

CEPH WORKSHOP

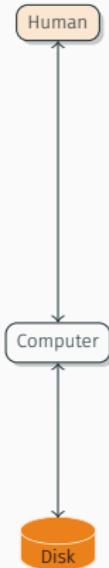
GridKA School 2015

Diana Gudu

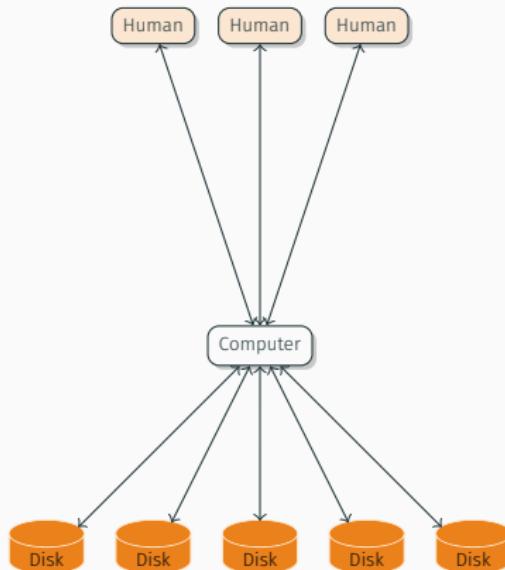
August 7, 2015

Karlsruhe Institute of Technology

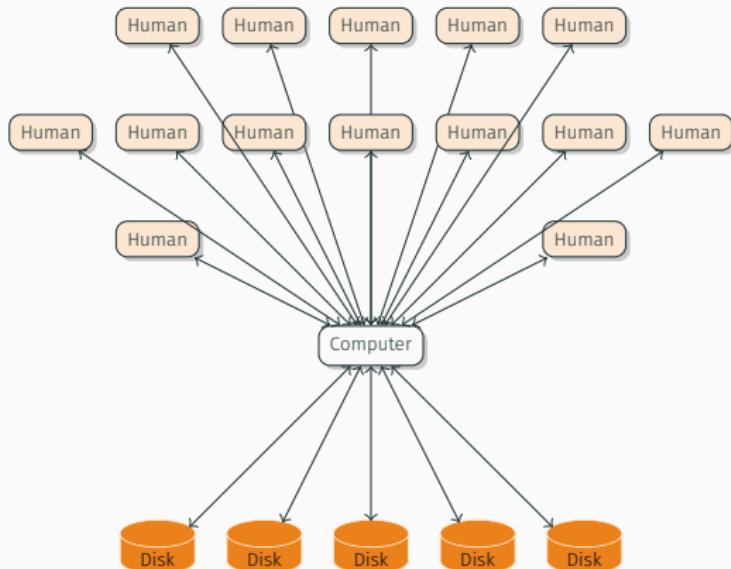
EVOLUTION OF STORAGE



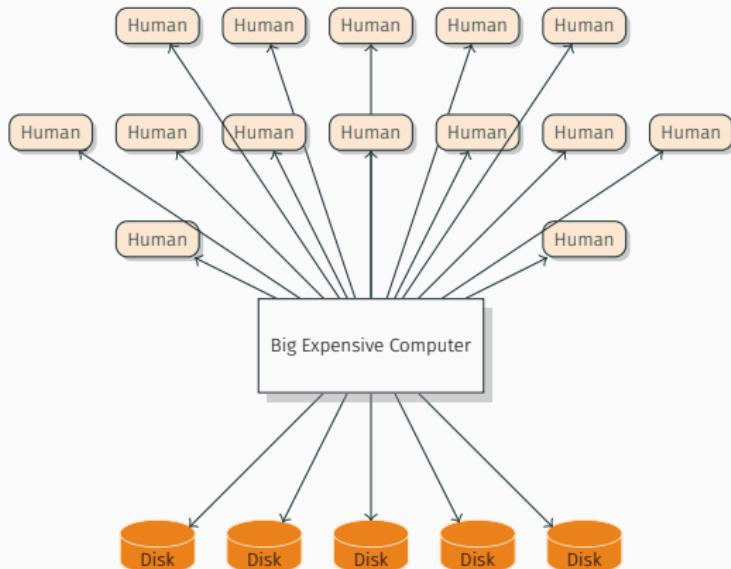
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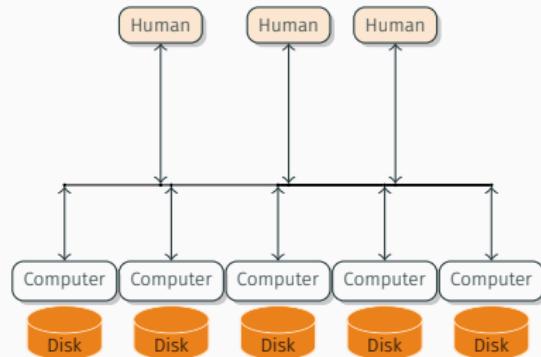
