Implementing Storage in OpenStack Components

Objectives

After completing this section, you should be able to describe how OpenStack implements Ceph storage for each storage-related OpenStack component.

OpenStack Storage Implementation Overview

Before Ceph, each of the storage components used local storage, such as direct attached physical or virtual disks, or network-attached storage (NAS), or storage area network (SAN) hardware. Use of NAS and SAN configurations supports larger storage that the control plane nodes can share, but that requires additional physical NICs or host adapters, limiting the ability of the control plane to scale easily.

The Network File System (NFS) is also a valid method for shared storage access across compute and controller nodes. Although mature and capable of significant performance and resilience when configured for redundancy, NFS has scaling limitations and was not designed for cloud application requirements. OpenStack needs a scalable storage solution design for use in the cloud.

Reviewing Ceph Capabilities in OSP

Ceph is a scalable storage solution that replicates data across commodity storage nodes. Ceph uses an object storage architecture for data storage, and provides multiple storage interfaces for object storage, block storage, and file systems.

Ceph integration with OpenStack features:

- Supports the same API that the Swift Object Store uses.
- Supports thin provisioning by using copy-on-write, making volume-based provisioning fast.
- Supports Keystone identity authentication, for transparent integration with or replacement of the Swift Object Store.
- Consolidates object storage and block storage.
- Supports the CephFS distributed file system interface.

Storage Implementation by Type

Each OpenStack service is an API abstraction that hides the back-end implementation. Many services can configure multiple back ends for use simultaneously. A service might configure multiple pools in Ceph, and use tiering or tagging criteria for transparently selecting an appropriate storage pool. Tiers can also accommodate workloads with different performance requirements. If tiers are implemented in an existing cluster, then CRUSH rule changes can result in significant pool data movement.

OpenStack services use unique service accounts, which are called after the service. The service account runs service actions on behalf of the requesting user or of another service. Similar accounts are created in Ceph for each OpenStack service that requires storage access. For example, the `Image` service is configured for Ceph access by using this command: