Ceph as Software-Define Storage (SDS)

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Mahmoud Shiri Varamini
(RHCSA-RHCE-ITILv3-Advance Bash Scripting)

shirivaramini@gmail.com

Agenda

- Software Define Storage:The Future of Storage
- RedHat Ceph Storage A platform for petabyte-scale storage
- Ceph Architecture and Components
- Real World Red Hat Ceph Storage
- Reference
- Questions

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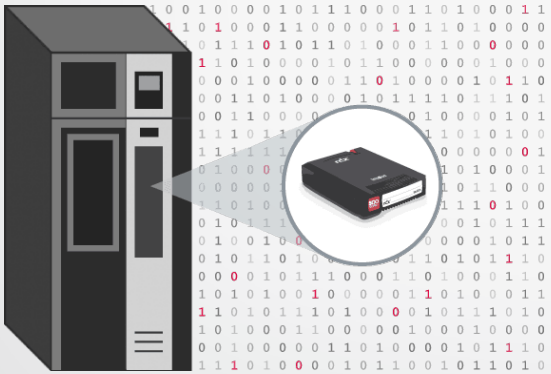
Software Define Storage: The Future of Storage

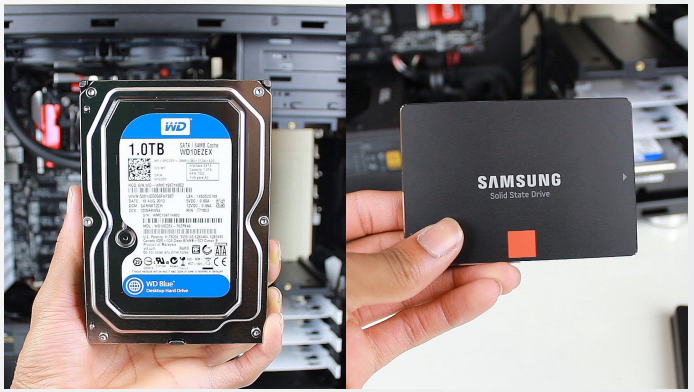
What's data storage?(1)

- **data storage** is the place where data is held in an electromagnetic or optical or mechanical form for **access by a computer processor**.

What's data storage?(2)

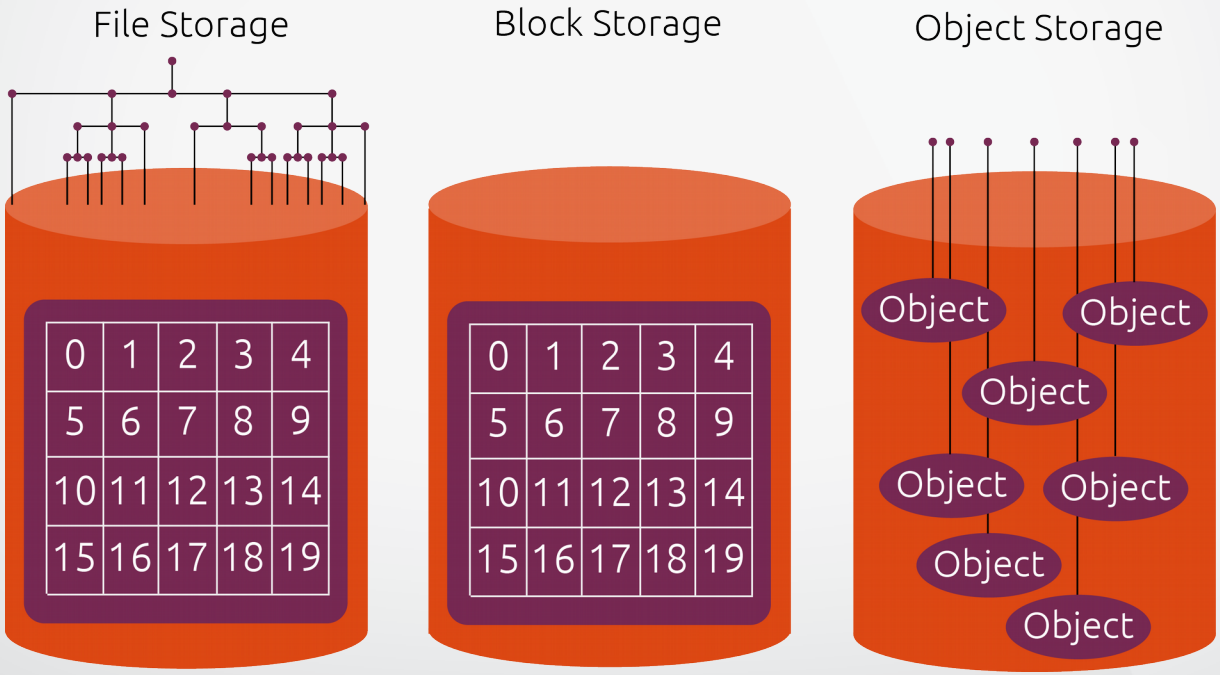
Storage is used to describe the devices and data connected to the computer through **Input/Output (I/O) operations**. hard disk and tape systems and other forms of storage that don't include **computer memory** and other **in-computer storage**.





