SUSE® Enterprise Storage 5

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Reduce IT Costs with an Intelligent Software-defined Storage Solution

Reduce IT costs with an intelligent software-defined storage management solution that uses commodity off-the-shelf servers and disk drives

- Significant CAPEX savings
- Reduce IT operational expense
- Optimize infrastructure without growing IT staff

SUSE Enterprise Storage

Award winning unified software-defined storage solution, powered by Ceph technology, that enables IT to transform their enterprise storage infrastructure to deliver highly scalable and resilient storage that is cost-efficient and able to seamlessly adapt to changing business and data demands

SUSE Enterprise Storage award wins in last 24 Months

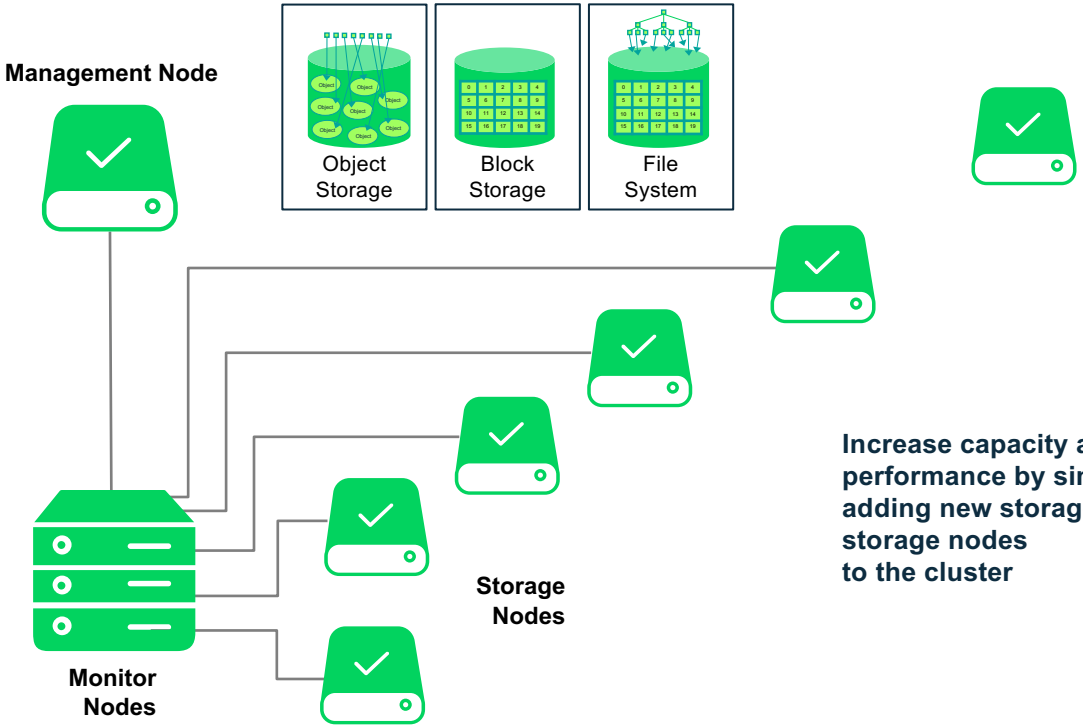
SUSE Enterprise Storage

Seamlessly adapt to changing business and data demands

- **Reduces** IT capital and operational **costs** with an intelligent software-defined storage management solution
- Delivers a highly **scalable** and **resilient** storage environment
- **Consolidates** block, object and file storage requirements
- Utilizes commodity off the shelf hardware
- Open
- Best solution for **disk-2-disk** backup target, OpenStack, large data applications and bulk storage requirements

SUSE Enterprise Storage

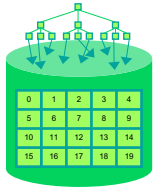
Unlimited Scalability with Self Managing Technology



Increase capacity and performance by simply adding new storage or storage nodes to the cluster

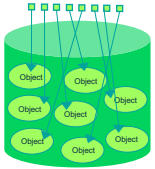
Recap of What We Launched with 4

- A truly **unified** block, object and file solution
- Expanded hardware-platform choice with the added support for 64 bit **ARM**.
- Long distance **replication** for block storage and multisite object storage replication for enhanced data protection and improved disaster recovery.
- Enhanced cluster orchestration using **Salt** for simplified storage cluster management.
- Early access to **NFS Ganesha** support and NFS access to S3 buckets
- **Optimised** for large data applications and **disk-2-disk** backup target use cases



