SUSE® Enterprise Storage:
Smart Choice for Disk-to-Disk Backup
You administer an enterprise network, and you’re looking for an efficient and scalable disk-to-disk backup solution that won’t break your budget. You make a list of all the features you need and look for the product that delivers those features with minimum cost and maximum flexibility. You add complications—more data, more clients, interconnected yet geographically dispersed networks. The numbers point to a single solution: SUSE Enterprise Storage.

The List

What is your list of must-have features for an enterprise disk-to-disk backup system? Most experts recommend a system that is:

- **Scalable**—your network won’t remain at a fixed size, and your backup solution shouldn’t either. Any option tailored to a fixed or maximum size is destined to fall short. Look for a solution with linear or near-linear scaling potential.

- **Self-Managing**—time is money, and the more time your staff spends with troubleshooting, rebooting, and reconfiguring is time lost for other essential tasks. Choose a solution that adapts to changing conditions without exacting a tax on corporate resources.

- **Fault-Tolerant**—disaster recovery is too important to leave to secondary, manually configured systems. Your solution should build in fault tolerance that happens automatically—without intervention or oversight.

- **Always On**—backup tapes and off-network storage add overhead and reduce flexibility. Better to keep your data within easy reach.

- **Easy to Upgrade**—don’t put your money into a system you’ll have to replace in 2-3 years—and that requires a time-consuming migration to a new hardware appliance.

SUSE Enterprise Storage delivers all these features without the cost drivers typically associated with high-end functionality. It runs on inexpensive commodity hardware, and most of the components are open source, which means you avoid the high prices and vendor lock-in associated with proprietary solutions. And SUSE Enterprise Storage beats the cost of other enterprise open source alternatives with an innovative licensing model that avoids per-gigabyte storage costs.
What is SUSE Enterprise Storage?

SUSE Enterprise Storage is an enterprise storage environment built on SUSE Enterprise Linux and is built on Ceph open source technology. SUSE Enterprise Storage can appear to the network as a monolithic backup target, offering an easy-to-use interface for backup operations.

*SUSE Enterprise Storage* combines the versatility and flexibility of Ceph with enterprise-grade certification and technical support. Minimal licensing costs, combined with the natural economies of commodity hardware and open source software, minimize acquisition expense. Once your system is running, it’s self-healing, self-managing design minimizes operational expense. A single system admin can manage up to 3-4 PB of data, six times more than an admin in an equivalent block-storage environment.
Figure 1 shows a typical SUSE Enterprise Storage backup scenario. Conceptually, the configuration is quite simple, and this simplicity is part of the cost advantage. A backup server receives data from application servers running on the network. The backup server organizes the data, performing space-saving steps such as deduplication. The storage cluster appears to the backup server as a filesystem, storage device, or object gateway, depending on how you configure the interface. The cluster stores the data in an object-based, fault-tolerant manner, managing the details of data storage and retrieval through an invisible and self-contained process.

Figure 1: Disk-to-disk backup with SUSE Enterprise Storage. (Note: Some networks might prefer to add a tape system or other modifications for additional redundancy or corporate governance reasons.)
Backup Server

The backup server acts as a focal point for the backup process. SUSE Enterprise Storage is certified with a number of commercial backup alternatives, including:

**Micro Focus Data Protector:**

**Veritas NetBackup:**

**Commvault:**
http://www.commvault.com/

**Veeam:**
https://www.veeam.com/

If you already use one of these enterprise backup applications on your network, you can continue to use it with SUSE Enterprise Storage. If you are considering one of these solutions for the first time, be aware that SUSE is certified with all of these backup alternatives.

SUSE Enterprise Storage will also work with other backup solutions. The SUSE technical support team will help you understand the details of integrating your backup solution with SUSE Enterprise Storage.

You can use a single backup server or set up additional backup servers to create multiple paths to the backup archive (Figure 2). Additional servers reduce the total time for the backup and help you adapt to geographic constraints. The near-linear scaling provided with SUSE Enterprise Storage makes it easy to dial up throughput (TBs/hr). As capacity is added to the cluster, available performance goes up, and thus bottlenecks are avoided.

