



# On-Ramp To OpenStack

## Section 2: RHEL OpenStack Platform Deep Dive

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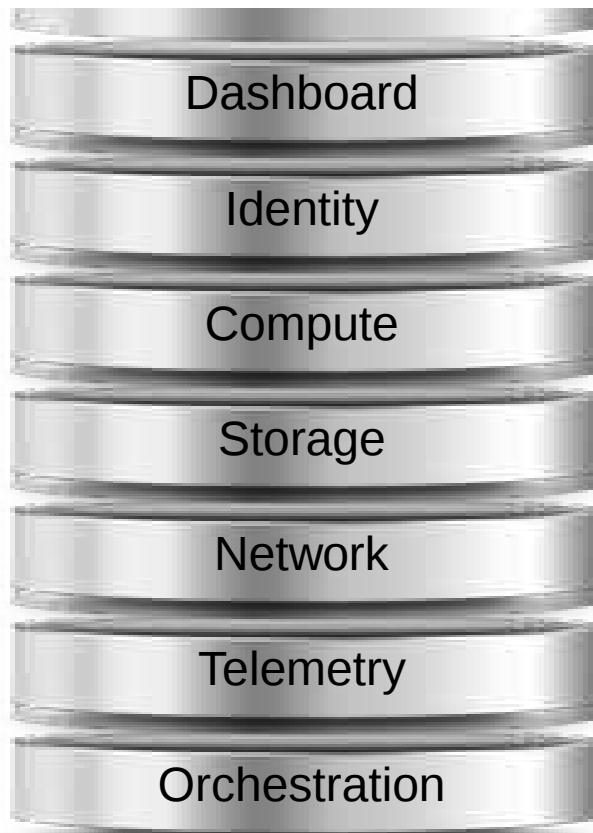
August 2015





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## What Problem Does OpenStack Solve?



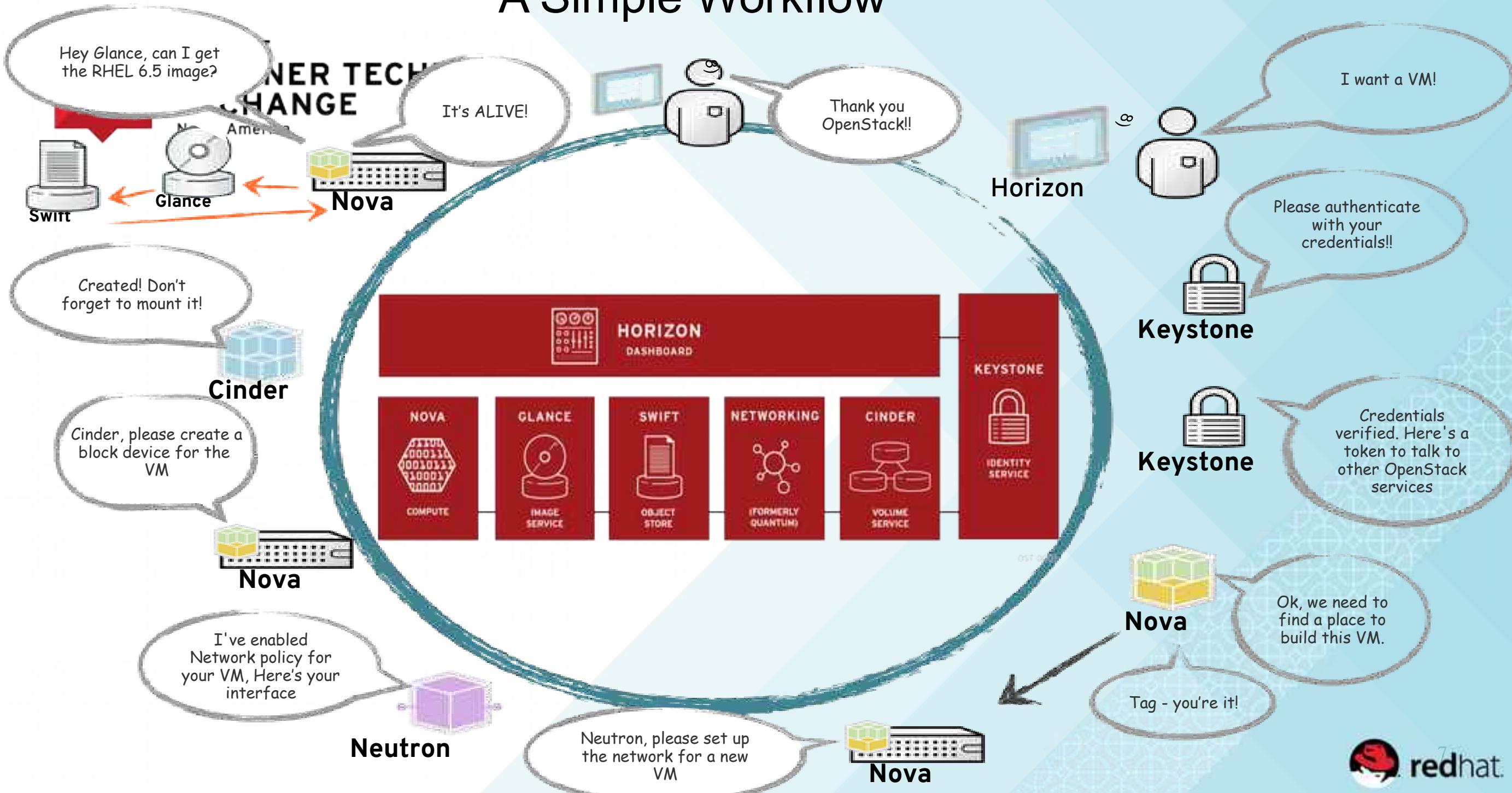
OpenStack provides a framework to build  
**elastic cloud infrastructure at massive scale**