File Storage

Block Storage



Object Storage

Introducing SUSE Enterprise Storage 5

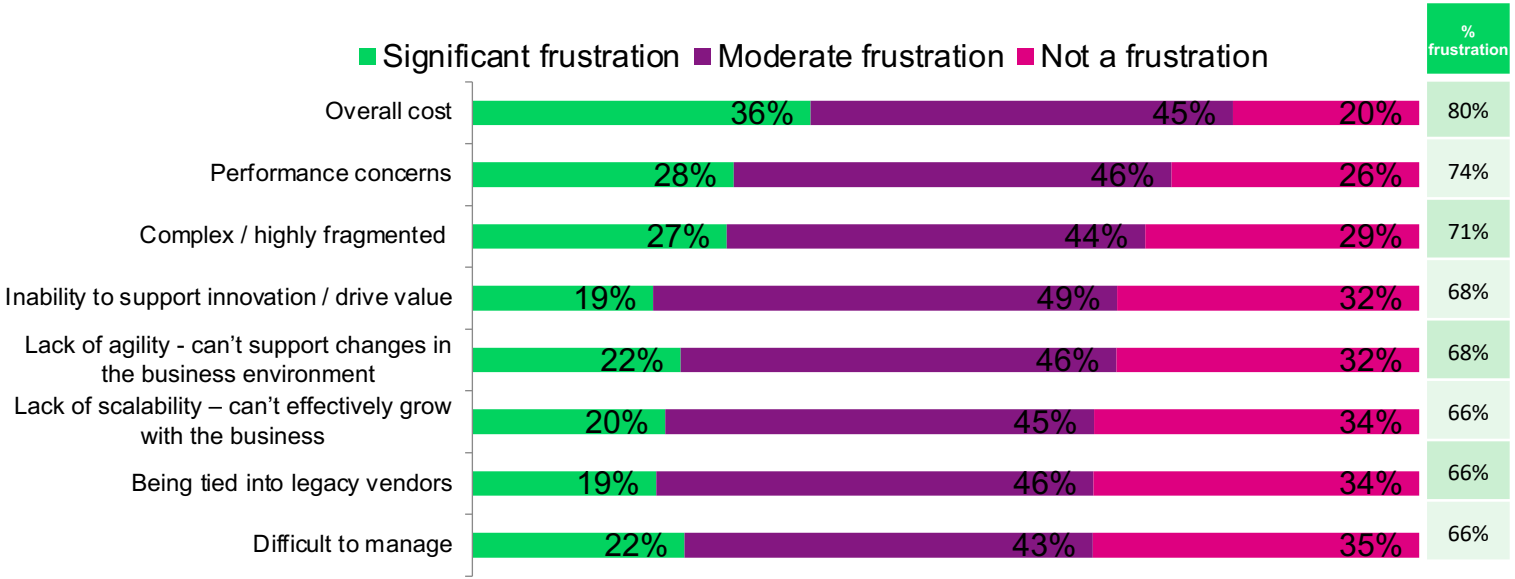
SUSE Enterprise Storage 5

SUSE Enterprise Storage 5 is the ideal solution for Compliance, Archive, Backup and Large Data. Customers can simplify and scale the storage of archive, backup and large data file applications without limitations.

Truly unify enterprise storage requirements with SUSE Enterprise Storage. Run production workloads for Block, Object and File storage within a single cluster, reducing capital and operation costs.

SUSE Enterprise Storage 5

Engineered to Reduce Storage Frustrations

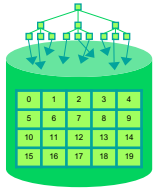


*1202 senior IT decision makers across 11 countries completed an online survey in July / August 2016

Introducing SUSE Enterprise Storage 5

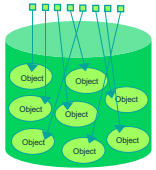
Faster, more efficient and simpler to manage

- The ability to service environments that require higher levels of performance through the enablement of the new “**BlueStore**” native object storage backend for Ceph. SUSE Enterprise Storage 5 offers up to **double the write** performance of previous releases, coupled with significant reductions in I/O latency
- The ability to free up capacity and reduce data footprint via **BlueStore** enabled Data Compression
- Increased **disk space efficiency** of a fault tolerant solution through enablement of Erasure coding for Replicated block devices and CephFS data
- Lowered operational cost with an expanded advanced graphical user interface for simplified management and improved cost efficiency, using the next generation **openATTIC** open source storage management system



File Storage

Block Storage

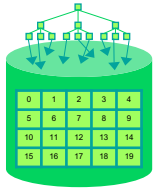


Object Storage

Introducing SUSE Enterprise Storage 5

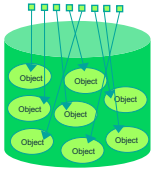
Faster, more efficient and simpler to manage

- Simplified cluster management and orchestration through enhanced **Salt** integration
- **Production** support of the Network File System (**NFS**) Gateway exporting **CephFS** and enabling users on a client computer to access files over a computer network
- **Production** support for the Network File System (**NFS**) Gateway exporting the RADOS object gateway (**RGW**) and enabling legacy file applications that need a filesystem interface the ability to access cloud native Amazon S3 or Swift data.
- **Preview** of Ceph's ability to export a file system to **CIFS/Samba** * for heterogeneous connectivity



