

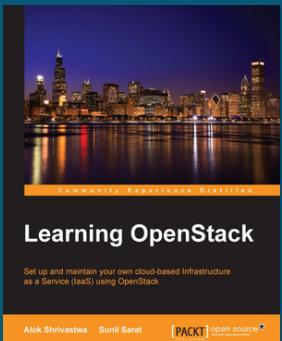


Ben Silverman Presents: **OpenStack Basics** An Overview For The Absolute Beginner





BEN SILVERMAN
Principal Cloud Architect, OnX



BS

DETAILS

- ✓ 25+ years of IT experience
- ✓ 4+ years experience with OpenStack and author of the OpenStack Foundation's Architecture Guide
- ✓ Designed American Express' first OpenStack cloud in 2013 that is still running 8-10k instances in production today
- ✓ Worked for Mirantis as a Senior Systems Architect
- ✓ International Speaker and Presenter on Cloud
- ✓ Certified in Red Hat and Mirantis Distributions of OpenStack
- ✓ Holds a Master of Science degree in Information Management from Arizona State University
- ✓ Co-author of "OpenStack for Architects" and "OpenStack Design and Implement Cloud Infrastructure" (2017)
- ✓ Technical Reviewer for the book "Learning OpenStack(2016)"



OpenStack Overload Syndrome (2013)



WHY CLOUD

WHAT IS CLOUD

WHAT IS
OPENSTACK

WHY USE IT

THE COMMUNITY

USING
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ARCHITECTURE

Why Cloud? What changed?

Everything for some, little for others, eventually,
everything will change for most.



WHY CLOUD

WHAT IS CLOUD

WHAT IS
OPENSTACK

WHY USE IT

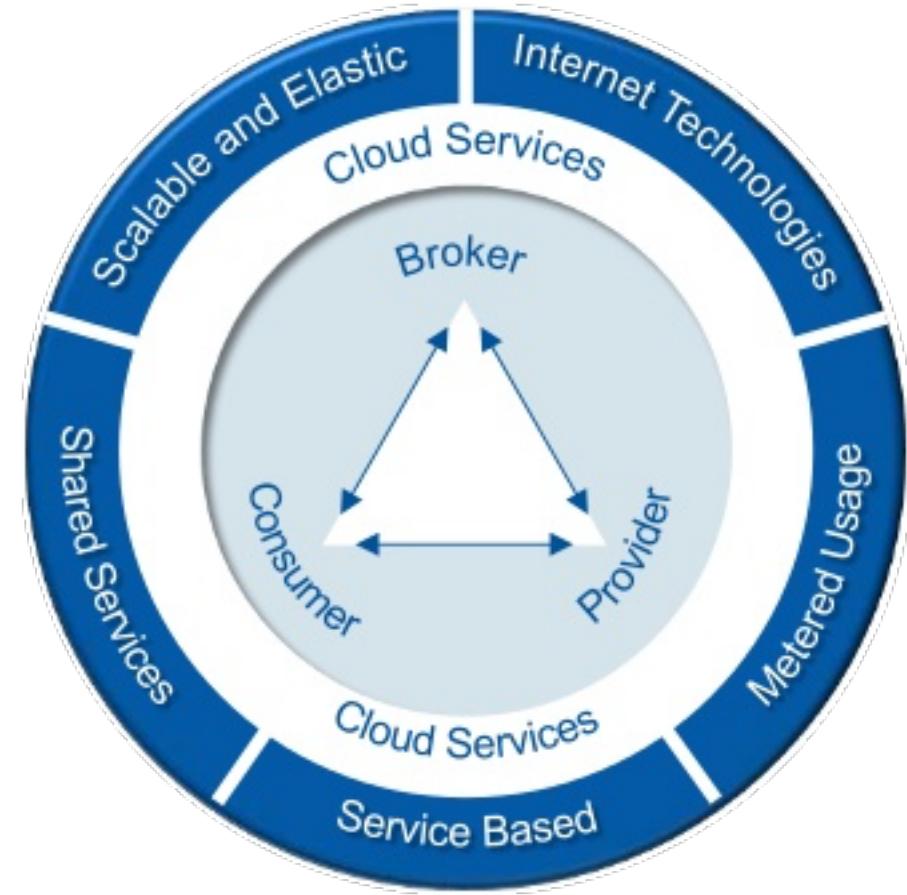
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The value of cloud computing is in the outcomes it enables.

Similar to the value of a elliptical trainer, the value is in building heart health or losing weight.



Gartner



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So we now know the why, but...