Facilitates management of

- ♦♦ **COMPUTE,**
- ♦♦ **STORAGE, and**
- ♦♦ **NETWORK resources**

Provides natural infrastructure  
for elastic applications

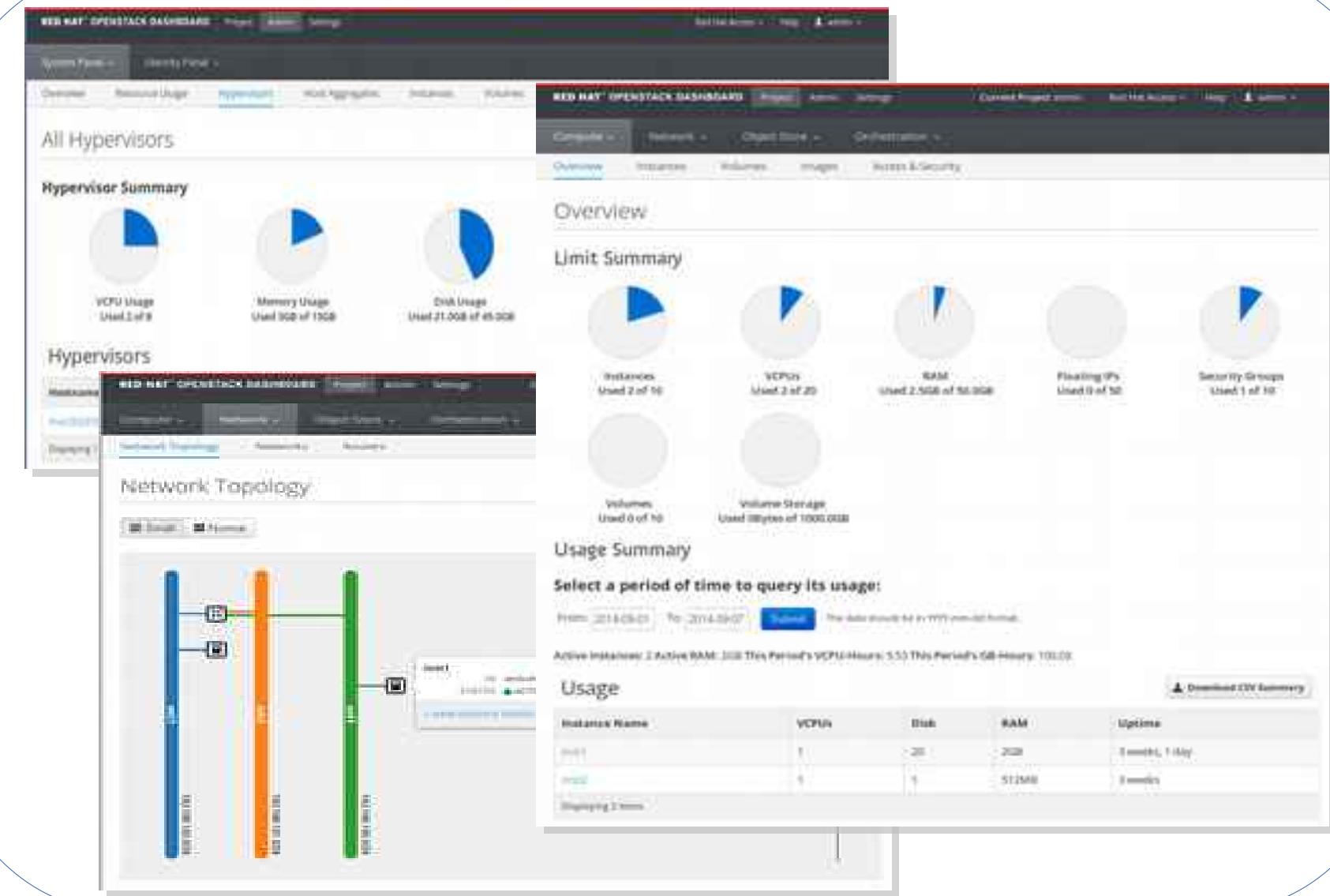
# A Simple Workflow





AMQP Message Bus

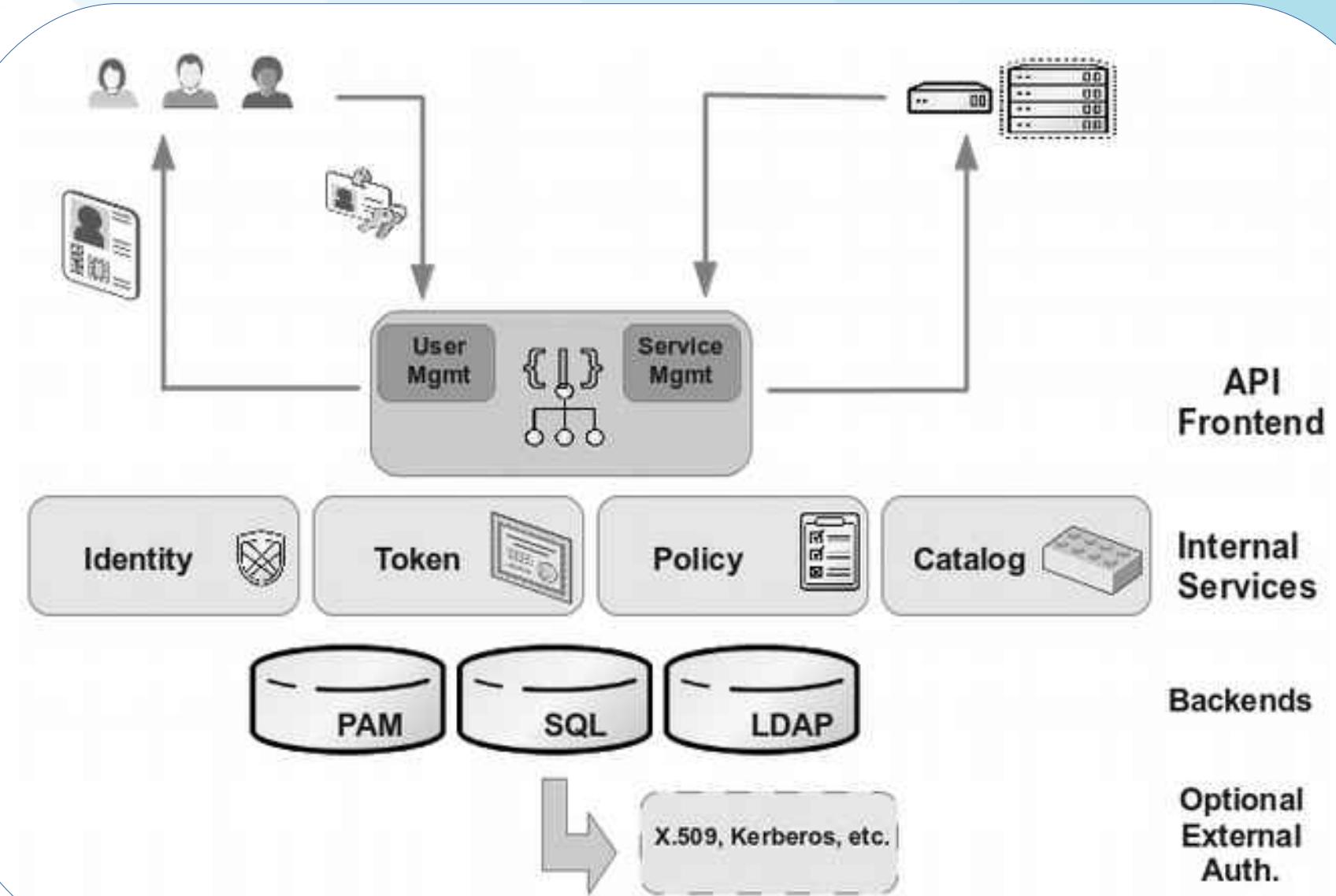
## OpenStack Components: Dashboard (“Horizon”)



- Simple self-service UI for end-users
- Growing list of cloud-administrator functions
  - Define Tenant/Project, User, Quota, Compute, Storage, Network and other resources
  - Limited infrastructure management
- Stateless client of OpenStack API's



## OpenStack Components: Identity (“Keystone”)

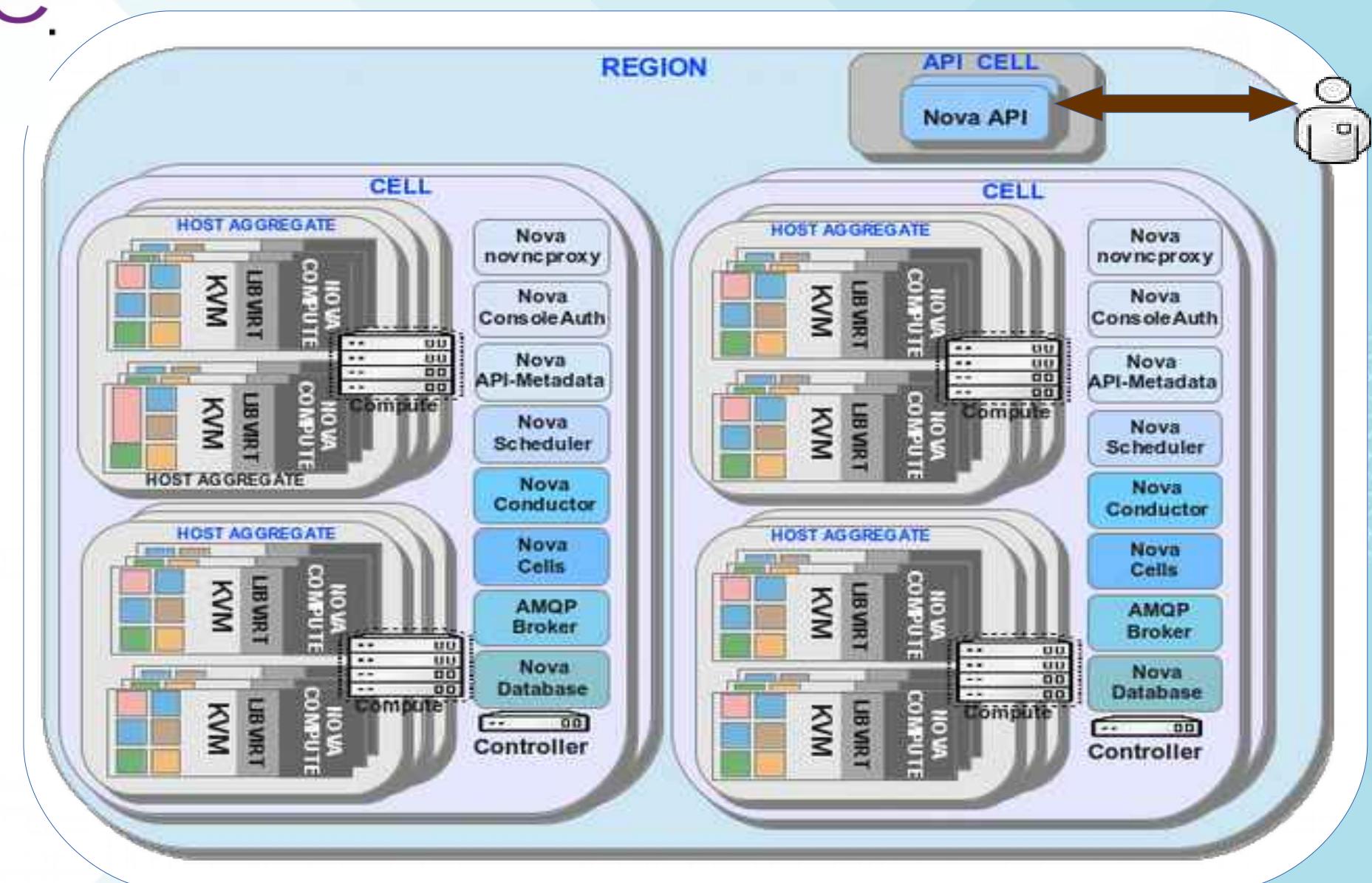


- Common Authentication/Authorization Framework
- Manages users, tenants and roles
- Supports pluggable backends (SQL, PAM, LDAP, etc.)
- Also provides Catalog Registry for OpenStack Services



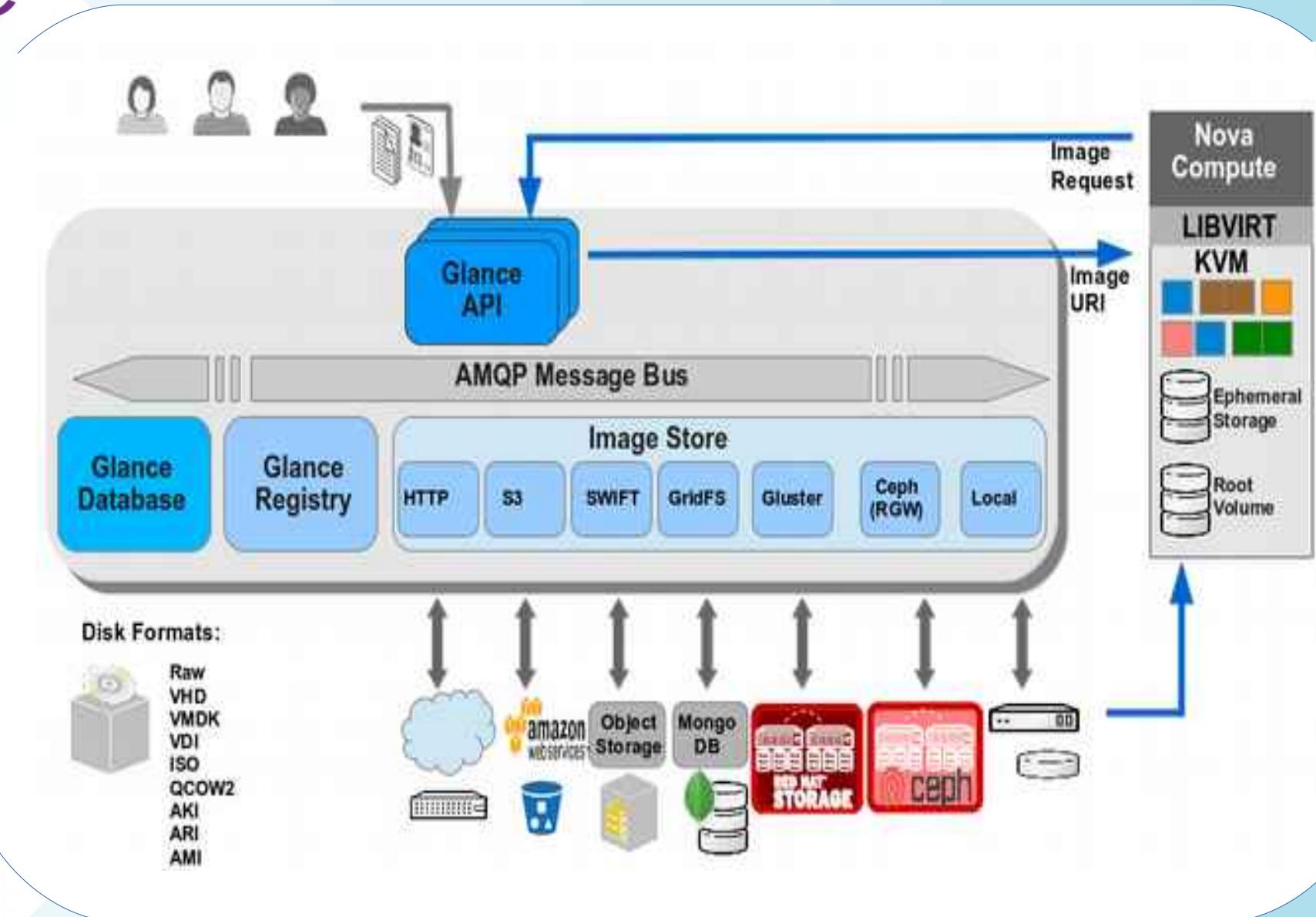


# OpenStack Components: Compute (“Nova”)



- Schedules, builds, runs and manages compute instances on underlying hypervisor
- Exposes native OpenStack API and Amazon EC2 compatible API
- Configures guest instances via Metadata injection or Config file

