


OpenStack Administration Workshop

Bogor, 19 November 2016

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Keywords



On-premise, Cloud, IaaS, PaaS, SaaS, Public Cloud,
Private Cloud, Hybrid Cloud, Community Cloud,
Virtualization, Storage Cluster, SDN, Keystone, Glance,
Nova, Neutron, Cinder, Swift, Horizon

Reference

- OpenStack Documentation
<http://docs.openstack.org>

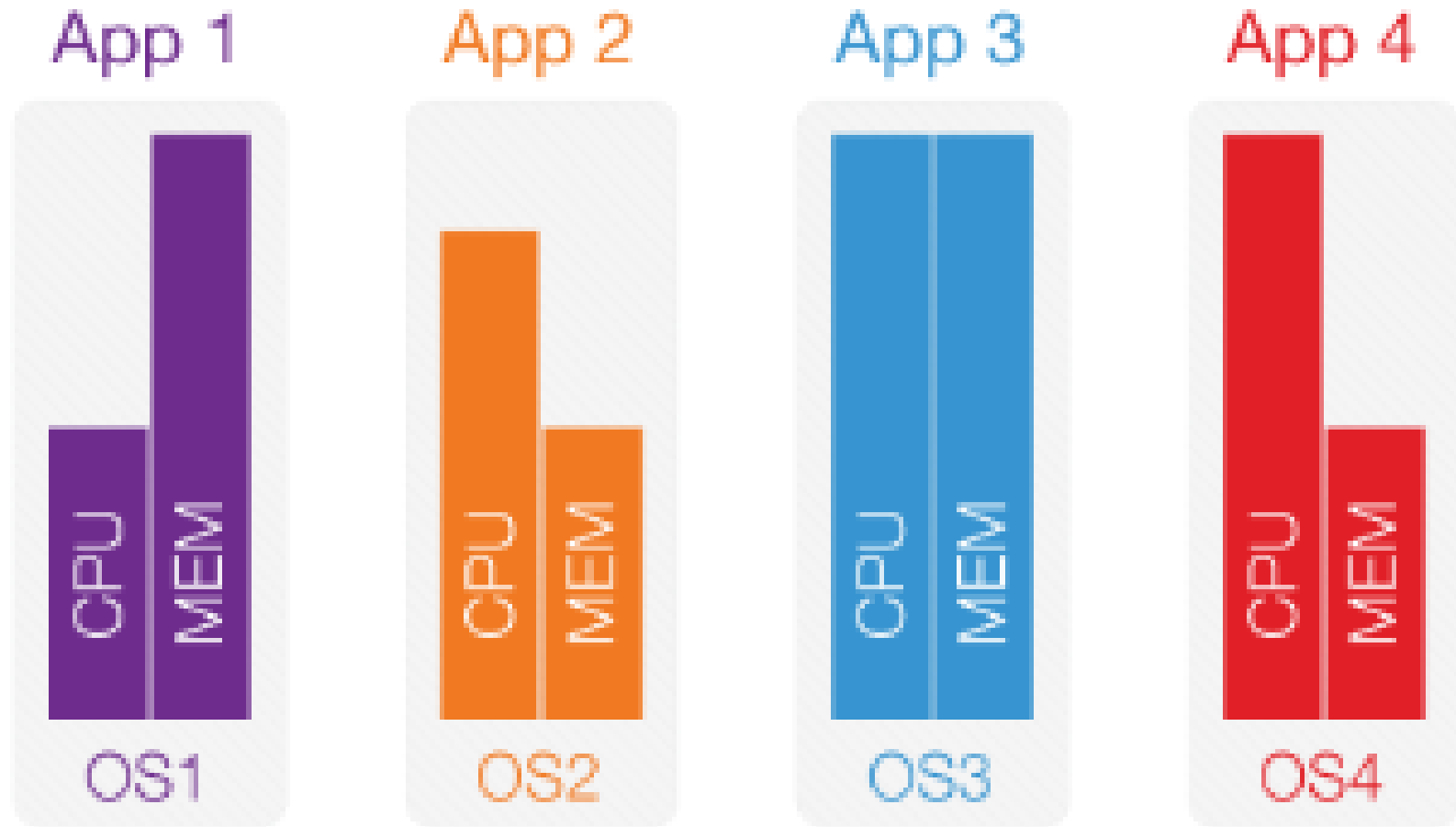


Cloud Computing

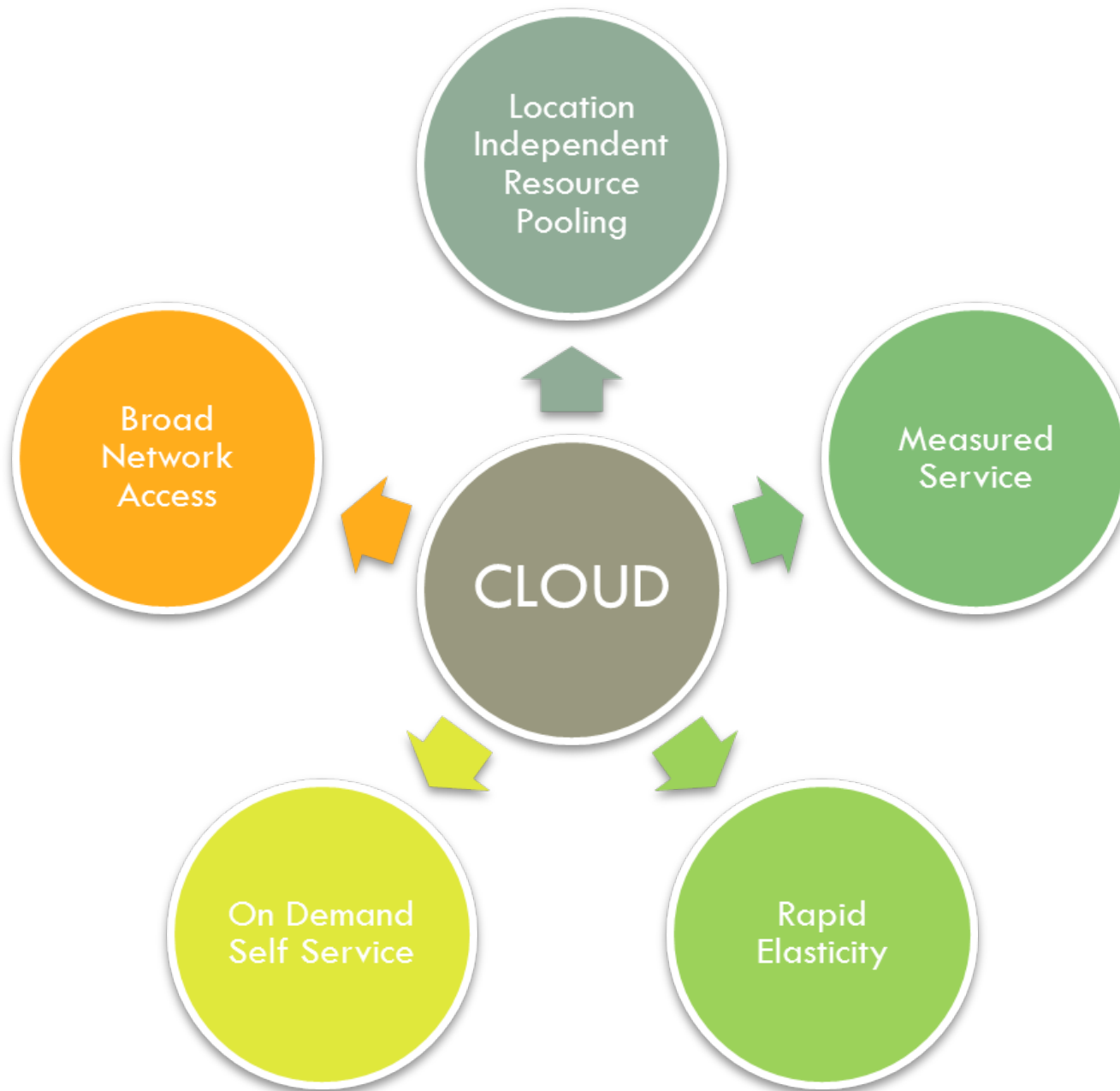
On-Premise vs Cloud



Conventional Data Center

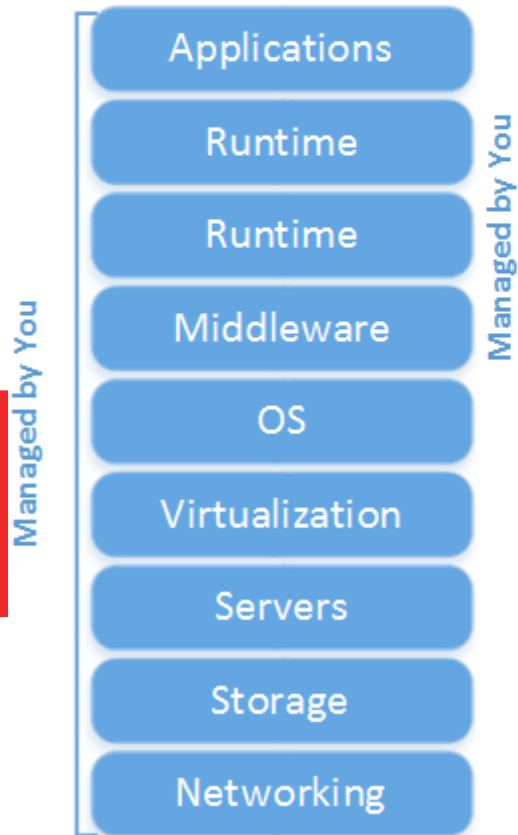


Cloud Characteristics

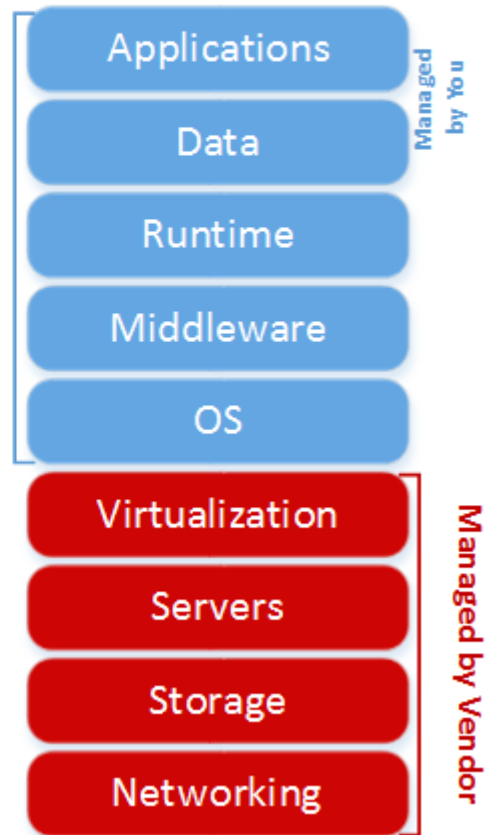


Cloud Types

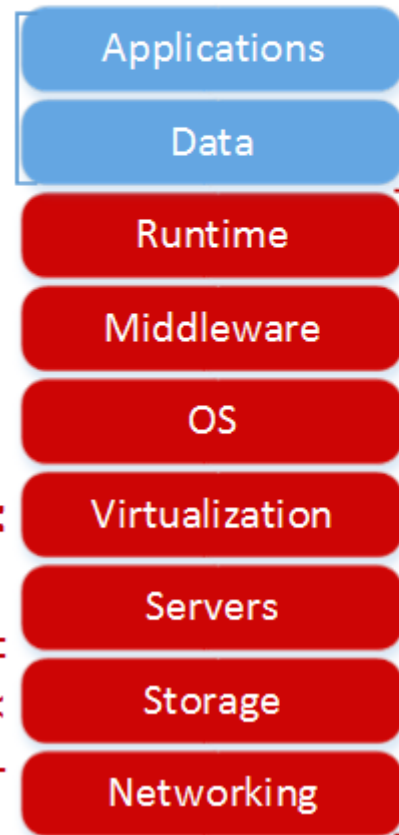
On Premise



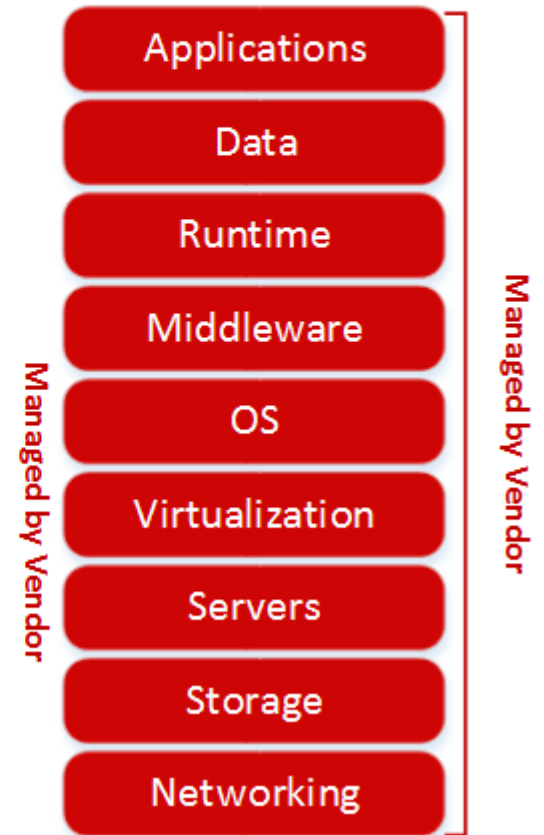