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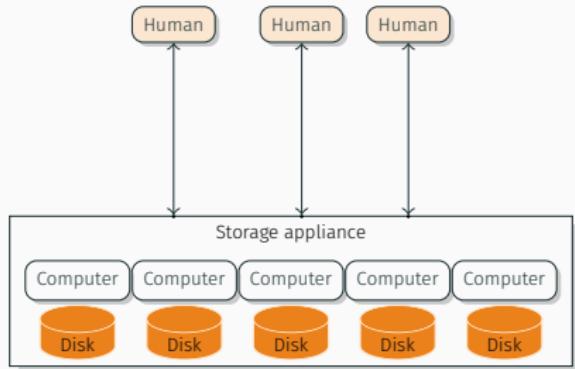
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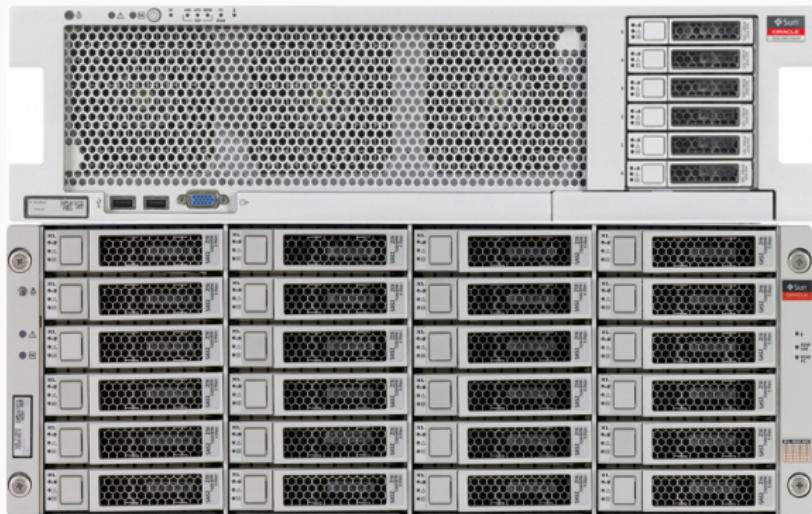
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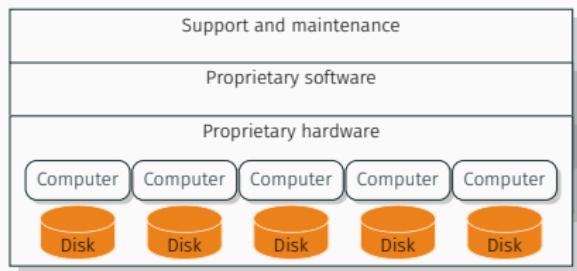


STORAGE APPLIANCE

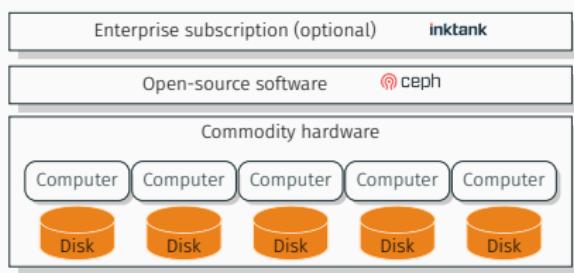
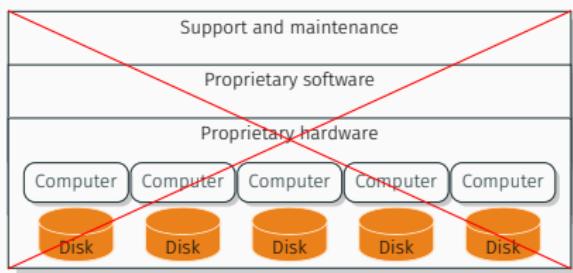