# OpenStack Components: Image Storage (“Glance”)



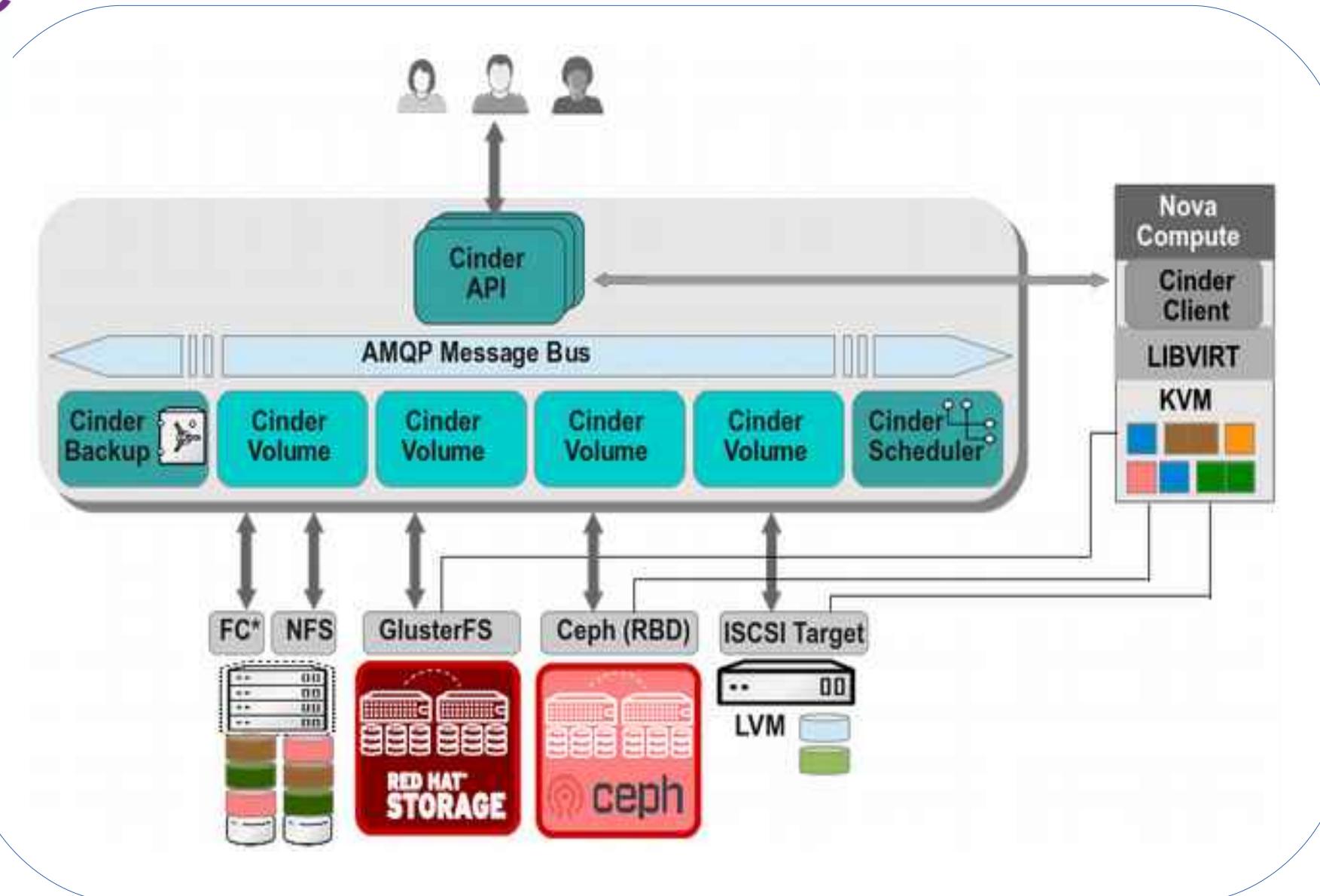
- Stores and retrieves Disk Images (VM templates)
- Supports RAW, VHD, VMDK, VDI, ISO, QCOW2, OVF, OVA and Amazon AMI/AI/ARI images
- Supports a variety of backend storage options, including local filesystem, Swift and Amazon S3



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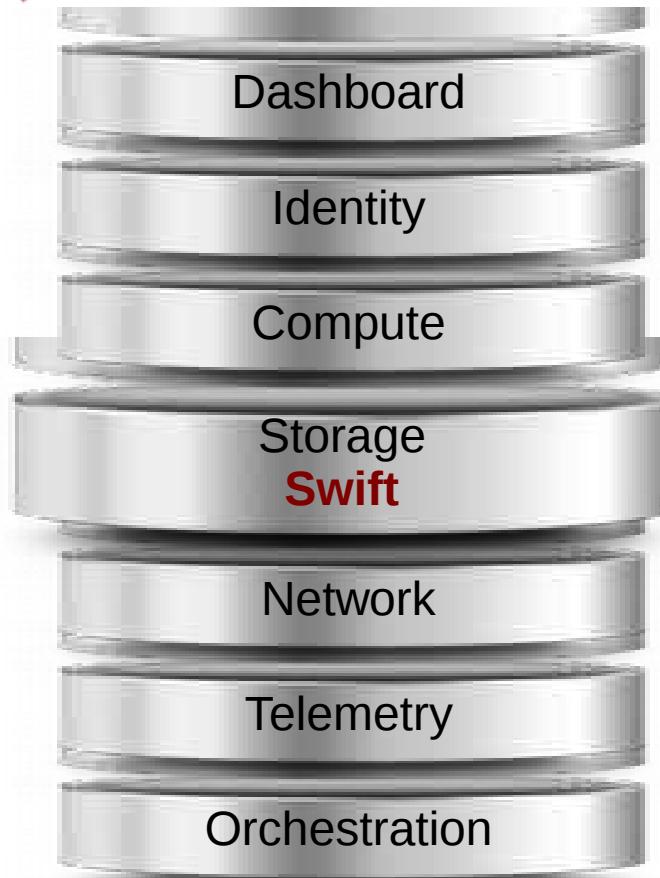
## OpenStack Components: Block/Volume Storage (“Cinder”)



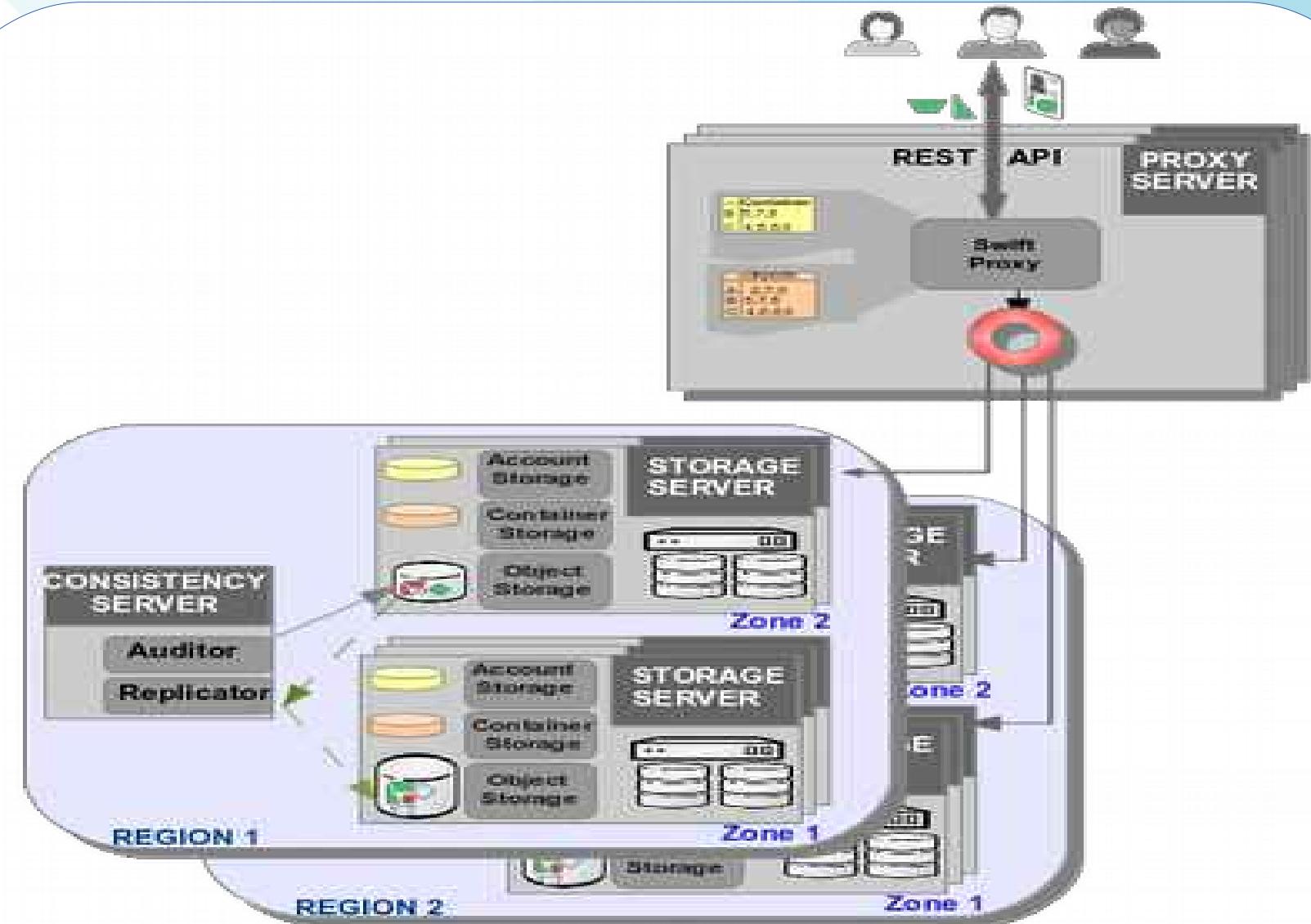
- Provides Block Storage for VM's (Persistent disks)
- Similar to Amazon EBS service
- Plugin architecture for vendor extensions (e.g., Ceph driver, Gluster driver for Red Hat Storage, NetApp driver, etc.)