IaaS: Infrastructure as a Service



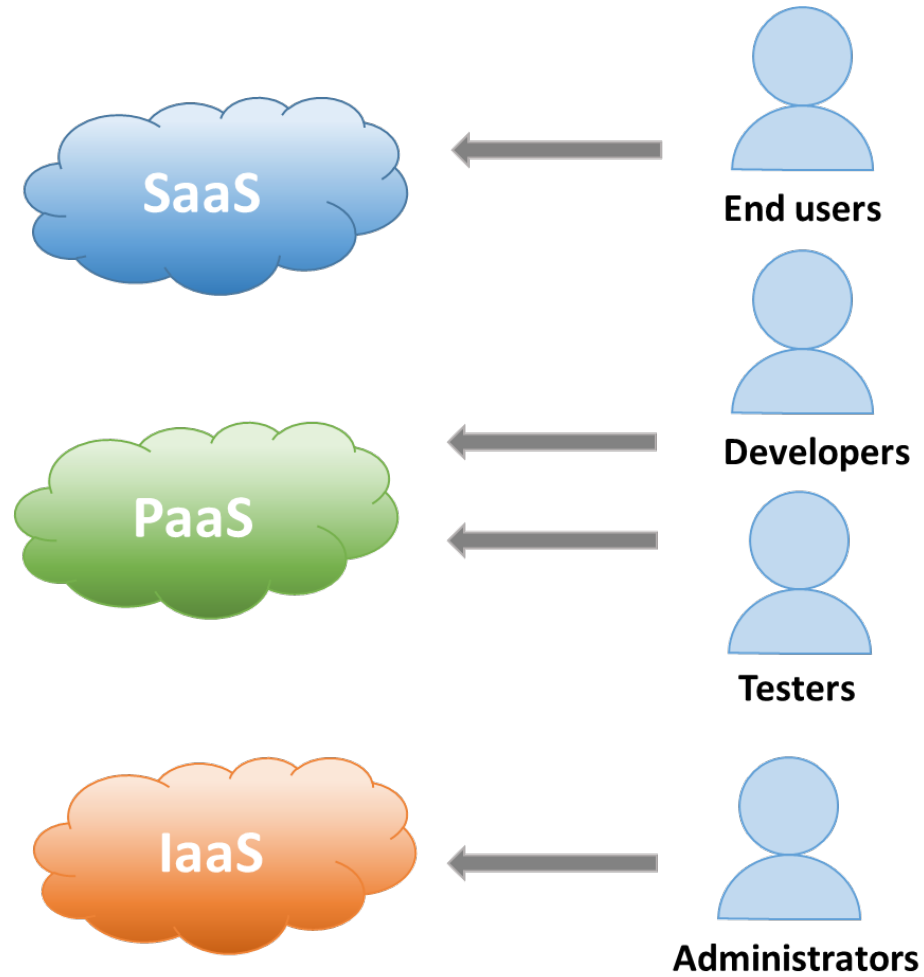
PaaS: Platform as a Service



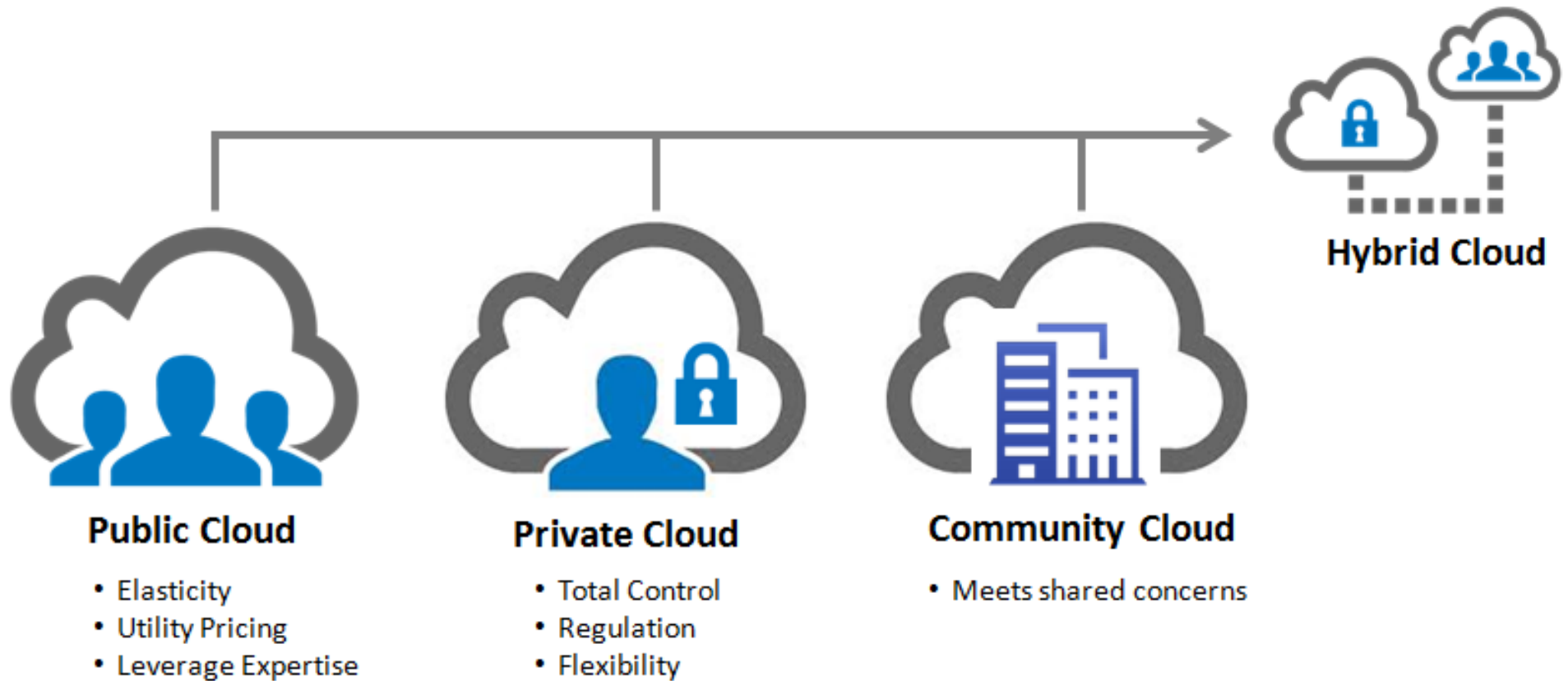
SaaS: Software as a Service



Cloud Users



Cloud Deployment Model



IaaS Public Cloud



Google Cloud Platform



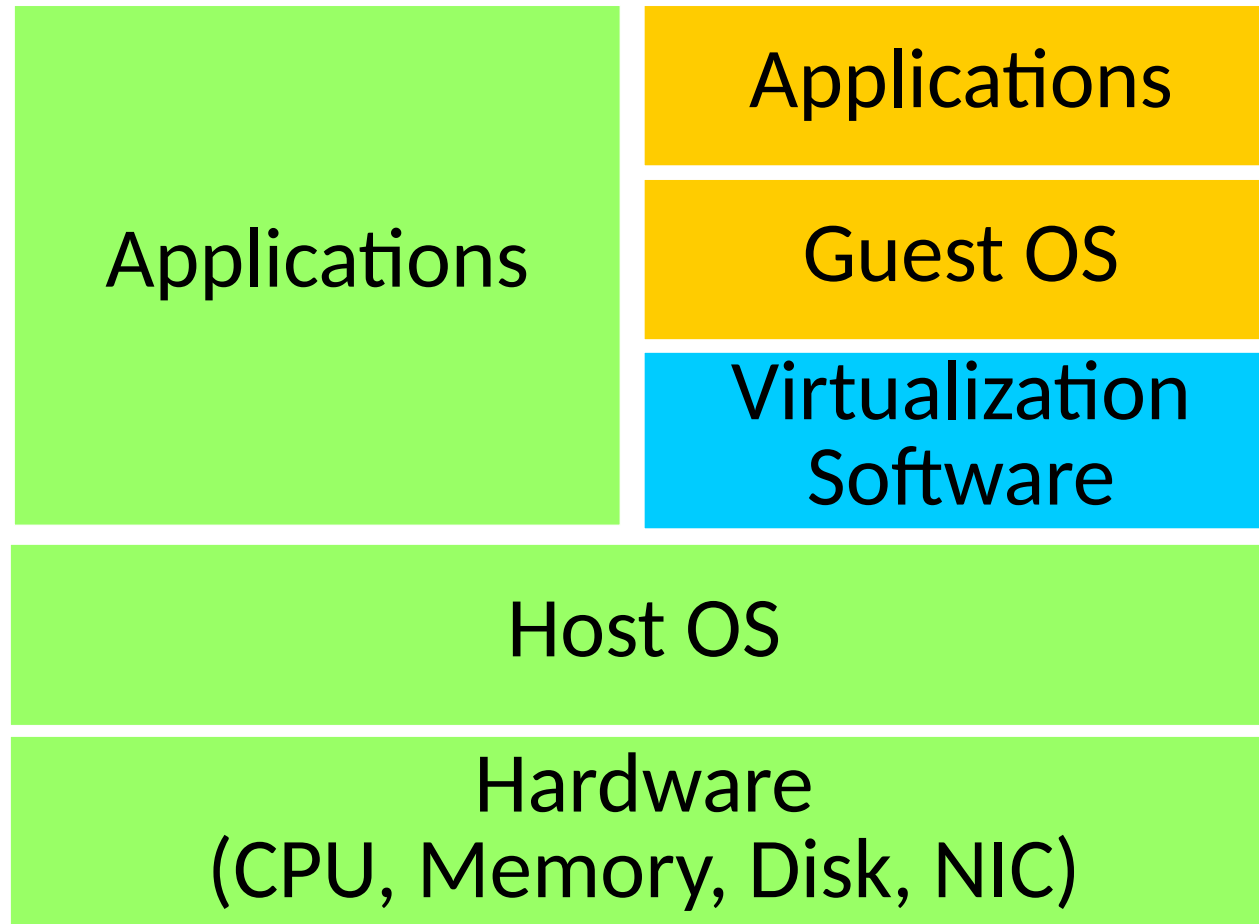


Virtualization

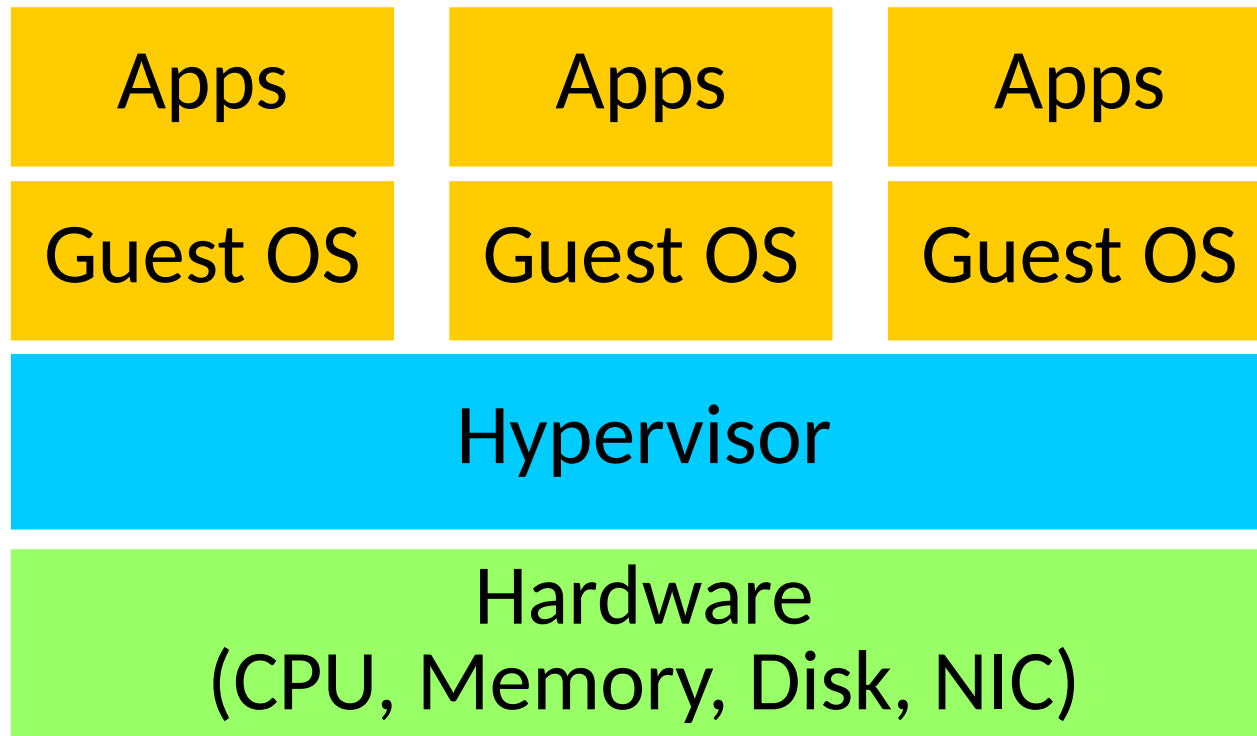
Virtualization Types

- Hardware Level
 - Full Virtualization: Oracle VirtualBox, VMWare Workstation, Qemu
 - Bare Metal Virtualization: RedHat KVM, Citrix Xen, VMWare Vsphere, Microsoft HyperV
- Operating System Level (OS Container): OpenVZ, LXC
- Application Level (Application Container): Docker, rkt

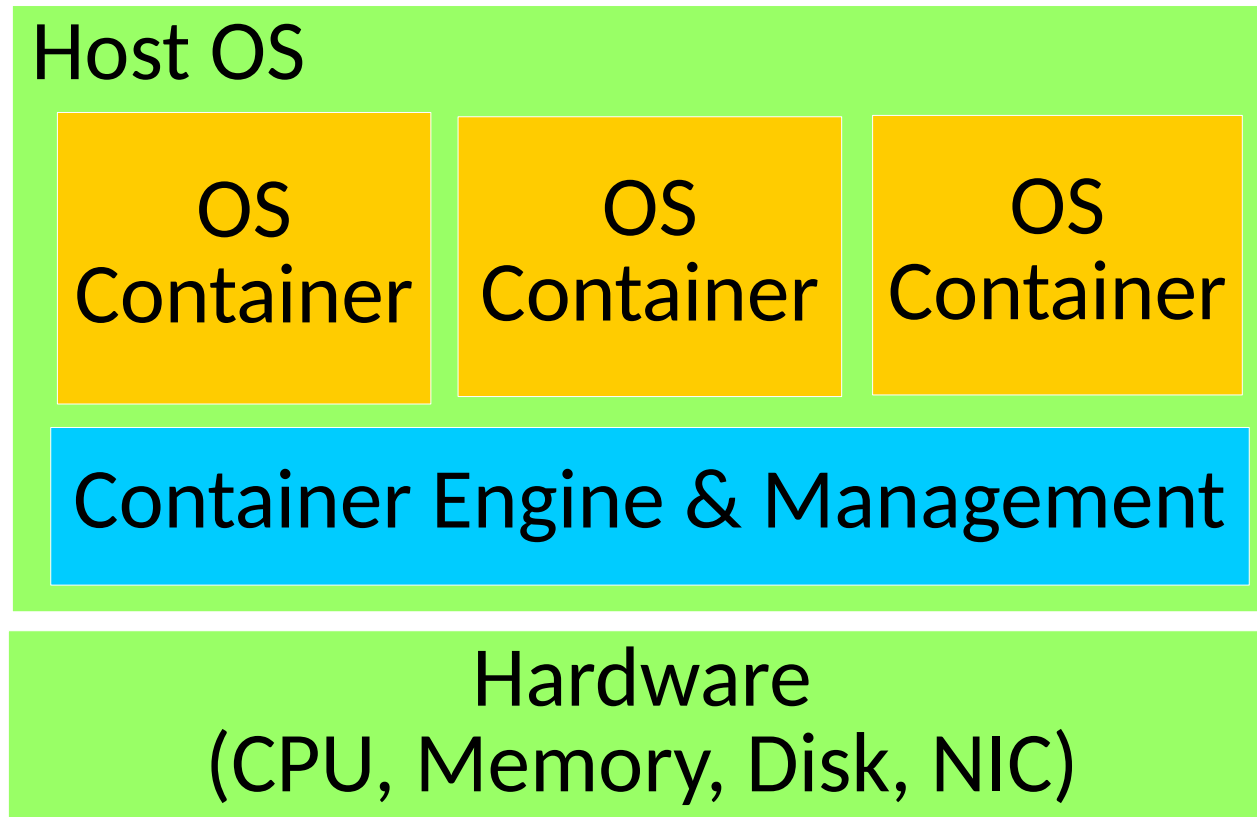
Full Virtualization