File Storage

Block Storage

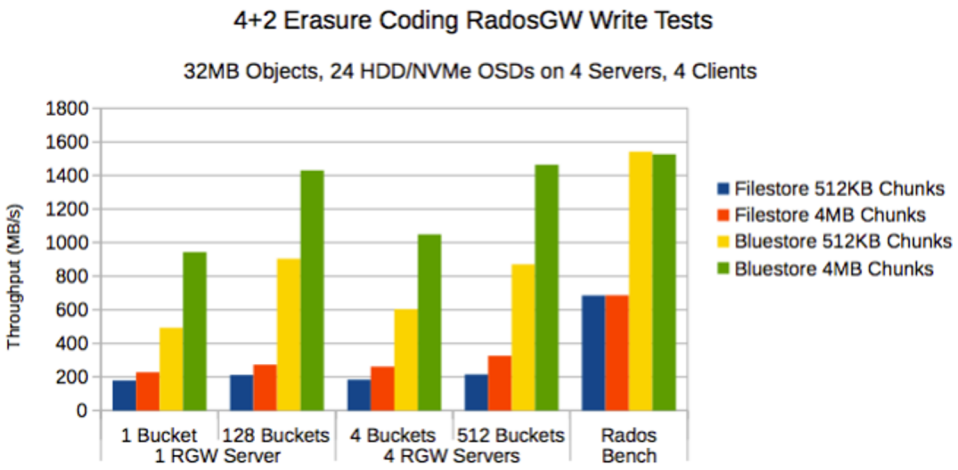


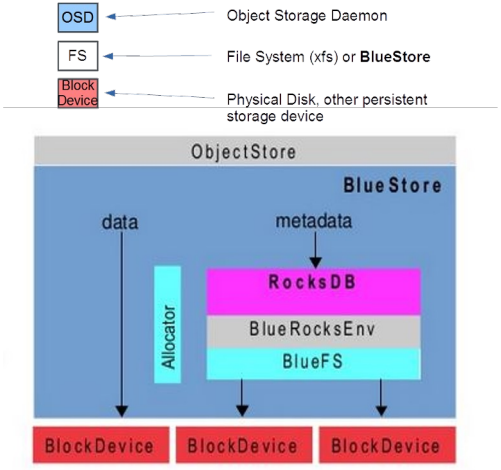
Object Storage

SUSE Enterprise Storage 5

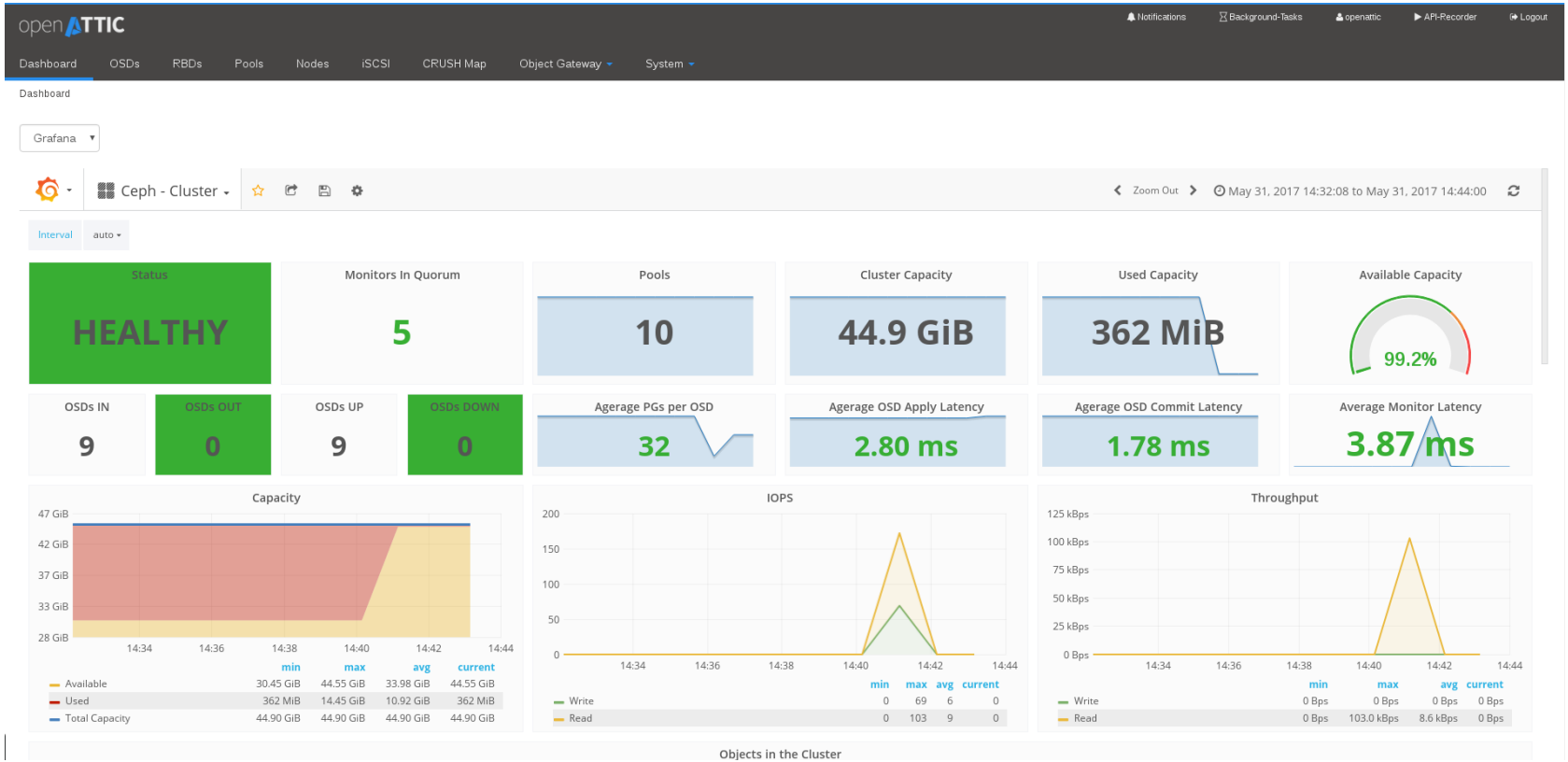
New Bluestore backend

- It will have a 2-3x write performance improvement over the current version based on Filestore
- Partnering with Intel for Intel CAS (Cache Acceleration Software)