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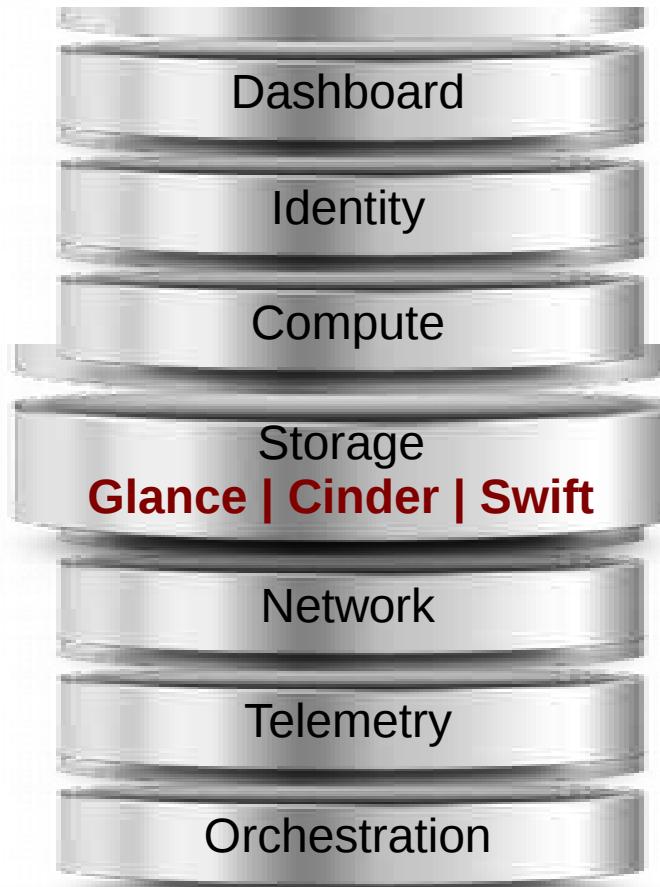
## OpenStack Components: Object Storage (“Swift”)



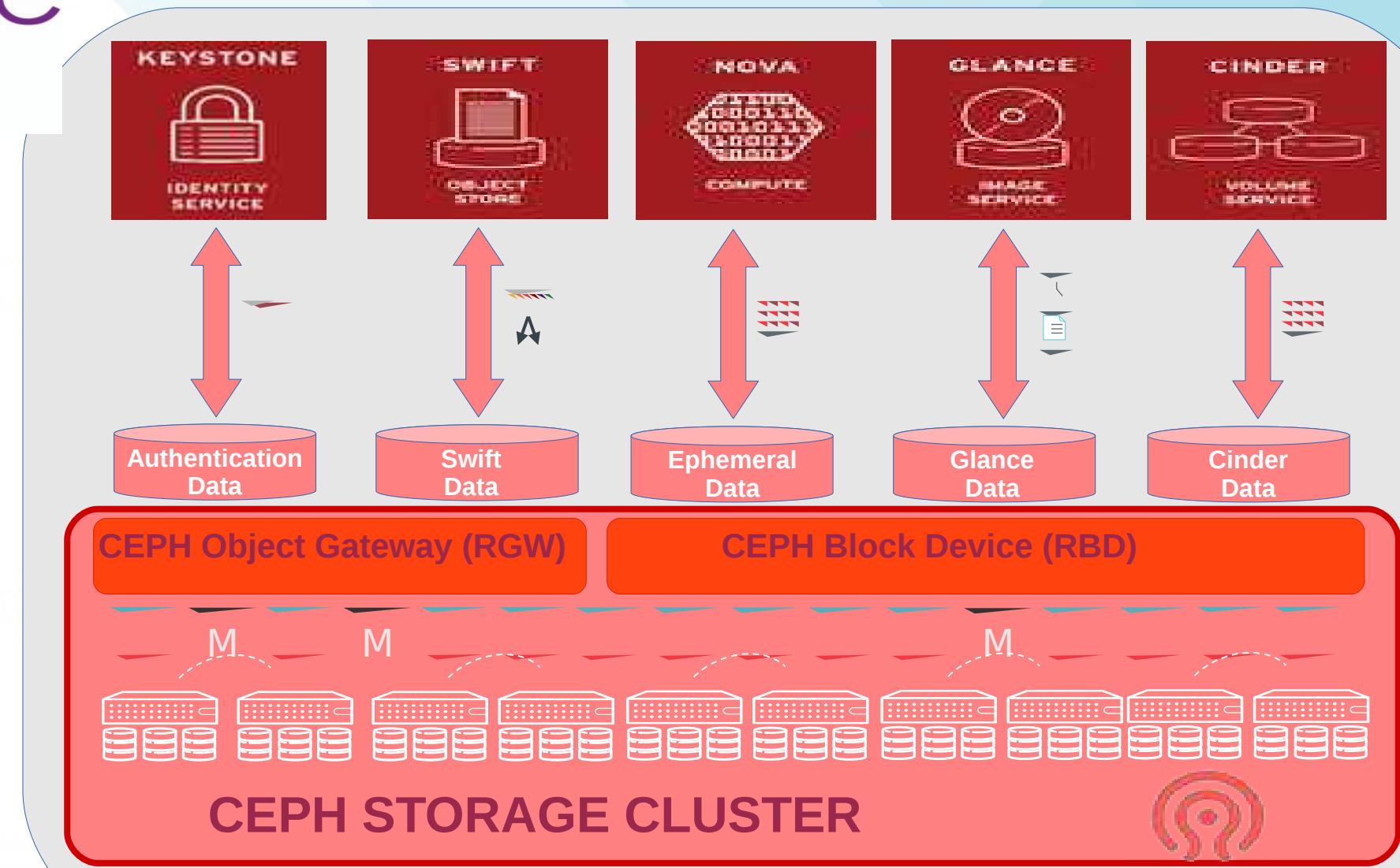
- Provides simple service for storing and retrieving arbitrary data
- Modeled after Amazon S3 service
- Both native API and S3 compatible API
- By default, 3 replicas of each data element



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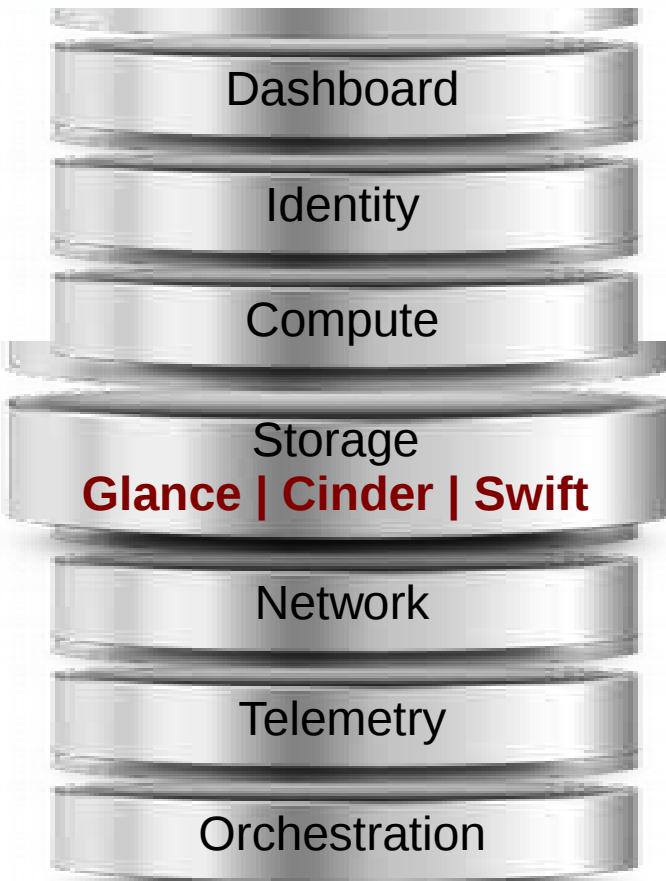
## Ceph: Scalable Storage Backend for OpenStack



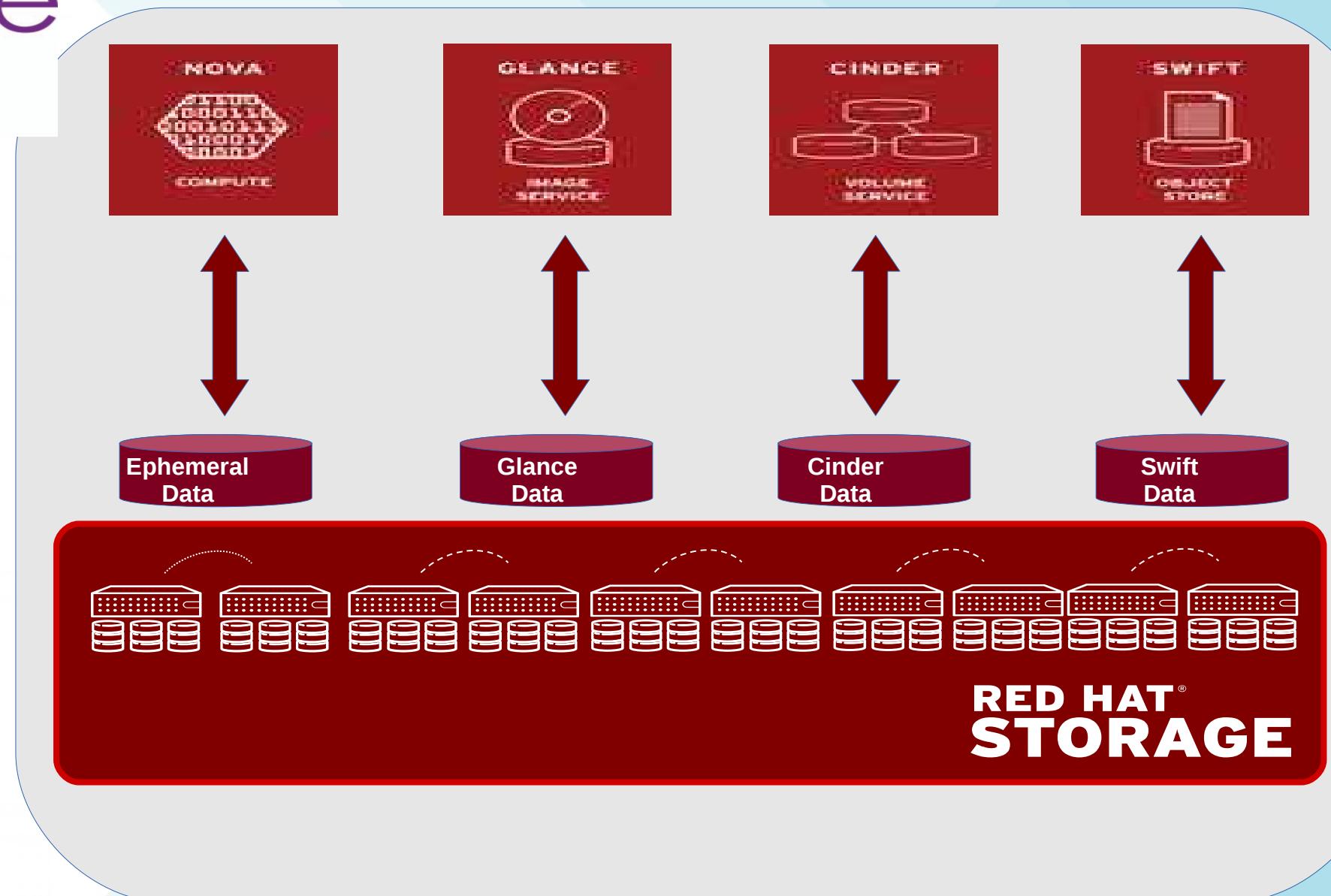
- Unifies Object and Block Storage for OpenStack Deployments
- Most popular distributed Storage back-end for production OpenStack deployments <sup>(1)</sup>



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## Red Hat Storage: Scalable Storage Backend for OpenStack