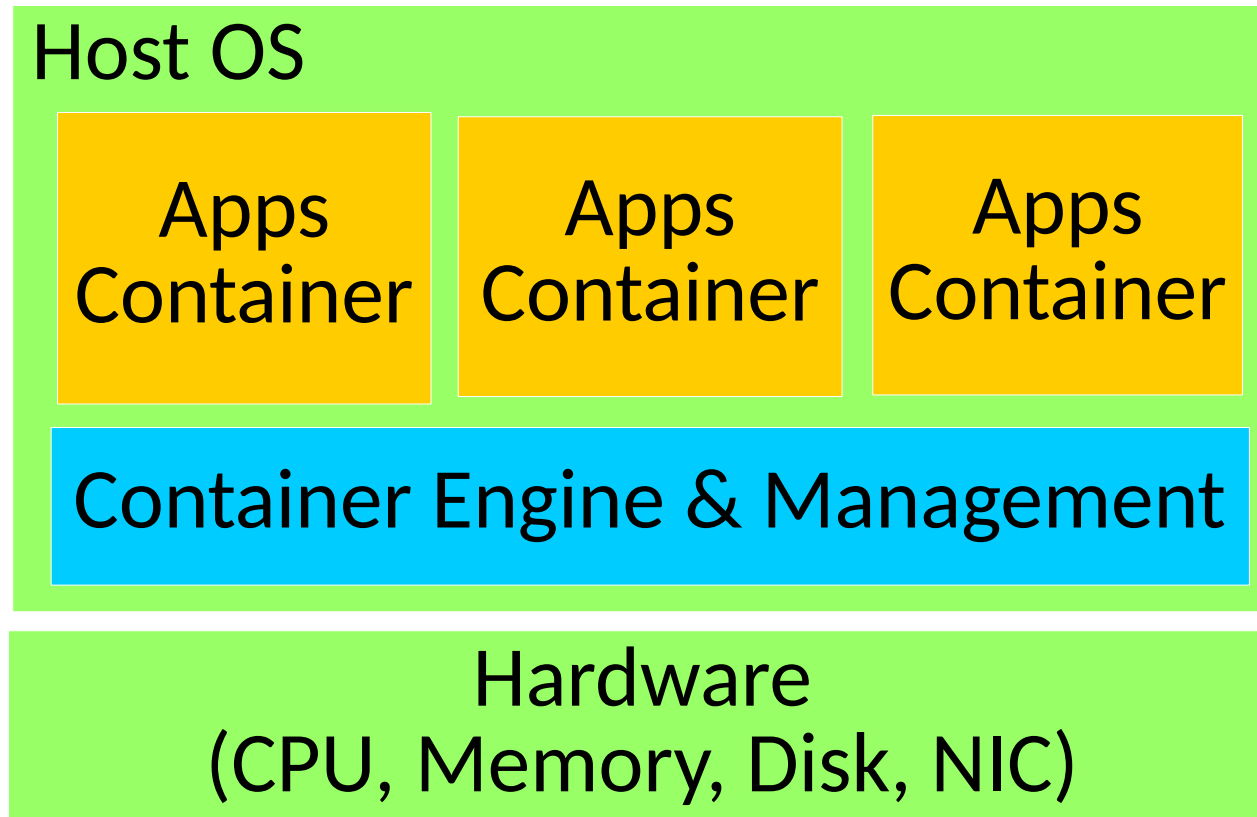
Bare Metal Virtualization



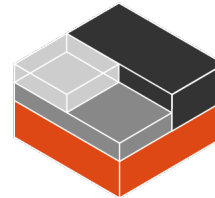
OS Container



Application Container



Containers, Hypervisors, Virtualization Softwares

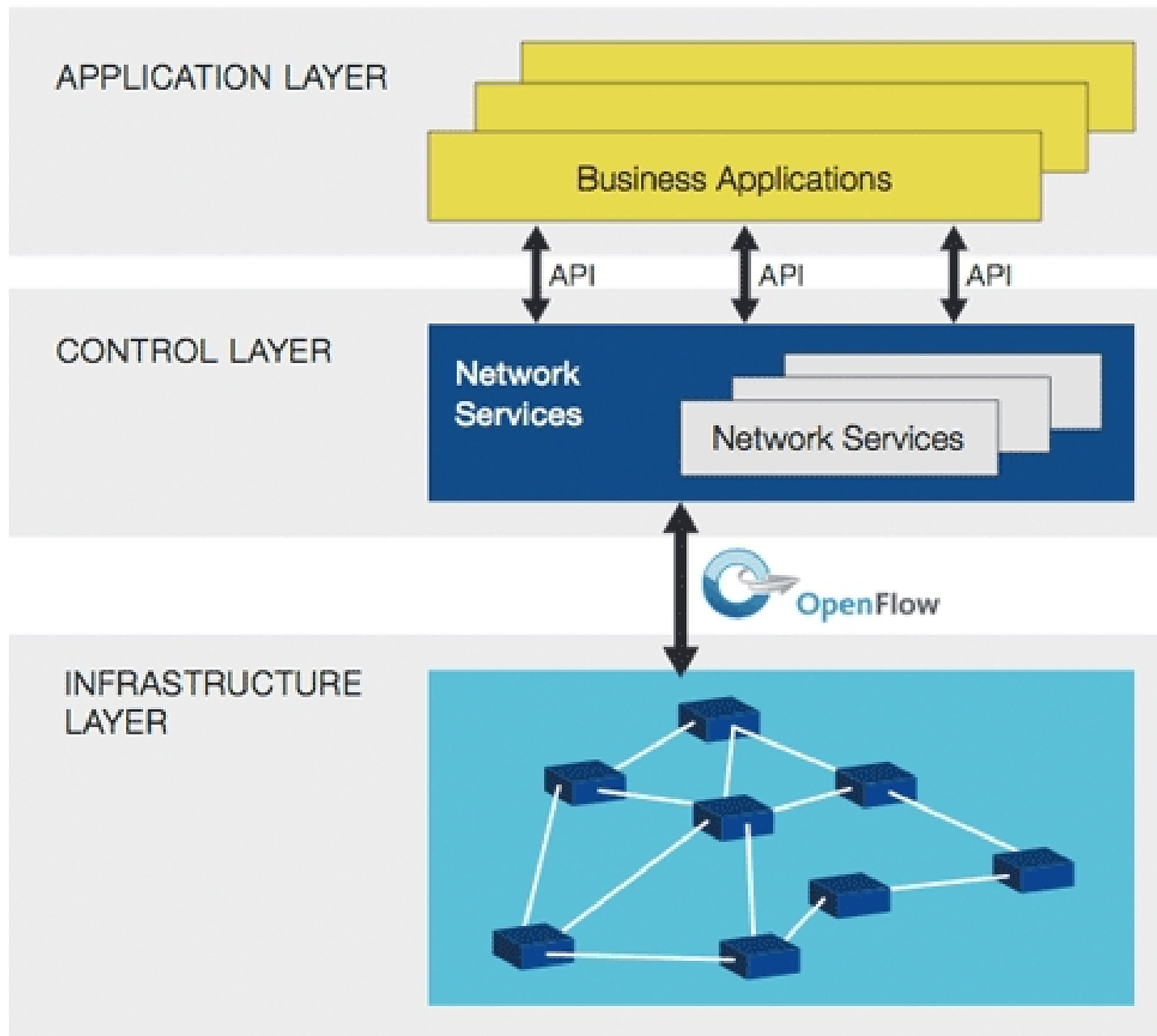


Software Defined Networking (1)

“an emerging architecture that is dynamic, manageable, cost-effective, and adaptable, making it ideal for the high-bandwidth, dynamic nature of today's applications. This architecture decouples the network control and forwarding functions enabling the network control to become directly programmable and the underlying infrastructure to be abstracted for applications and network services. The OpenFlow[®] protocol is a foundational element for building SDN solutions.”

