# Getting Started with OpenStack

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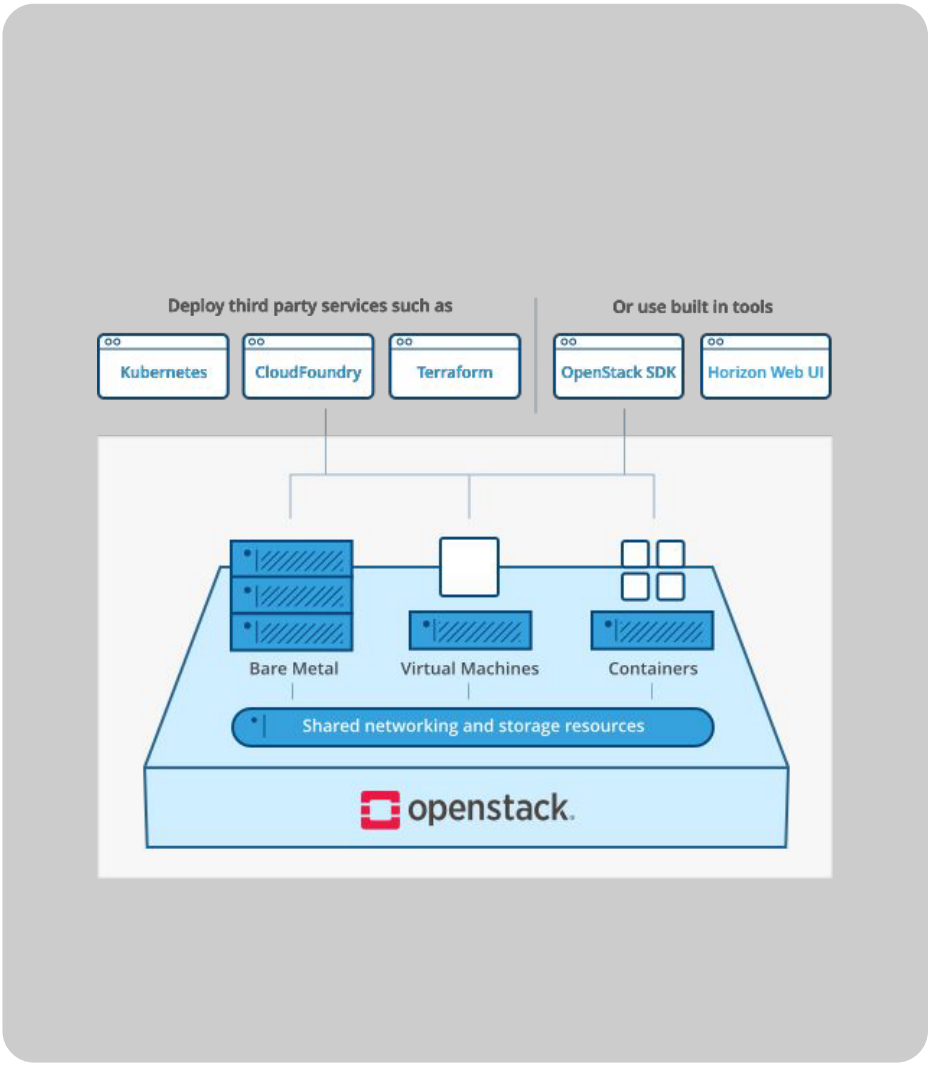
# Agenda

- Introduction to OpenStack
- Most Common OpenStack Services
- Other Services
- Getting Involved
- Q&A