Because the interface to the cluster takes a simple and well-known form, the backup operator can focus on configuring and managing the backup process without getting involved with the details of the SUSE Enterprise Storage architecture.

**Interfaces**

The interface from the backup server to the SUSE Enterprise Storage cluster can take several different forms. You can tailor the interface to your existing network, choosing the form that fits best with your configuration. The SUSE Enterprise Storage interface options include:

**RADOS Block Device (RBD)**—the cluster appears as a network block device accessed through Ceph’s native RBD protocol.

**CephFS filesystem**—the cluster takes the form of a network filesystem.

**iSCSI**—the interface takes the form of a network block device accessed through the industry standard iSCSI protocol.

**Object Gateway**—an object-based storage gateway typically used with cloud-based storage systems such as Amazon S3 or OpenStack Swift.

The choice of protocol will depend on the architecture and needs of your backup environment. If the backup servers

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**Figure 2:** Multiple backup servers can access the same cluster to increase throughput or optimize for geographic constraints. Scaling up throughput can improve performance and eliminate bottlenecks.
run on Linux and require a shared file backend, CephFS makes perfect sense. If however, each backup server writes to its own storage, then RBD or iSCSI make the most sense. RBD is clearly preferred as it is client-cluster vs client-server. This means that a client using RBD writes directly to each storage device in the cluster, making it scale in a more linear manner. ISCSI provides a more universal protocol that is load balanced across a number of gateway nodes.

The newest connection technology coming to most backup applications is S3. This protocol is designed to be able to support WAN latency and massive scale. Being optimized for transfers made in large chunks known as objects, makes it the perfect match for backup applications.

**SUSE Enterprise Storage Cluster**

The underlying Ceph technology in SUSE Enterprise Storage uses an object storage model for inexpensive and highly scalable storage. It relies on a hash system for storing and retrieving data from the cluster, thus eliminating the overhead and performance bottleneck associated with a lookup table or other centralized component. See the box titled “How Ceph Stores Data” for a quick look at what happens inside the cluster.

SUSE Enterprise Storage is easy to set up and configure, usually requiring less than two hours of configuration time once the hardware is unpacked and ready. Your cluster will need a minimum of four storage nodes. Although it is theoretically possible to run in a virtual environment, SUSE recommends that you place the nodes on separate hardware-based systems for performance reasons.

Your cluster will also need at least one admin node. For small clusters, the admin node can run on one of the storage systems. On larger clusters, the admin node could be a second physical server. The admin node manages the cluster and serves as a central point for deploying software updates. The storage nodes hold and maintain the Ceph object store.

Each storage node runs one or more Object Storage Daemons (OSDs). The OSDs hold the data stored in the archive. Your archive will also need three or more monitor daemons. The monitor daemons maintain a map of the cluster that provides the information necessary to store and retrieve the data. In small clusters, a monitor daemon could simply be a process running on a storage node. The monitor daemon can also run on a separate monitor node for higher capacity systems.
How SUSE Enterprise Storage Stores Data

SUSE Enterprise Storage stores data in a safe and highly efficient manner. The software handles the details of the storage automatically, so you’ll never have to trace through all the steps manually, but if you’re wondering what happens under the hood, the OSDs in the cluster are organized into placement groups, and the placement groups are organized into pools. The client writes data to a pool, and the storage software uses a hash function to determine which placement group within the pool will receive the data. Further processing within the placement group determines which OSD will receive the data.

The monitor daemons hold a map of the cluster called the CRUSH map, with a system of rules for traversing the hierarchy known as the CRUSH algorithm. OSDs regularly check the health of other OSDs and send the information to the monitors. If an OSD goes down, the monitors incorporate the new status information into new versions of the CRUSH map.

SUSE Enterprise Storage defaults to data replication and also offers the option of erasure coding for fault tolerance. Either alternative ensures that a lost OSD will not result in data loss.

For more on the data storage process, see the “SUSE Enterprise Storage Technical Overview.”

