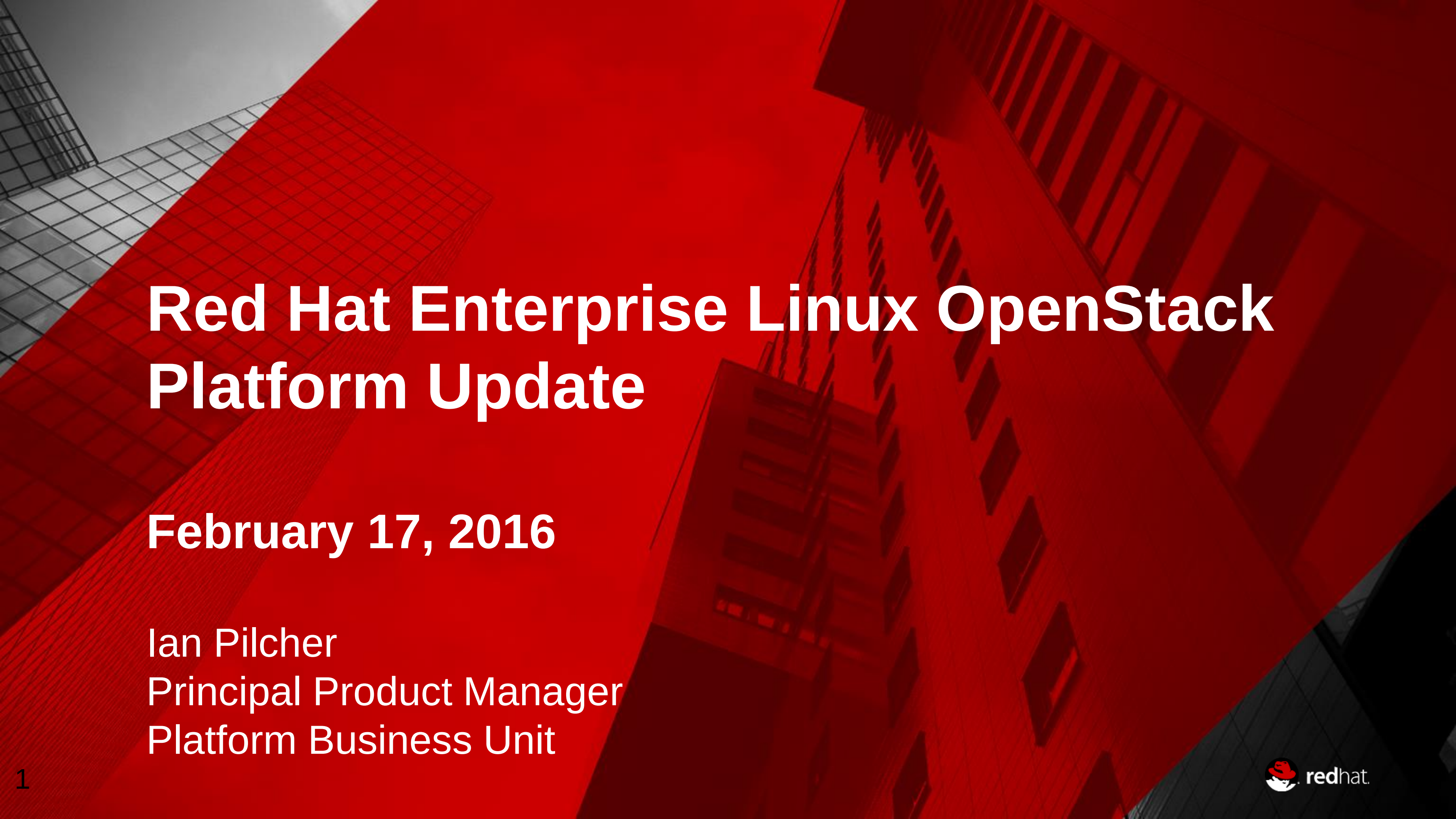


Red Hat Enterprise Linux OpenStack Platform Update

February 17, 2016

Ian Pilcher
Principal Product Manager
Platform Business Unit

AGENDA

Introductions

War stories

OpenStack in a Minute or So..

Understanding TripleO (OpenStack review)