Type of Storage(1)

- File-level storage
- Block-level storage
- Object storage



Type of Storage(2)

- Data model (structured vs unstructured)
- Protocol (NFS,SMB,iSCSI,FC)
- Type of access (locally,remote)
- Access data (server,network,API)
- Caching and meta data mechanism
- Performance and Scability
- Use case (physical,virtual,cloud)
- Real world scenario

What Exactly is Software Defined Storage?

- Software-Defined Storage (SDS) **separates** the **storage software from the storage hardware**.
- a model that allows organizations to buy storage hardware systems from multiple vendors that address specific use cases but have the ability to operate, not just manage, them from a single interface.

Why consider software-defined storage (SDS)?

- Traditional data storage cannot overcome today's challenges of **scale**, **integration** and **flexibility**.
- Simply adding **storage capacity** drives up costs for both storage and management.
- Manually managing across **heterogeneous storage systems**, **silos and clouds** increases administrative **overhead**.
- Cloud environments and analytics, mobile and social applications **require efficient, scalable solutions** that deliver more value from data.

software-defined storage pros

Why are 60% of firms already committed to an SDS approach?

Increased flexibility

You can use a mix of heterogeneous hardware to meet changing demands.

Automated management

Policy-driven control helps put data in the right place at the right time at the right cost, automatically.

Cost efficiency

Using standards-based hardware, you can lower both acquisition costs and total cost of ownership.

Unlimited scalability

You can scale out your storage infrastructure and still manage it as a single enterprise-class system.

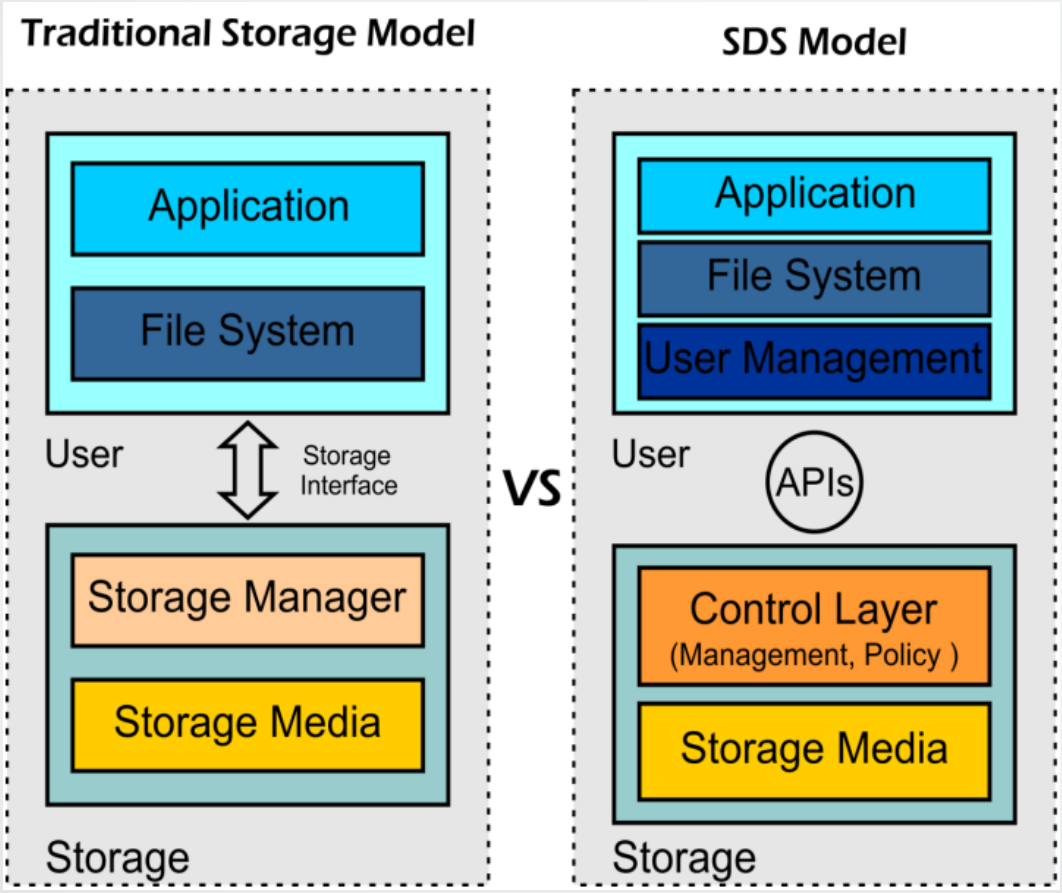
Enhanced agility

You can rapidly update your storage infrastructure to keep pace with business demands.