Oracle <http://www.e-business.com/zfs-7420-storage-appliance>

FUTURE OF STORAGE



FUTURE OF STORAGE



CEPH

Philosophy

- open-source

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- community focused

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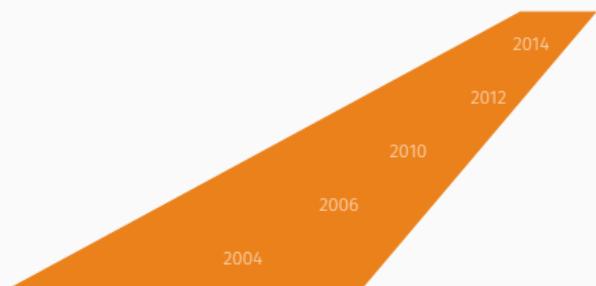
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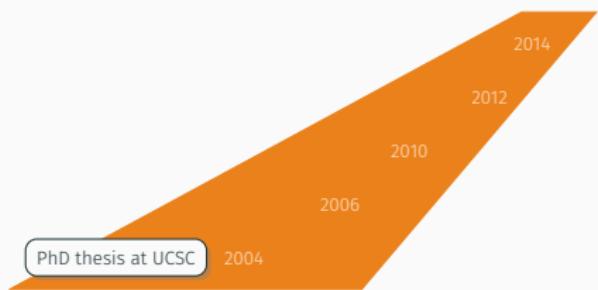
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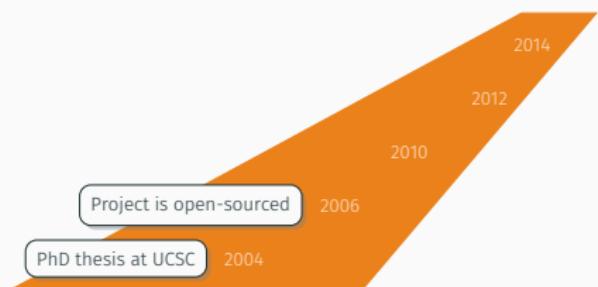
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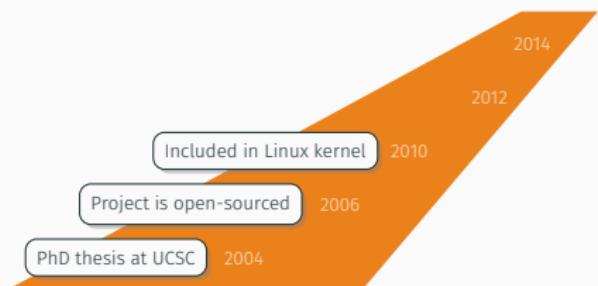
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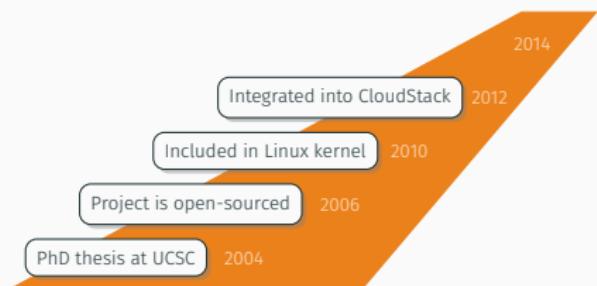
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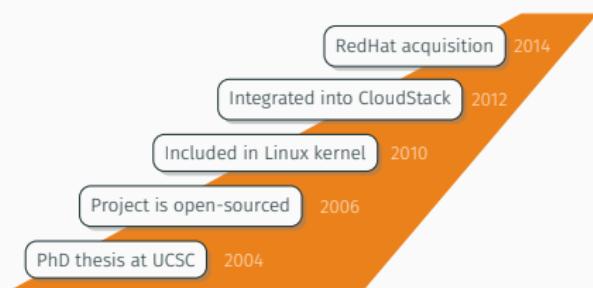