Red Hat’s Involvement

Red Hat OpenStack Platform

TripleO concepts
Walking through director’s deployment flow

director Features

Key director features

Partner Integration

Roadmap for director

Red Hat Portfolio Integration

Integration with other Red Hat’s products

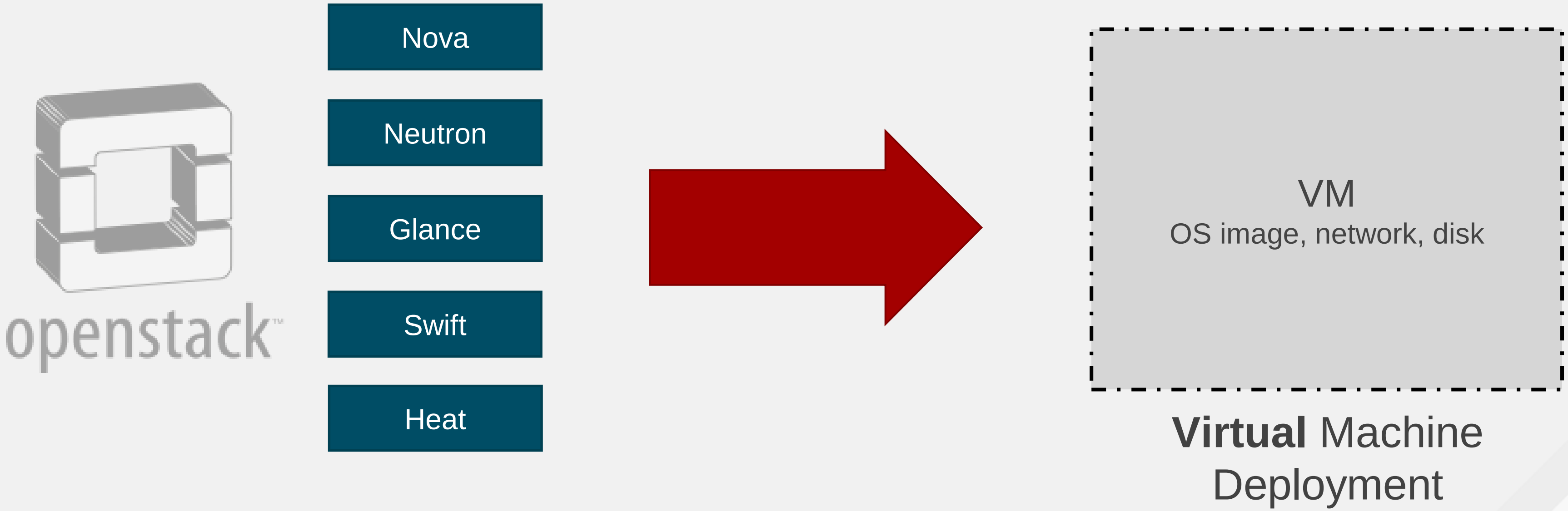
Concluding Remarks

Space for additional questions

OpenStack in a Minute or So

OpenStack - a quick review...

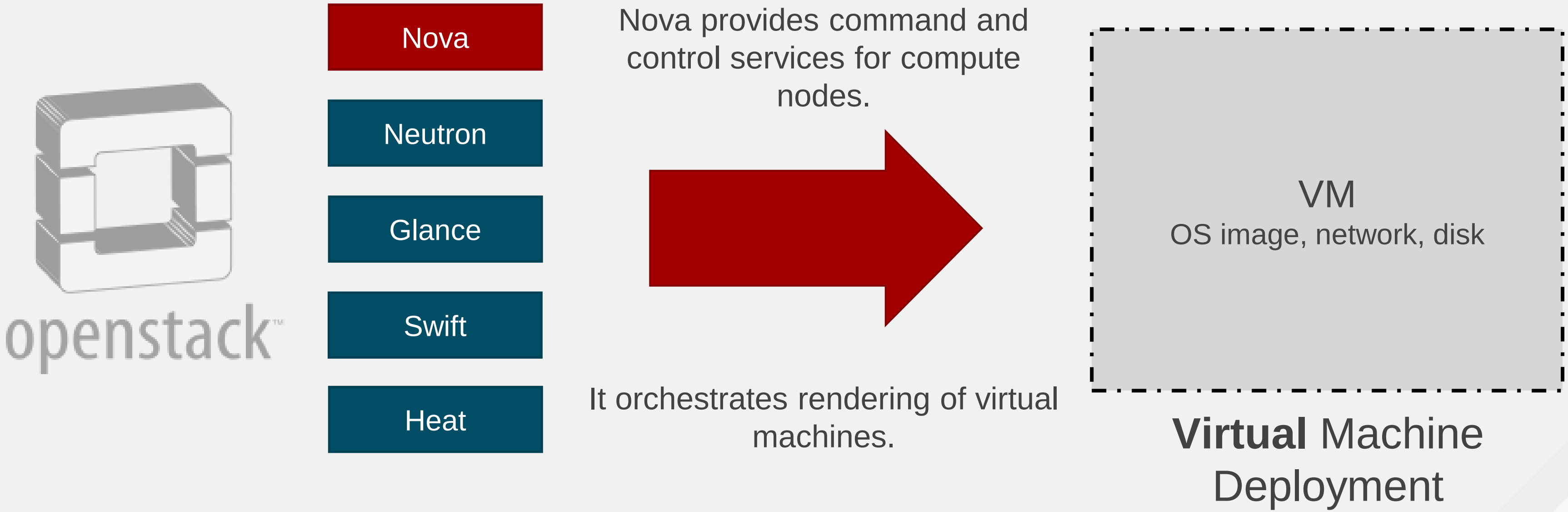
OpenStack components* manage compute, network and storage resources



*Only a select subset of OpenStack components are shown here.

OpenStack - **Nova**, Glance & Heat

OpenStack components* manage compute, network and storage resources



Nova provides command and control services for compute nodes.