SUSE Enterprise Storage 5 Management with OpenATTIC



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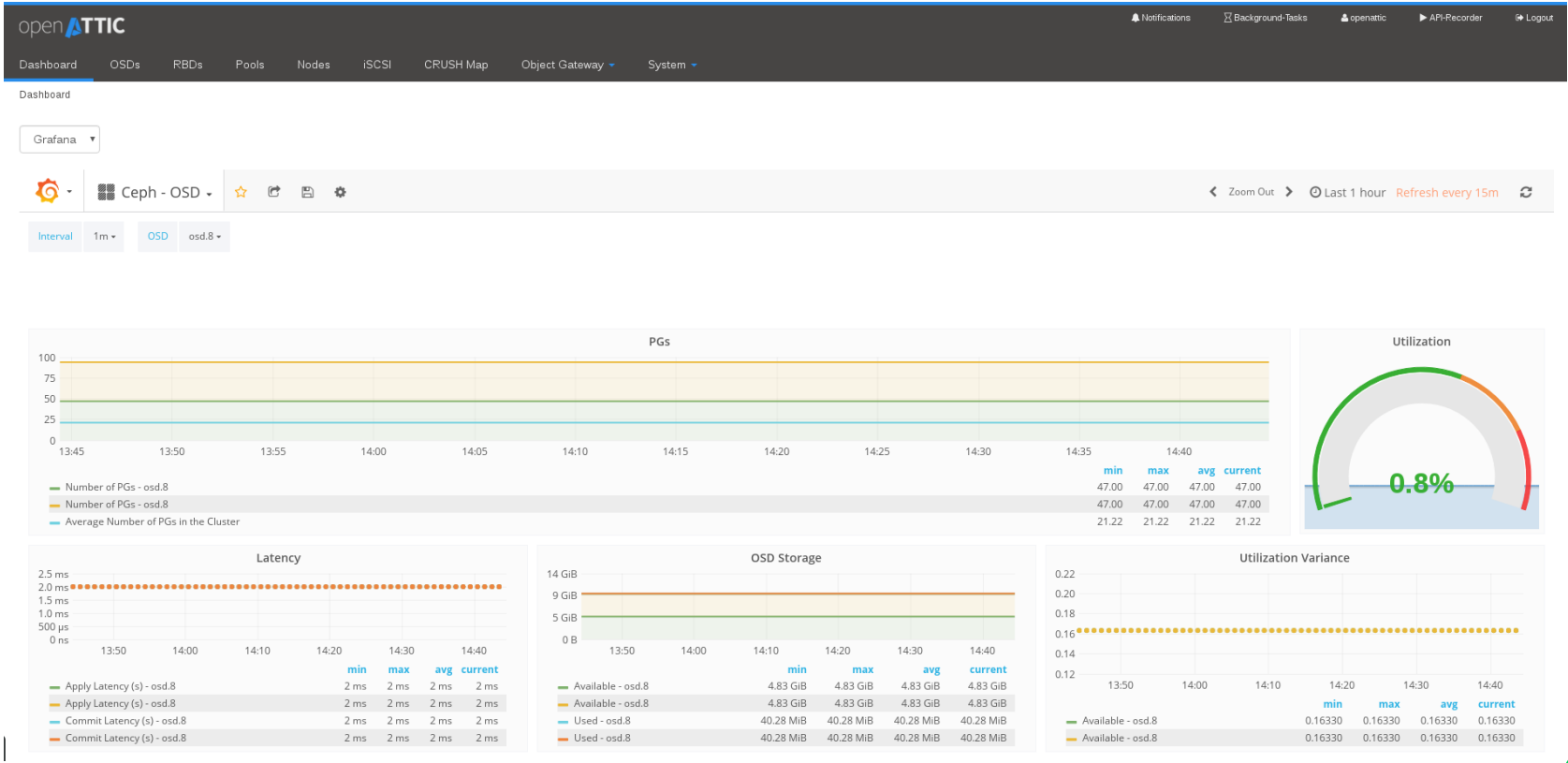
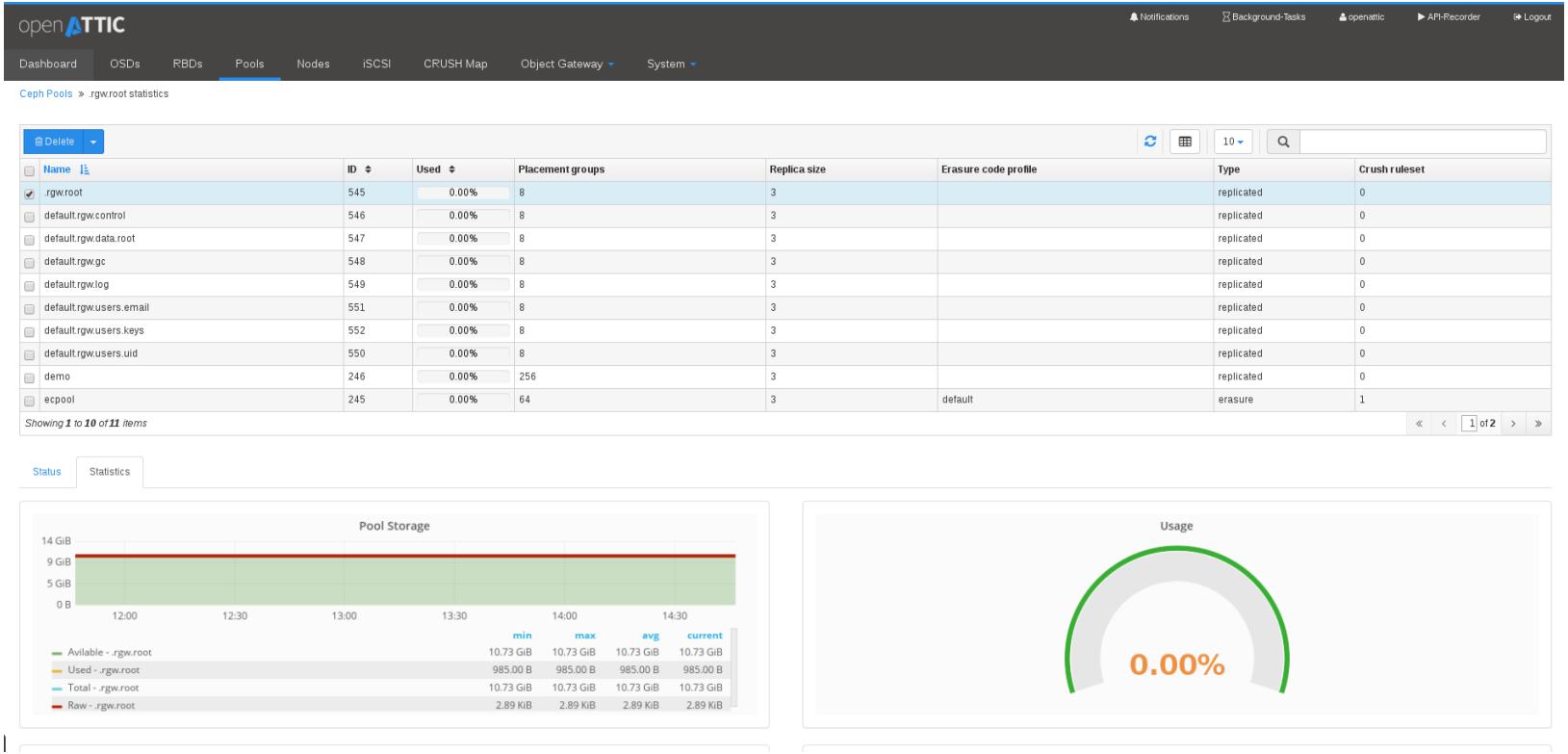
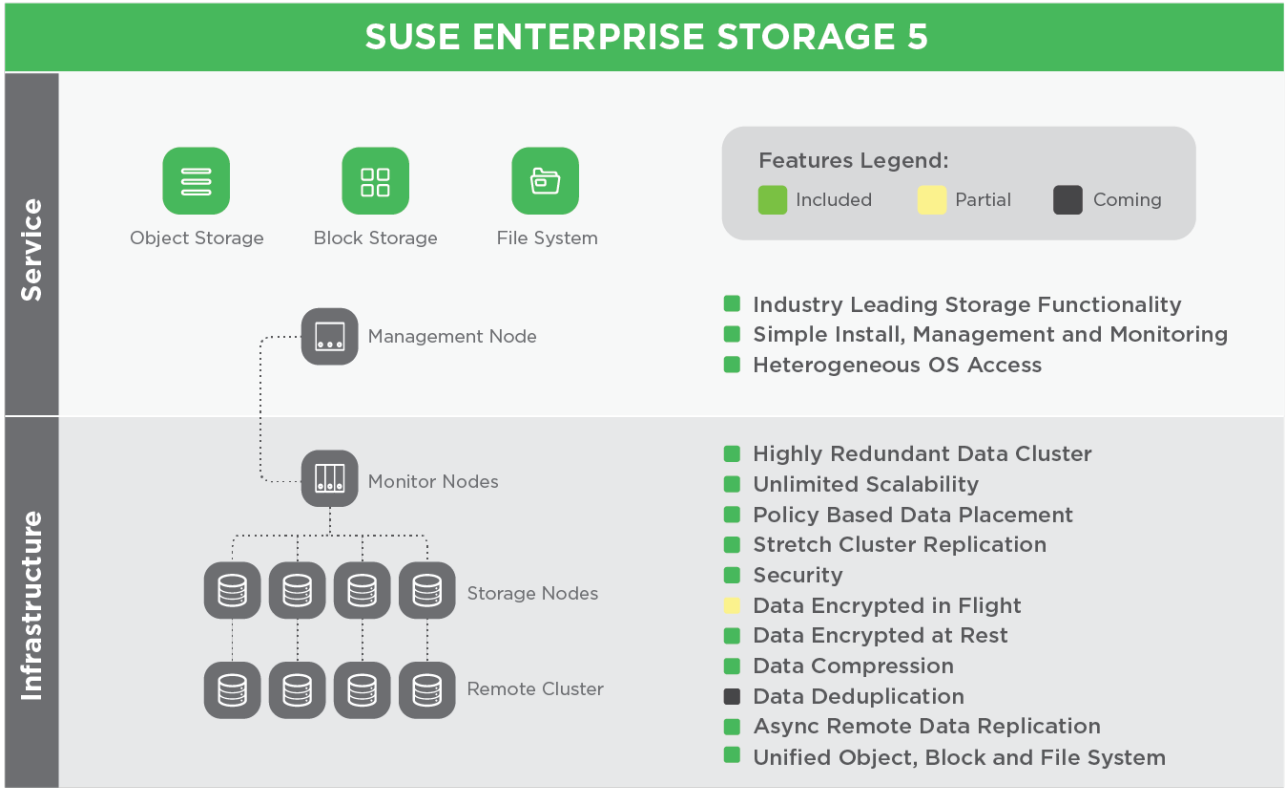