What is “Cloud”

Clouds are pools of virtual resources (such as raw processing power, memory, network, storage, or cloud-based applications) orchestrated by management and automation software...*

Public cloud: shared resource, “pay-as-you-go” models are common

Private Cloud: dedicated to a single user

Hybrid cloud: a mix of private cloud and public cloud **orchestrated together**

Multi-cloud is the use of **multiple** cloud computing services in a single **heterogeneous** architecture

4 CLOUD MODELS

* Red Hat - <https://www.redhat.com/en/topics/cloud>



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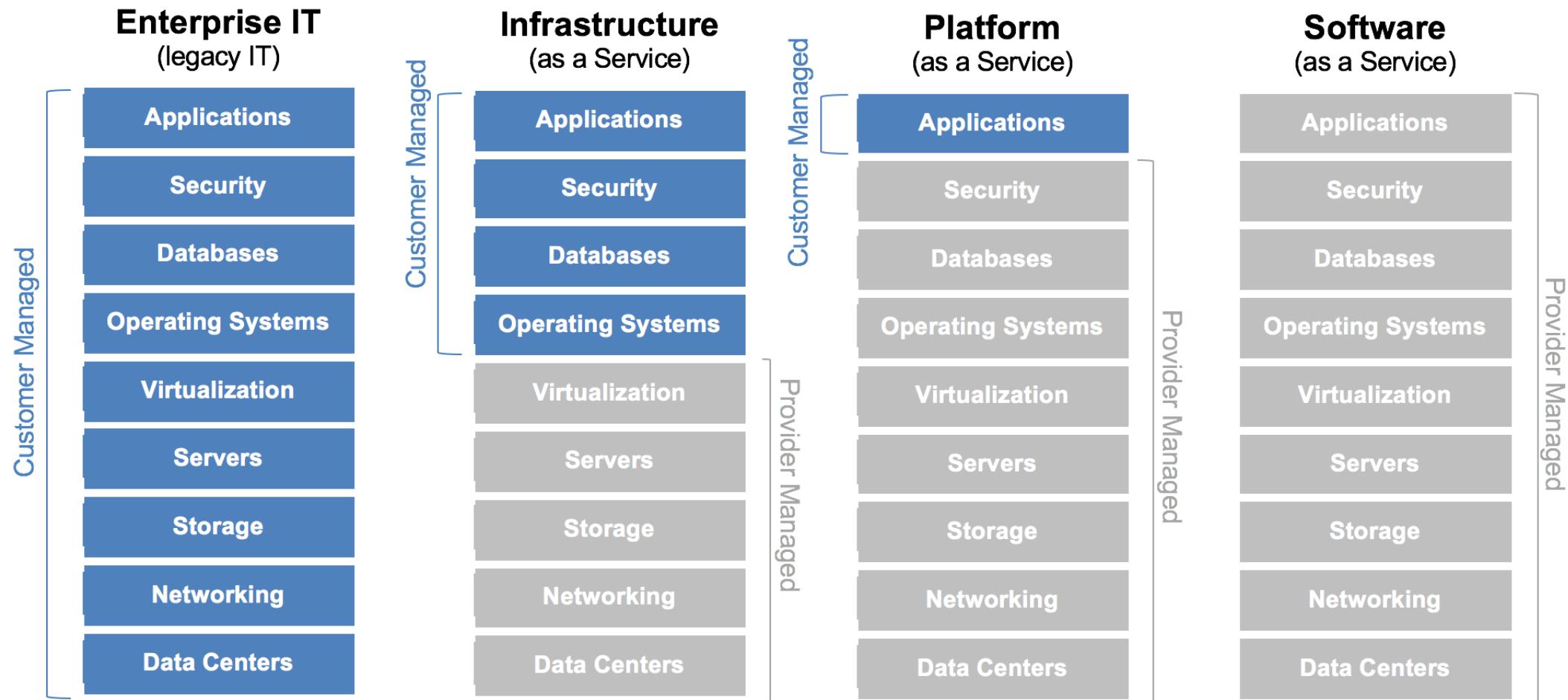
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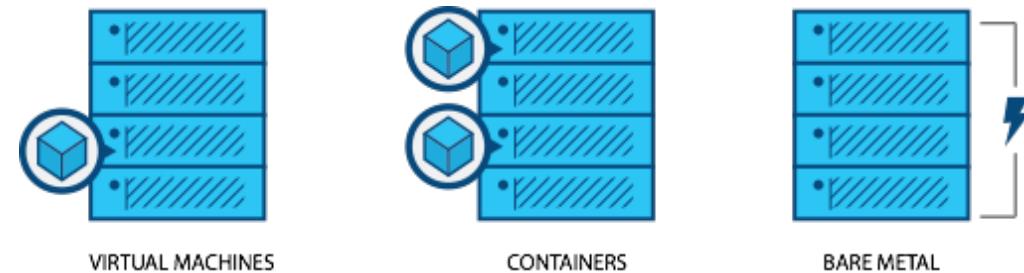
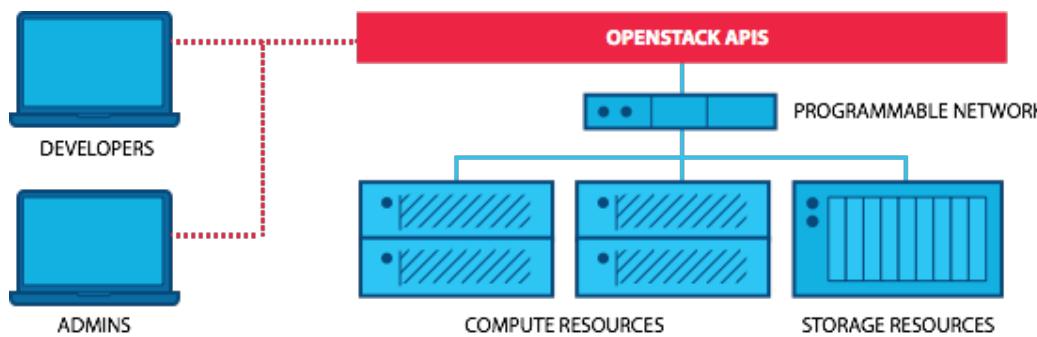
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What is OpenStack