<https://www.opennetworking.org/sdn-resources/sdn-definition>

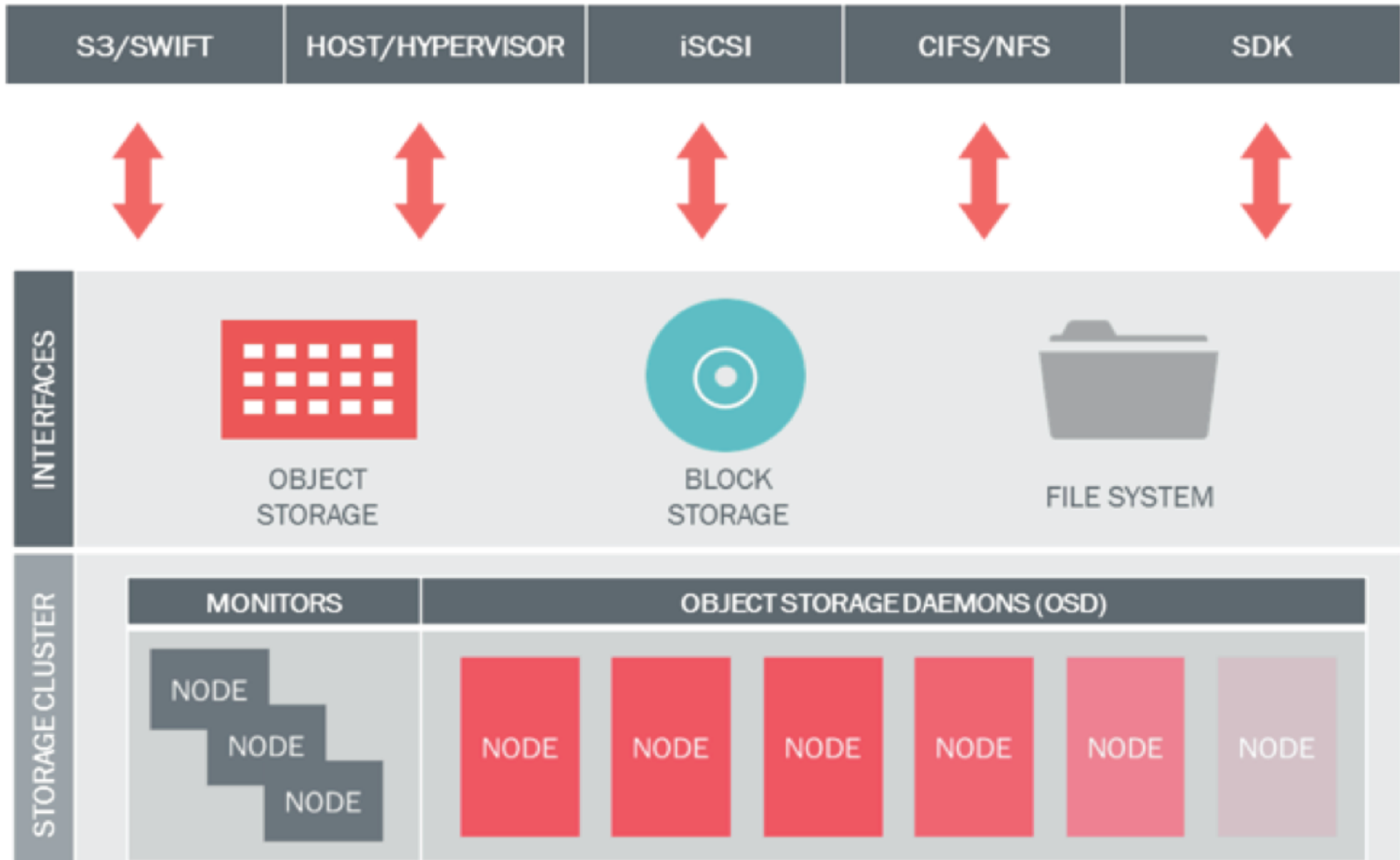
Software Defined Networking (2)



OpenFlow Based Plugin

- Open vSwitch
- Cisco UCS
- Linux Bridge
- Nicira NVP
- Ryu OpenFlow
- NEC OpenFlow
- Big Switch
- CloudBase Hyper-V
- Midionet
- Brocade VCS
- Juniper
- Mellanox
- ML2

Storage Clusters



Storage Clusters Software



Cloud Software

 EUCALYPTUS

cloudstack
open source cloud computing



Open**Nebula**.org

 **stackato**TM


Cloudify

 apache
StratosTM



 **CLOUD FOUNDRY**TM



OpenStack

OpenStack Platinum Members



AT&T



Canonical



Hewlett Packard Enterprise



IBM



Intel



Rackspace



Red Hat, Inc.



SUSE

OpenStack Gold Members



Aptira



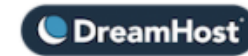
CCAT



Cisco



Dell



DreamHost



EMC



Ericsson



Fujitsu



Hitachi



Huawei



inwinSTACK



Juniper Networks



Mirantis



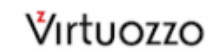
NEC



NetApp



Symantec

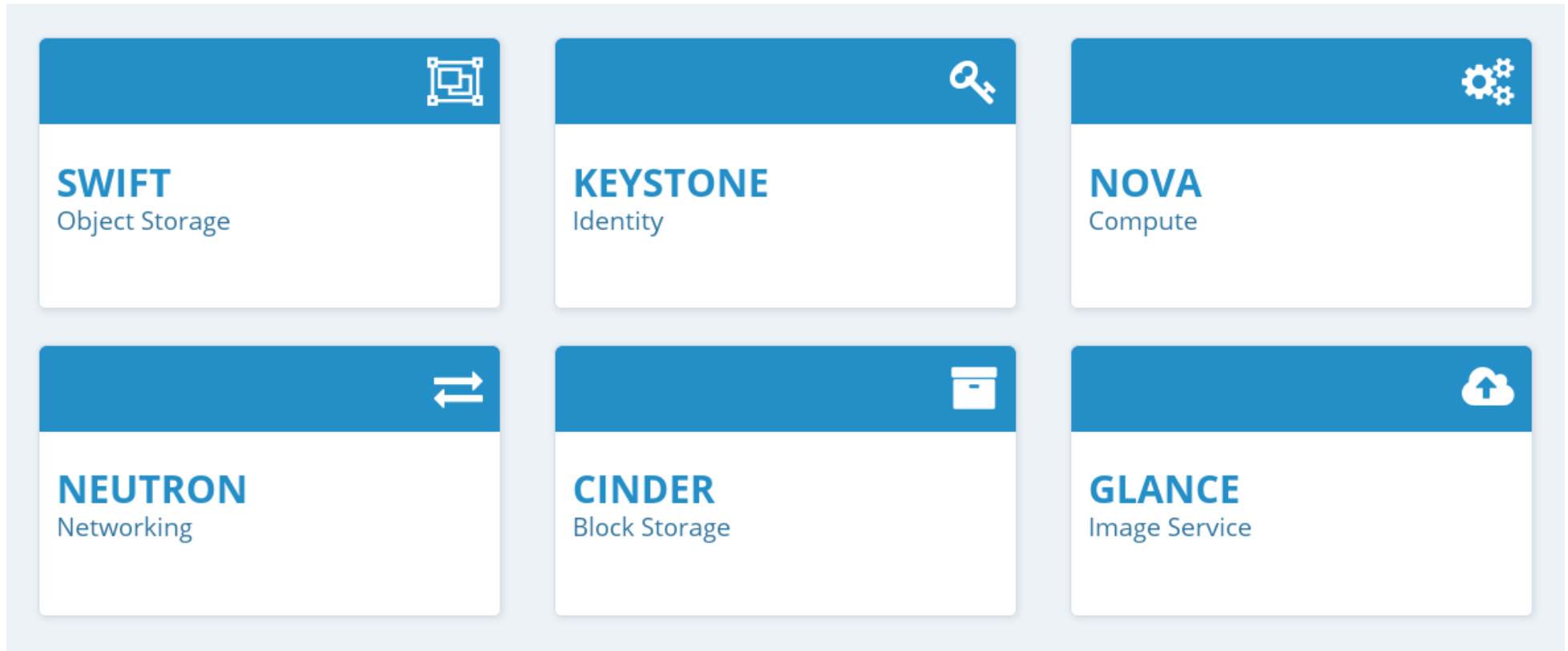


Virtuozzo



Yahoo Inc.














OpenStack Core Services



OpenStack Core Services (2)

- **Keystone (identity)**, centralized service for authentication and authorization of OpenStack services and for managing users, projects and roles
- **Neutron (networking)**, provide connectivity between the interfaces of OpenStack services
- **Glance (image)**, registry service that used to store resources such as VM images and volume snapshots
- **Nova (compute)**, manage and provisions Vms running on hypervisor nodes
- **Cinder (block storage)**, manage persistent block storage volumes for Vms
- **Swift (object storage)**, store and retrieve files and arbitrary data

OpenStack Optional Services

 HORIZON Dashboard	 CEILOMETER Telemetry	 HEAT Orchestration
 TROVE Database	 SAHARA Elastic Map Reduce	 IRONIC Bare-Metal Provisioning
 ZAQAR Messaging Service	 MANILA Shared Filesystems	 DESIGNATE DNS Service
 BARBICAN Key Management	 MAGNUM Containers	 MURANO Application Catalog
 CONGRESS Governance		

OpenStack Optional Services (2)

- **Horizon (dashboard)**, web browser-based dashboard that used to manage OpenStack services
- **Ceilometer (telemetry)**, provides measurements of cloud resources
- **Heat (orchestration)**, template-based orchestration engine that supports automatic creation of resource stacks
- **Manila (shared FS)**, provides file storage to a VMs.
- **Ironic (bare metal provisioning)**, provision physical or bare metal machines.
- **Trove (DBaaS)**, allow users to select, provision, operate and administrate variety of relation and non-relation databases.
- **Sahara (data processing)**, provisioning and management of Hadoop clusters on OpenStack

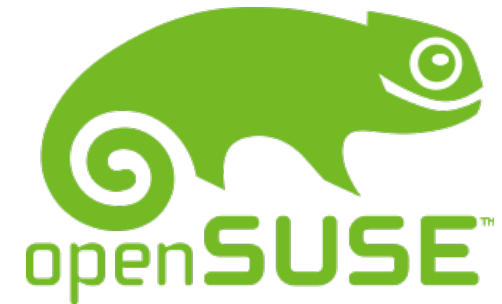
OpenStack Version

Series	Status	Release Date	EOL
Pike	Future Development		
Ocata	Under Development	2017-02-22	
Newton	Stable	2016-10-06	
Mitaka	Security Supported	2016-04-07	2017-04-10