Minimal vendor lock-in

Heterogeneous hardware and open APIs mitigate vendor lock-in and enable the automation of infrastructure provisioning.

traditional storage model vs SDS model



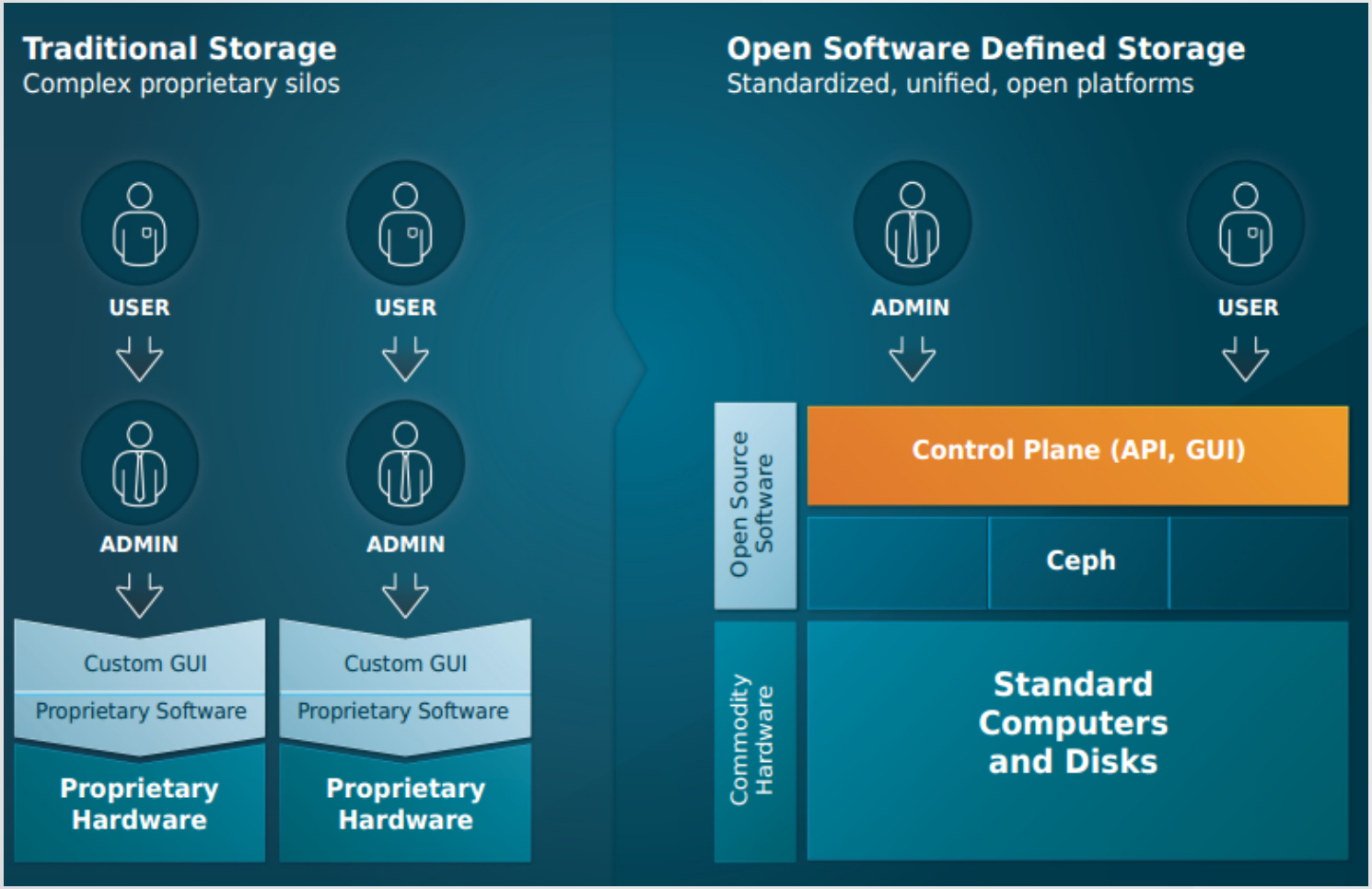
Benefits of SDS

- **Bring your own hardware**: take advantage of commodity prices.
- **Built-in “IT Deflation**”: keep up with the increased demand for storage.
- **Hardware independent**: lives on beyond the life of the hardware.
- **Flexibility to scale**: as much or as little as required.
- **Low ongoing costs**: perpetual license followed by annual maintenance.
- **Gain new features**: just by upgrading the software.
- **Simplified management**: compute and storage managed together.

Limitations of SDS

- **more components to manage** (as software and hardware are independent)
- **Solutions are typically less mature**, hardened and sophisticated than traditional storage arrays (they have not been around for as long)
- **May require more infrastructure** to match the low latency and high performance of a storage array (as it is a distributed architecture)

THE FUTURE OF STORAGE



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RedHat Ceph Storage
A platform for petabyte-scale storage

Red Hat Ceph Storage Overview

Ceph is an **open source project**, which provides **software-defined**, unified storage solutions. Ceph is a **distributed storage system** which is **massively scalable** and **high-performing** without any **single point of failure**. From the roots, it has been designed to be highly scalable, up to exabyte level and beyond while running on **general-purpose** commodity hardware.