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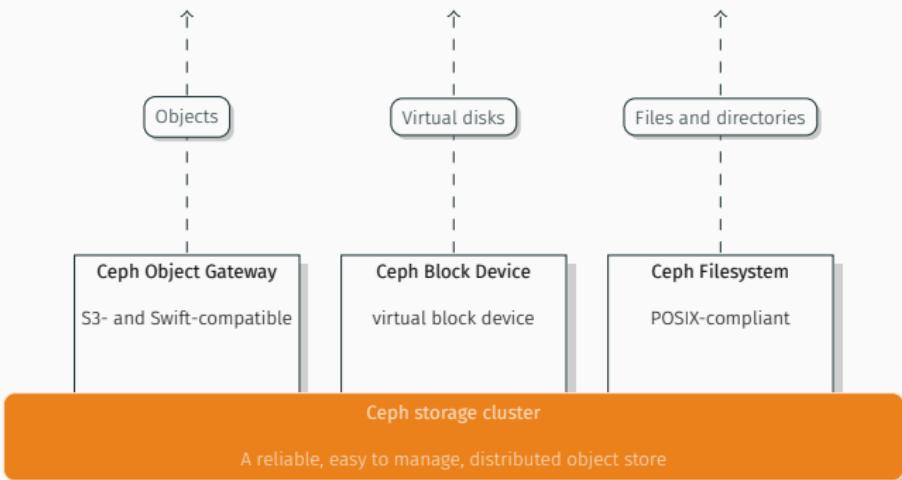
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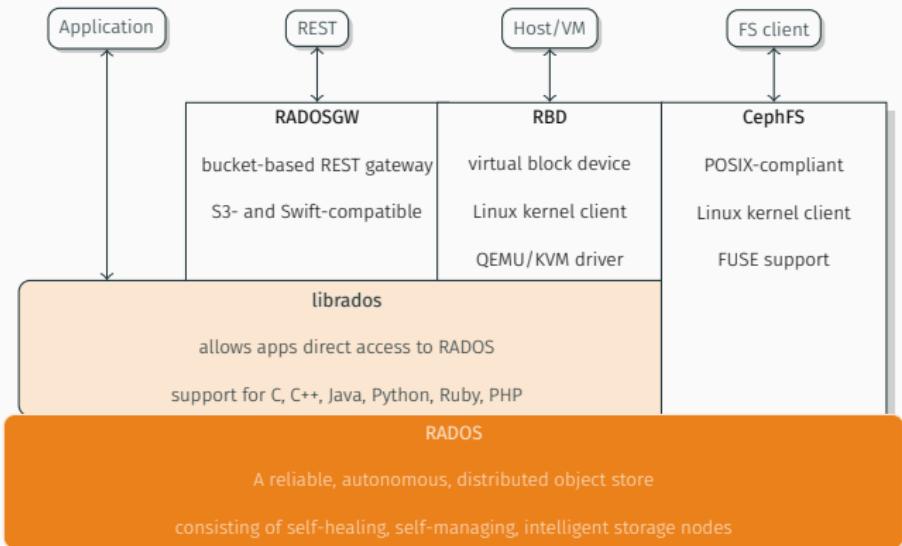
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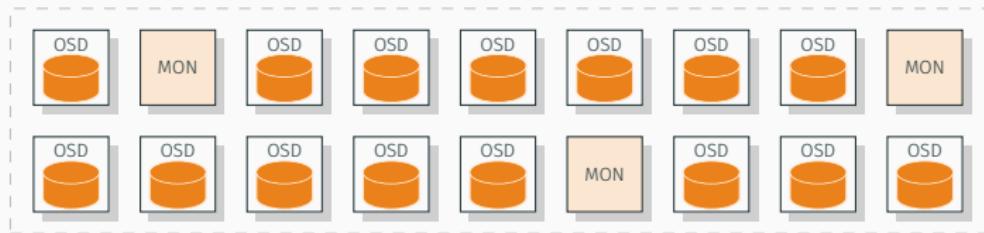
CEPH ARCHITECTURE



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RADOS



CEPH DAEMONS

OSD

- serve objects to clients
- one per disk
- backend: btrfs, xfs, ext4
- peer-to-peer replication and recovery
- write-ahead journal

MON

- maintain cluster state and membership
- vote for distributed decision-making
- small, odd number

DATA PLACEMENT

HOTELS



<http://free-stock-illustration.com/hotel+key+card>



<http://2.bp.blogspot.com/-o-rlrv094E/TXxj8D-B2LI/AAAAAAAAGhb/VEbrbHpxVxo/s1600/DSC02213.JPG>

HOTELS

- What if the hotel had 1 billion rooms? Or ∞ ?