OpenStack Distribution



CentOS



debian

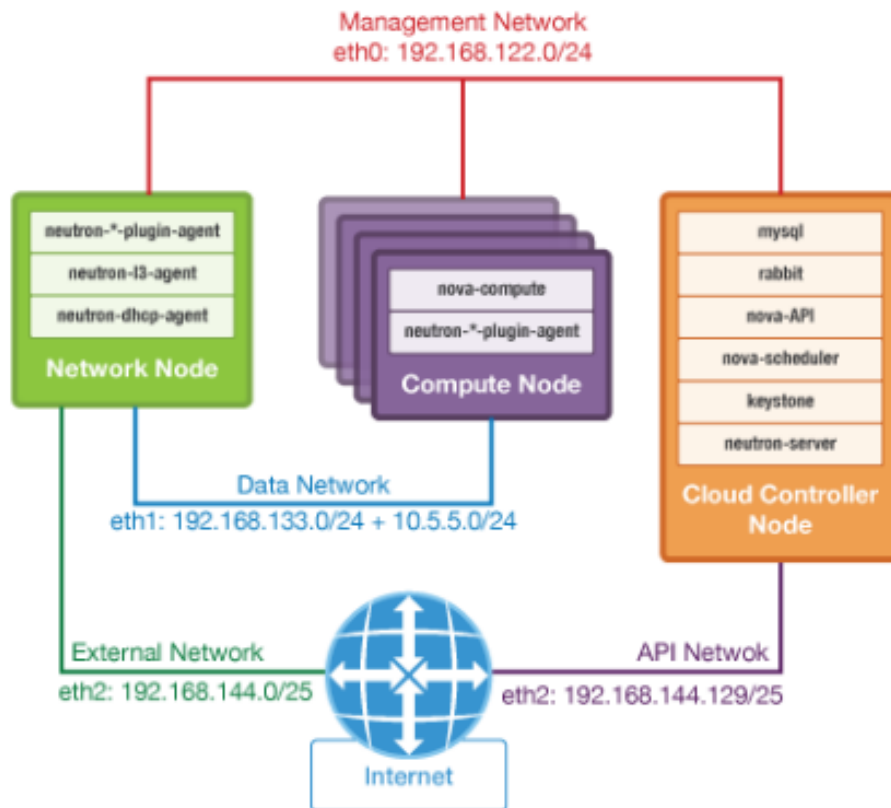
OpenStack Images

- Cirros: <http://download.cirros-cloud.net>
- CentOS: <http://cloud.centos.org/centos/>
- OpenSUSE:
<http://download.opensuse.org/repositories/Cloud:/Images:/>
- Ubuntu: <http://cloud-images.ubuntu.com>
- Debian: <http://cdimage.debian.org/cdimage/openstack/>
- Windows Server: <https://cloudbase.it/windows-cloud-images/>

OpenStack Deployment Tools

- Devstack <http://docs.openstack.org/developer/devstack/>
- OpenStack Ansible <https://github.com/openstack/openstack-ansible>
- Packstack & Triple O: <https://www.rdoproject.org/>
- Juju OpenStack: <https://jujucharms.com/openstack>
- Crowbar: <http://crowbar.github.io>
- Fuel: <https://www.fuel-infra.org>

OpenStack Networking

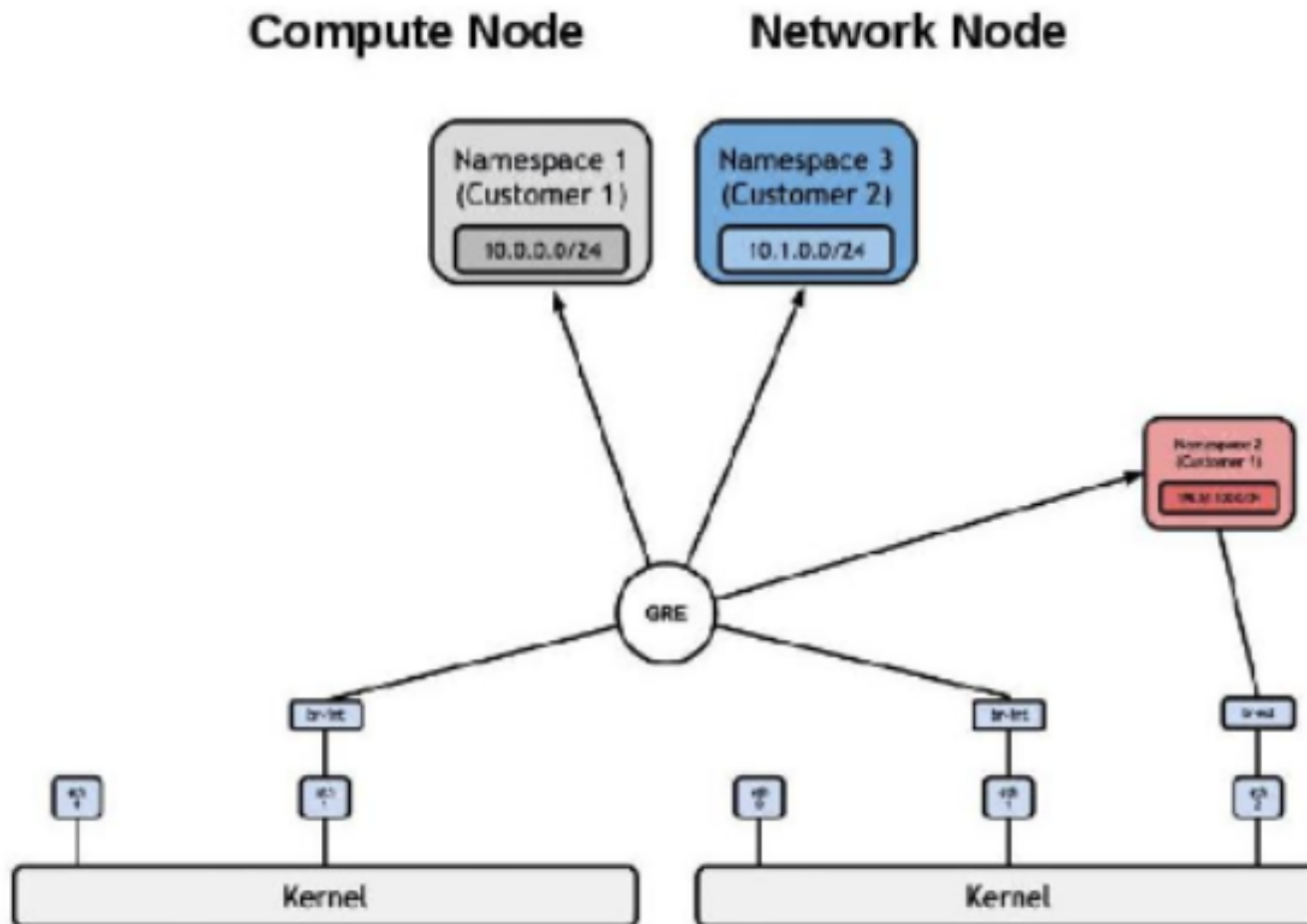


Next, we present a general overview of the networks present in **OpenStack Clouds**. We have:


- **Internal management network:** this is used by all the physical nodes to talk to each other.
- **Provider network:** this is GRE- or VLAN-based, used by VMs on different hosts to talk to each other.
- **External network:** the official, routable network to the Internet.
- **OAM network:** another official network for API access from external hosts; it can be the same as the External network.

Please note that **GRE** stands for **Generic Routing Encapsulation**. In contrast to other tunneling solutions, GRE does not offer any form of encryption. Don't confuse it with **IPsec** or other similar technologies.

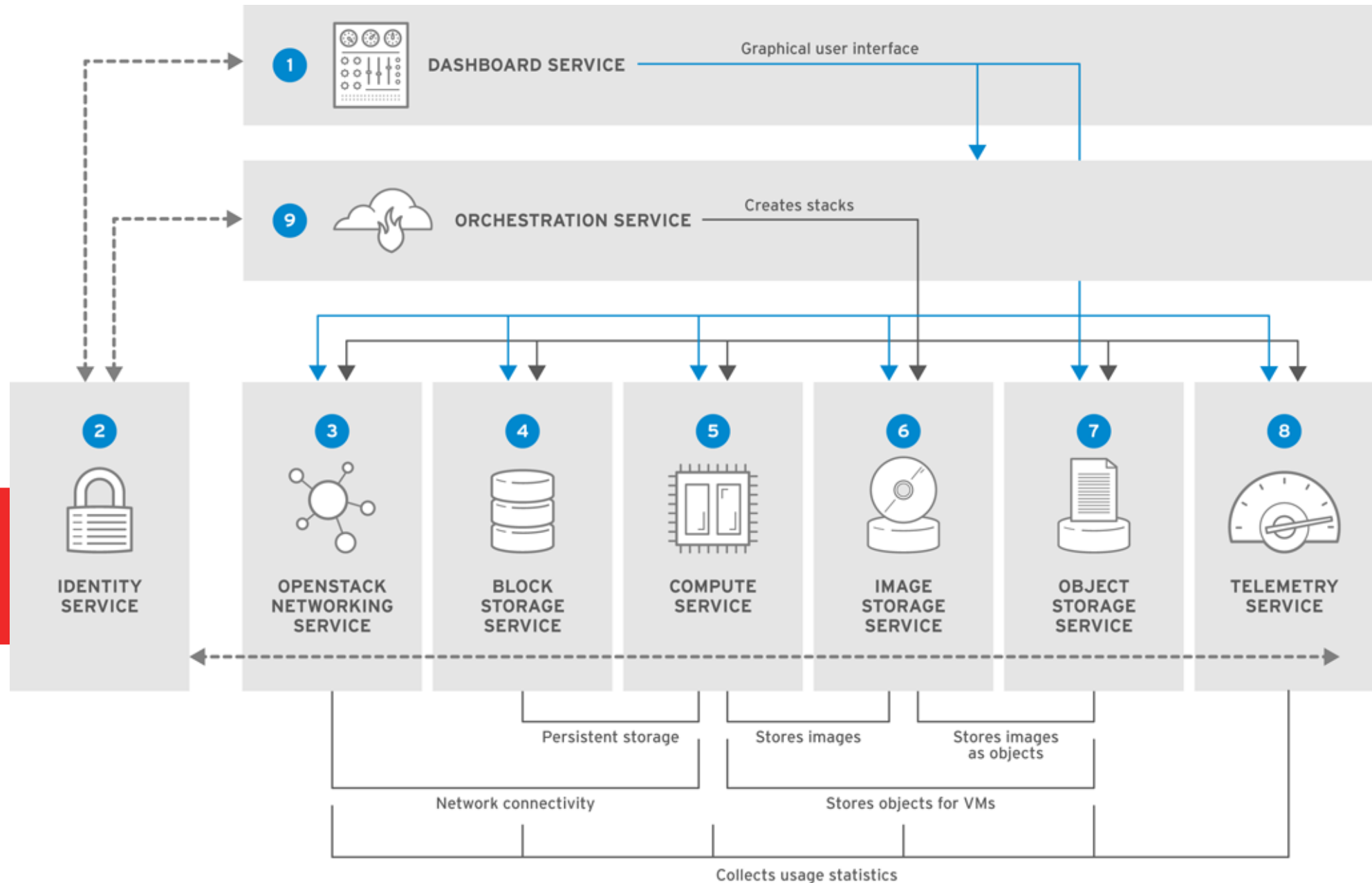
OpenStack Networking (2)



Prerequisite Services

- NTP: NTPD, Chrony
 - MQ: RabbitMQ, zeroMQ
 - SQL: MariaDB, MySQL, PostgreSQL
 - NoSQL: MongoDB
- 

