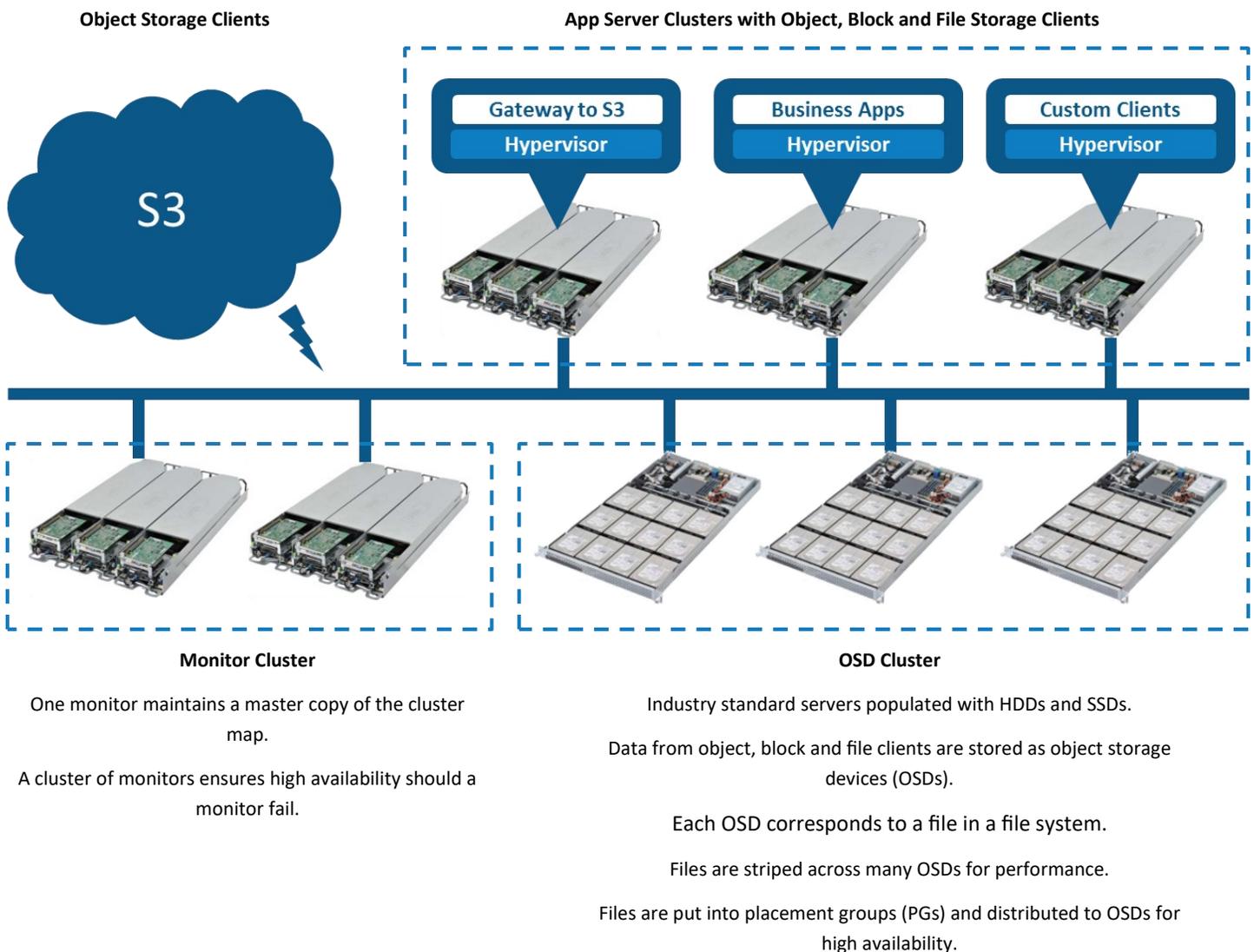
# SUSE Enterprise Storage Environment

## Server Clusters The New Data Center Storage Building Block

Deploying app server clusters to achieve both high performance and high availability is already a best practice in enterprise data centers. Migrating to SUSE Enterprise Storage 4 means replacing proprietary storage systems with more server clusters. The difference is the new clusters will host storage software previously running on the proprietary storage system controllers.

The future of enterprise storage looks like the diagram below where clusters of industry standard servers become the basic building block for data center storage—differentiated by the configuration needed to serve the client application.