Ceph Releases

There are three to four stable releases a year:

- Long Term Stable: until the next two LTS are published
- Stable release until the next stable release is published
- Development / testing release: no backports

x.**0**.z - development releases (for early testers and the brave at heart)

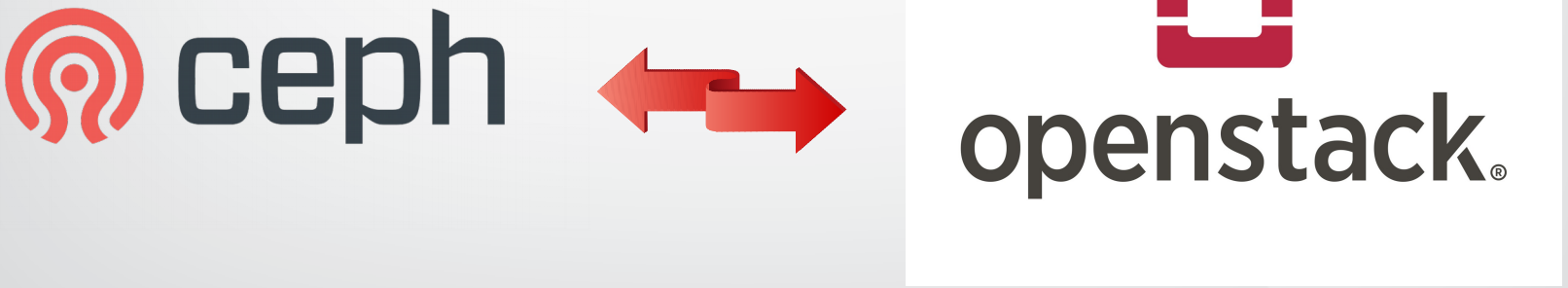
x.**1**.z - release candidates (for test clusters, brave users)

x.**2**.z - stable/bugfix releases (for users)

	Dumpling LTS	Emperor Stable	Firefly LTS	Giant Stable	Hammer LTS	Infernalis Stable	Jewel LTS	Kraken Stable
First release	August 2013	November 2013	May 2014	October 2014	April 2015	November 2015	April 2016	January 2017
Estimated retirement	March 2015		January 2016		May 2017		November 2017	
Actual retirement	May 2015	May 2014	April 2016	April 2015		April 2016		

Red Hat Ceph Storage Use cases

Red Hat Ceph Storage is specifically designed for today's **modern workloads**_like **OpenStack** and data analytics—as well as rich media and archival storage.it can adapt to growing **cloud infrastructures**, serve as a massively scalable **object storage system**, simplify **media repositories**, and simplify **backup and recovery**.

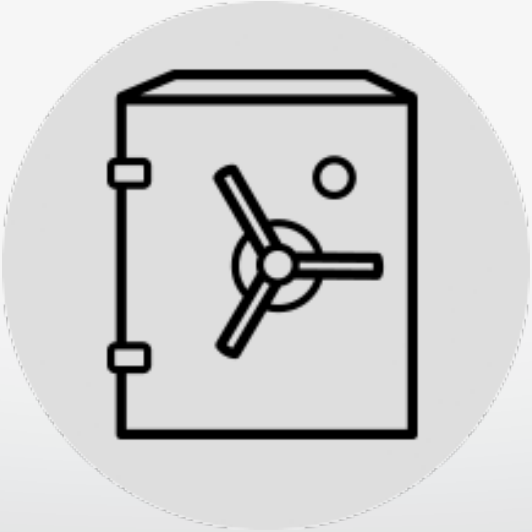


Red Hat Ceph Storage Use cases: Cloud infrastructure

- expected to **react quickly to changing infrastructure** demands—that's just the nature of today's IT.
- cloud infrastructure needs **scale-out storage**, and the best option for that is Ceph. Red Hat **Ceph Storage is tightly integrated with OpenStack** and scales with user needs.

Red Hat Ceph Storage Use cases: Backup and recovery

- Datacenters have been backing data up and recovering files for decades.backup and recovery are still high among IT concerns.
- Ceph Storage can **replace tape libraries** or **expensive, proprietary storage arrays**. Deployed in cluster networks,Ceph Storage will run—by default—a failure-recovery processes and replicate objects 3 times over.



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Ceph Architecture and Components