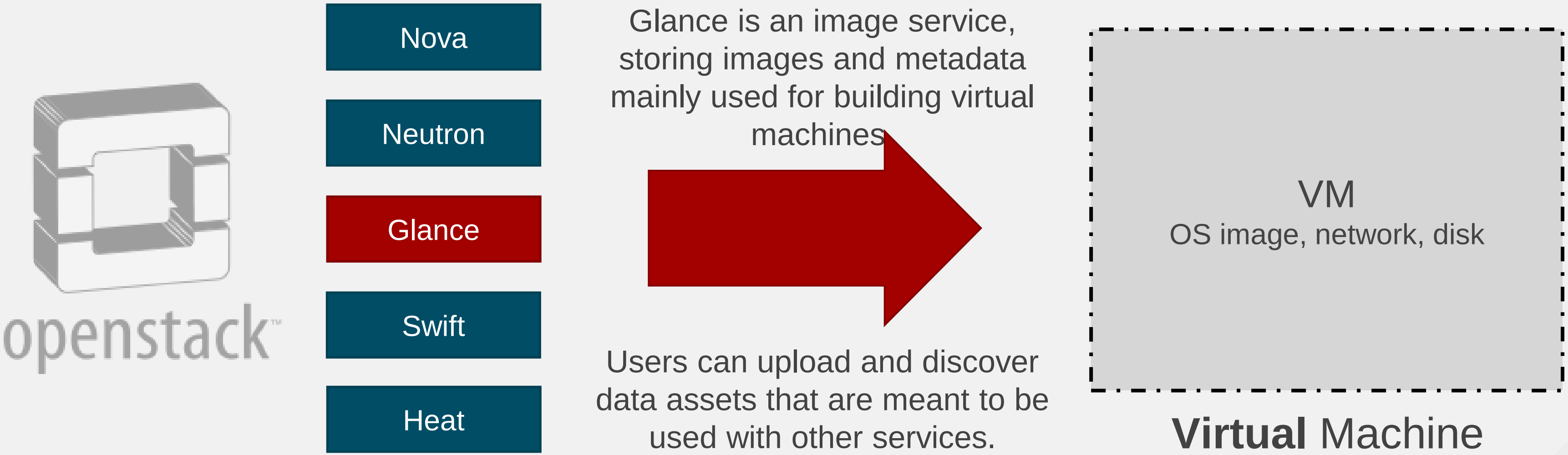
It orchestrates rendering of virtual machines.

Virtual Machine Deployment

*Only a select subset of OpenStack components are shown here.

OpenStack - Nova, **Glance** & Heat

OpenStack components* manage compute, network and storage resources



Glance is an image service, storing images and metadata mainly used for building virtual machines

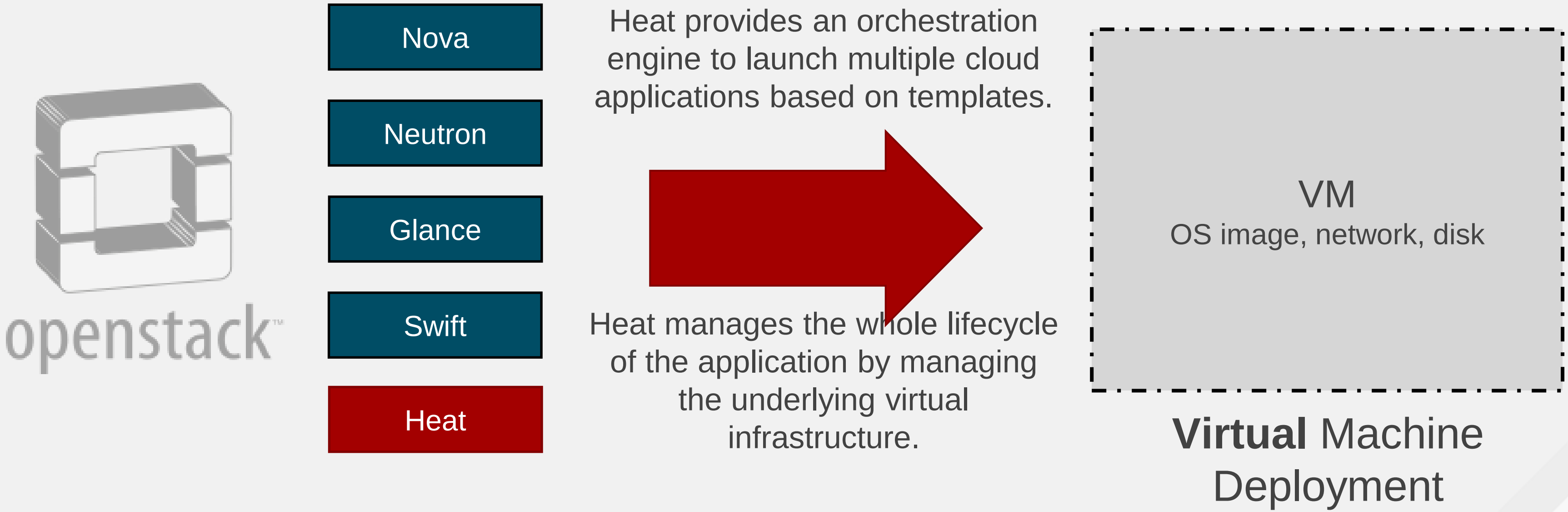
Users can upload and discover data assets that are meant to be used with other services.