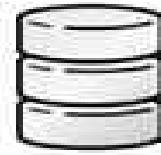
- Provides unified distributed storage platform for OpenStack (Object, Block and Image) storage
- Enables dynamic capacity allocation with rebalancing and failure handling with geo-replication
- Enables Shared-storage Live Migrations of guest instances by providing shared ephemeral storage for instances





# Open Software Defined Storage: Red Hat Portfolio

## RED HAT STORAGE SERVER



### Scale-out Unified File and Object Storage

#### OPTIMIZED WORKLOADS

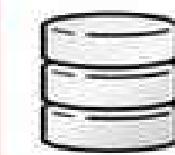
- File
- Unified File and Object
- Data Protection / Disaster Recovery
- Virtual Infrastructure
- Hadoop, Big Data
- OpenStack Application Workloads

#### MULTI-PROTOCOL

- NFS, CIFS, SWIFT, HDFS
- Native Rest-based API

BASED ON GLUSTER.ORG

## RED HAT INKTANK CEPH



### Distributed Object and Block Storage

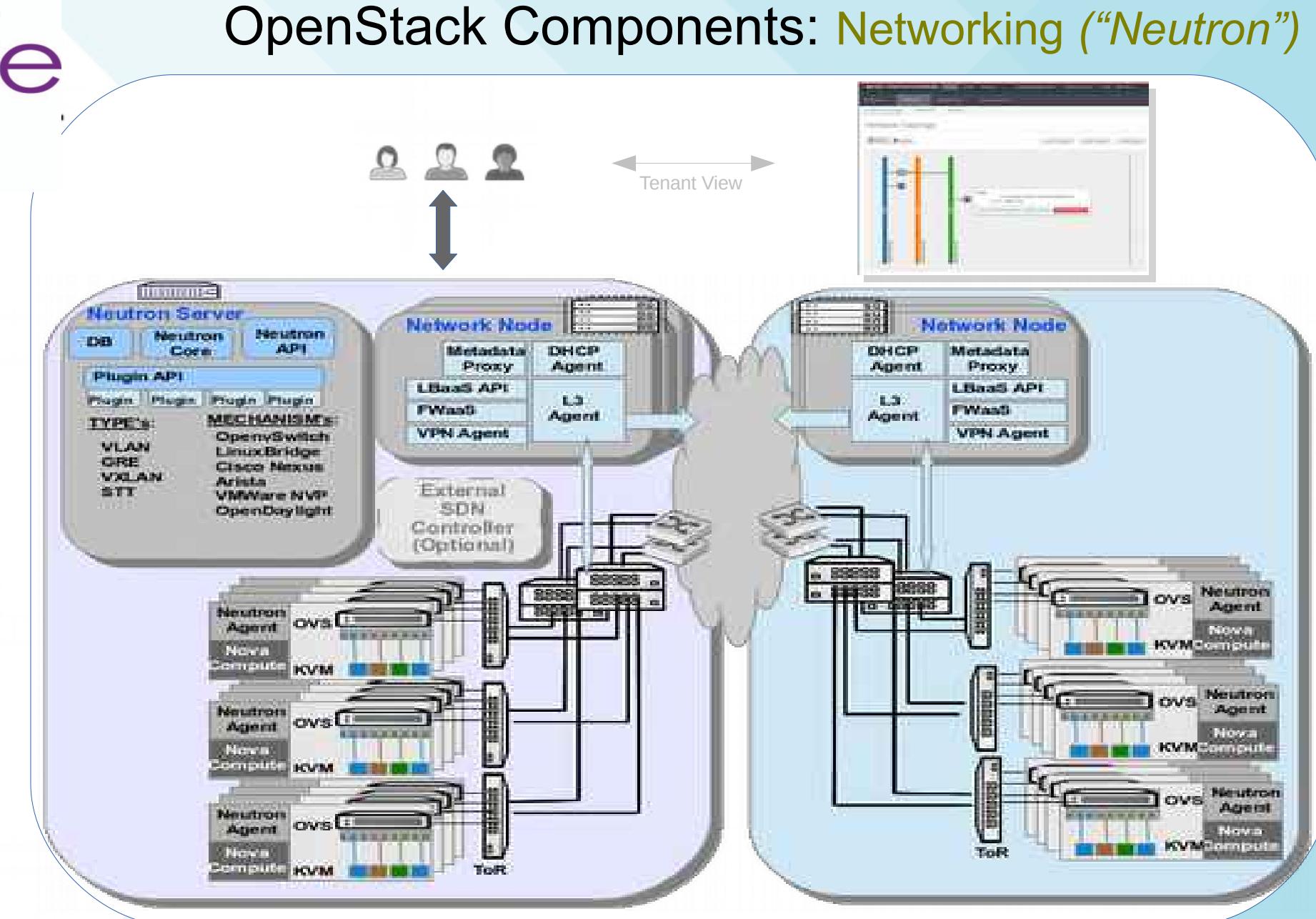
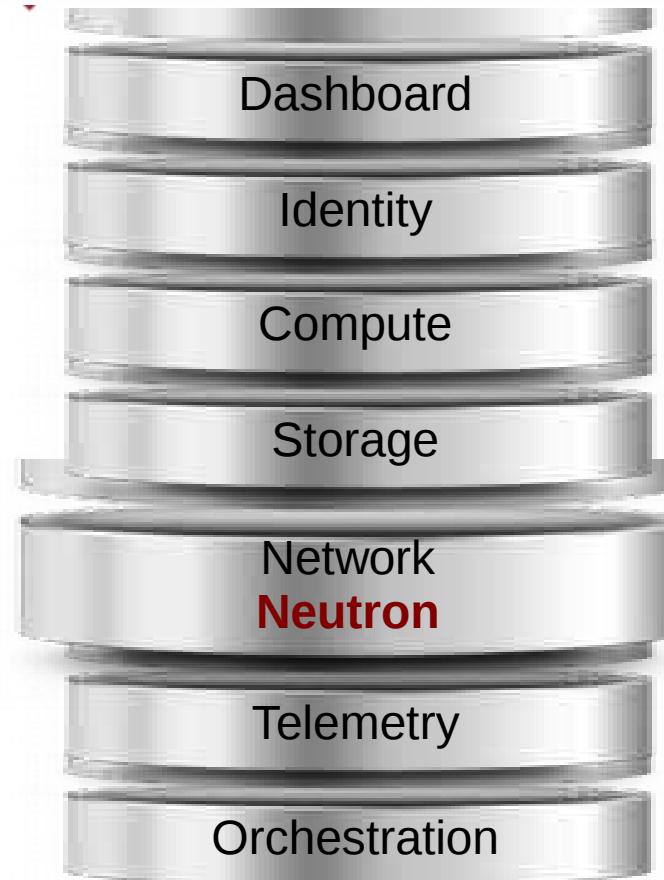
#### OPTIMIZED WORKLOADS

- OpenStack Infrastructure Storage
  - OpenStack Cinder (Block), Glance (Image)
- Distributed Object Storage
  - S3 Compatible
  - Native Rest-based API
  - Cloud Storage
  - Applications
  - Cold Storage

BASED ON CEPH.COM COMMUNITY



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- Framework for network connectivity
- Plugin architecture enabling vendor extensibility and optional Software-Defined Networks (SDN) controller integration
- Interconnect tenant compute instances via various overlay network types
- L3-agent for external connectivity, DHCP-agent for IP address allocation
- LoadBalancer-as-a-Service, Firewall-as-a-Service and VPN-as-a-Service

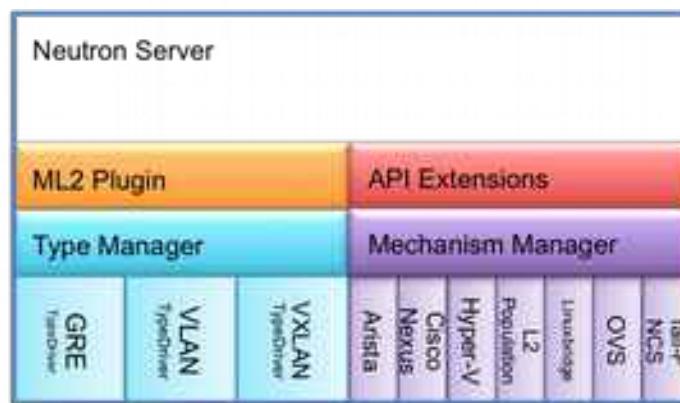
# Neutron Enablement Mechanisms

- **Underlying Technologies**

- Network Namespaces
  - Create isolated view of network interfaces and policies to enable multi-tenancy
- Security groups with iptables and ipset
  - Sets of IP filter rules that are applied to an instance's networking to control type and direction of allowed traffic
- Open vSwitch (OVS)
  - Fully featured flow-based virtual switch
  - Supports traffic isolation using overlay networking technologies
  - Enables end servers to participate in the SDN
  - Can be controlled by an SDN Controller
  - Support for hardware offload of OVS datapath to allow high throughput, high packet rates applications

- **Distributed Virtual Router**

- Adds high availability and fault tolerance to Neutron

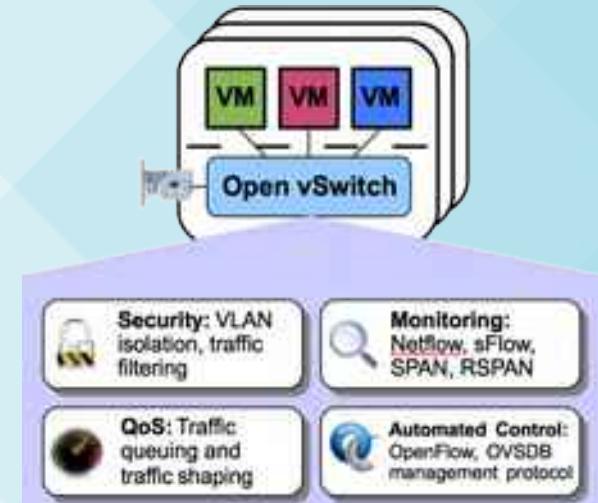


- **Neutron Modular Layer 2 Plugins (ML2)**

- Allows integration of third party network services with Mechanism Drivers
  - Freescale SDN, Nuage Networks, SR-IOV capable NIC
  - Cisco APIC ML2 Driver (including a L3 routing plugin)
- Supports an extensible set of network types for overlays with Type Drivers
  - Flat network, VLAN, VXLAN, GRE
- Works with a variety of virtual networking mechanisms simultaneously
- Supports multi-segment L2 networks
- Supports heterogeneous network configurations
- Supports OpenDaylight SDN controller