Red Hat Ceph Storage

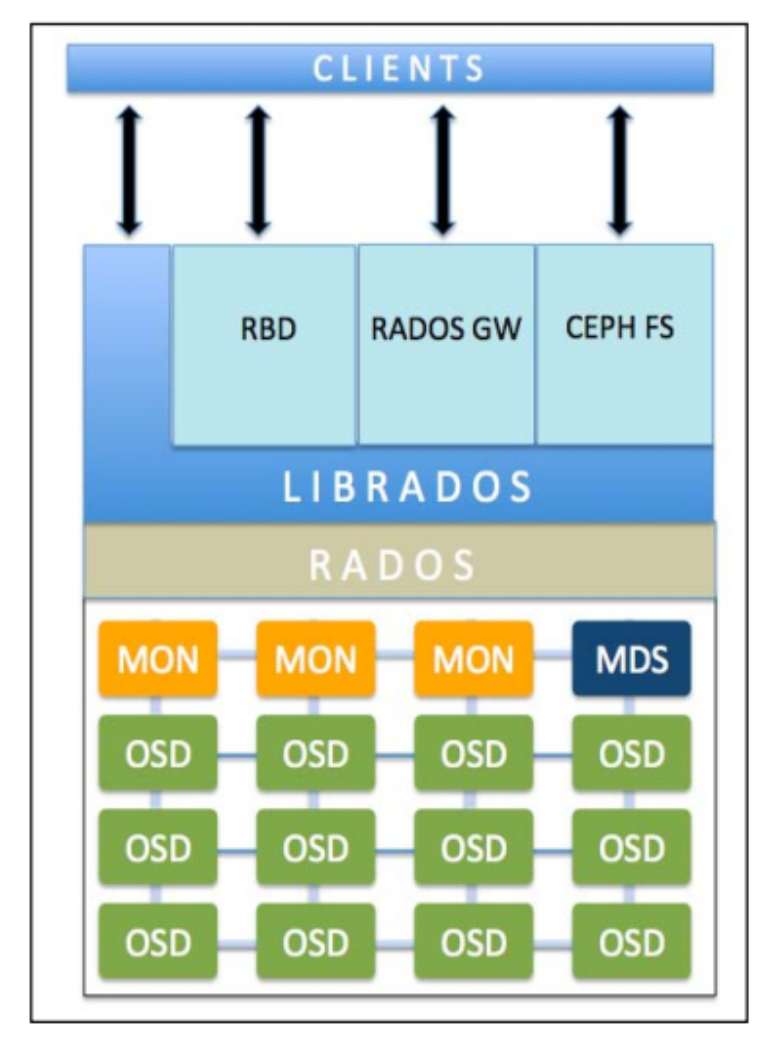
we will cover the following topics:

- Ceph storage architecture
- Ceph Reliable Autonomic Distributed Object Store (RADOS)
- Ceph Object Storage Device (OSD)
- Ceph monitors (MON)
- librados
- The Ceph block storage
- Ceph Object Gateway
- Ceph MDS and CephFS

Ceph storage architecture (1)

- Ceph storage cluster is **made up of several different software daemons.**
- Each of these daemons takes care of **unique Ceph functionalities** and **adds values to its corresponding components** and Each of these daemons is **separated from the others**.
- This is one of the things that keeps Ceph cluster storage **costs down** when compared to an enterprise, **proprietary black box storage system.**

Ceph storage architecture (2)



Reliable Autonomic Distributed Object Store (RADOS)

- is the **foundation of the Ceph storage cluster.**
- Everything in Ceph is stored in the **form of objects**, and the RADOS object store is **responsible for storing these objects**, irrespective of their data type.
- The RADOS layer **makes sure that data always remains in a consistent state and is reliable**.
- For data **consistency**, it performs **data replication**, **failure detection**, and **recovery**, as well as data migration and rebalancing across cluster nodes.

Object Storage Device (OSD)

- As soon as your application issues a write operation to your Ceph cluster, **data gets stored in Ceph Object Storage Device (OSD)** in the **form of objects**.
- Only component of a Ceph cluster where actual user data is stored and the same data is retrieved when a client issues a read operation.
- usually, **one OSD daemon** is tied to **one physical disk of your cluster**.
- the total number of physical disks in your Ceph cluster is the number of OSD daemons working underneath to store user data to each physical disk.

Ceph monitors (MONs)

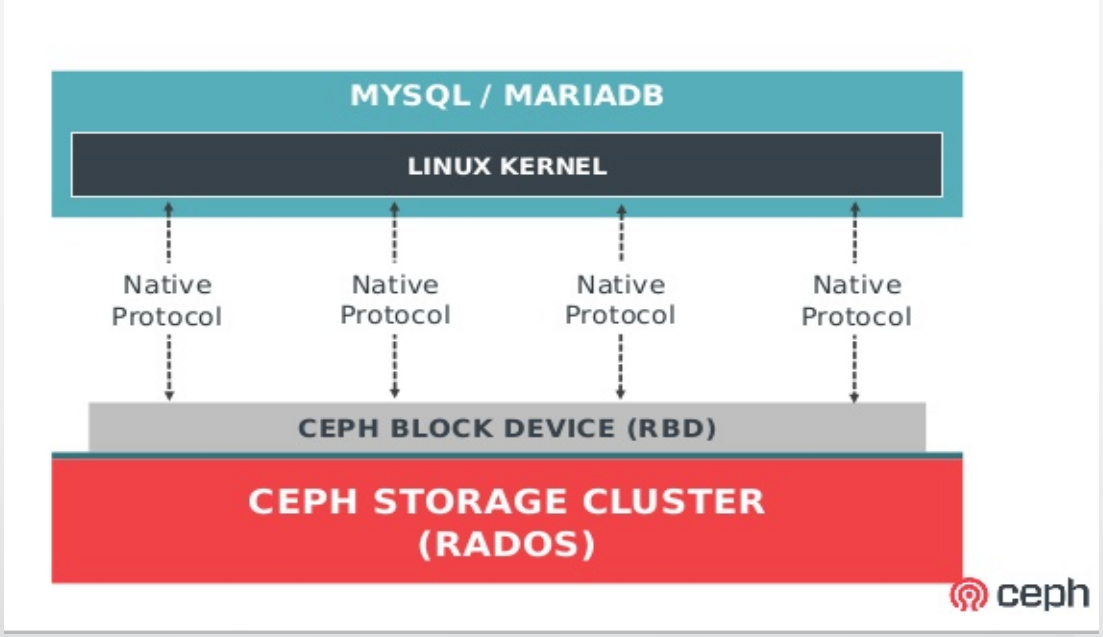
- **track the health** of the entire cluster **by keeping a map** of the cluster state, which includes OSD, MON, PG, and CRUSH maps.
- All the cluster nodes **report to monitor nodes** and **share information** about **every change in their state**.
- maintains a separate map of information for each component.
- does not store actual data; this is the job of OSD