#13,565,983

What if the hotel changed constantly?



<http://waltonian.com/news/eastern-library-renovations-continue/>

Scale-up everything?



http://www.millenniumhotels.com/content/dam/global/en/the-heritage-hotel-manila/images/cons-photographics-lobby-reception-desk%2003062011_34-basicB-preview-2048.jpg

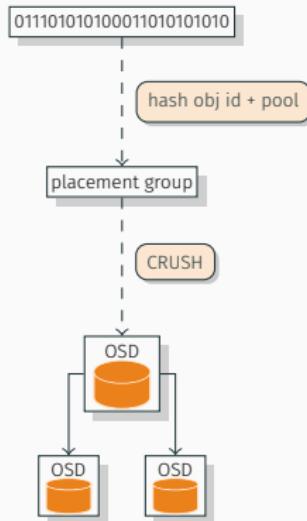
HOTELS

- The hotel itself must assign people to rooms instead of a centralized place
- The hotel should grow itself organically

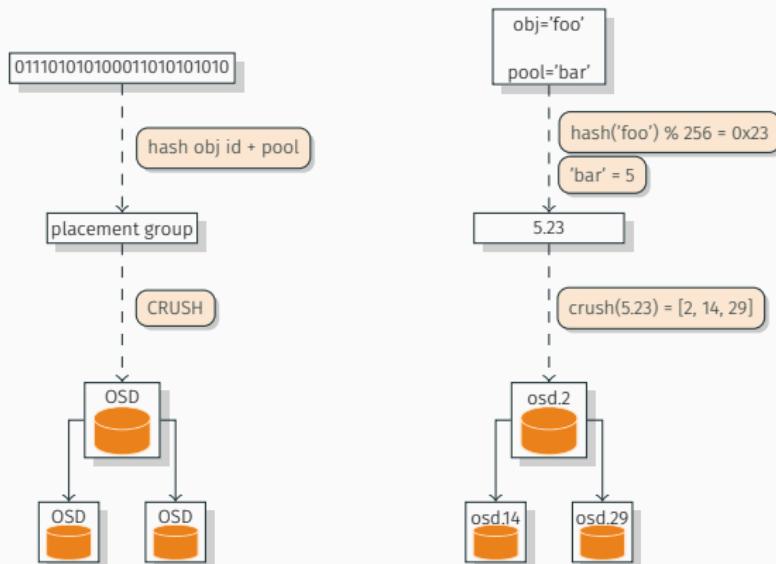
HOTELS

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- The hotel should grow itself organically
- Deterministic placement algorithm
- Intelligent nodes

CRUSH



CRUSH

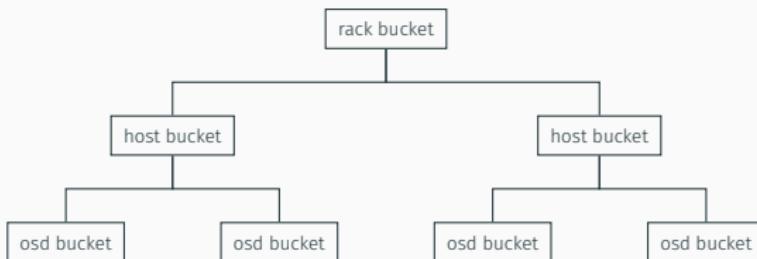


Controlled Replication Under Scalable Hashing

- Pseudo-random placement algorithm
- Repeatable, deterministic
- Statistically uniform distribution
- Stable mapping: minimal data migration
- Rule-based configuration, topology aware