SUSE Enterprise Storage 5 Management with OpenATTIC

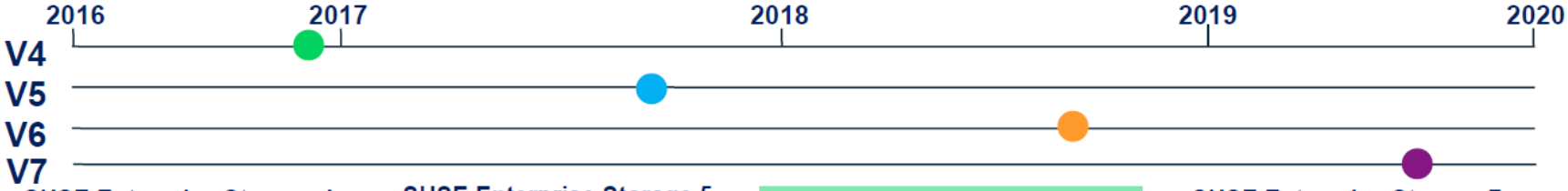


Enterprise Ready SUSE Enterprise Storage

Major Feature Summary



SUSE Enterprise Storage



SUSE Enterprise Storage 4

Built On
- Ceph Jewel release
- SLES 12 SP2 (Server)

Manageability
- Initial openATTIC management
- Initial DeepSea Salt integration

Interoperability
- Arch64
- CephFS (production use cases)
- NFS Ganesha (Technology Preview)
- NFS access to S3 buckets (Technology Preview)

Availability
- Multisite object replication

SUSE Enterprise Storage 5

Built On
- Ceph Luminous release
- SLES 12 SP3 (Server)

Manageability
- openATTIC management phase 2
  - Grafana monitoring dashboard
  - Prometheus event alert - email
- DeepSea Salt integration phase 2
  - Online Filestore to BlueStore

Interoperability
- NFS Ganesha
- NFS access to S3 buckets
- CIFS Samba (Technology Preview)
- CephFS Multi MDS support

Availability
- Erasure coded block and file

Efficiency
- BlueStore back-end
- Data compression

SUSE Enterprise Storage 6

Built On
- Ceph "N" release
- CaaS Platform (Server)

Manageability
- openATTIC management phase 3
  - Event alert - SNMP traps
- DeepSea Salt integration phase 3
- Integration with SUSE Manager
- Automatic Metric Reporting phase 1
- IPv6

Interoperability
- Containerized SES
- CIFS/Samba
- Quality of Service (QoS)
- RDMA back-end (Technology Preview)

Availability
- Asynchronous iSCSI replication

SUSE Enterprise Storage 7

Built On
- Ceph "P" release
- CaaS Platform (Server)

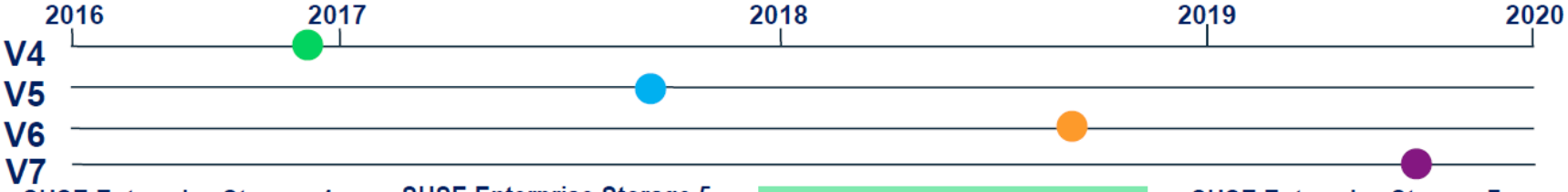
Manageability
- openATTIC management phase 4
- DeepSea Salt integration phase 4
- Integration with Kubernetes
- Automatic Metric Reporting phase 2
- Last good configuration rollback

Interoperability
- RDMA back-end

Availability
- CephFS snapshots
- Asynchronous file replication

SUSE Enterprise Storage Management

DeepSea and openATTIC



SUSE Enterprise Storage 4

Install
- Initial DeepSea (Salt) integration

Configure
- Initial DeepSea (Salt) integration
- Crush map editor

Manage
- View, create, delete Ceph pool
- View, create, delete RBD
- View OSDs
- Manage EC profiles

Monitor
- Ceph performance
- Ceph pool status
- RBD status

Diagnose
- Ceph health status

SUSE Enterprise Storage 5

Install
- Import unmanaged SES cluster

Configure
- Online Filestore to BlueStore

Manage
- Deploy, configure, assign nodes
- iSCSI target management
- RGW users, buckets, keys
- View, create, delete CephFS
- NFS Ganesha gateway

Monitor
- Grafana dashboards
- Prometheus event alert – email
- CephFS status

Diagnose
- OSD health status

SUSE Enterprise Storage 6

Install
- Initial integration with Kubernetes
- Integration with SUSE Manager
- Integration with SUSE OpenStack