Librados

- The **librados library** is a convenient **way to get access to RADOS** with the support of the PHP, Ruby, Java, Python, C, and C++ programming languages.
- provides a **native interface to the Ceph storage cluste**r, RADOS, and a base for other services such as RBD, RGW, as well as the POSIX interface for CephFS.
- **librados API supports direct access to RADOS** and enables you to **create your own interface** to the Ceph storage cluster.

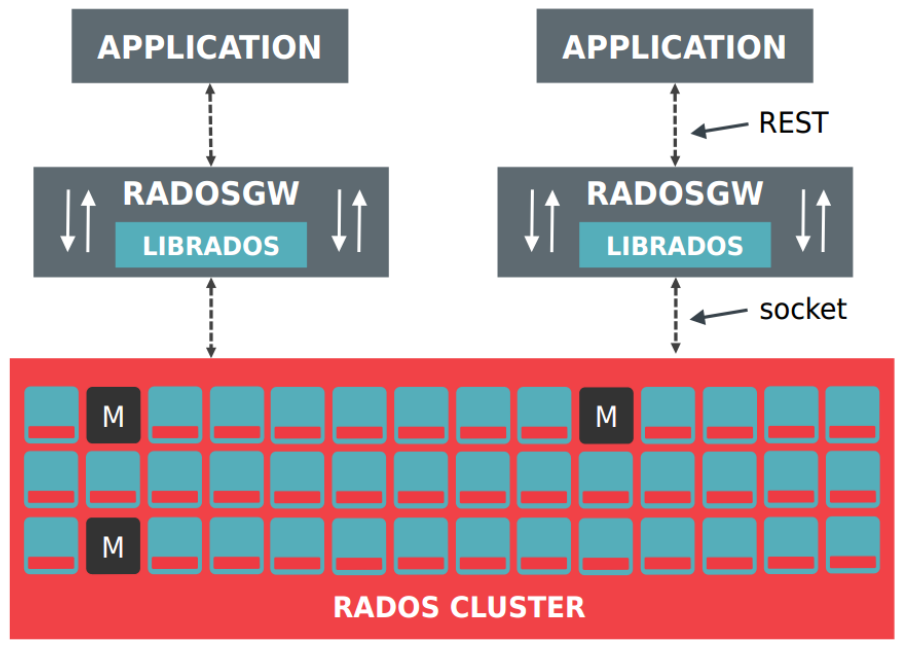
Ceph Block Device

- known as **RADOS block device (RBD)**, provides **block storage**, which can be mapped, formatted, and mounted just like any other disk to the server.
- Ceph block device is equipped with enterprise storage features such as thin provisioning and snapshots.