Programmable infrastructure that lays a common set of APIs on top of compute, networking and storage

One platform for virtual machines, containers and bare metal



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OpenStack is open source

HERE'S WHY THAT MATTERS

Choice & control: ability to choose between and switch vendors

Ability to contribute or directly influence the roadmap

Widely adopted open source APIs are the new standards

Part of a vibrant community to share knowledge and help each other

OPENSTACK PRINCIPLES

1 OPEN SOURCE

2 OPEN DESIGN

3 OPEN DEVELOPMENT

4 OPEN COMMUNITY



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Primary business drivers

#1 cost

($\frac{2}{3}$ of users said cost was their #1 business driver)

#2 operational efficiency

#3 accelerate innovation

Source: User Survey, April 2016, 1183 responses



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Q & A

What runs on OpenStack?

TELECOM/NFV

86% of telecoms say OpenStack is important to their business; many are using OpenStack to virtualize their networks and implement edge computing to achieve agility and significant cost savings.

MULTI-CLOUD

DigitalFilm Tree uses interoperable OpenStack private and public clouds to process thousands of hours of raw footage into a one-hour TV show.

HPC

CERN runs one of the largest OpenStack clouds to process data from the Large Hadron Collider, giving physicists the resources they need to unleash the secrets of the universe.

E-COMMERCE

Walmart moved their global e-commerce platform to OpenStack, powering desktop, mobile, tablet and kiosk users.

ENTERPRISE APPS

Comcast powers customer-facing and internal applications and services for both production and development environments with OpenStack.

DEVELOPER PRODUCTIVITY

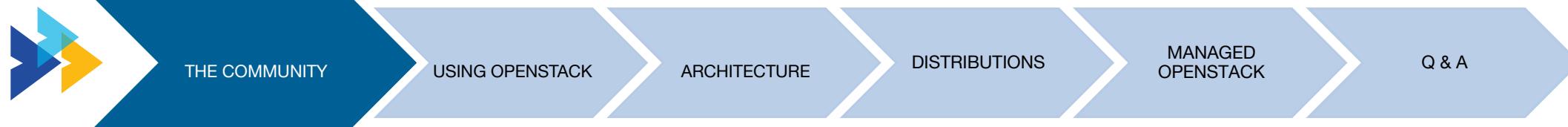
Adobe Digital Marketing uses OpenStack to convert their existing virtualization environment into self-service IT.

BIG DATA

Banco Santander runs 1,000 compute nodes of OpenStack in data centers across the world, and uses Cloudera on OpenStack to power fraud detection.

WEB SERVICES

Workday moved their on-demand software services from static, virtualized environments to a fully elastic and scalable platform based on OpenStack.



History of OpenStack

2010	NASA + Rackspace develop the basis of OpenStack	2014	OpenStack Marketplace opens to showcase maturing ecosystem; “Juno” release seen as enterprise grade	2016 - April	Half the Fortune 100 run OpenStack; Certified OpenStack Administrator program launched	2017	OpenStack emerges as one platform for containers, VMs and bare metal
2012	OpenStack Foundation established	2015	OpenStack Powered interop certification launched	2016	China booms; 86% of telecoms say OpenStack important to their business		



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The OpenStack Community



70,000+

MEMBERS



185

COUNTRIES



650+

ORGANIZATIONS



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OpenStack's software releases



Most clouds run one of the two most recent releases

Learn more about the releases at openstack.org/software



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The OpenStack Framework

The screenshot shows the 'PROJECT NAVIGATOR' tab selected on the openstack.org website. The page title is 'Browse All OpenStack Projects'. It includes a search bar and a section for 'Core Services (6 Results)'.