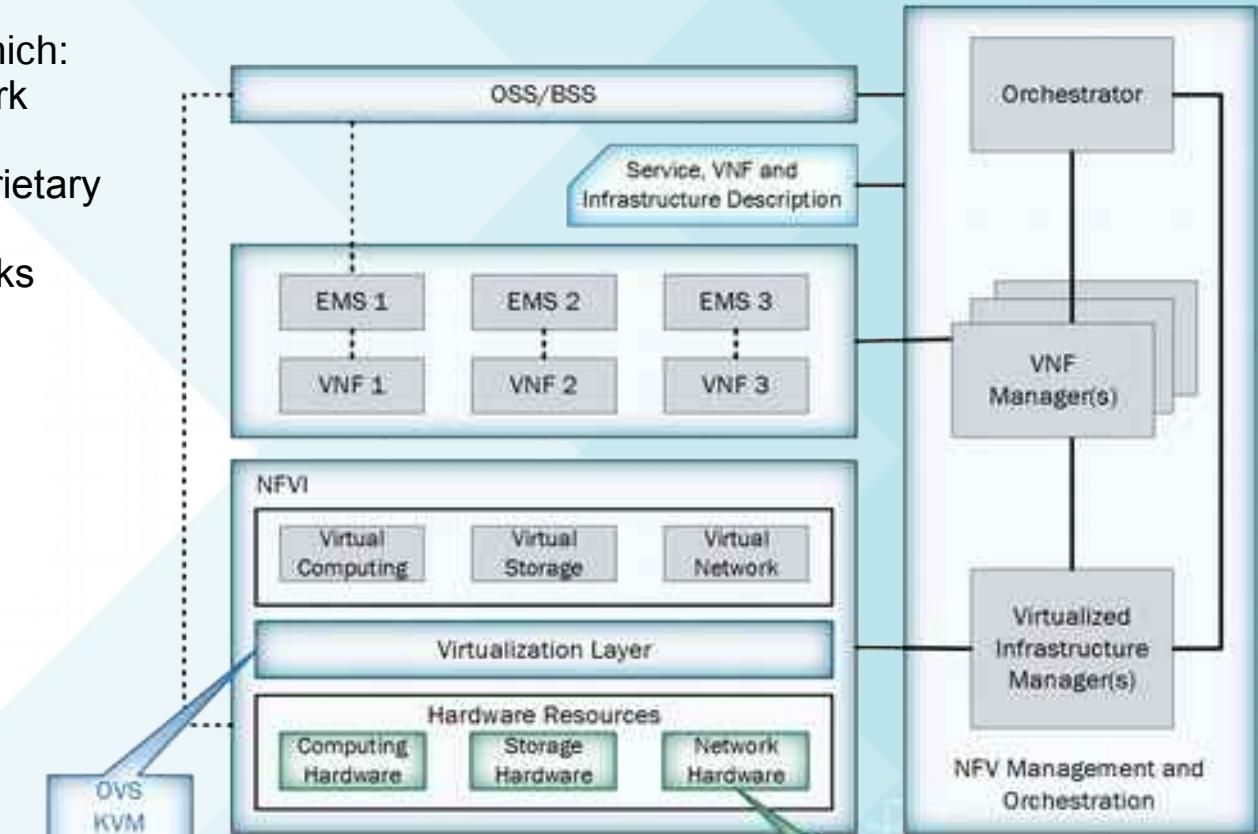
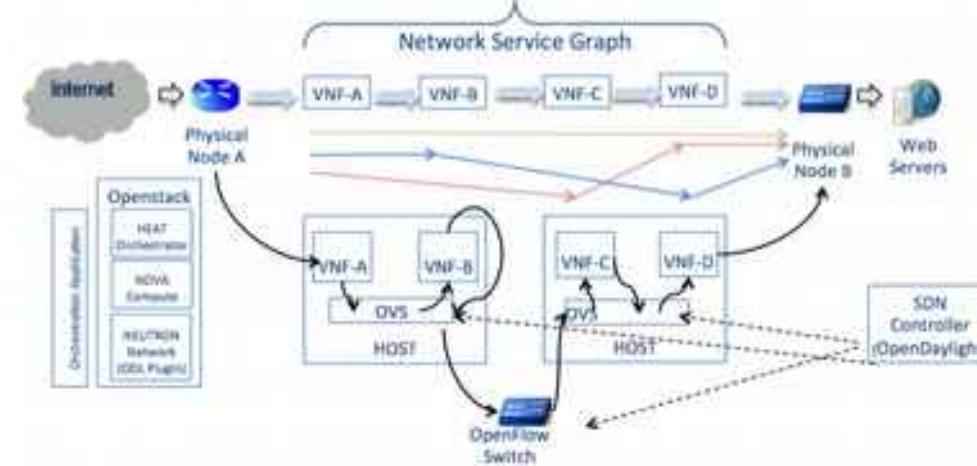
- **L3 Routing Plugin**

- Arista, Big Switch, Brocade, Cisco CSR, etc.



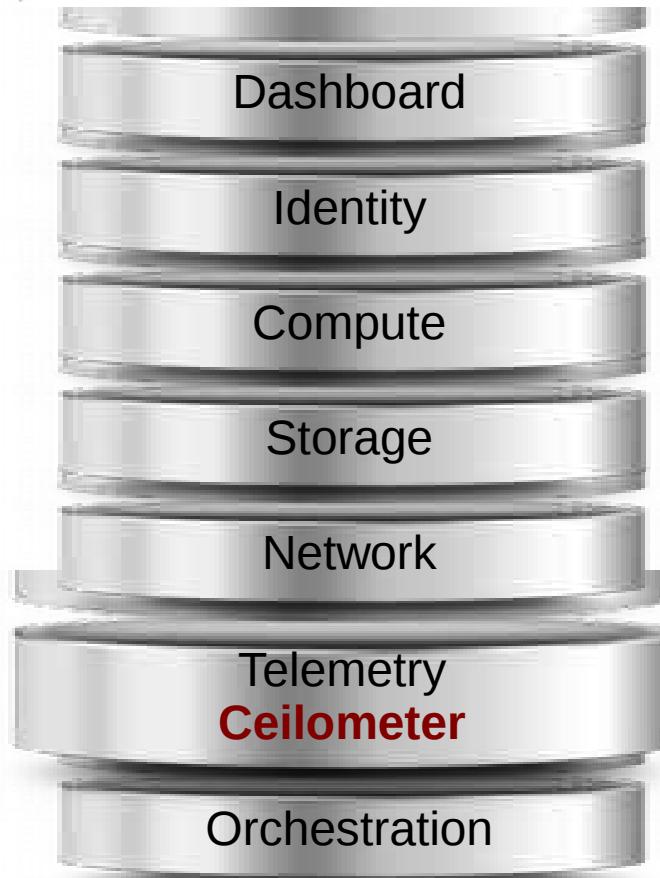
# Network Function Virtualization (NFV)

- Network Function Virtualization (NFV) is a network architecture which:
  - Decouples network functions from underlying physical network infrastructure
  - Moves traditional network functions usually deployed in proprietary hardware to software running in a Virtual Machine appliance
  - Telco focused to enable agile, cost effective, scalable networks
- Standard is defined by ETSI NFV ISG
- OpenStack support for NFV managed by NFV Work Group
- NFV enabling features supported in Juno
  - SR-IOV capable NIC support
  - IPv6
  - Intelligent NUMA node placement for guests
  - vCPU topology exposed to guests via flavors
- Popular Use Cases
  - vIMS, vEPC, vCDN, vCPE, vRouter
  - Service Chaining

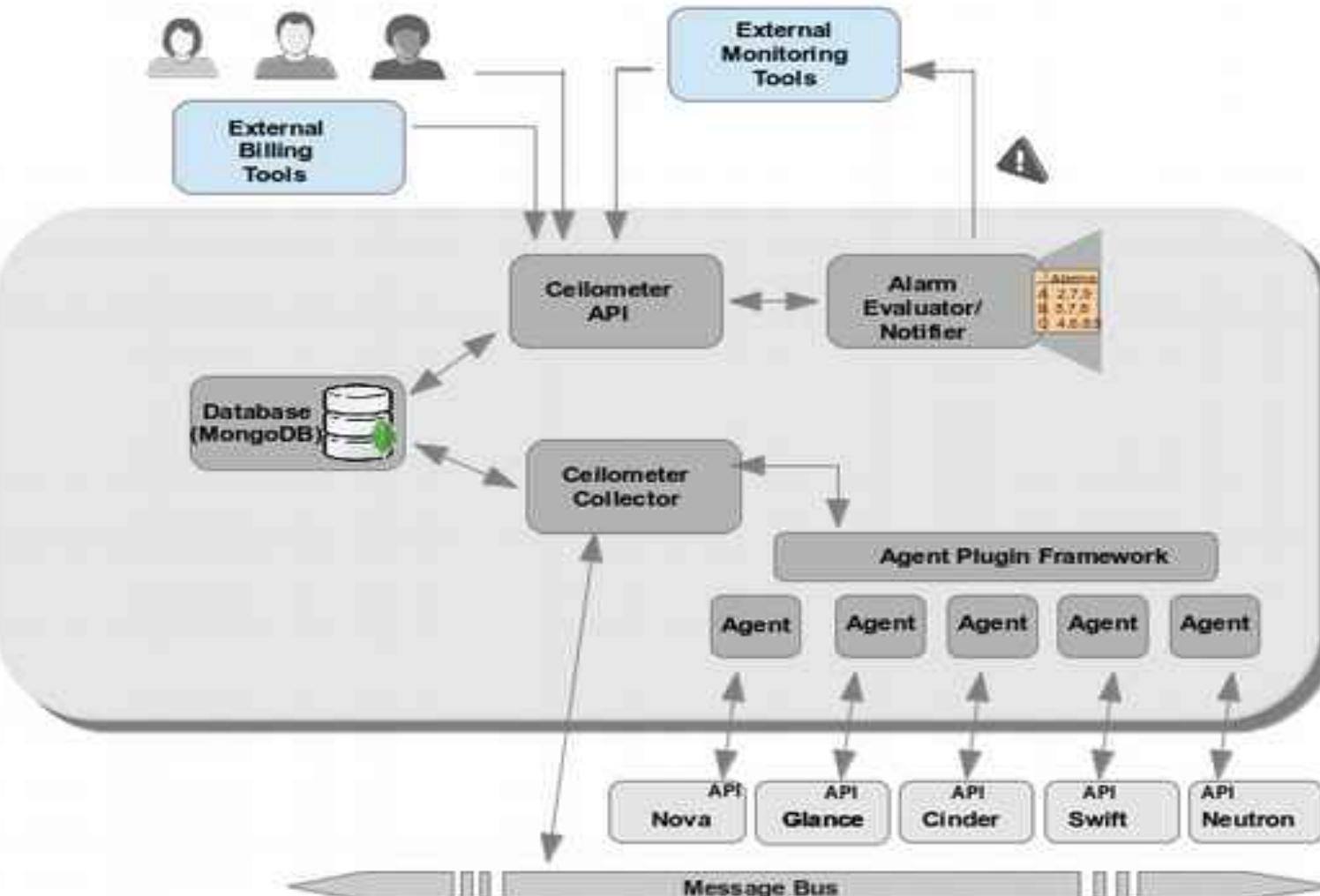




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## OpenStack Components: Telemetry (“Ceilometer”)