Virtual Machine Deployment

*Only a select subset of OpenStack components are shown here.

OpenStack - Nova, Glance & **Heat**

OpenStack components* manage compute, network and storage resources



Nova

Neutron

Glance

Swift

Heat

Heat provides an orchestration engine to launch multiple cloud applications based on templates.

Heat manages the whole lifecycle of the application by managing the underlying virtual infrastructure.

VM
OS image, network, disk

Virtual Machine Deployment

*Only a select subset of OpenStack components are shown here.

Red Hat's Involvement

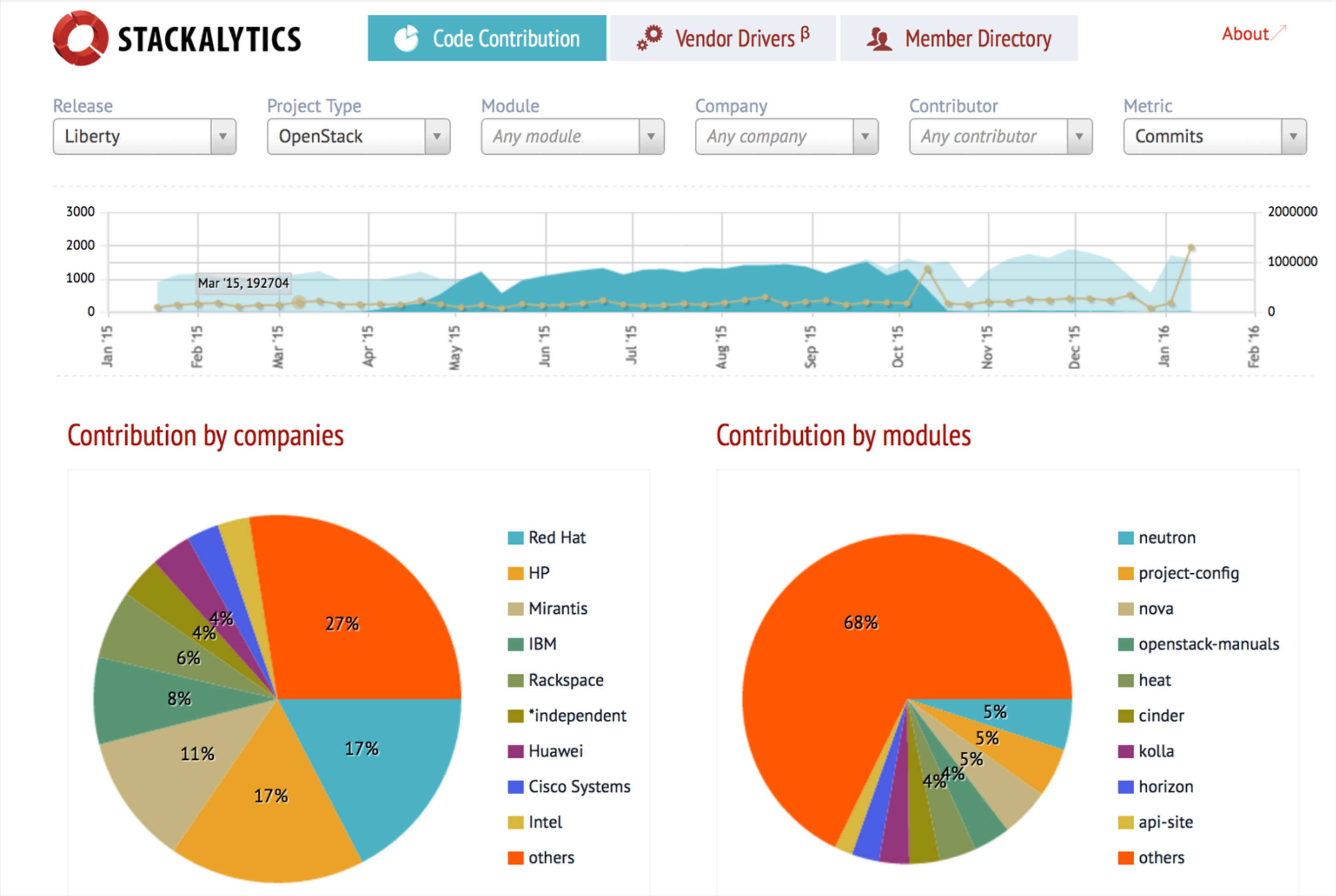
The OpenStack Community

- OpenStack community releases a new major version every **six months**
- Current **upstream** version codenamed **Liberty** (shipped **15th October 2015**)
- Contributions to the project come from both corporate and non-corporate entities
- Ships source-code (**trunk code**) - no certifications, support, or packages

- In terms of scale, the **Liberty** version had:
  - **25,268** code commits
  - **1,933** individual contributors
  - **164** organisations contributing
  - **400**+ new features