Service	Type	Description
NOVA	Compute	Manages the lifecycle of compute instances in an OpenStack environment. Responsibilities include spawning, scheduling and decommissioning of machines on demand.
NEUTRON	Networking	Enables network connectivity as a service for other OpenStack services, such as OpenStack Compute. Provides an API for users to define networks and the attachments into them. Has a pluggable architecture that supports many popular networking vendors and technologies.
SWIFT	Object Storage	Stores and retrieves arbitrary unstructured data objects via a RESTful, HTTP based API. It is highly fault tolerant with its data replication and scale out architecture. Its implementation is not like a file server with mountable directories.

WHAT GETS CALLED
OPENSTACK?

USING THE SAMPLE
CONFIGURATIONS

CORE SERVICES &
OPTIONAL SERVICES



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OpenStack for AWS Users



* Not an actual AWS User

OpenStack	AWS
Nova	EC2
Magnum/Murano	EC2 Container Service
Swift	S3
Trove	RDS
Keystone	IAM
Ceilometer/Gnocci	Cloudwatch
Heat	Cloudformation
Zaqar	SQS
Mistral	SWF
MagnetoDB	DynamoDB
VPNaas (Neutron)	VPC
Horizon	AWS Management Console



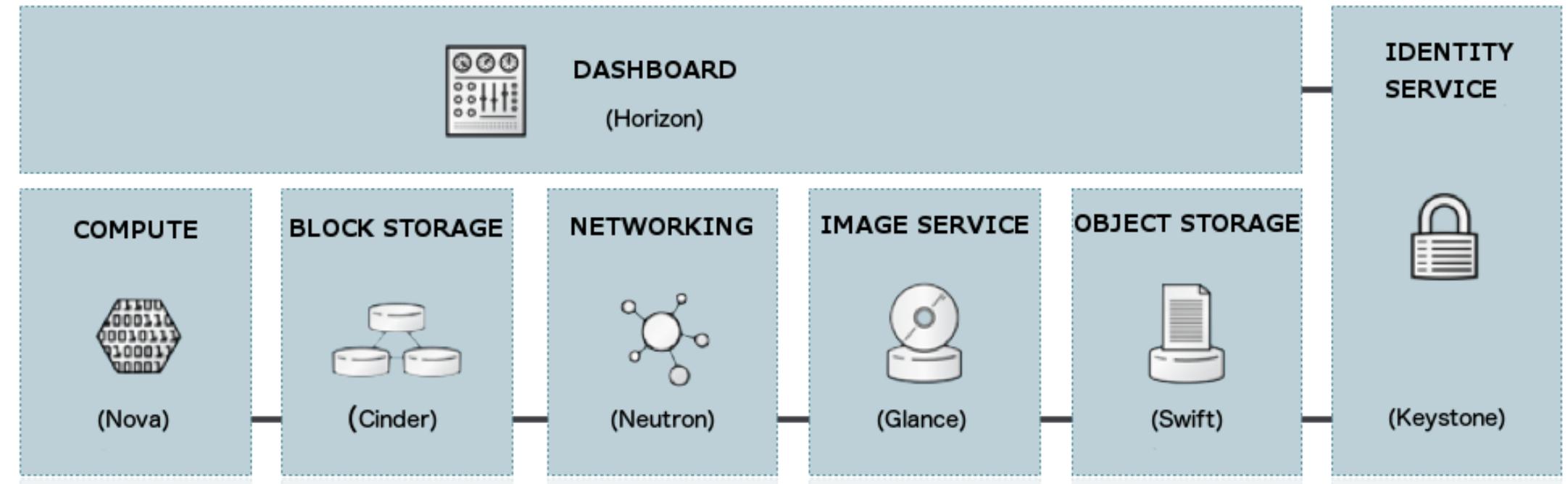
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OpenStack Service Overview





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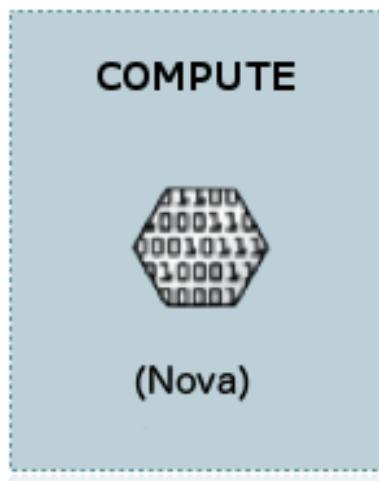
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Nova (Compute)



To implement services and associated libraries to provide massively scalable, on demand, self service access to compute resources, including bare metal, virtual machines, and containers.



- Provides configuration and coordinates the creation of a Virtual Machine instance
- Fault tolerant, recoverable and provides API compatibility with a range of hypervisors and external providers like Amazon's EC2
- Utilizes the REST API service and is driven by messaging (RabbitMQ) which allows the service to scale across multiple nodes.