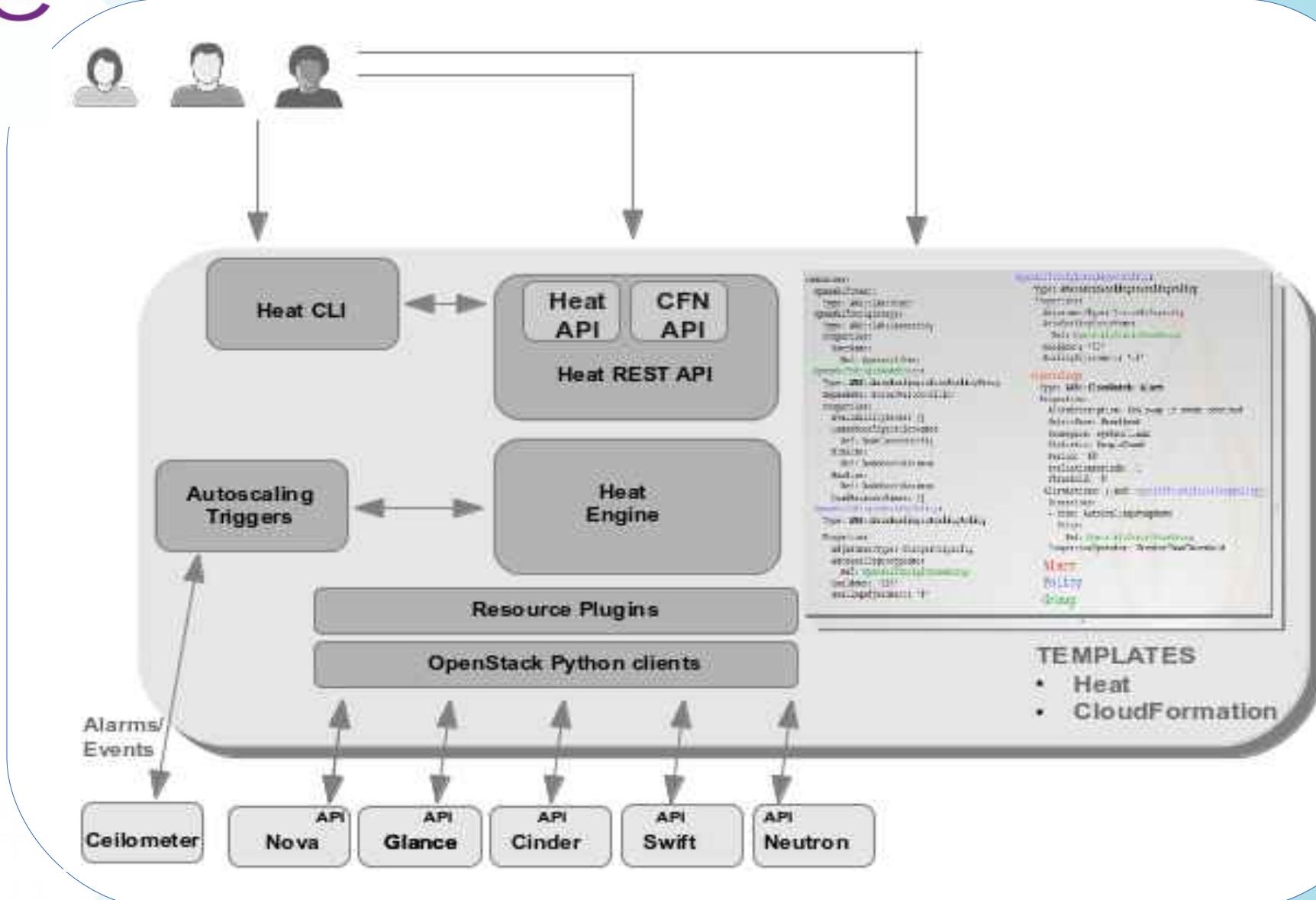
- Measurement collection infrastructure for entire OpenStack deployment
- Eliminates need for individual agents for each OpenStack service
- Targets monitoring/metering, but flexible to collect for other use cases



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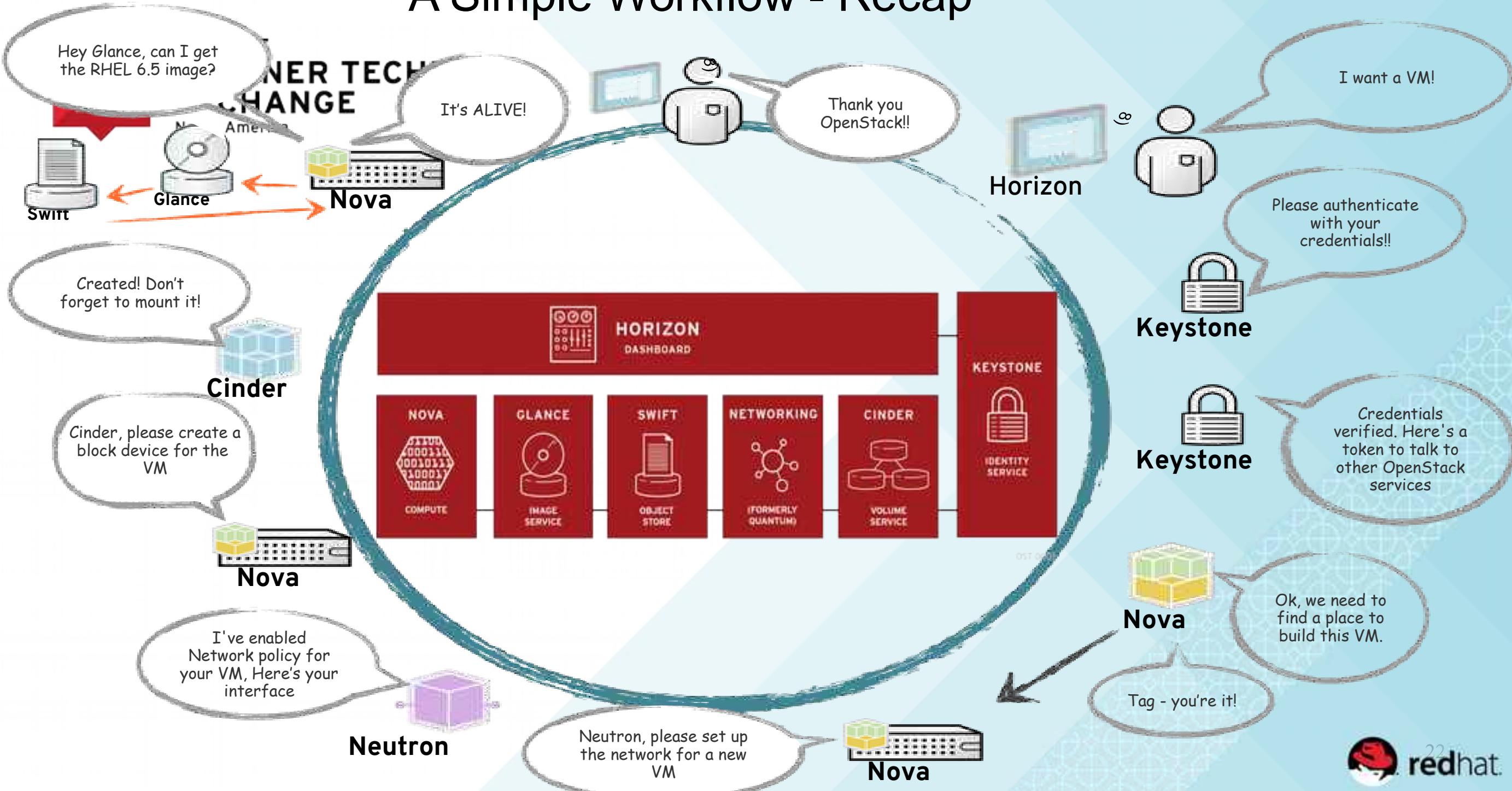


## OpenStack Components: Orchestration (“Heat”)



- AWS CloudFormation implementation for OpenStack
- Deploys composite cloud applications
- Autoscaling of applications leveraging Ceilometer alarm events

# A Simple Workflow - Recap

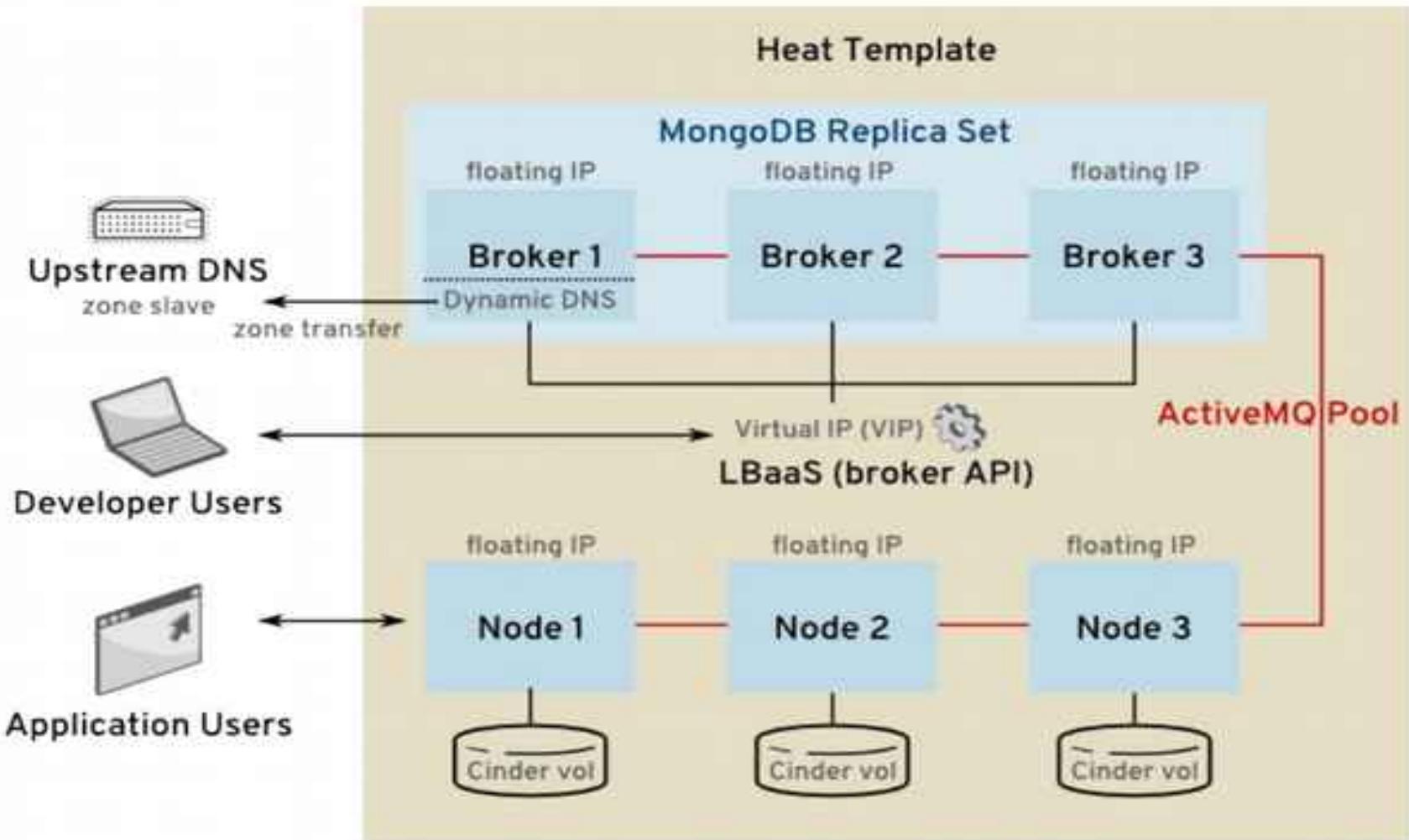


# OpenStack Example Use Case: Platform-as-a-Service (PaaS)

# Deploying OpenShift PaaS with OpenStack Heat

## Goals:

1. Deliver PaaS services more efficiently
2. Reduce manual PaaS infrastructure configuration requirements
3. Leverage modular components for improved scalability