Configure
- Guided upgrade process
- SES client configuration
- Convert EC to replication (visa versa)

Manage
- CIFS Samba gateway
- QoS
- Cache tiering
- Snapshots
- Enhanced Ceph Manager integration
- Enhanced CephFS management
- Internationalization

Monitor
- Role based monitoring/management
- Event alerts
- SNMP traps
- Automatic Metric Reporting phase 1

SUSE Enterprise Storage 7

Install
- Enhanced Kubernetes integration

Configure
- Crush map ruleset assistant
- Ceph cluster topology map

Manage
- CephFS snapshots
- Remote mirror
- Last good configuration rollback

Monitor
- Enhanced Automatic Metric Reporting
- Ceph client performance
- Multiple cluster dashboard

Diagnose
- Guided troubleshooting

Disk to Disk Target Certification

VERITAS

NETBACKUP

commvault

Hewlett Packard Enterprise

VEEAM

File System Use Cases

COMMVAULT VERITAS VEEAM Hewlett Packard Enterprise

Backup
- Solution supported with key backup ISVs (Commvault, Veritas, Veeam, HPE Data Protector)
- Ideal for low RTO & RPO backups*

Archiving
- Supported for healthcare archives, image and video archives, HPC Aachives
- Support ror many open source tools and commercial ISVs (Commvault, Veeam)
- Some customers have to deploy their own home-grown archival solutions

Analytics
- Certified configuration of SUSE Enterprise Storage is available for SAP Hana
- Storage for Hadoop supported through OEM partners

Commercial HPC
- Customers deploying SUSE Enterprise Storage in home directories of HPC clusters with high throughput requirements
- Not supported for low latency applications currently

*SUSE Supports these ISVs with Block and file (thru CephFS). Both Block and File show similar performance.

Home Directories
- Large home directories supported in various use cases
- Examples: HPC storage, application binaries and data (video and images, medical data)
- Linux home directories

Object Storage Use Cases

VERITAS COMMVAULT

Backup

- Solution supported with key backup ISVs (Commvault and Veritas)
- Ideal for high-throughput requirements through S3

Archiving

- Supported and deployed for healthcare archives, image and video archives, HPC archives
- Supported with commercial ISVs (Commvault, etc.) and open source tools (DMF)

Analytics

- Supported through S3A only for Hadoop and Spark
- Repositories for unstructured data (IoT data, log repositories, social data, etc.)

Cloud Storage

- Supported for CSP use cases (modern email, S3 Storage, File Sync and Share etc.)
- Supported with Openstack.* Preferred storage Solution for SUSE Openstack Cloud
- Use cases include image repos. and data storage

*SUSE, with the acquisition of HPE Helion, has over 23% of the marketshare in OpenStack Cloud.

Content Storage and Distribution

- Supported for use cases of video surveillance, repositories and distribution
- Support for multiple protocols (Swift, S3) and 1:1 and 1:Many distribution

Block Use Cases

COMMVAULT VERITAS VEEAM Hewlett Packard Enterprise

Backup

- Solution supported with key backup ISVs (Commvault, Veritas, Veeam, HPE Data Protector, EMC Networker)
- Ideal for low RTO/RPO use cases

Compliance Archives (with iTernity)

- Archiving supported with iCAS for compliance
- Fits requirements of WORM storage

Analytics

- Certified configuration of SUSE Enterprise Storage is available for SAP Hana

Cloud Storage

- Supported with Openstack.* Preferred storage solution for SUSE Openstack Cloud
- Use cases are primary storage (with Cinder)

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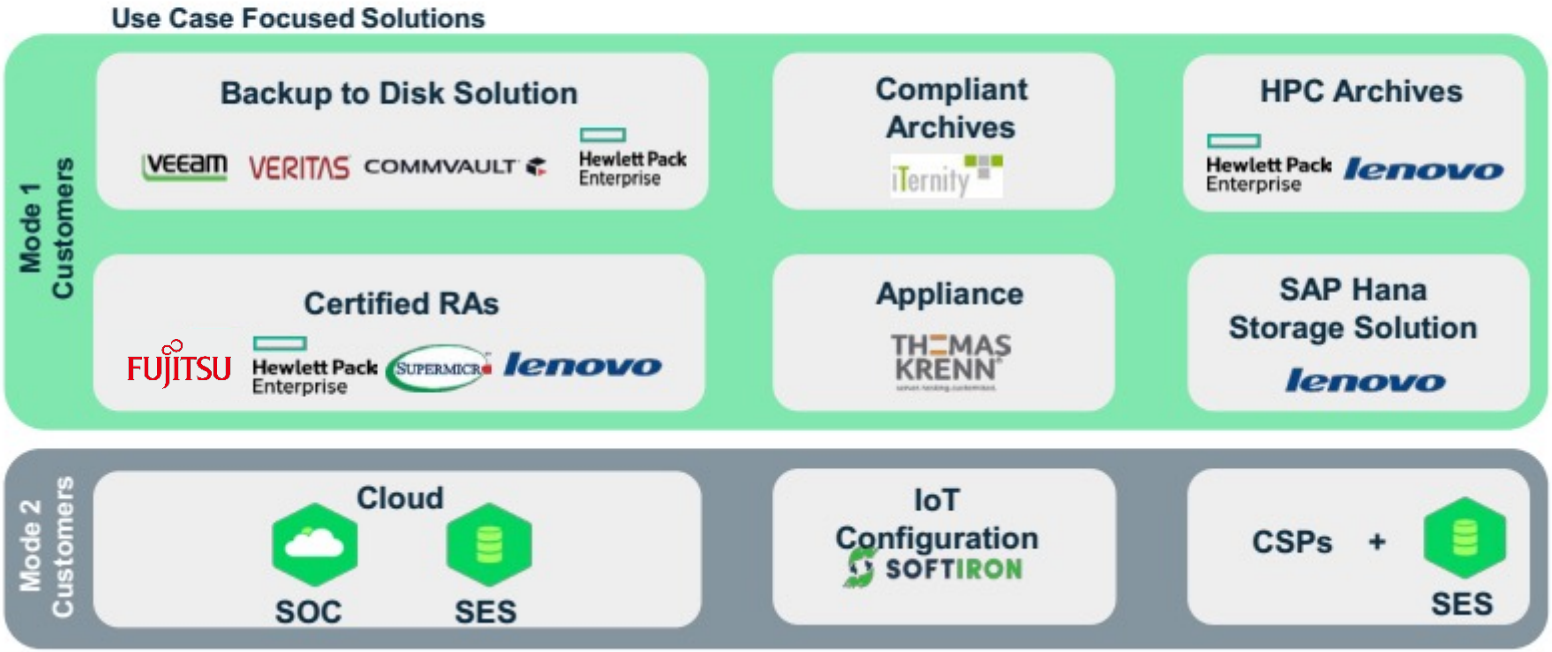
VM