Red Hat’s OpenStack Contribution

- Red Hat is a **Platinum Founding** member of the **OpenStack Foundation**
- Red Hat has been a top corporate contributor to the previous **seven** releases**! (Commits)**
    - Commitment has been **broad** across **all components**
    - Consistent leadership across individual **commits**, **lines of code**, and **bugs fixed**
- Red Hat is also leading development in underlying **dependencies**, e.g.
    - The Linux Operating System
    - KVM Hypervisor and Libvirt virtualisation library
    - Ceph Storage, since acquisition of Inktank
    - Open vSwitch networking



STACKALYTICS

Release: Liberty

Project Type: OpenStack

Module: *Any module*

Company: *Any company*

Contributor: *Any contributor*

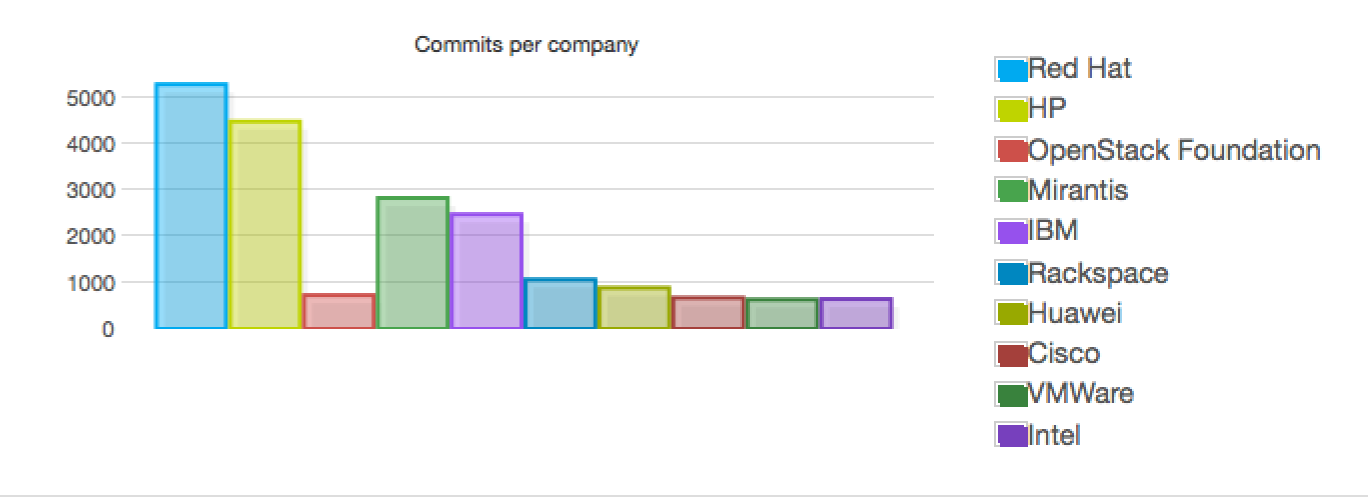
Metric: Commits

Contribution by companies

Contribution by modules

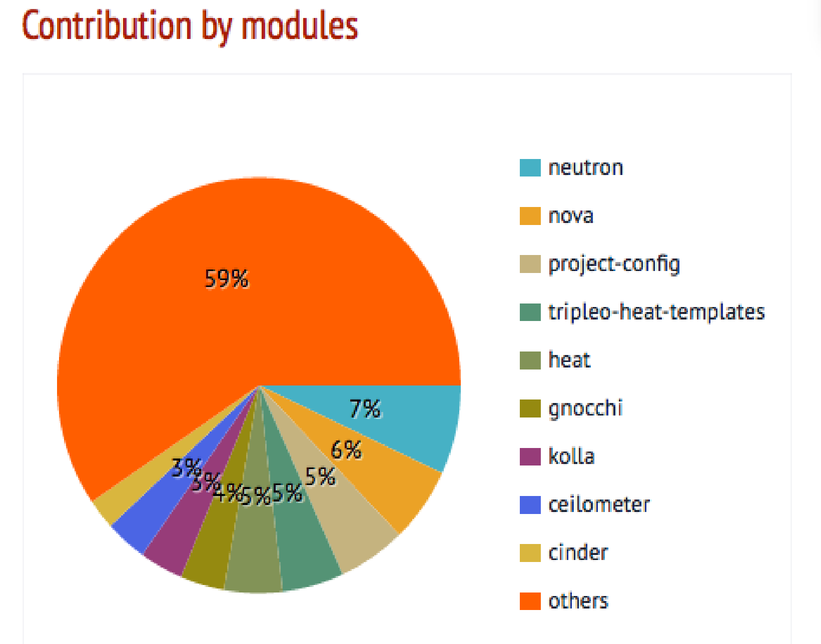
OpenStack commits for the Liberty release, integrated projects.

Source: http://activity.openstack.org/dash/browser/scm-companies.html?release=liberty



Red Hat contributes across **all** OpenStack projects and can thus support a customer on **all** aspects of OpenStack.