# Introduction to OpenStack

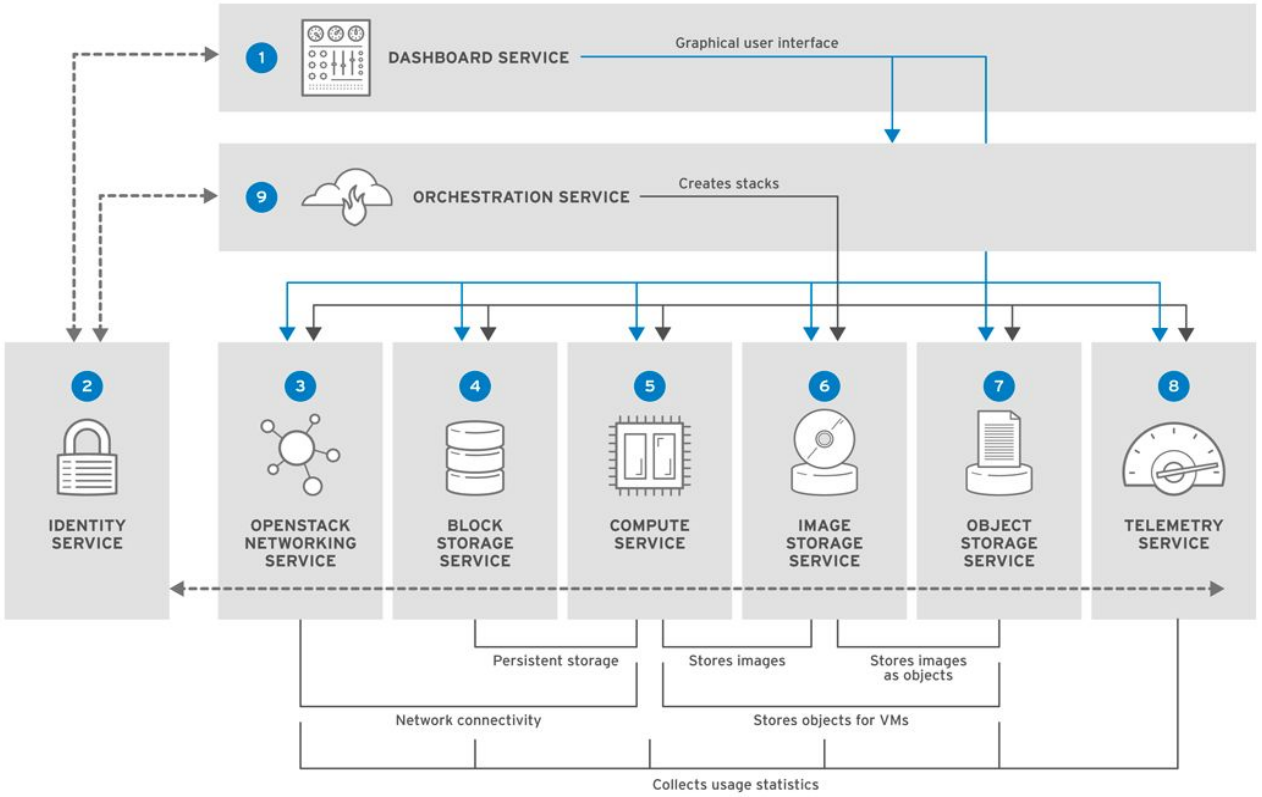
# What is OpenStack?

OpenStack is Infrastructure as a Service that utilizes a common API and authentication to control large pools of Compute, Storage and Networking resources in one or more Data Centers.



# Most Common OpenStack Services

# How the services interact




OpenStack Services Overview

1. Dashboard - User interface built to give a graphical way to interact with OpenStack services
2. Identity - Identity management service for projects, users, groups, roles, endpoints, etc.
3. Networking - Software defined networking API service that can be backed by different SDN solutions. Default is Open vSwitch
4. Block Storage - Block storage API that can be backed by many different storage backends including Ceph, NFS, SAN, LVM, etc.
5. Compute - Compute API for OpenStack. Default hypervisor is KVM. ESXi also supported
6. Image - API for storing golden machine images. Backed by Object, Block, File or HTTP storage
7. Object - Object storage allows access to storage objects via API. Object storage is either Swift or Ceph RadosGW
8. Telemetry - Ceilometer is a collection of services for gathering metrics over time and alerting capability on those metrics
9. Orchestration - Orchestration of OpenStack resources into complete application stacks. Heat stacks defined in YAML templates



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# Identity

# Identity Service - Keystone

## Overview

The Identity service provides API client authentication, service discovery, and distributed multi-tenant authorization.