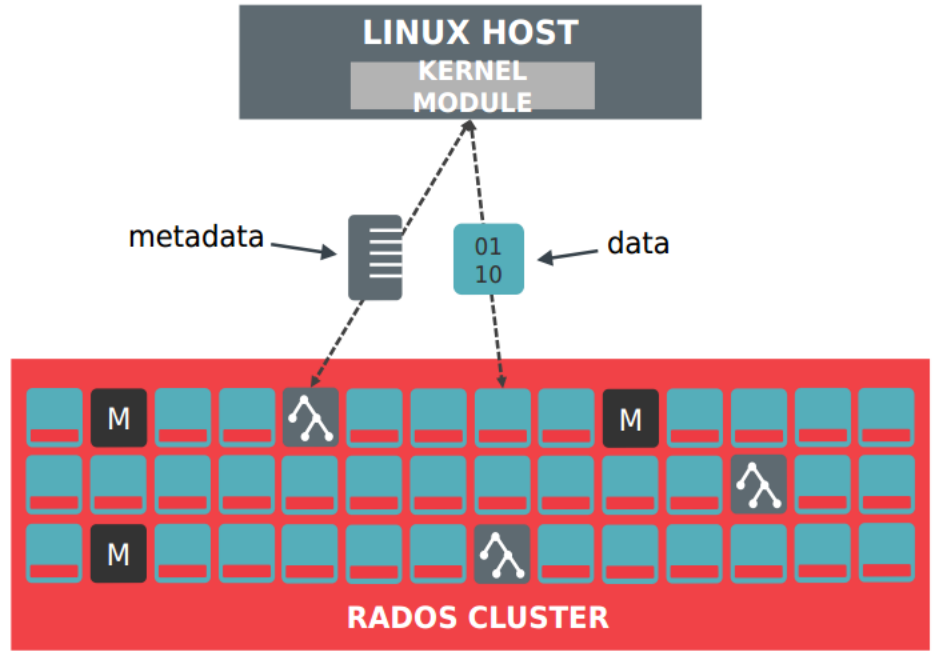
Ceph Object Gateway

- also known as RADOS gateway (RGW), provides a **RESTful API** interface, which is **compatible with Amazon S3** (Simple Storage Service) and OpenStack Object Storage API (Swift).
- RGW also supports the multitenancy and OpenStack Keystone authentication services.



Ceph Metadata Server (MDS)

- keeps **track of file hierarchy and stores metadata only for CephFS**.
- **Manages metadata for a POSIX-compliant shared filesystem**
- File metadata (owner, timestamps, mode, etc.)
- Stores metadata in RADOS



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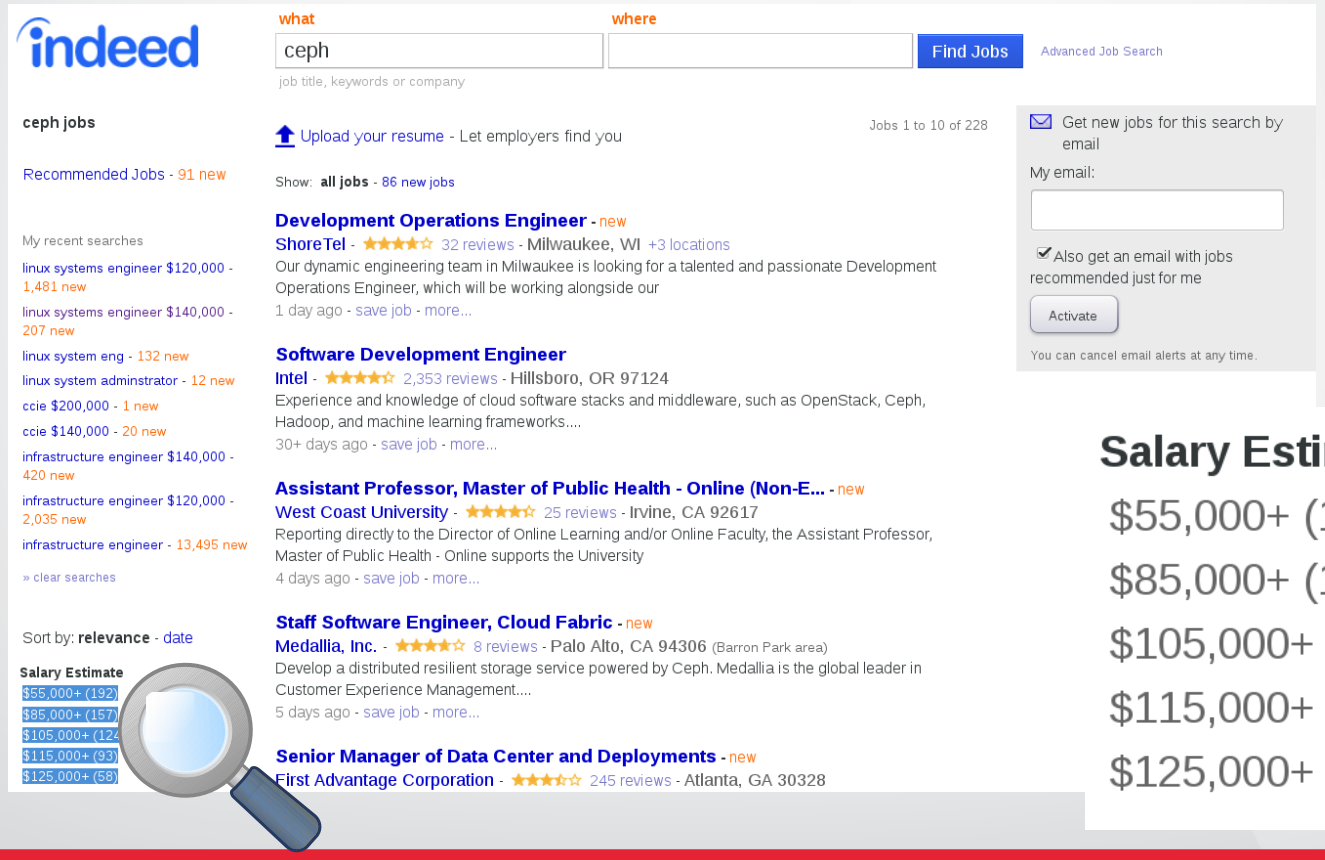
Real World Red Hat Ceph Storage

International Users

- Many different individuals and organizations are making long-term strategic bets on Ceph, and that number is growing every day!