OpenStack Services Diagram

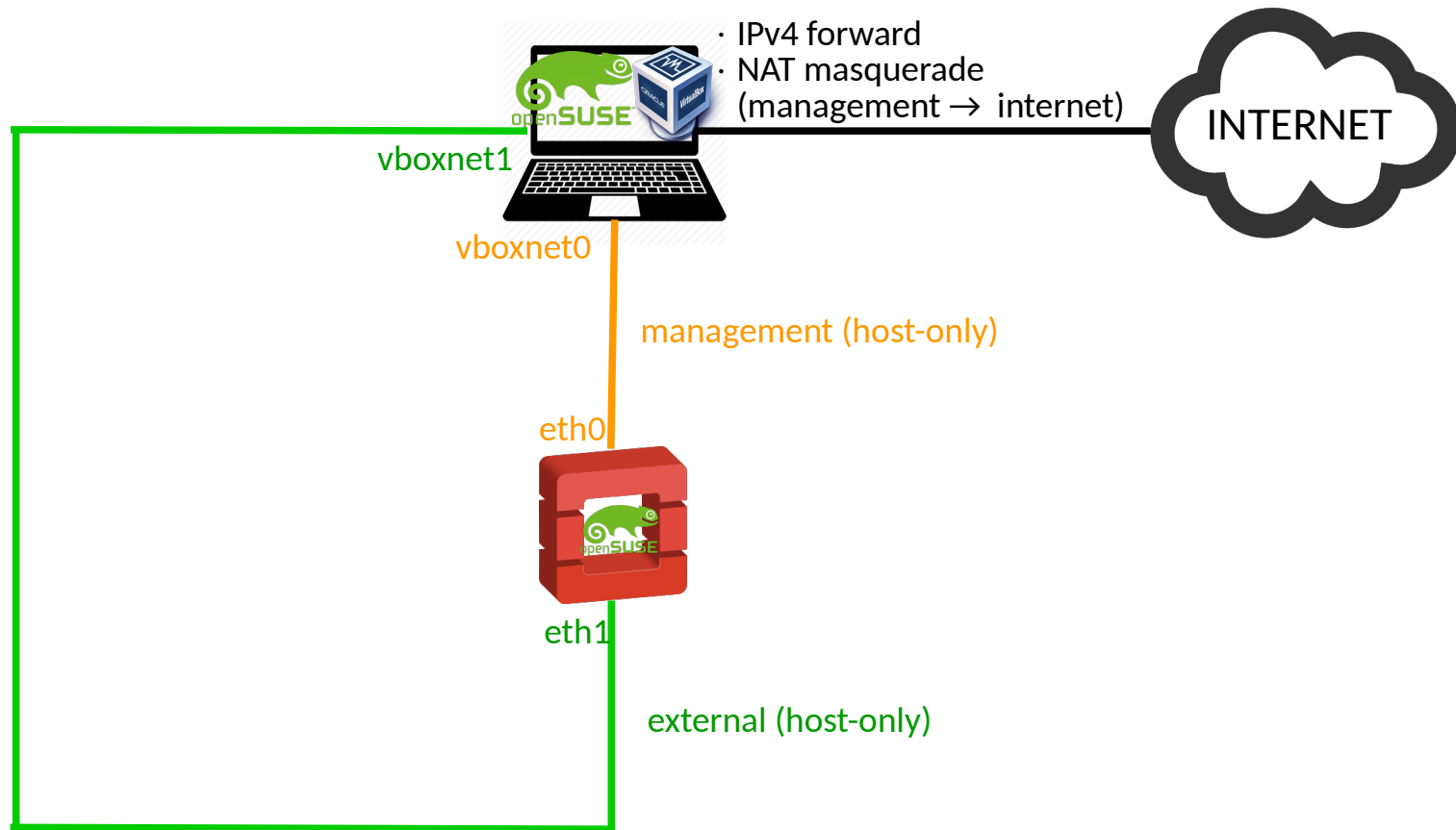





Lab I

*Keystone, Neutron, Glance,
Nova, Horizon*

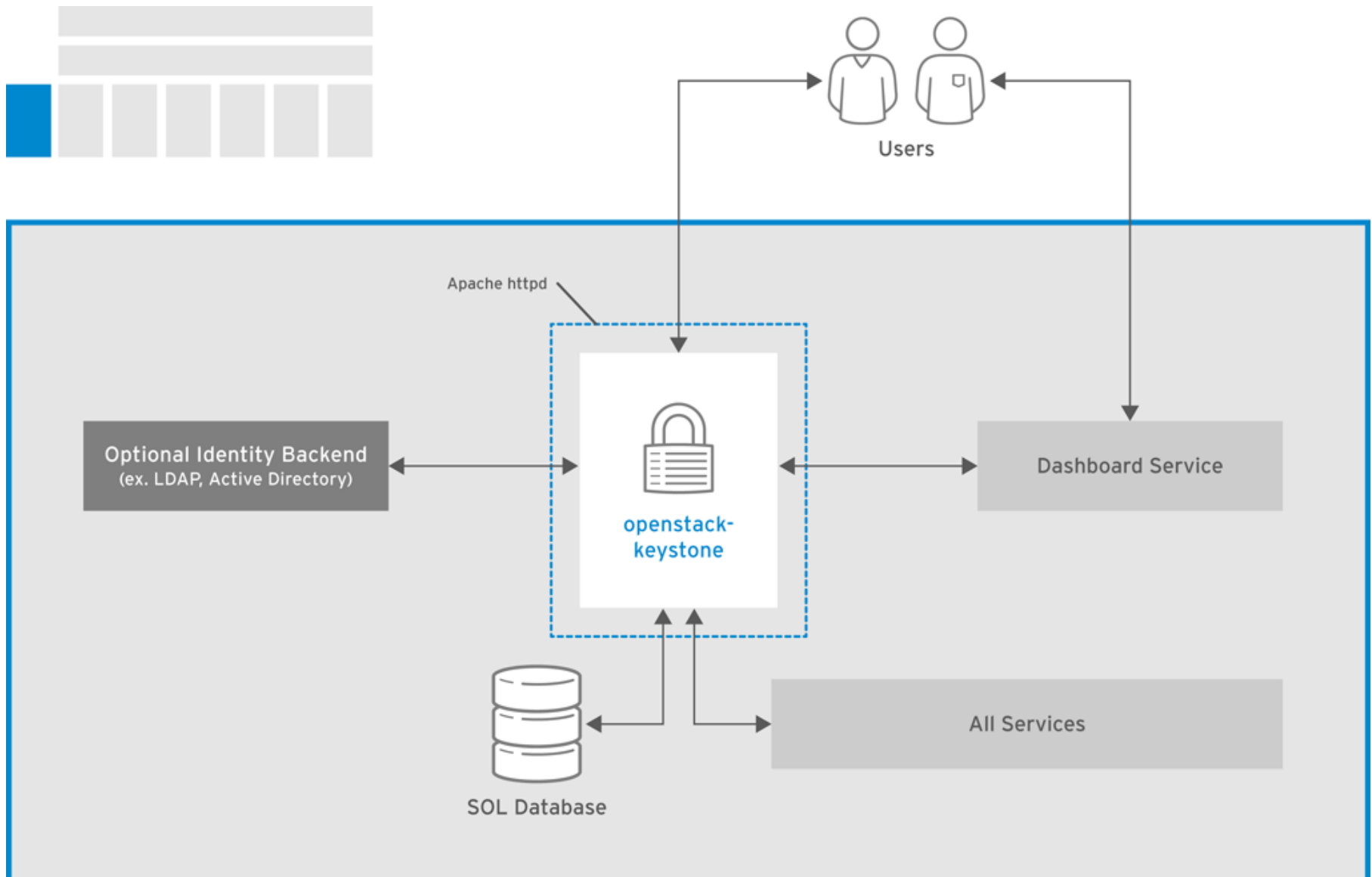
Lab I Topology




Keystone Components

- **Keystone server**, centralized server provide authentication and authorization services using RESTful interface.
 - **Keystone driver**, accessing identity information in repositories external to OpenStack (SQL DB, LDAP, AD).
 - **Keystone modules**, middleware modules run in the address space of the OpenStack component that is using the identity service.
- 

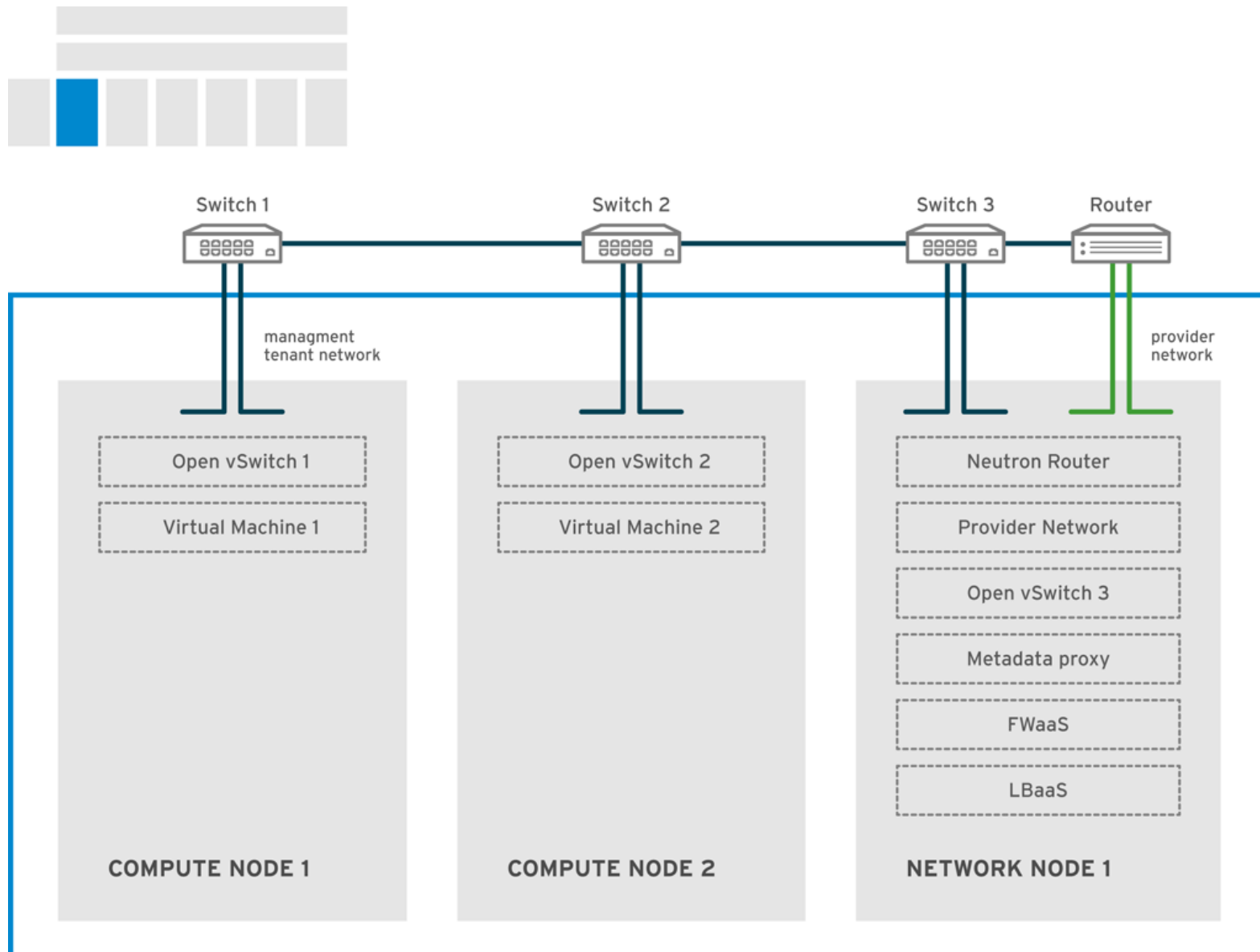
Keystone Flow Diagram



Neutron Components

- **Neutron servers**, python daemon that manages user request and expose the networking API.
 - **Neutron plugins**, specific set of networking technology/mechanisms to implement the networking API.
 - **Neutron agents**, service that runs on each OpenStack node to perform local networking configuration for the node virtual machines and for networking services such as Open vSwitch.
- 

Neutron Configuration Example



Glance Components

- **Glance API**, interacts with storage backends to handle requests for image retrieval and storage.
- **Glance registry**, manage all metadata for each image.