Source http://stackalytics.com/?release=liberty&metric=commits&company=red%20hat



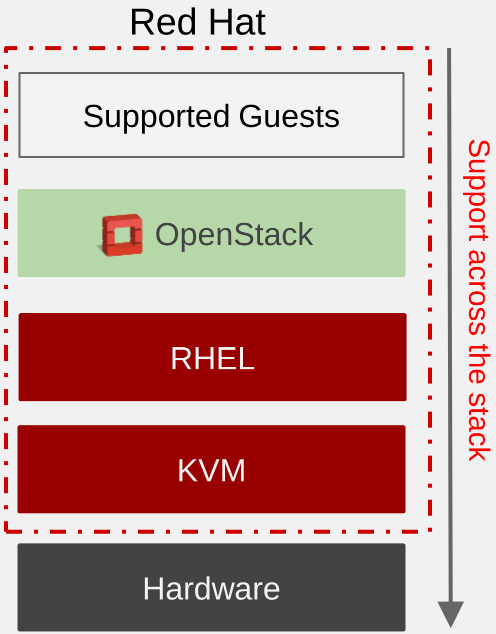
Red Hat OpenStack Platform

Red Hat Enterprise Linux OpenStack Platform

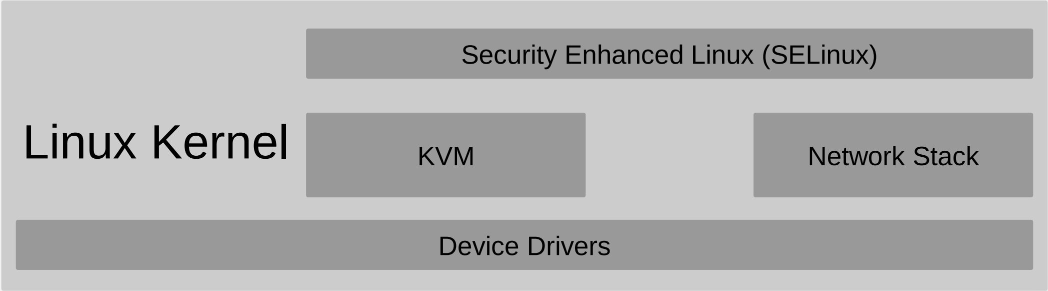
- Red Hat’s officially **supported**, **enterprise-class**, OpenStack distribution
- Built specifically for, and tightly **integrated** with **Red Hat Enterprise Linux**
- Released every **six months; ~two months** after upstream availability
- Today based on **Kilo** - our version ‘**7.0**’

- Focus on:
  - Code **maturity, stability,** and **security**
  - **Back-ports** of important security/stability patches throughout lifecycle
  - 3rd party **ecosystem** of value-add components and **certified** platforms
  - Writing rich product **documentation** and **reference architectures**

Co-engineered and Integrated

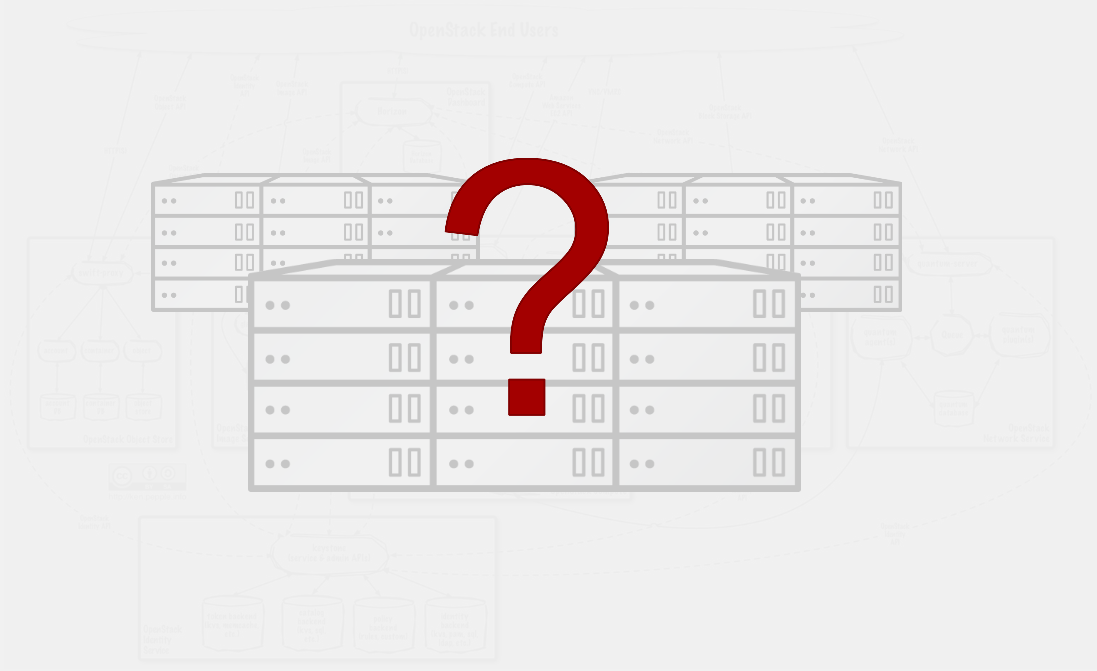


- OpenStack cannot be productized as a stand alone layer!
- Red Hat Enterprise Linux OpenStack Platform is purposely designed with the recognition of the unique dependencies OpenStack has on the underlying Linux it's installed on.
- Engineered together with RHEL, KVM, OpenStack & integrated hardware.