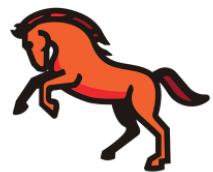
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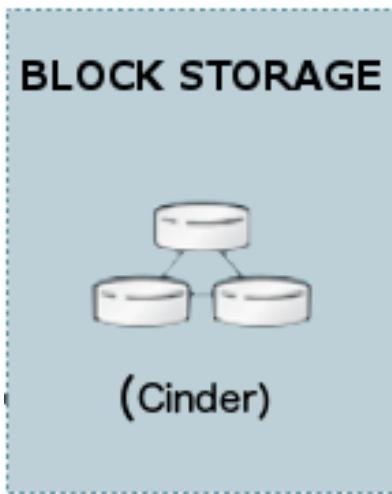
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Cinder (Block Storage)



The OpenStack **Block Storage service (cinder)** provides persistent block storage for compute instances. The Block Storage service is responsible for managing the life-cycle of block devices, from the creation and attachment of volumes to instances, to their release.



- Provides persistent block storage resources to instances that they can consume via drivers for physical infrastructure
- This includes secondary block storage devices much like Amazon's EBS or Azure Storage Disk
- Can be used to create volume snapshots for bootable volumes that can be detached and re-attached to a new instance or used as a backup vol



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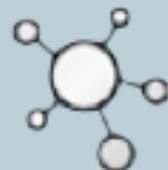
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Neutron (Networking)

Neutron provides the networking capability for OpenStack. It helps to ensure that each of the components of an OpenStack deployment can communicate with one another quickly and efficiently.

NETWORKING



(Neutron)

- Provides a the software defined network functionality to the infrastructure and workloads running under and on the OpenStack platform. Neutron delivers Network-as-a-Service to the virtual compute environment.
- Prior to Neutron there was Quantum and Nova networks. Nova network was based on bridged physical interfaces. Neutron has similar capabilities called provider networks.
- Neutron was designed to standardize and abstract the networking from physical and software differences in the underlying infrastructure while adding automation and software abstraction to configuration.



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Glance (Image Service)



Glance image services include discovering, registering, and retrieving virtual machine images. Glance has a RESTful API that allows querying of VM image metadata as well as retrieval of the actual image.



- Glance is used as a service for uploading, discovering and retrieving images for use in provisioning instances and bare metal assets
- The glance service stores images and metadata
- Glance supports many different image types such as RAW, QCOW2, ISO, VHD, VMDK, VDI, AMI and others.



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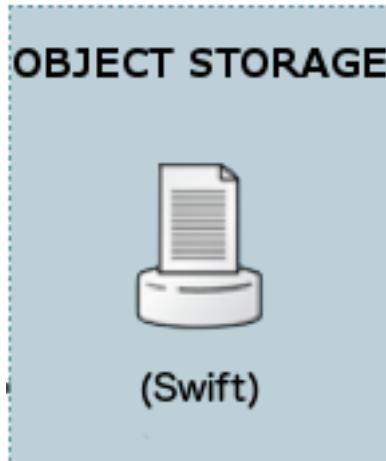
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Swift (Object Storage)



Swift is a highly available, distributed, eventually consistent object/blob store. Organizations can use Swift to store lots of data efficiently, safely, and cheaply. It's built for scale and optimized for durability, availability, and concurrency across the entire data set. Swift is ideal for storing unstructured data that can grow without bound.



- Swift is a highly available, distributed and consistent object data store
- Swift is fully S3 compatible and can be configured to use AWS's S3 service
- Swift technology is the same technology used at Dropbox and is used by many enterprise storage clouds from fortune 500 companies



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Keystone (Identity)



Keystone is an OpenStack service that provides API client authentication, service discovery, and distributed multi-tenant authorization by implementing OpenStack's Identity API. It supports LDAP, OAuth, OpenID Connect, SAML and SQL.



- Simply processes API requests, provides identity, token, catalog, and policy services.
- Token service administers and verifies tokens that are used by other services to authorize user's credentials have been validated.
- Also provides a service registry that can be used for endpoint discovery and its policy service exposes a rule-based authorization engine.