Glance Components Diagram

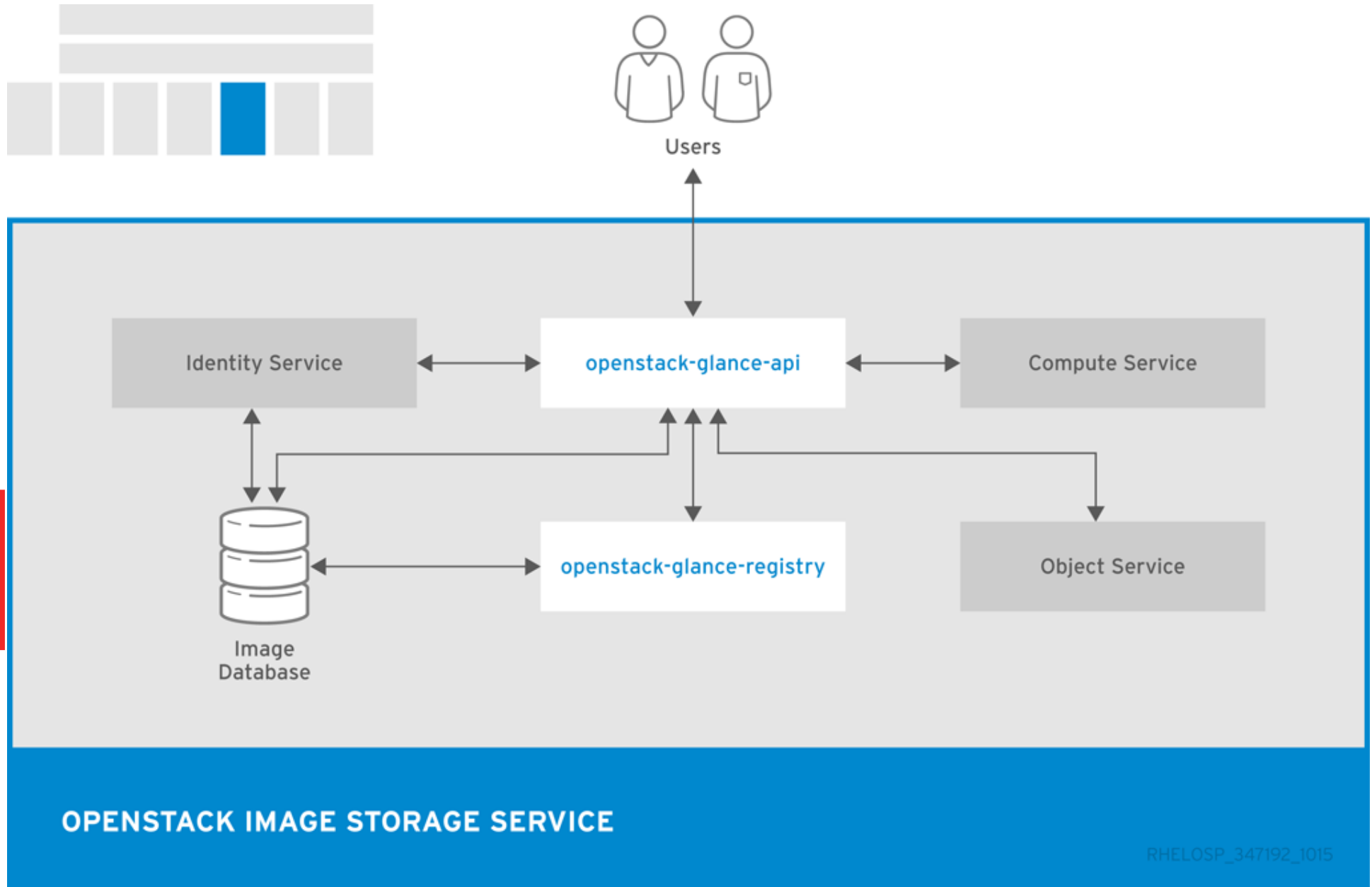


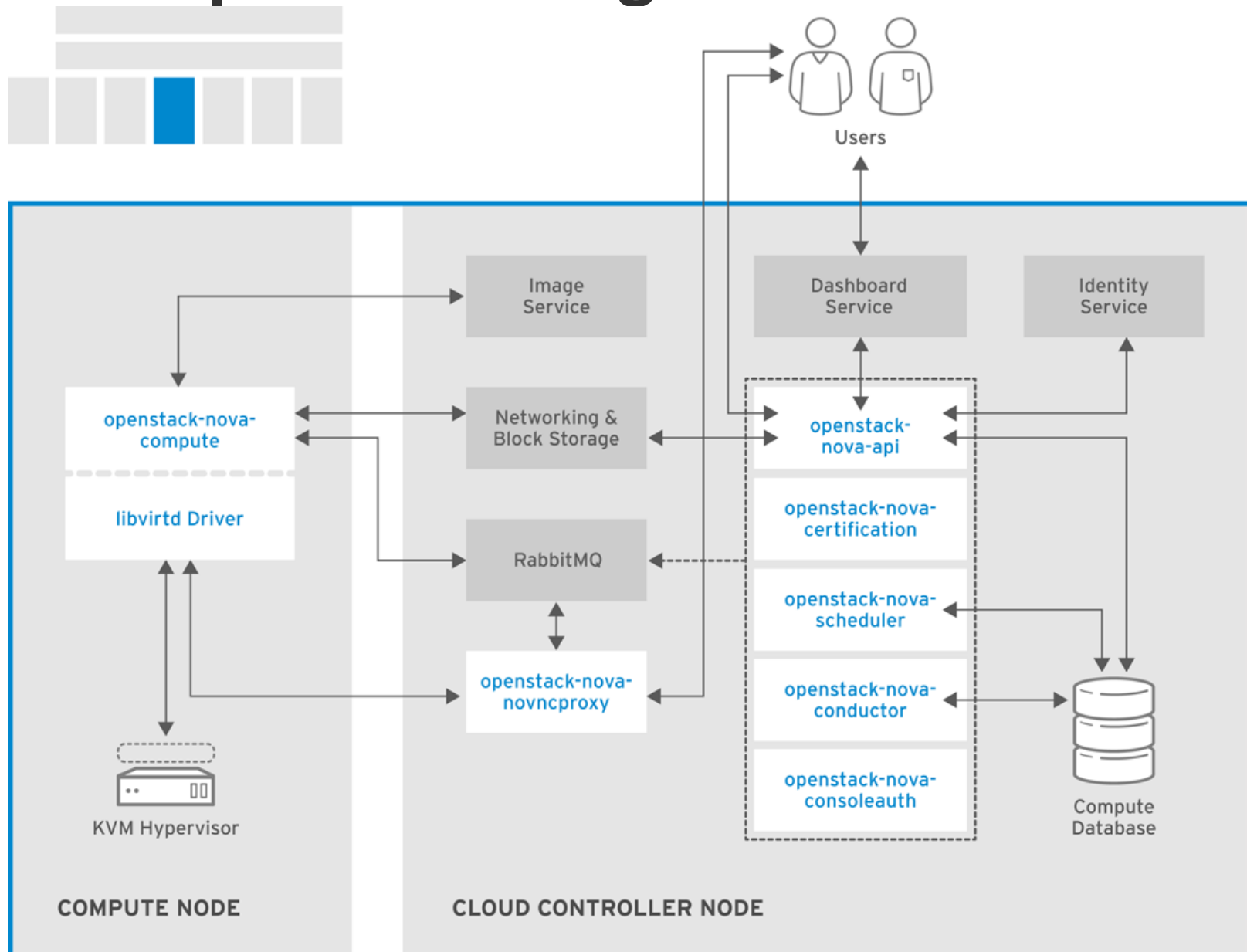
Image Disk Formats

- aki/ami/ari, amazon kernel/machine/ramdisk image.
- iso, archive format for optical discs.
- qcow2, qemu/kvm support copy on write.
- raw, unstructured format
- vhd, hyper-v
- vdi, virtualbox
- vmdk, vmware
- bare, no metadata
- ova
- ovf

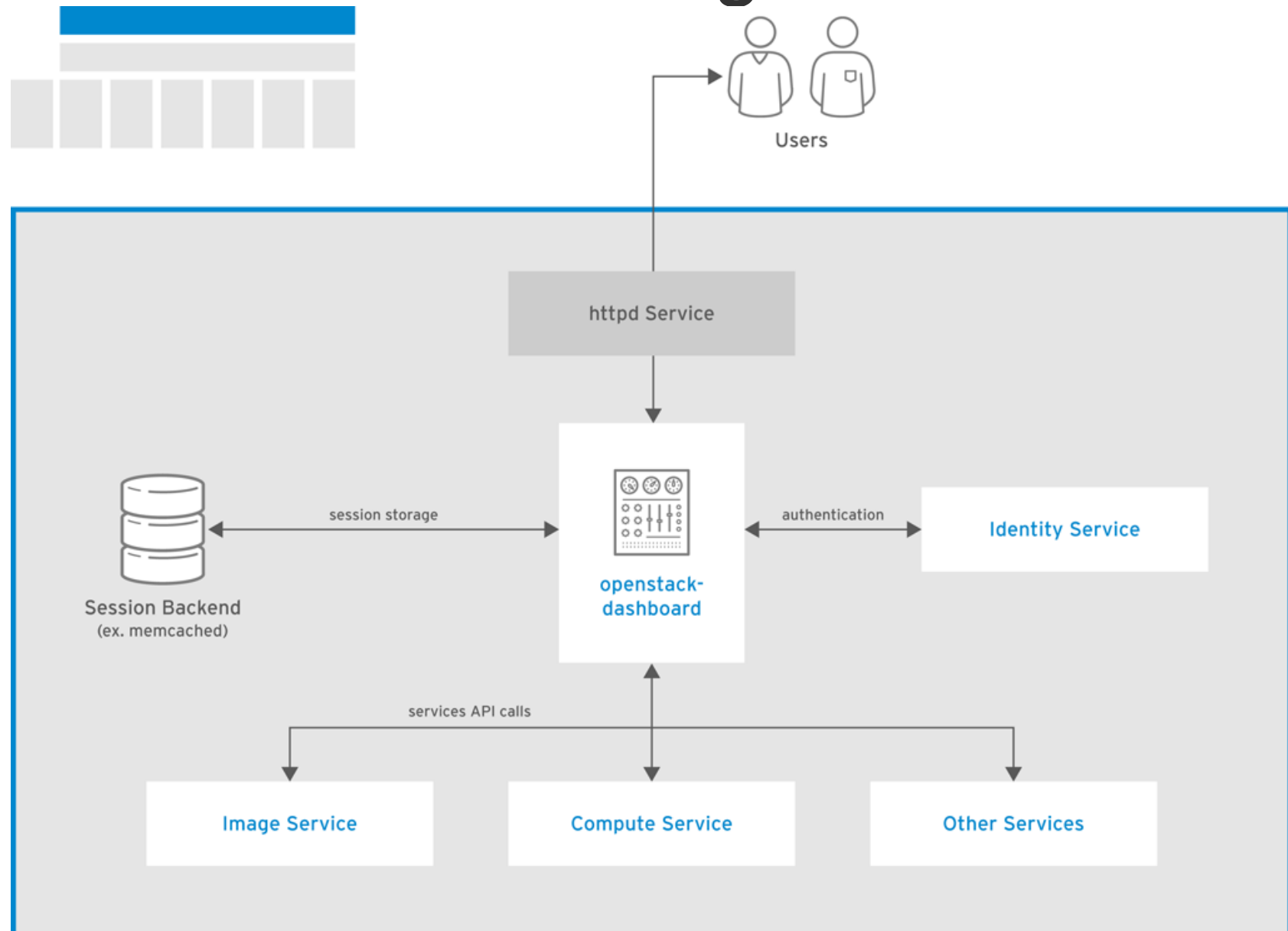
Nova Components

- **Nova API**, handles requests and provides access to the compute services.
- **Nova cert**, provide the certificate manager.
- **Nova compute**, run on each compute node to create and terminate instances.
- **Nova conductor**, provides database-access support for compute nodes to reduce security risks.
- **Nova consoleauth**, handles console authentication.
- **Nova novncproxy**, provides a VNC proxy for browser to enable consoles to access instances.
- **Nova scheduler**, dispatches requests for new instances to the correct node based on configured weights and filters/


Nova Components Diagram



Horizon Interactions Diagram



Horizon Tabs

- Project tab, view and manage the resources in a selected project
 - Admin tab, administration tab to view usage, manage instances, volumes, flavors, images, networks and so on.
 - Identity tab, view and manage projects and users.
 - Settings tab, view and manage dashboard settings.
- 

Horizon Project Tab

openstack

admin

admin

Project

Compute

Overview

Instances

Volumes

Images

Access & Security

Network

Orchestration

Object Store

Admin

Identity

Overview

Limit Summary

Instances
Used 0 of 10

VCPUs
Used 0 of 20

RAM
Used 0 of 51,200

Floating IPs
Used 0 of 50

Security Groups
Used 1 of 10

Volumes
Used 0 of 10

Volume Storage
Used 0 of 1,000

Usage Summary

Select a period of time to query its usage:

From: 2015-11-01

To: 2015-11-25

Submit

The date should be in YYYY-mm-dd format.

Active Instances: 0 Active RAM: 0Bytes This Period's VCPU-Hours: 0.00 This Period's GB-Hours: 0.00 This Period's RAM-Hours: 0.00

Usage

Download CSV Summary

Instance Name	VCPUs	Disk	RAM	Time since created
No items to display.				

Displaying 0 items

Horizon Admin Tab

openstack

admin

admin

Project

Admin

System

Overview

Resource Usage

Hypervisors

Host Aggregates

Instances

Volumes

Flavors

Images

Networks

Routers

Defaults

Metadata Definitions

System Information

Identity

Overview

Usage Summary

Select a period of time to query its usage:

From: 2015-11-01

To: 2015-11-25

Submit

The date should be in YYYY-mm-dd format.

Active Instances: 0 Active RAM: 0 Bytes This Period's VCPU-Hours: 0 This Period's GB-Hours: 0 This Period's RAM-Hours: 0

Usage

Download CSV Summary

Project Name	VCPU	Disk	RAM	VCPU Hours	Disk GB Hours	Memory MB Hours
No items to display.						
Displaying 0 items						

Horizon Identity Tab

openstack

admin

admin

Project

Admin

Identity

Projects

Users

Projects

Filter

+ Create Project

✕ Delete Projects

	Name	Description	Project ID	Enabled	Actions
<input type="checkbox"/>	admin	admin tenant	8de4dad72776457bb603ff4c666c6f1d	Yes	Manage Members
<input type="checkbox"/>	services	Tenant for the openstack services	03a4921f11f64eeaa16f42b98947ab59	Yes	Manage Members

Displaying 2 items

Horizon Settings Tab

openstack

admin

admin

Project

Admin

Settings

User Settings

Change Password

Identity

User Settings

Language *

English (en)

Timezone *

UTC

Items Per Page * ?