# Identity Service - Keystone

## Terminology

### Roles

- Roles are the permissions given to users within a project
- A first-class piece of metadata associated with the user for the project. It is assigned directly to users or groups for projects or inherited from domains

### Users

- Used by services and administrators to manage the OpenStack cloud
- A digital representation of a person, system, or service who uses OpenStack services
- Keystone validates the incoming requests are made by the user who claims to be making the call
- Have a login and may be assigned a token to access resources
- Must be assigned to a project and be assigned a role

### Credentials

- Data that is known only by the user that proves who they are, such as a username and password, a username and API key, or an auth token

# Identity Service - Keystone

## Terminology

Tokens

- Identifying credential associated with a user, an arbitrary bit of text that is used to access resources.
- A token may be revoked at any time and is valid for a finite duration.
- While OpenStack Identity supports token-based authentication, the intention is to support additional protocols in the future.
- Its main purpose is to be an integration service and not aspire to be a full-fledged identity store and management solution

Group

- Collection of users

Services

- Refers to a service running in OpenStack such as Compute (Nova), Object Storage (Swift), or Image Service (Glance)
- Provided by one or more endpoints in which users can access resources and perform operations

# Identity Service - Keystone

## Terminology

Endpoints

- Network-accessible addresses where you can access a given service via an URL and port
- Can be configured to service requests on three URLs: a public facing URL, an administration URL, and an internal URL

Domain

- Collection of projects, groups, and users that define the administrative boundaries for managing OpenStack Identity entities

Region

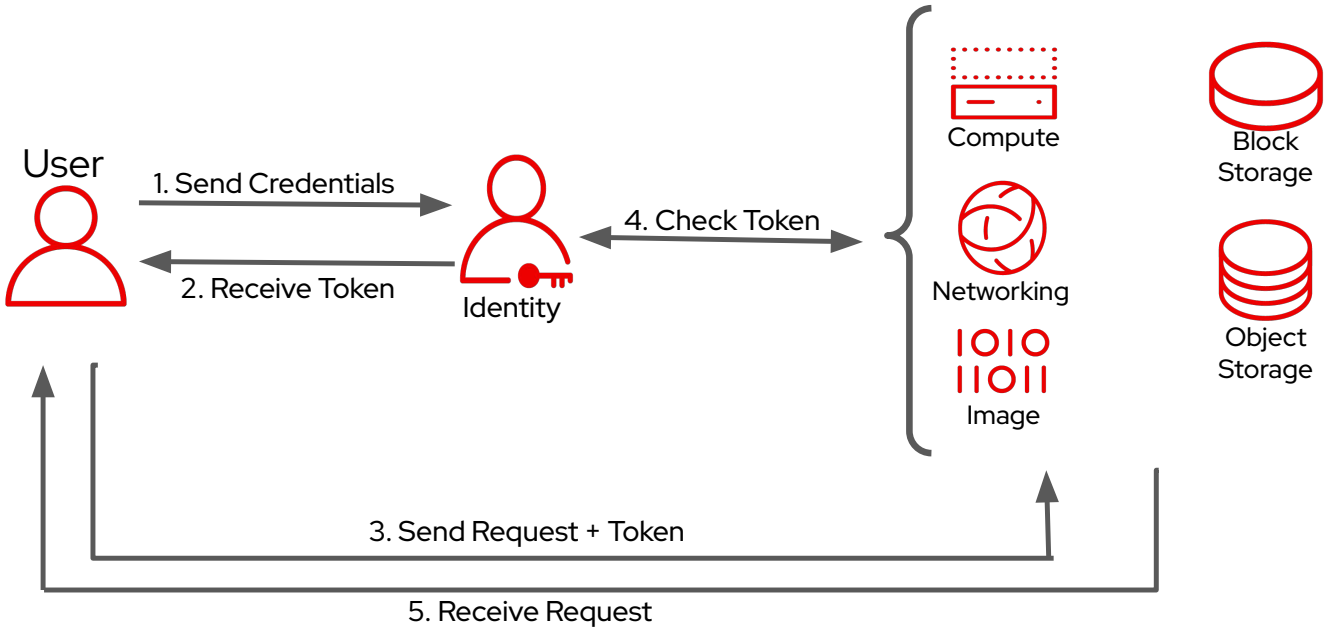
- Separates the OpenStack environments that have dedicated API endpoints but utilize a common Keystone service

Catalog

- A listing of the different endpoints that have been created for the OpenStack services