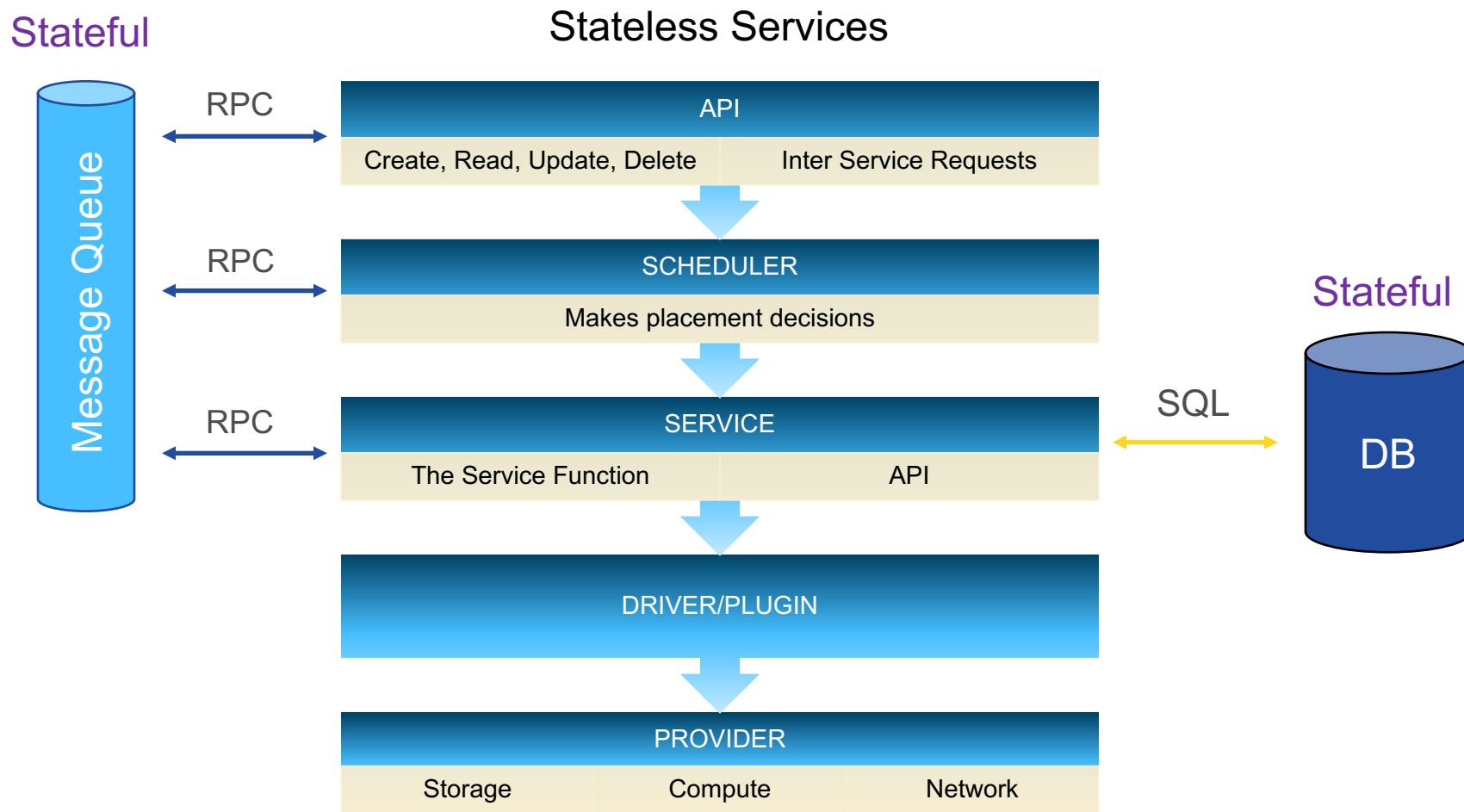
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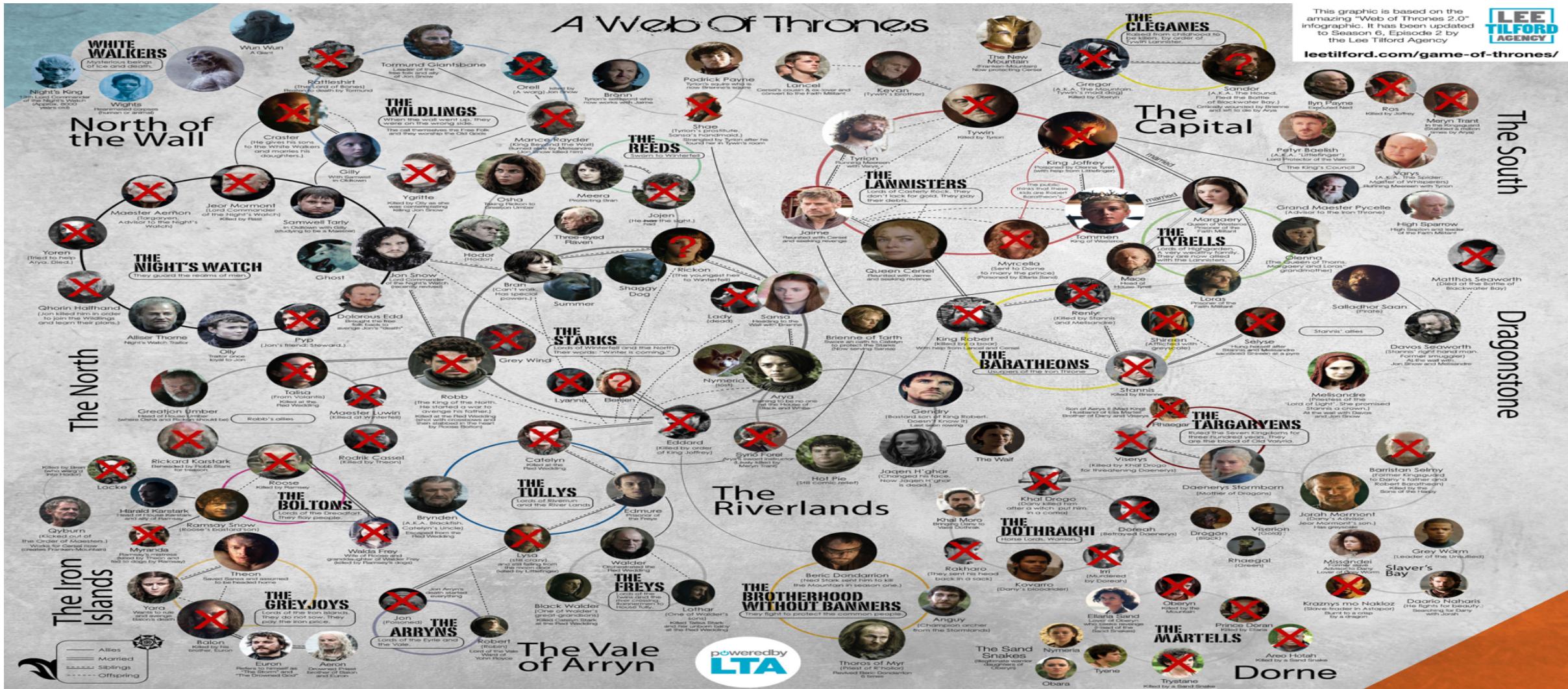
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A Simple View of How OpenStack Services Work