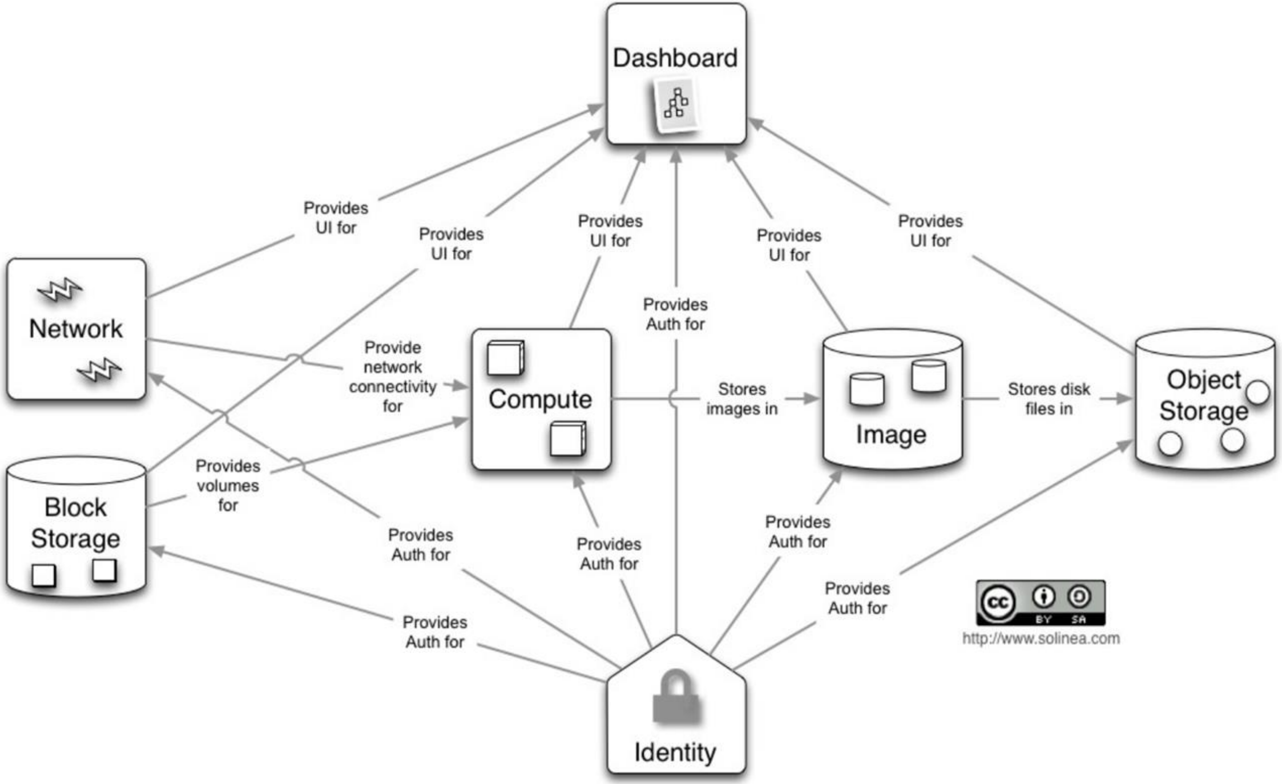


Deploying OpenStack

OpenStack World Challenge

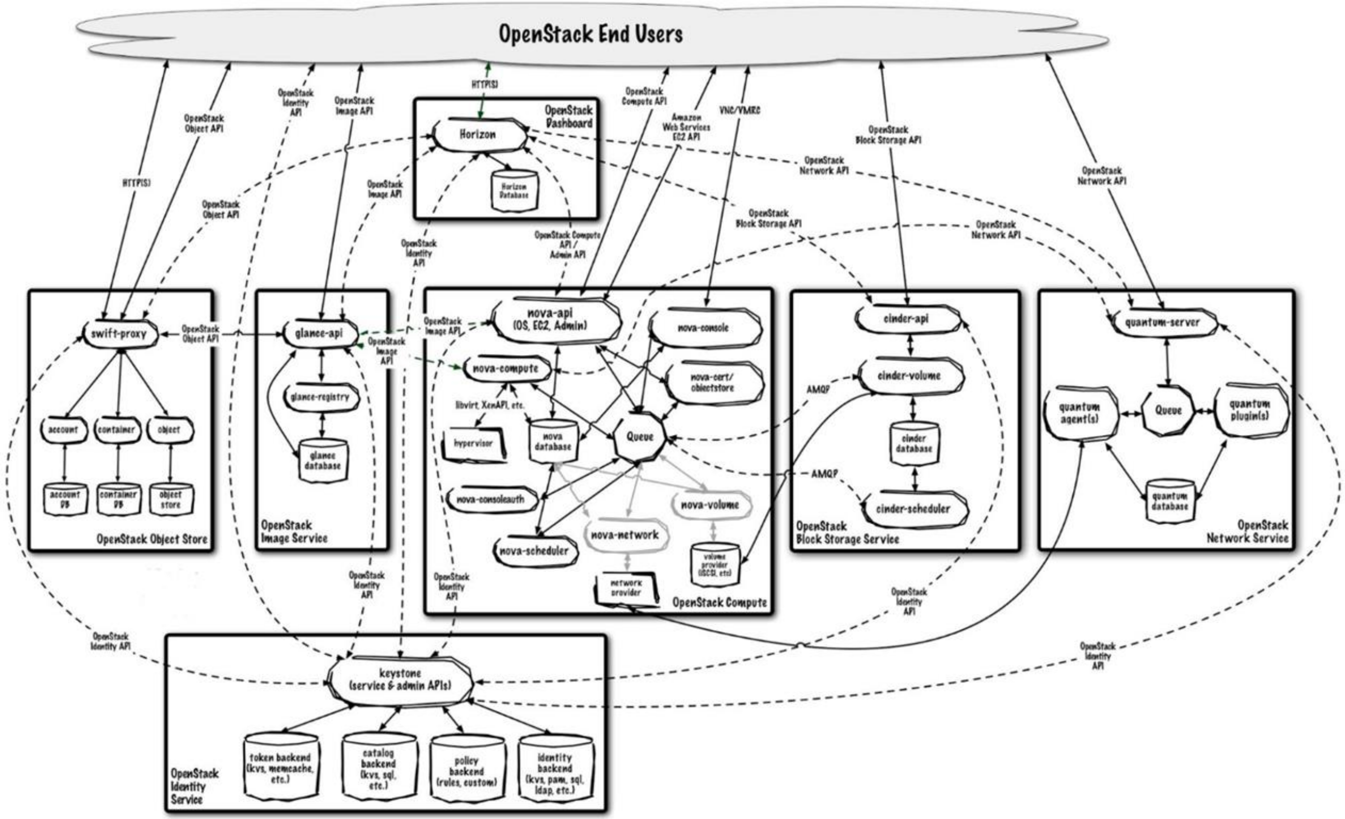


A Thing of Beauty



*Only a select subset of OpenStack components are shown here.

The Reality

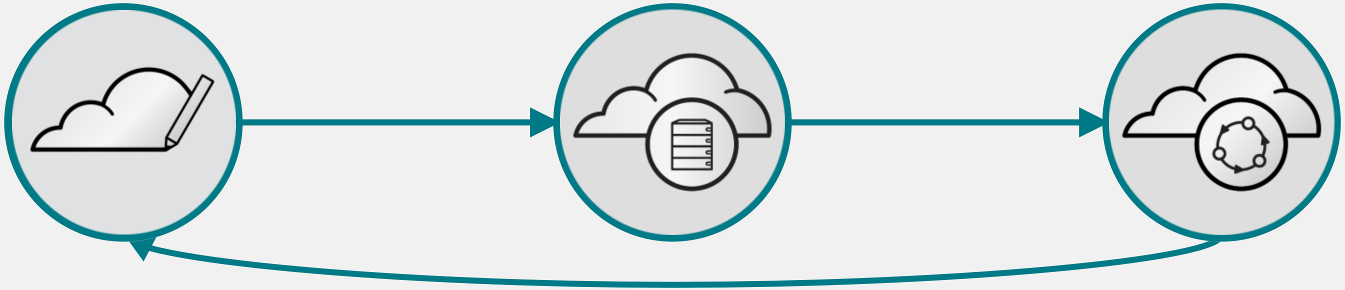


*Only a select subset of OpenStack components are shown here.

RHEL OpenStack Platform director

Project’s Mission

LIFECYCLE



PLANNING

Network topology
Service parameters
Resource capacity

DEPLOYMENT