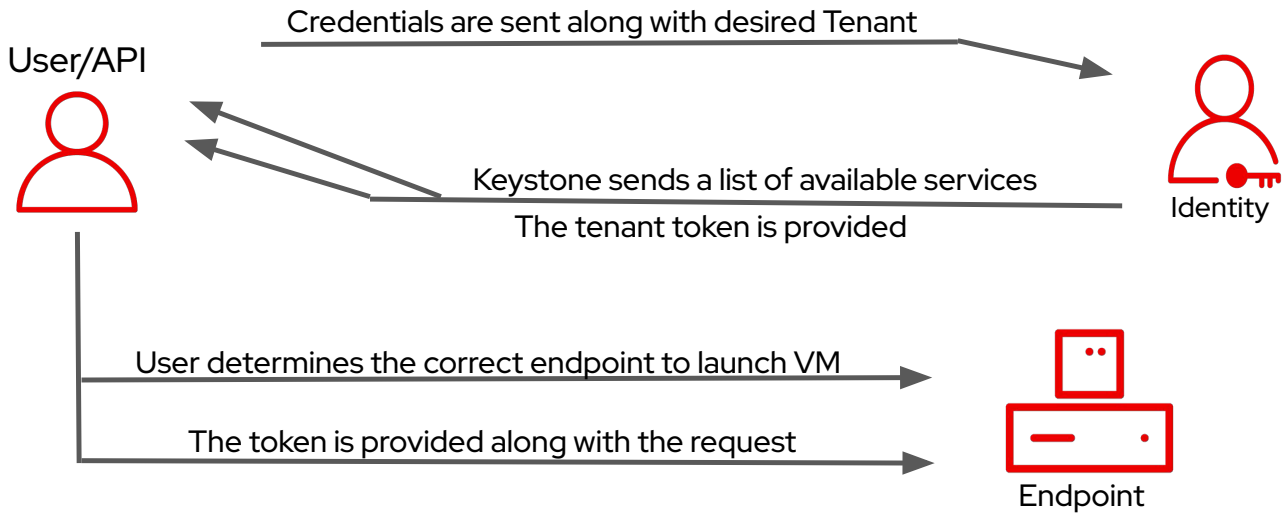
# Identity (Keystone)

## Retrieving a Token



# Identity (Keystone)

## Retrieving a Token



# Image

# Image Management Service - Glance

## Overview

The image management service is the component that discovers, registers, and retrieves virtual machine images

- Capabilities of the Image Service:
  - Administrators can create base templates from which their users can start new compute instances
  - Users can choose from available images or create their own from existing servers
  - Snapshots can also be stored in the Image Service so that virtual machines can be backed up quickly

# Compute

# Compute Service - Nova

## Overview

The Compute Service provides a way to provision compute instances (aka virtual servers). It supports creating virtual machines, baremetal servers (through the use of ironic), and has limited support for system containers.

- Capabilities of the Compute Service:
  - Creation and administration of flavors (machine sizes)
  - Management of quotas
  - Management of Security Groups

# Networking

# Networking Service - Neutron

## Overview

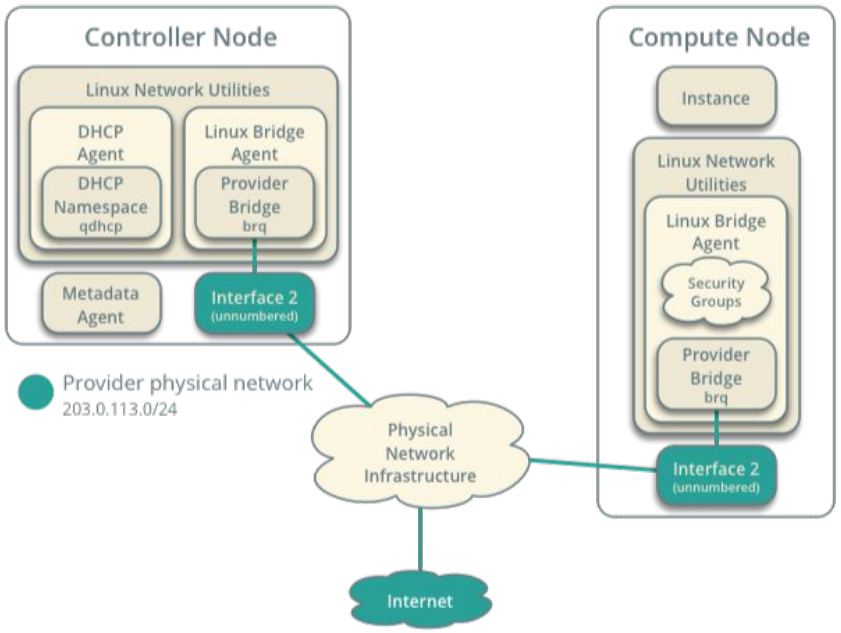
The Networking Service provides network connectivity between interface devices managed by other OpenStack services. It manages all networking facets for the Virtual Networking Infrastructure (VNI) and the access layer aspects of the Physical Networking Infrastructure (PNI) in your OpenStack environment.