Red Hat Ceph storage specialist job opportunity and Salary

According indeed.com , almost 620 jobs opportunity active on U.S.A that 9.2% of them earn more than 125000$ per year!!



What Now?

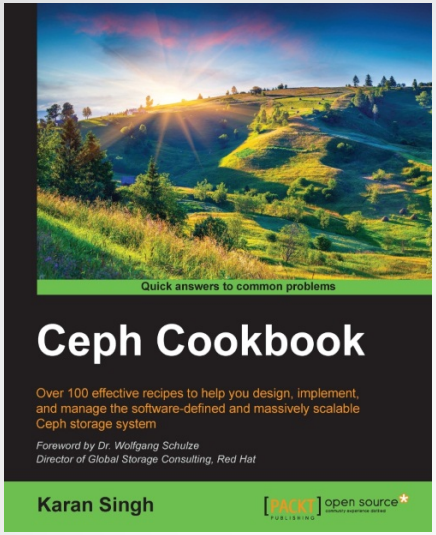
Getting Started with Ceph

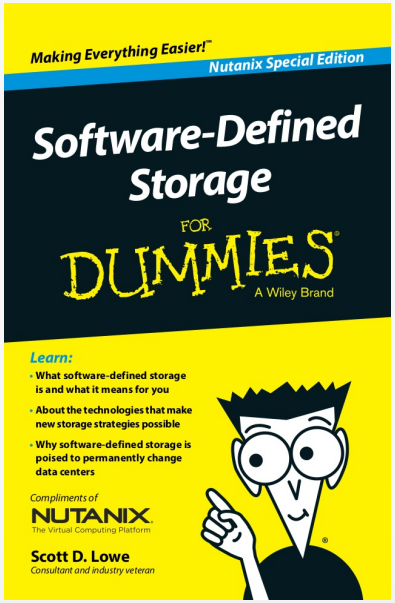
- Read about the latest version of Ceph: http://ceph.com/**docs**
- Deploy a test cluster using ceph-deploy: http://ceph.com/**qsg**
- Deploy a test cluster on the AWS free-tier using Juju: http://ceph.com/juju
- Ansible playbooks for Ceph: https://www.github.com/alfredodeza/ceph-ansible

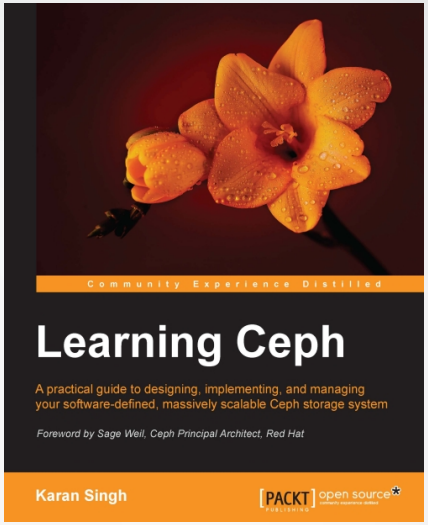
Getting Involved with Ceph

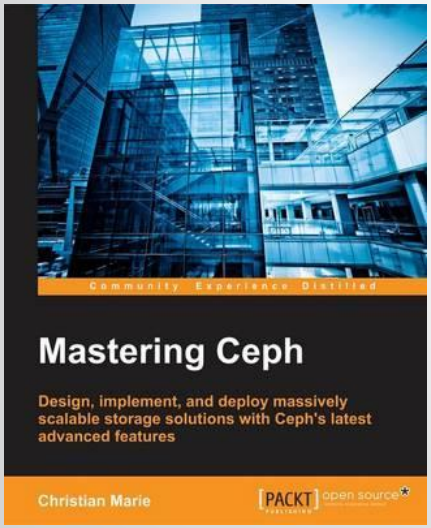
- Most discussion happens on the mailing lists ceph-devel and ceph-users. Join or view archives at http://ceph.com/list
- IRC is a great place to get help (or help others!) #ceph and #ceph-devel. Details and logs at http://ceph.com/irc
- Download the code: http://www.github.com/ceph
- The tracker manages bugs and feature requests. Register and start looking around at http://tracker.ceph.com
- Doc updates and suggestions are always welcome. Learn how to contribute docs at http://ceph.com/docwriting

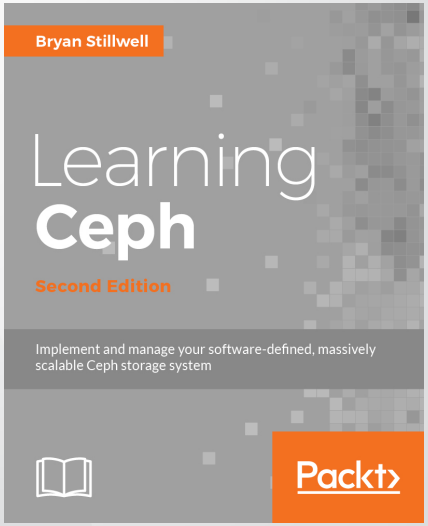
To Learn More











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