VM Storage

- RBD for KVM
- iSCSI for VMware and Hyper-V

Example SUSE Enterprise Storage Partnerships

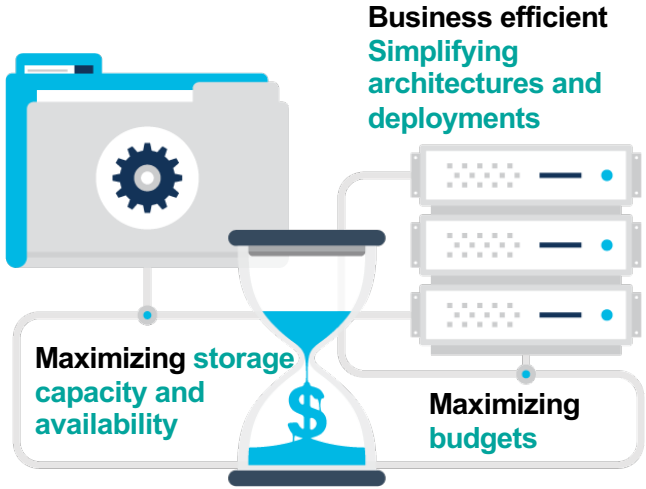


Integration with SUSE's Portfolio

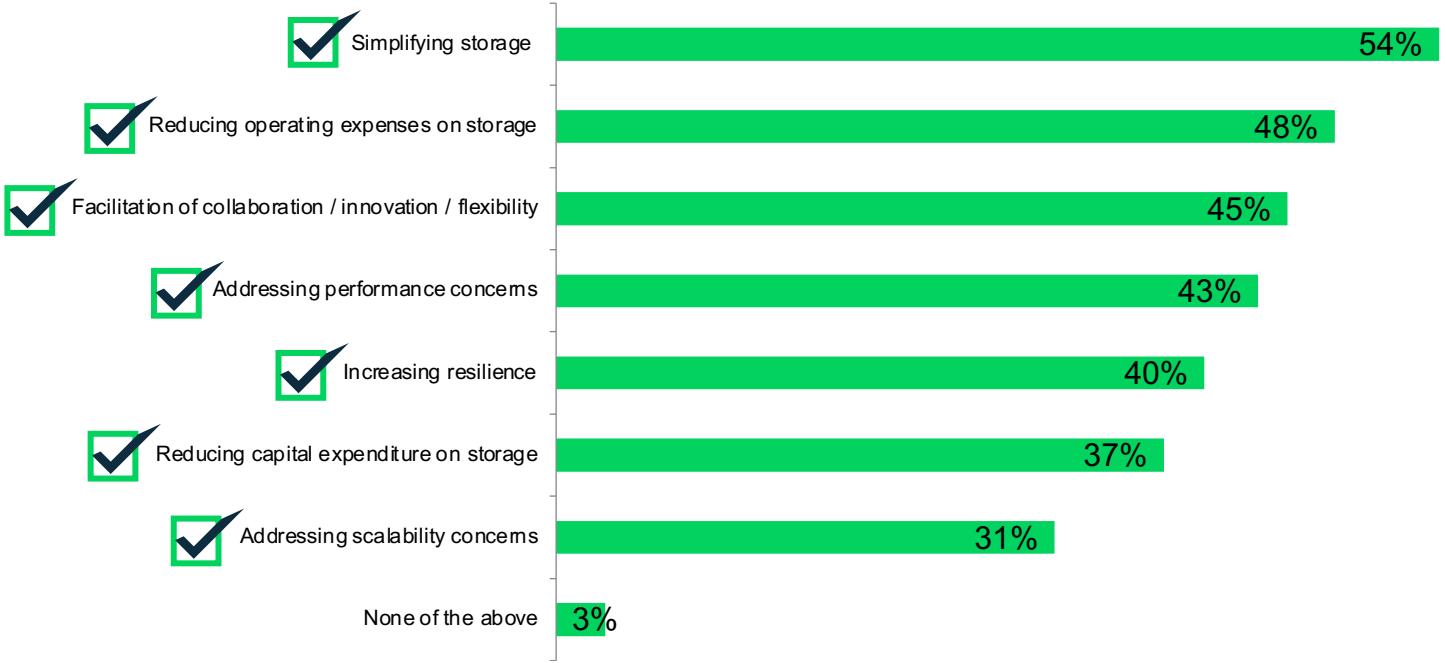
Perfect Technology Match in the Software Defined Datacenter!

- **SUSE Containers as a Service Platform**, with Kubernetes based containers ochestration, supports RBD, iSCSI and CephFS as persistent storage backends. RBD backend format recommended for máximum performance.

- **SUSE OpenStack Platform** has native Ceph integration for core módules like Cinder and Glance. Manila shared filesystem can leverage CephFS and NFS provided by SUSE Enterprise Storage. Get the best performance and the simpliest management connecting your Prive Cloud to SUSE OpenStack Storage!



How Can SUSE Enterprise Storage Help You?