Capabilities of the Networking Service:

- It enables projects to create advanced virtual network topologies
- Provides both Provider and Self Service neworks
- Provides networks, subnets, and routers as object abstractions
- Supports Security Groups to block or unblock ports, port ranges, or traffic types

# Networking (Neutron)

## Architecture



# Additional Networking Services

- Load balancing (Octavia)
- DNS (Designate)

# Dashboard

# Dashboard - Horizon

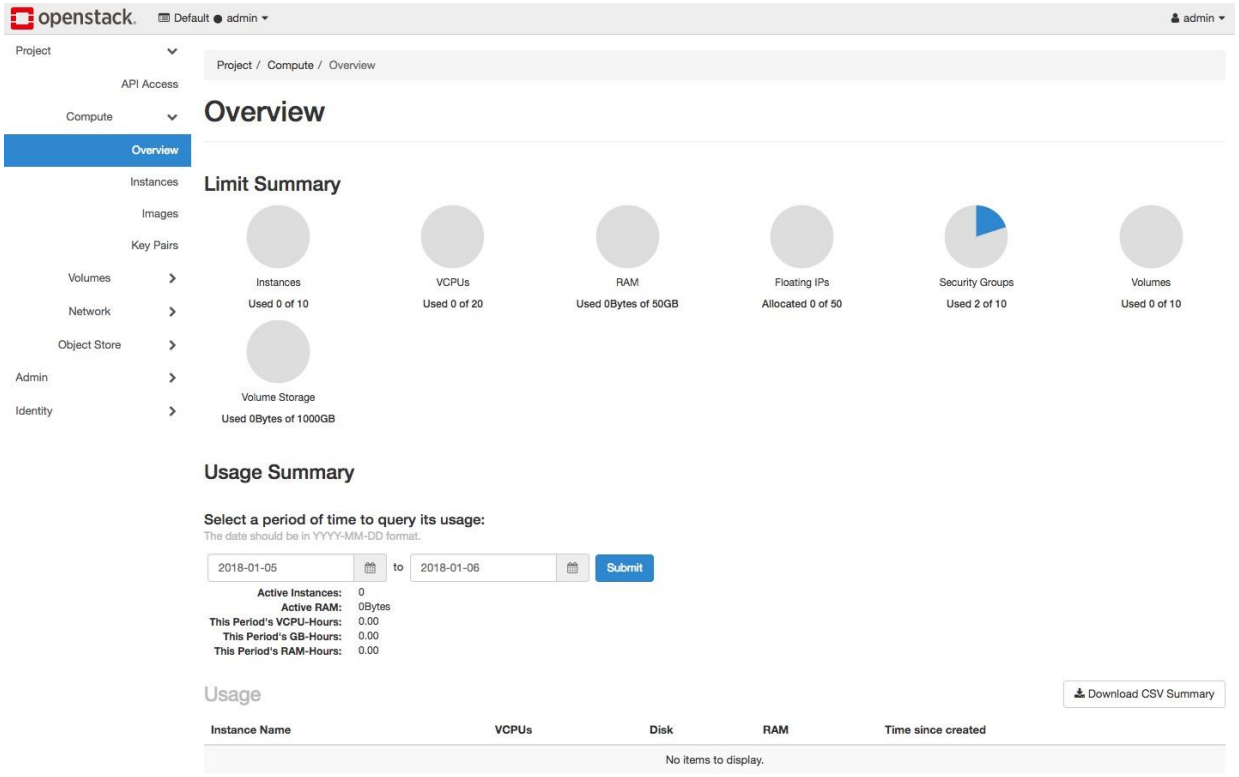
## Overview

The Dashboard provides a web based user interface to OpenStack services including Nova, Swift, Keystone, etc.