Reference Architecture:

<https://www.redhat.com/en/resources/deploying-a-highly-available-openshift-enterprise-2-environment-on-rhel-osp-4-using-heat-templates>

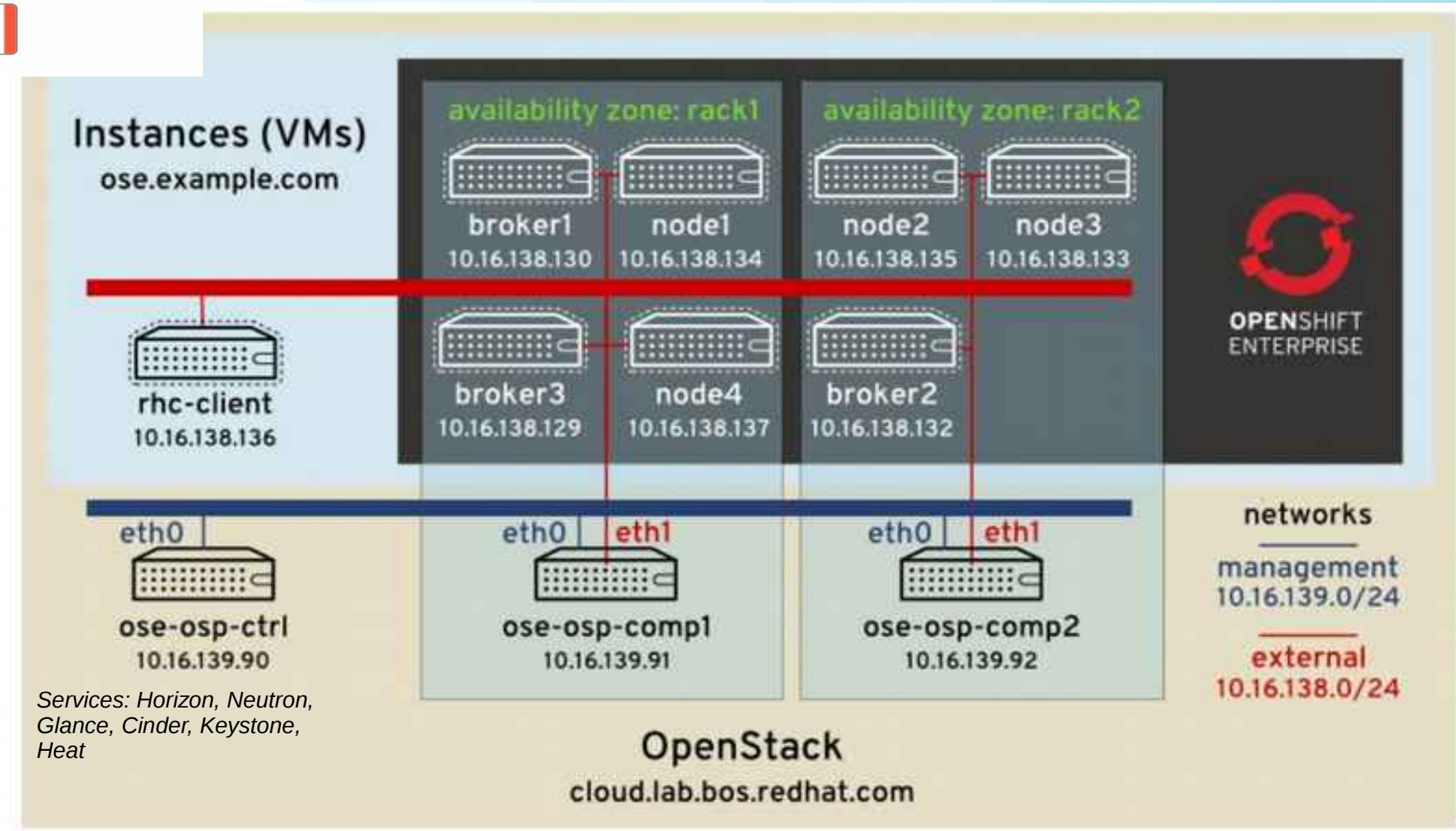




# Deploying OpenShift PaaS with OpenStack Heat

## Attributes:

1. OpenShift broker and node components deployed as OpenStack instances
2. OpenStack Heat template defines OpenShift broker and node HA configuration
3. OpenShift client, broker, and node images stored in OpenStack Gance
4. OpenStack Neutron provides Load-balancer-as-a-Service (LBaaS) functions



Reference Architecture: <https://www.redhat.com/en/resources/deploying-a-highly-available-openshift-enterprise-2-environment-on-rhel-osp-4-using-heat-templates>



# Hybrid Cloud Management: Red Hat CloudForms



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## ED HAT CLOUDFORMS

Cloud operations management

GOVERNANCE AND COMPLIANCE



IT SERVICE CATALOGS



METERING, CHARGEBACK, QUOTAS



EXECUTIVE AND OPS DASHBOARDS



IT PROCESS ORCHESTRATION



MONITORING, ANALYTICS, ALERTING



OUT-OF-THE-BOX INTEGRATION



RED HAT® CLOUDFORMS  
ADAPTIVE MANAGEMENT PLATFORM



EC2



vmware



redhat



Microsoft



openstack

Watch Now

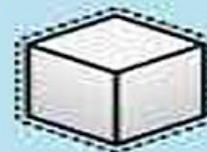




## RED HAT CLOUDFORMS

Built for enterprise scale cloud operations management

### AGENT-FREE, VIRTUAL APPLIANCE ARCHITECTURE



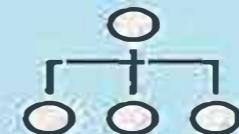
Rapid deployment, non-invasive  
(Industry Standard OVF)

### WEB-BASED OPERATIONS, ADMIN AND SELF-SERVICE



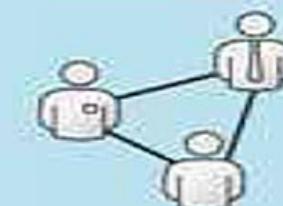
Access anywhere from  
any browser

### ENTERPRISE DIRECTORY SUPPORT



Leverage directory for  
authentication and role

### SUPPORTS MULTI-TENANCY



Securely share  
infrastructure

### HORIZONTALLY SCALABLE



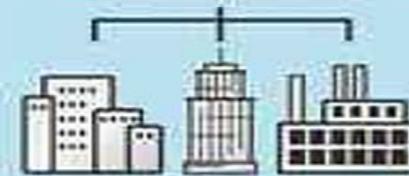
Highly scalable,  
load balancing

### LOAD BALANCING, FAILOVER/BACK



Provides reliability,  
high availability

### MANAGEMENT ACROSS MULTIPLE LOCATIONS



Single pane of glass,  
unified management

### MANAGEMENT ACROSS VIRTUAL PLATFORMS & PUBLIC CLOUDS



Single pane of glass,  
unified management

# RESOURCES / NEXT STEPS

# RED HAT® OPENSTACK CLOUD INFRASTRUCTURE PARTNER NETWORK

**HITACHI**  
Inspire the Next



**WIPRO**  
Applying Thought!

**JUNIPER**  
NETWORKS

**vmware**

**NEC**

**puppet**  
labs

**SUPERMICRO**

**Seagate**

**BULL**

**EMC<sup>2</sup>**

**AMD**

**eNovance**  
Multi-Cloud Experts

**LOCKHEED MARTIN**

**lenovo**

**FUJITSU**

**Mellanox**  
Technologies

**SOLARFLARE**

**Symantec**

**NetApp**

**hp**

**IBM**

**intel**

**CISCO**

**DELL**

**Mavenspire**



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- **200** new Companies since Program Launch
- **1100+** solutions in Red Hat OpenStack CIPN marketplace

# Red Hat OpenStack Training

## [CL210: Red Hat OpenStack Administration](#)

*How to install, configure, use and maintain Red Hat OpenStack*

**Length:** 4-days (ILT)  
5-days (ROLE)

**Modes:** Instructor-led  
Virtual  
Red Hat Online (ROLE)

## [CL306: Neutron Networking with RHEL OSP](#)

*Install, configure and use Software Defined Networks (SDN) with Neutron on OpenStack*

**Length:** 2-days (ILT)  
3-days (ROLE)

**Modes:** Instructor-led  
Virtual  
Red Hat Online (ROLE)

## [CL314: Apache QPID Messaging with RHEL OSP](#)

*Implement Apache Qpid as a standalone service or as part of RHEL OpenStack Platform*

**Length:** 2-days (ILT)

**Modes:** Instructor-led

## [CL315: RabbitMQ Messaging with RHEL OSP](#)

*Implement RabbitMQ as a standalone service or as part of RHEL OpenStack Platform*

**Length:** 2-days (ILT)  
3-days (ROLE)

**Modes:** Instructor-led  
Virtual  
Red Hat Online (ROLE)

## [CL332: High Availability with RHEL OSP](#)

*Implement OpenStack services in a highly-available manner and test failover scenarios*

**Length:** 2-days (ILT)  
3-days (ROLE)

**Modes:** Instructor-led  
Red Hat Online (ROLE)

## COMING SOON:

### [CL312: Swift Object Storage with RHEL OSP](#)

*Install, configure and use Object Storage with Swift on OpenStack*

### [CL342: Troubleshooting with RHEL OSP](#)

*Install, configure and use Object Storage with Swift on OpenStack*

# CALL TO ACTION



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# Considerations



How can OpenStack **enhance** your Infrastructure Cloud Strategy



How can you foster **innovation** while minimizing **risk**?



What attributes are important in a Technology Vendor to **partner** with?



How would you **measure** success to your organization?



How do you follow up from this workshop towards a **plan** for execution?



## THREE WAYS TO GET OPENSTACK FROM RED HAT

### 90-DAY EVALUATION

1

**RED HAT®  
ENTERPRISE LINUX®  
OPENSTACK® PLATFORM**

[redhat.com/openstack/evaluation](http://redhat.com/openstack/evaluation)

### PURCHASE SUPPORTED PRODUCT

2

**RED HAT®  
ENTERPRISE LINUX®  
OPENSTACK® PLATFORM**

3

**RED HAT®  
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# END OF SECTION 2



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