OpenStack Architecture - Today





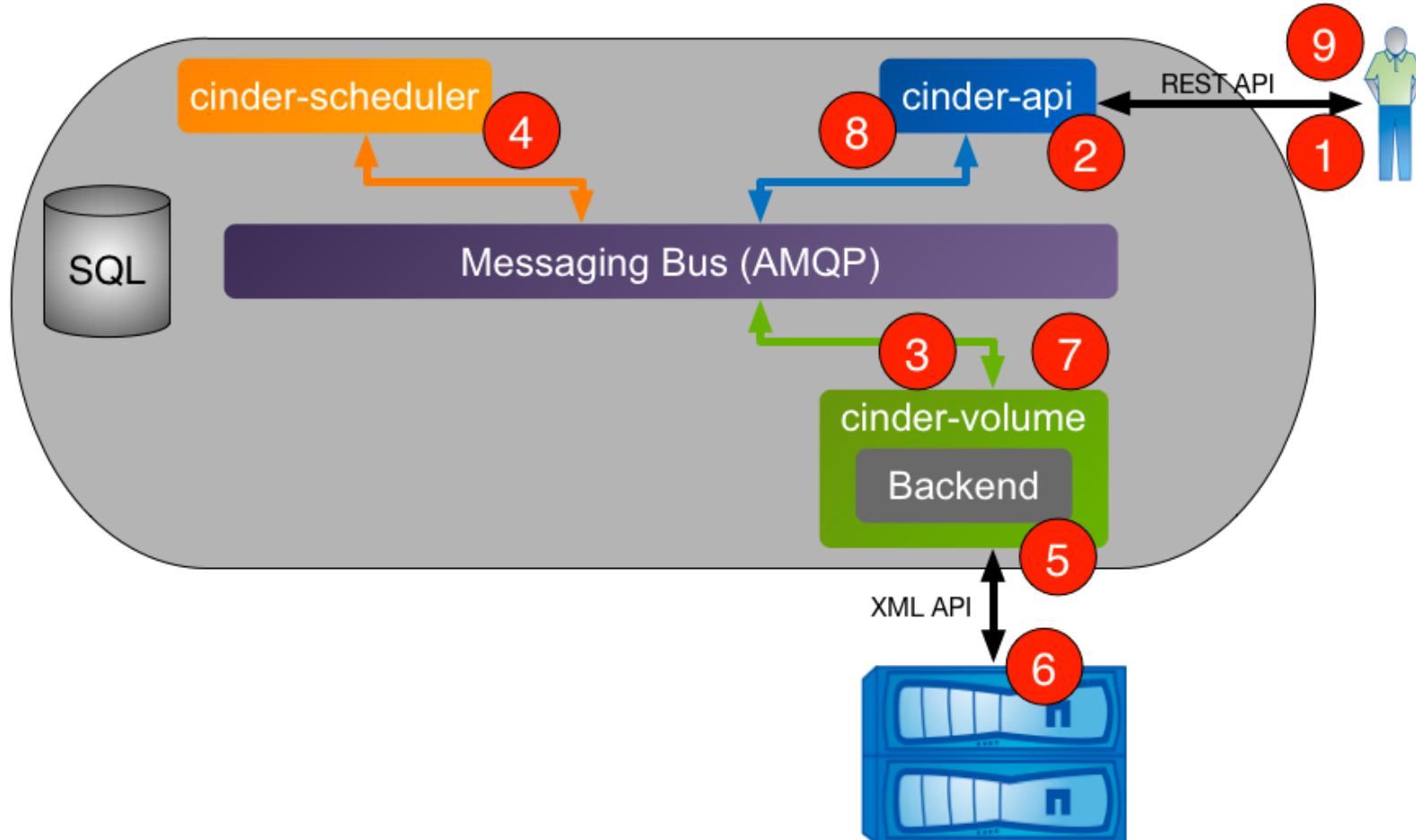
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Real Life Example – Cinder Volume Creation