Capabilities of the Dashboard

- Allows for the management and administration of the OpenStack services
- Based on roles it controls what a user is able to see and manage

# Dashboard (Horizon)

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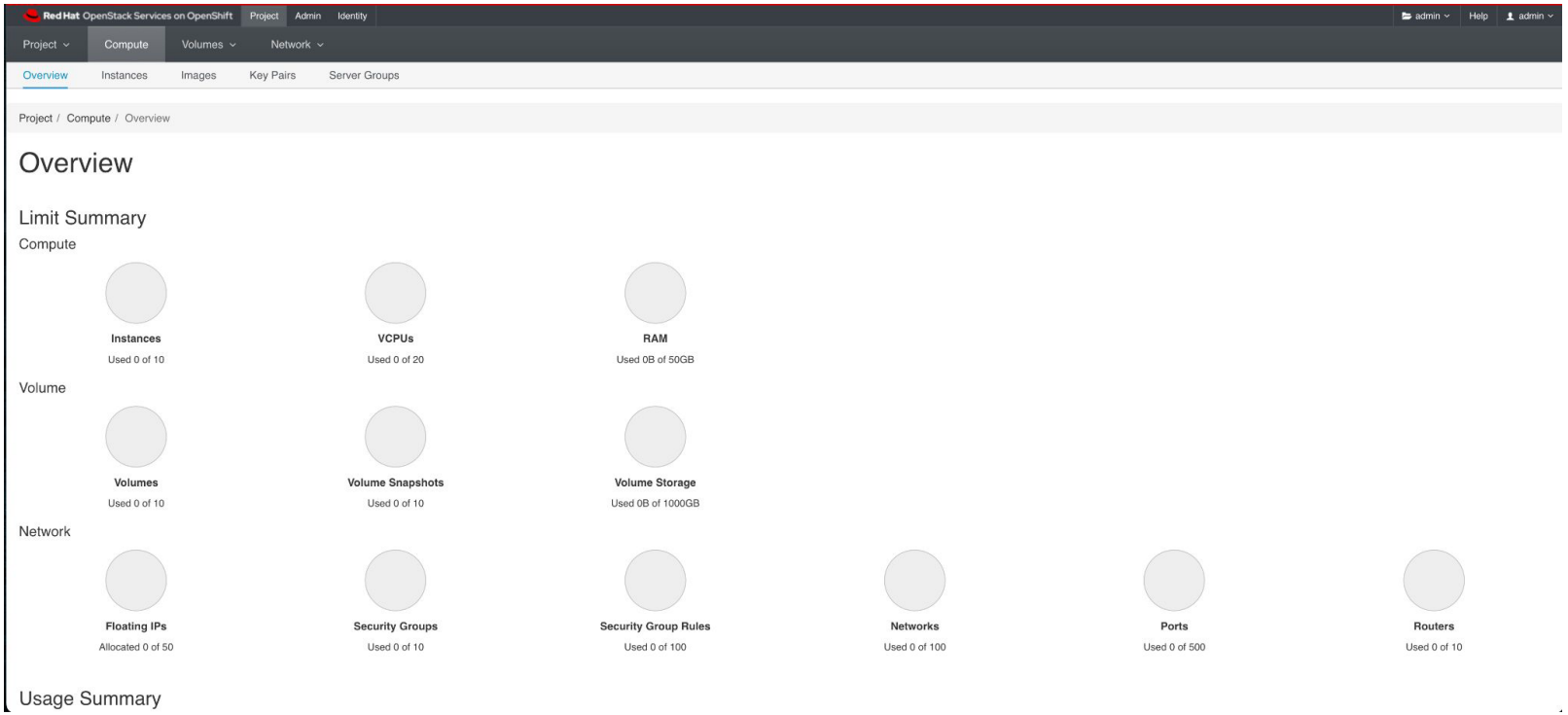
# Dashboard (Horizon)

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# Block Storage

# Block Storage Service - Cinder

## Overview

The Block Storage service provides volumes to Nova virtual machines, Ironic bare metal hosts, containers and more.