### SUSE Enterprise Storage 4 Environment—Unified Object, File and Block Storage

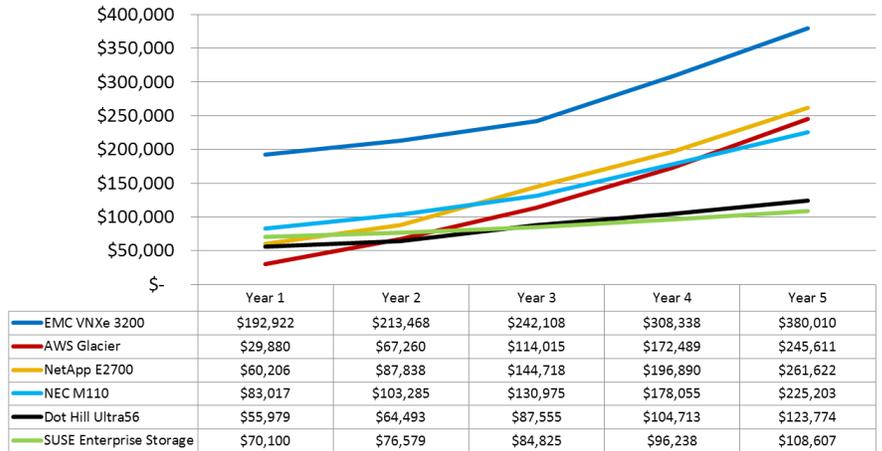


# Product Review



## The Right Storage Architecture for Large Data

Hyperscale cloud service providers have proven a software defined object storage architecture can drive down the cost of storing fast-growing large data by 40%. Plus, your ability to deploy storage service levels will go down from months to days. It's not an exaggeration to say that if someone does not lead your company on a migration to software defined storage, your company will someday be at a competitive disadvantage.



Data from a recent five year storage TCO analysis by IT Brand Pulse shows that software defined storage systems offer lowest cost and drive costs per gigabyte per month well below one penny.

## Unified Software Defined Storage is Now Possible

The implementation of software defined storage is usually part of a broader project to build a private cloud based on a software defined data center architecture. Because SUSE Enterprise Storage 4 is first with CephFS, it offers the unique ability to provide object, block, and file storage from a single unified platform. It's also integrated with the SUSE OpenStack Cloud and Amazon S3.

Unified SUSE Enterprise Storage 4 allows busy private cloud builders to build hyperscale-class efficiency into their storage environment.

## Expert Linux Engineering & Support

Open-source cloud operating systems and software defined storage platforms are based on the Linux operating system.

SUSE is a Linux OS pioneer and successful software vendor with thousands of installations. I would expect to receive nothing less than expert support from SUSE for their software based storage.

## Looking Forward to Performance Products

Today SUSE Enterprise Storage 4 includes object, iSCSI block, and CephFS file storage for high-capacity applications. This offering will help IT organizations start their migration to software defined storage in non-mission-critical environment. This suite of products also provides IT organizations with software to cost-reduce bulk storage, the class of storage where spending is increasing the fastest.

Having said that, the most expensive storage are the systems deployed to support transaction-oriented applications. I look forward to seeing future releases of SUSE Enterprise Storage which address I/O-intensive applications.



# Summary



## The Bottom Line

The general availability of open-source-based SDS apps from Linux vendors like SUSE marks the beginning of a new era of much more agile, scalable, and cost-effective storage. SDS will displace traditional enterprise storage as the dominant storage architecture and therefore creates a strategic imperative for storage IT pros.

The bottom line for IT organizations is SUSE is the right kind of company, and SUSE Enterprise Storage is the right set of products to address the exploding cost of bulk storage with a low-risk approach.

## Recommendations

- Learn about SDS technologies, products, fails, and successes.
- Determine the return-on-investment for deployment of SDS in your environment.
- Create an SDS migration strategy for your company.
- Start small and fail fast. Deploy SUSE Enterprise Storage in a DevOps lab or in a non-critical production environment.

## Resources

[Linux: The Operating System of the Cloud](#)

[CEPH Architecture](#)

[SUSE OpenStack Cloud](#)

[Epic Migration to Software Defined Storage](#)

[Enterprise Mass Storage: Less Than A Penny Per GB Per Year](#)

[SUSE Enterprise Storage](#)

## The Author



Frank Berry is founder and senior analyst for IT Brand Pulse, a trusted source of testing, research and analysis about cloud IT infrastructure, including operating platforms, servers, storage and networking. As former vice president of product marketing and corporate marketing for QLogic, and vice president of worldwide marketing for the automated tape library (ATL) division of Quantum, Mr. Berry has over 30 years experience in the development and marketing of IT infrastructure. If you have any questions or comments about this report, contact [frank.berry@itbrandpulse.com](mailto:frank.berry@itbrandpulse.com).