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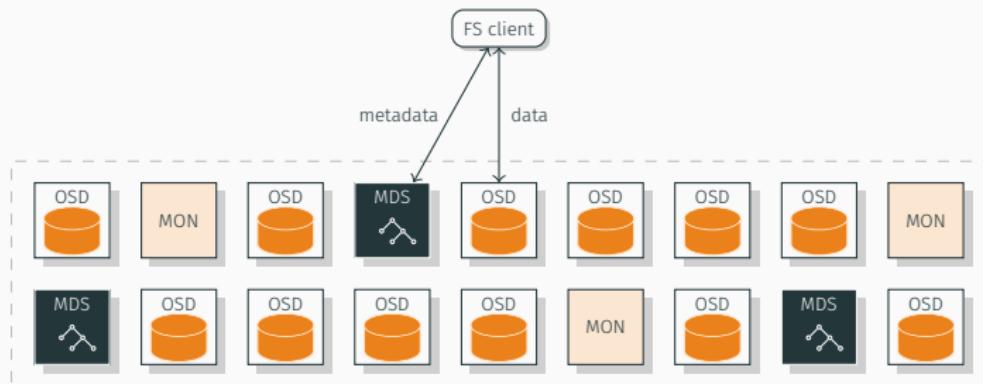
CEPH CLIENTS

- direct access to RADOS for applications
- C, C++, Python, Java, Erlang, PHP
- native socket access, no HTTP overhead

- RESTful API
- unified object namespace
- S3 and Swift compatible
- user database and access control
- usage accounting, billing

- Storage of disk images in RADOS
- Images are striped across the cluster
- Decoupling of VMs from host
- Thin provisioning
 - physical storage only used once you begin writing
- Snapshots, copy-on-write clones
- Support in Qemu, KVM

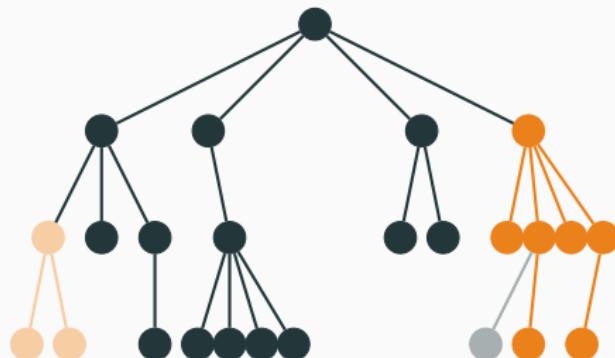
CEPHFS



Metadata Server

- Manages metadata for POSIX-compliant filesystem
 - directory hierarchy
 - file metadata: owner, timestamps, mode etc
- Stores metadata in RADOS
- Multiple MDS for HA and load balancing

DYNAMIC SUBTREE PARTITIONING

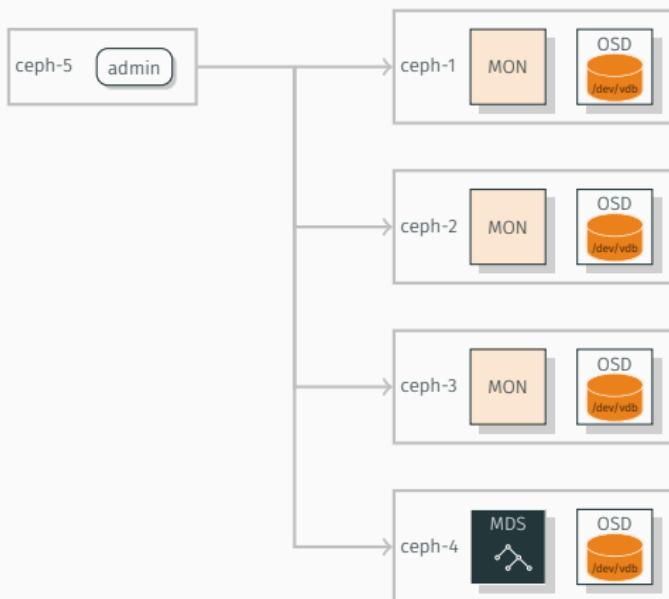


TUTORIAL

OVERVIEW

- Deploy a Ceph cluster
- Simple operations with the storage cluster
- CRUSH
- RBD
- CephFS
- Advanced topics: erasure coding, cache tiering

CLUSTER SET-UP



QUESTIONS?