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Other Services (Projects) Available

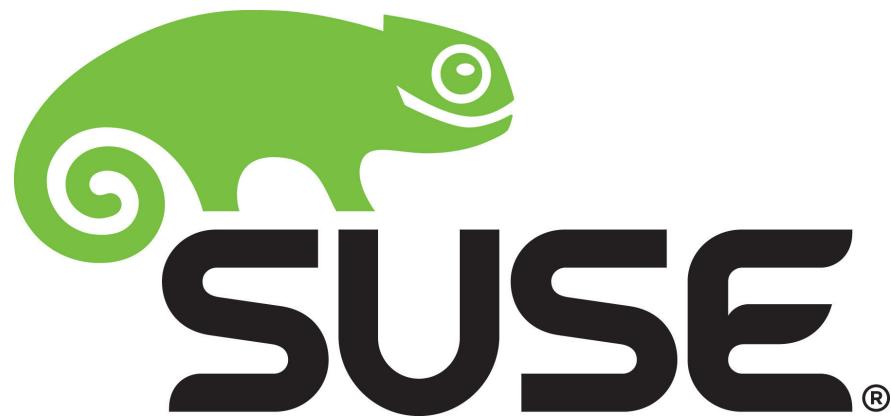
- [Barbican \(Key Manager service\)](#)
- [Blazar \(Resource reservation service\)](#)
- [Cloudkitty \(Rating service\)](#)
- [Congress \(Governance service\)](#)
- [Cyborg \(Accelerator Life Cycle Management\)](#)
- [Designate \(DNS service\)](#)
- [Dragonflow \(Distributed Control Plane of Neutron\)](#)
- [Freezer \(Backup, Restore, and Disaster Recovery service\)](#)
- [Heat \(Orchestration service\)](#)
- [Ironic \(Bare Metal service\)](#)
- [Karbor \(Data Protection Orchestration Service\)](#)
- [Kolla \(Production Ready Containers\)](#)
- [Kuryr \(Docker networking w/Neutron\)](#)
- [Magnum \(Container Infrastructure Management service\)](#)
- [Manila \(Shared File Systems service\)](#)
- [Masakari \(Instances High Availability Service\)](#)
- [Mistral \(Workflow service\)](#)
- [Monasca \(Monitoring\)](#)
- [Murano \(Application Catalog service\)](#)
- [Octavia \(Load-balancer service\)](#)
- [Openstack Charms \(Juju Charms for deployment of OpenStack\)](#)
- [Openstackansible \(Ansible playbooks and roles for deployment\)](#)
- [Openstackclient \(Command-line client\)](#)
- [Oslo \(Common libraries\)](#)
- [Puppet Openstack \(Puppet modules for deployment\)](#)
- [Rally \(Benchmark service\)](#)
- [Refstack \(Interoperability Test Report\)](#)
- [Sahara \(Data Processing service\)](#)
- [Searchlight \(Search service\)](#)
- [Senlin \(Clustering service\)](#)
- [Shade \(Multi-cloud Python SDK for End Users\)](#)
- [Solum \(Software Development Lifecycle Automation service\)](#)
- [Storlets \(Compute inside Object Storage service\)](#)
- [Tacker \(NFV Orchestration service\)](#)
- [Telemetry \(Telemetry service\)](#)
- [Tricircle \(Networking automation across Neutron service\)](#)
- [Tripleo \(Deployment service\)](#)
- [Trove \(Database service\)](#)
- [Vitrage \(RCA \(Root Cause Analysis\) service\)](#)
- [Watcher \(Infrastructure Optimization service\)](#)
- [Zaqar \(Message service\)](#)
- [Zun \(Containers service\)](#)



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Distributions

**RED HAT[®]
OPENSTACK[®]
PLATFORM**





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Remotely Managed OpenStack





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Thank You

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