Metadata Server

The Ceph Metadata Server (MDS) manages Ceph File System (CephFS) metadata. It provides POSIX-compliant, shared file-system metadata management, including ownership, time stamps, and mode. The MDS uses RADOS instead of local storage to store its metadata. It has no access to file contents.

The MDS enables CephFS to interact with the Ceph Object Store, mapping an inode to an object and the location where Ceph stored the data within a tree. Clients who access a CephFS file system first send a request to an MDS, which provides the needed information to get file content from the correct OSDs.

Cluster Map

Ceph clients and OSDs require knowledge of the cluster topology. Five maps represent the cluster topology, which is collectively referred to as the *cluster map*. The Ceph Monitor daemon maintains the cluster map. A cluster of Ceph MONs ensures high availability if a monitor daemon fails.

- The *Monitor Map* contains the cluster's *fsid* ; the position, name, address, and port of each monitor; and map time stamps. The `fsid` is a unique, auto-generated identifier (UUID) that identifies the Ceph cluster. View the Monitor Map with the `ceph mon dump` command.

- The *OSD Map* contains the cluster's `fsid` , a list of pools, replica sizes, placement group numbers, a list of OSDs and their status, and map time stamps. View the OSD Map with the `ceph osd dump` command.

- The *Placement Group (PG) Map* contains the PG version; the full ratios; details on each placement group such as the PG ID, the Up Set, the Acting Set, the state of the PG, data usage statistics for each pool; and map time stamps. View the PG Map statistics with the `ceph pg dump` command.

- The *CRUSH Map* contains a list of storage devices, the failure domain hierarchy (such as device, host, rack, row, room), and rules for traversing the hierarchy when storing data. View the CRUSH map with the `ceph osd crush dump` command.

- The *Metadata Server (MDS) Map* contains the pool for storing metadata, a list of metadata servers, metadata servers status, and map time stamps. View the MDS Map with the `ceph fs dump` command.

Ceph Access Methods

Ceph provides the following methods for accessing a Ceph cluster:

- Ceph Native API (`librados`)
- Ceph Block Device (RBD, `librbd`), also known as a RADOS Block Device (RBD) image
- Ceph Object Gateway
- Ceph File System (CephFS, `libcephfs`)

The following diagram depicts the four data access methods of a Ceph cluster, the libraries that support the access methods, and the underlying Ceph components that manage and store the data.