Self-Healing

SUSE Enterprise Storage is designed to manage itself and respond to changing conditions within the cluster. If a node goes down, the storage software automatically redistributes the workload, relying on the built-in fault tolerance to ensure that no data is lost. If you add a node to the cluster, the storage system incorporates the new node into the storage system and distributes data to it.
Lowest-in-Class TCO

As your data needs increase, you can keep adding new nodes to the cluster for near-linear scaling. SUSE’s innovative subscription model means you won’t owe per-gigabyte storage fees as your network grows. Just buy another server and add another SUSE Enterprise Storage server subscription.

Inexpensive acquisition cost, low maintenance costs, and avoidance of the costly capacity-based licensing used throughout the storage industry lead to a lowest-in-class Total Cost of Ownership (TCO) for SUSE Enterprise Storage.

A recent study of eight leading backup solutions showed SUSE Enterprise Storage at less than half the cost of Red Hat Enterprise storage for an equivalent configuration—and 20% less than the least expensive alternative. See https://itbrandpulse.com/enterprise-storage-tco-case-study/ for more information.

Setting Up Your SUSE Enterprise Storage

The “SUSE Enterprise Storage Administration and Deployment Guide” provides step-by-step instructions for setting up your Ceph cluster. Start by installing SUSE Enterprise Storage on the admin node, and you can use network installation to configure the other nodes on the cluster. You’ll also need to set up the Network Time Protocol (NTP) on your system, turn off any firewalls that are active within the cluster, and install an SSH server.

Once your systems are up and running, you can use DeepSea to configure your cluster using a few simple commands.

DeepSea is a collection of scripts and components based on the Salt configuration management framework. “See the SUSE Enterprise Storage Administration and Deployment Guide” for a closer look at how to configure your Ceph cluster with DeepSea.

The technical team at SUSE will help you with understanding and organizing your SUSE Enterprise Storage installation and deployment.

Managing

SUSE Enterprise Storage comes with some simple command-line utilities for managing the cluster. You can use systemctl to start and stop services and gather status information. For instance, the following command:

- `systemctl start target`

starts the service specified as target. The ceph command, which has several subcommands and options, is also useful for managing users and status information.

If you prefer to work in a GUI, use the openATTIC storage management tool to manage your Ceph cluster from a single central interface. SUSE sponsors and maintains the openATTIC project, and openATTIC’s intuitive web interface is well integrated with the SUSE Enterprise Storage environment.

The openATTIC dashboard (Figure 3) provides status information on the Ceph cluster.

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**Figure 3:** OpenATTIC provides a convenient graphic interface for managing the Ceph cluster.
Setting Up Multiple Sites

As your data needs increase, you can keep adding new Many companies have policies requiring off-site redundant storage of backup data. Other organizations have multiple offices and require a unified solution for backup across different locations. The human overhead for maintaining tape storage and transporting tapes to off-site locations is a principle Total Cost of Ownership (TCO) driver for many organizations.

SUSE Enterprise Storage provides an effortless solution for off-site redundant backup using the object gateway. You can configure the object gateway as an interface for either the Amazon S3 or OpenStack Swift object storage formats.

As shown in Figure 4, you can use the object gateway to combine the Ceph resources from different sites into a single cluster, or you can operate the offsite location as a separate cluster and mirror data to it. Once you finish configuring the multi-site backup system, it will operate automatically with minimal need for management or oversight.

Figure 4: Use the object gateway interface to combine two locations into one cluster or to back up to a second cluster at an offsite location.
Conclusion

SUSE Enterprise Storage is a comprehensive solution for your enterprise disk-to-disk backup needs, providing:

• Accessible, always-on storage
• Easy and inexpensive upgrades
• Built-in fault tolerance
• A self-managing architecture for minimal overhead
• High performance with near-linear scaling to ultra-high-capacity environments
• Lowest-in-class total cost of ownership

SUSE adds advanced technical support, hardware certification, and a highly efficient licensing model with no per-gigabyte storage costs, so you’ll never pay more just for saving more data.

Contact your SUSE representative for more on SUSE Enterprise Storage as a solution for disk-to-disk backup.

1-800-796-3700 (U.S. and Canada)
1-801-861-4500 (Worldwide)

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