Capabilities of the Block Storage Service:

- It enables the ability to add extra block-level storage to your instances
- It allows you to boot from Volume
- It allows for backup and restoration through LVM snapshots

# Object Storage

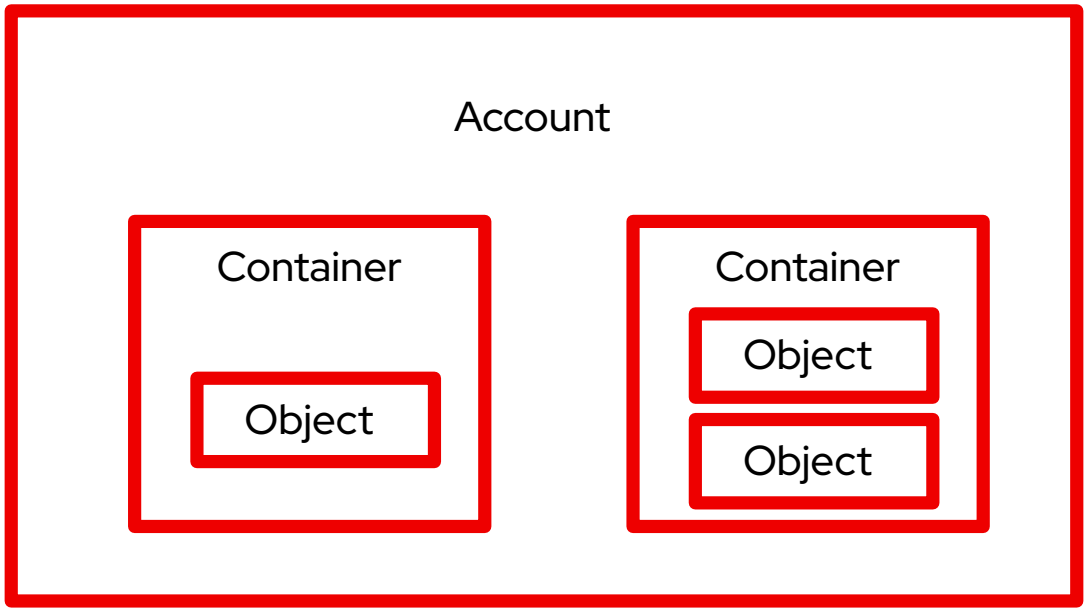
# Object Storage Service - Swift

## Overview

The Object Storage Service provides provides highly available, distributed, eventually consistent object/blob storage. It can be used to storage large quantity of data efficiently, safely and cheaply. Think S3.

# Object Storage (Swift)

## Overview



# Orchestration

# Orchestration Service - Heat

## Overview

A Heat template describes the infrastructure for a cloud application in a text file that is readable and writable by humans and can be checked into version control and used with, for example, Git

Infrastructure resources that can be described include:

- Servers
- Floating IPs
- Volumes
- Security Groups
- Users

# Orchestration Service - Heat

## Overview

A Heat template describes the infrastructure for a cloud application in a text file that is readable and writable by humans and can be checked into version control and used with, for example, Git

Capabilities of the Orchestration Service:

- Provides an auto scaling service that integrates with Ceilometer, so you can include a scaling group as a resource within a template.
- Templates can also specify the relationships between resources (e.g. this volume is connected to this server). This enables Heat to call out to the OpenStack APIs to create all of your infrastructure in the correct order to completely launch your application.
- Heat manages the whole lifecycle of the application
  - When you need to change your infrastructure, simply modify the template and use is to update your existing stack
- Heat knows how to make the necessary changes. It will delete all of the resources when you are finished with the application, too.
- Heat primarily manages infrastructure, but the templates integrate well with software configuration management tool

# Other Services

# Hardware Projects

- Ironic (Baremetal)
- Cyborg (Accelerators)

# Deployment

- Kolla-Ansible
- OpenStack-Ansible
- Sunbeam

# Getting Involved

# Getting Involved

- Contributions
  - Code
  - Documentation
  - Reviews
  - Translations
- Special Interest Groups (SiGs)
  - Public Cloud
  - Scientific
- Working Groups
  - Diversity and Inclusion

# Q&A

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