20

Log Lines Per Instance * ?

35

Description:

Modify dashboard settings for your user.

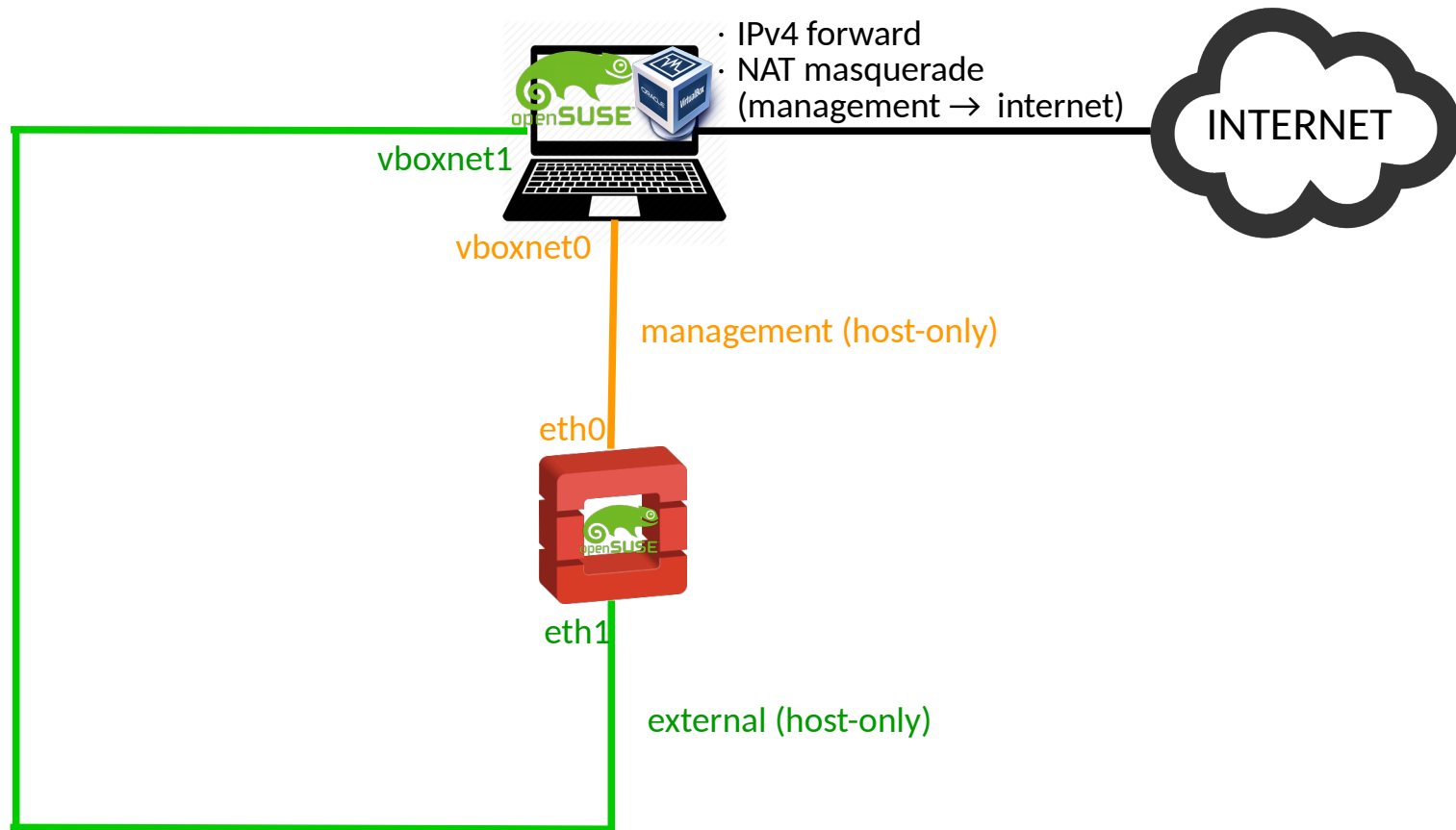
Save




Lab II

Cinder, Swift

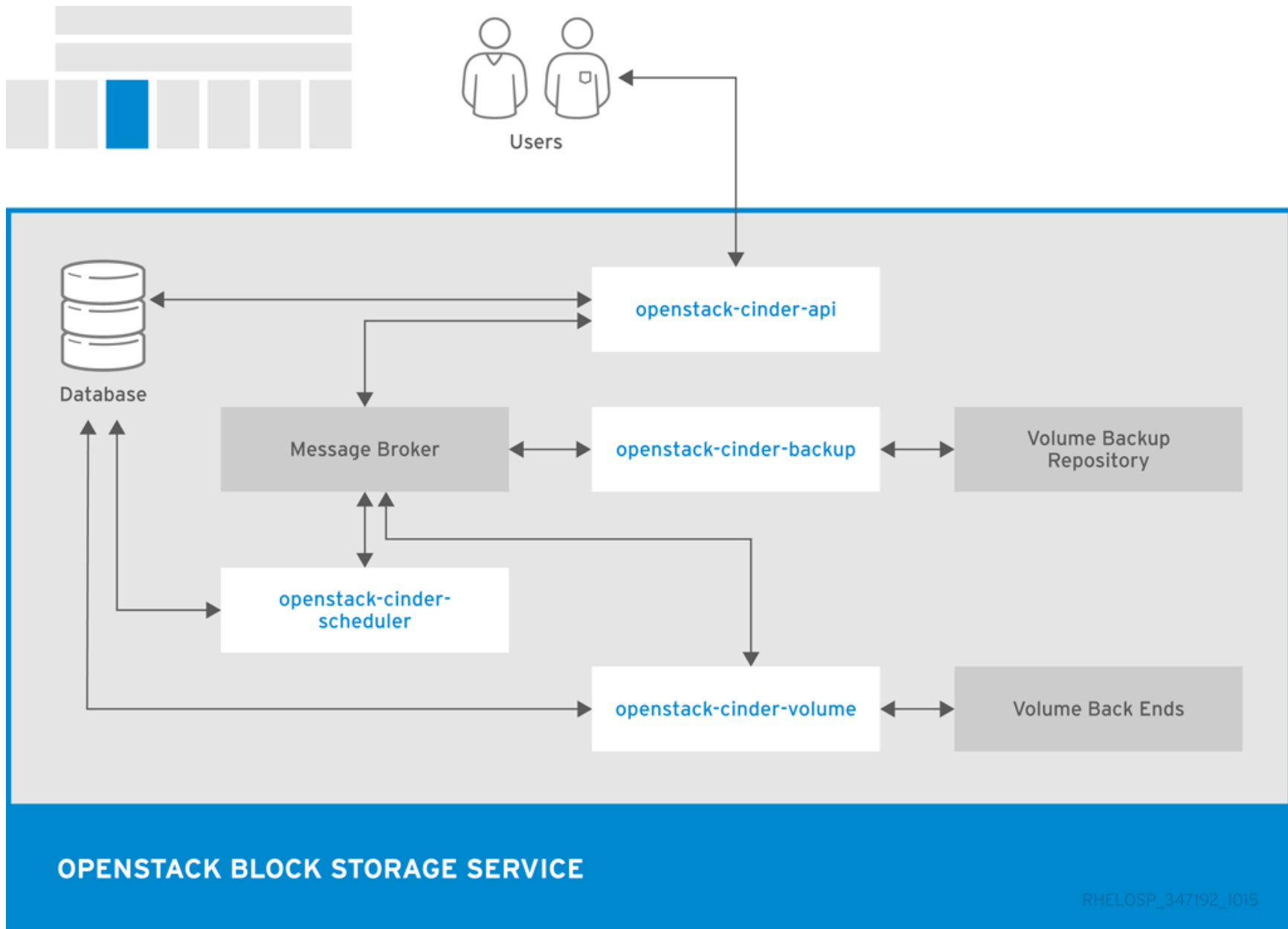
Lab II Topology



Cinder Components

- **Cinder API**, responds to request and places them in the message queue.
 - **Cinder backup**, backup a block storage volume to an external storage repository.
 - **Cinder scheduler**, assigns tasks to the queue and determines the provisioning volume server.
 - **Cinder volume**, designates storage for VMs.
- 

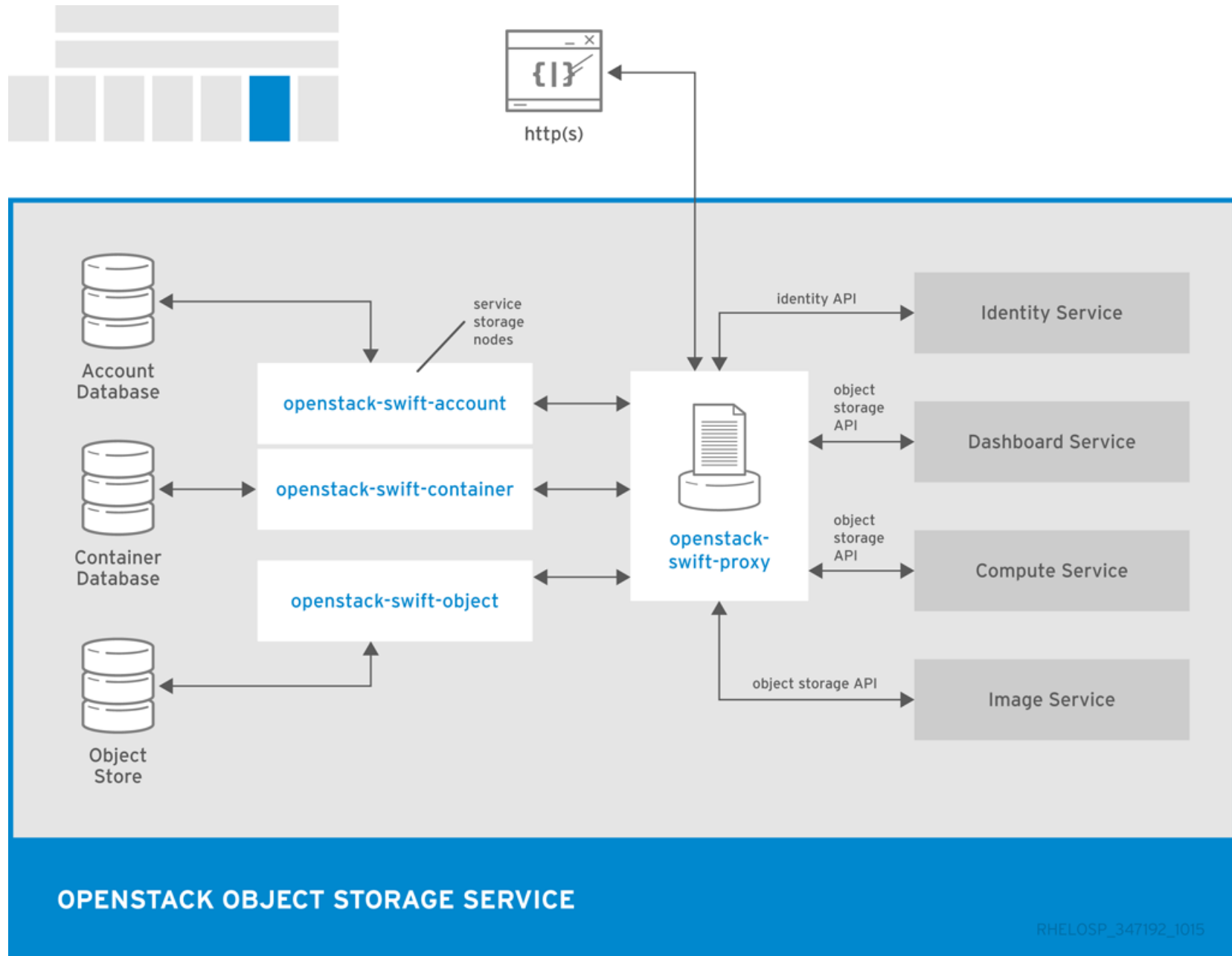
Cinder Components Diagram



Swift Components

- **Swift account**, handles listing of containers with the account database.
- **Swift container**, handles listing of objects that are included in a specific container with the container database.
- **Swift object**, stores, retrieves, and delete objects.
- **Swift proxy**, expose the public API, provides authentication, and route requests.
- **Swift auditor**, verifies the integrity of accounts, containers and objects and protect against data corruption.
- **Swift replicator**, ensures consistent and available replication throughout the swift cluster including garbage collection
- **Swift updater**, identifies and retries failed updates.

Swift Components Diagram





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