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SUSE Enterprise Storage Deployment

Subscription model

Base Configuration (Priority Subscription)

SUSE Enterprise Storage and limited use of SUSE Linux Enterprise Server to provide:

- 4 storage OSD nodes (1-2 sockets)
- 6 infrastructure nodes

Expansion Node (Priority Subscription)

SUSE Enterprise Storage and limited use of SUSE Linux Enterprise Server to provide:

- 1 SES storage OSD node (1-2 sockets)
- 1 SES infrastructure node

SUSE Enterprise Storage Minimum Configuration

4 SES OSD storage nodes

- 10 Gb Ethernet (2 networks bonded to multiple switches)
- 32 OSD's per storage cluster
- OSD journal can reside on OSD disk
- Dedicated OS disk per OSD storage node
- 1 GB RAM per TB raw OSD capacity for each OSD storage node
- 1.5 GHz per OSD for each OSD storage node
- Monitor nodes, gateway nodes and metadata server node can reside on SES OSD storage nodes:
  - 3 SES monitor nodes (requires SSD for dedicated OS drive)
  - iSCSI gateway, object gateway or metadata server nodes require redundant deployment
  - iSCSI gateway, object gateway or metadata server require incremental 4 GB RAM and 4 Cores

Separate management node

- 4 GB RAM, 4 Core, 1 TB capacity

https://www.suse.com/documentation/ses-3/book_storage_admin/data/cha_ceph_sysreq.html

Recommended Configuration (Production)

7 SES OSD storage nodes (no single node exceeds ~15%)

- 10 Gb Ethernet (4 physical networks bonded to multiple switches)
- 56+ OSDs per storage cluster
- RAID 1 OS disks for each OSD storage node
- SSDs for Journal
  - 6:1 ratio SSD journal to OSD
- 1.5 GB RAM per TB raw OSD capacity for each OSD storage node
- 2 GHz per OSD for each OSD storage node

Dedicated physical nodes for infrastructure nodes:

- 3 SES Monitors; 4 GB RAM , 4 core processor, RAID 1 SSDs for disk
- 1 SES management node; 4GB RAM, 4 core processor, RAID 1 SSDs for disk
- Redundant physical deployment of gateway nodes or metadata server nodes:
  - SES iSCSI gateway nodes 16 GB RAM, 4 core processor, RAID 1 SSDs for disk
  - SES metadata server nodes (one active/one hot standby); 32 GB RAM, 8 core processor, RAID 1 SSDs for disk

https://www.suse.com/documentation/ses-3/book_storage_admin/data/cha_ceph_sysreq.html

Summary

SUSE Enterprise Storage

Business Benefits

SAVINGS: Total cost of ownership

- Reduced CAPEX expenditures
- Reduced OPEX expenditures

FLEXIBILITY: Adaptability to evolving business needs

- Reduced dependency upon proprietary “Locked In” storage

CONFIDENCE: Reliability and availability

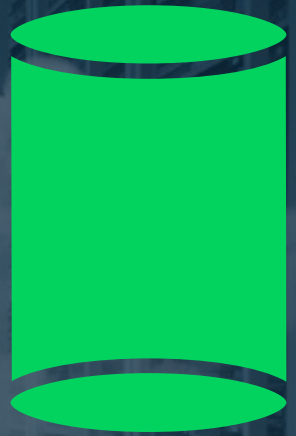
- Leverage SUSE world-class support and services

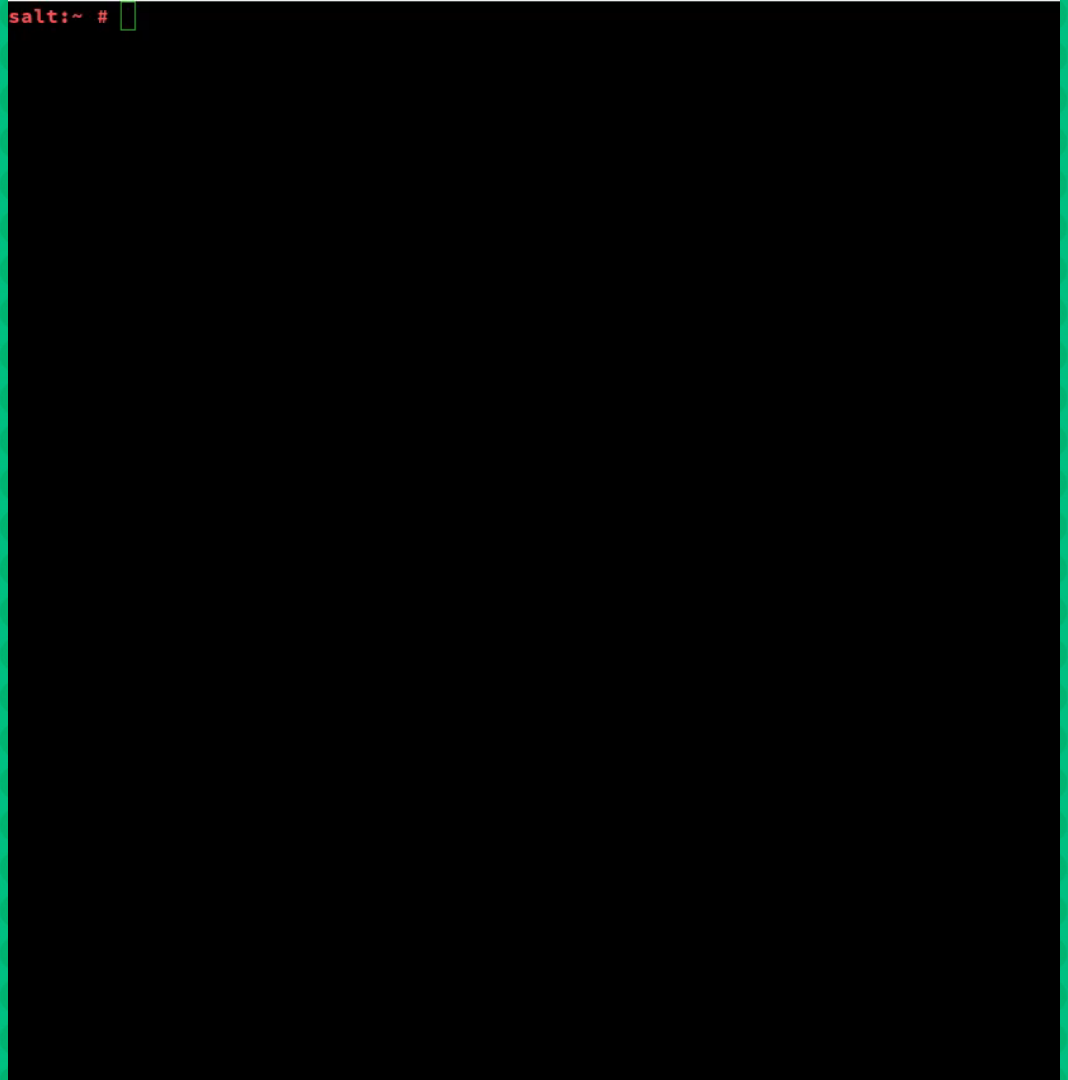
Why SUSE and Software-defined Storage?

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. Customers should expect to receive nothing less than expert support from SUSE for their software-based storage.

Learn more at suse.com/storage/

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