Deployment orchestration
Service configuration
Sanity checks

OPERATIONS

Updates and upgrades
Scaling up and down
Change management

Ingredients

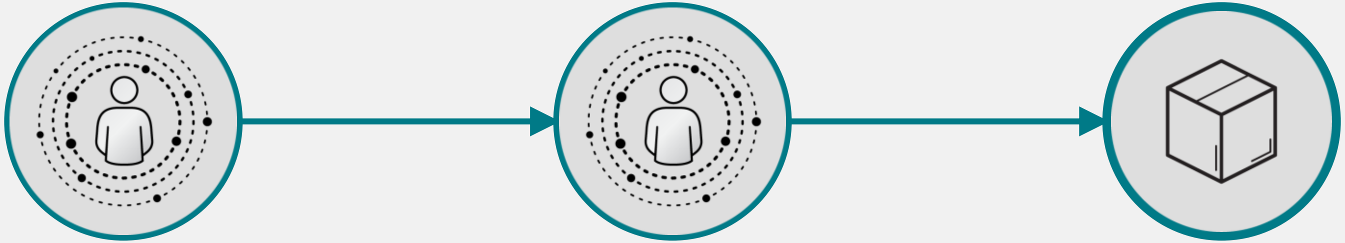
RHEL OPENSTACK PLATFORM INSTALLER

TRIPLEO

SPINALSTACK

RHEL OPENSTACK PLATFORM DIRECTOR

From Upstream to Product



UPSTREAM OPENSTACK

TripleO

MIDSTREAM COMMUNITY

RDO-Manager

DOWNSTREAM PRODUCT

RHEL OpenStack Platform director

RHEL OpenStack Platform director

Key values

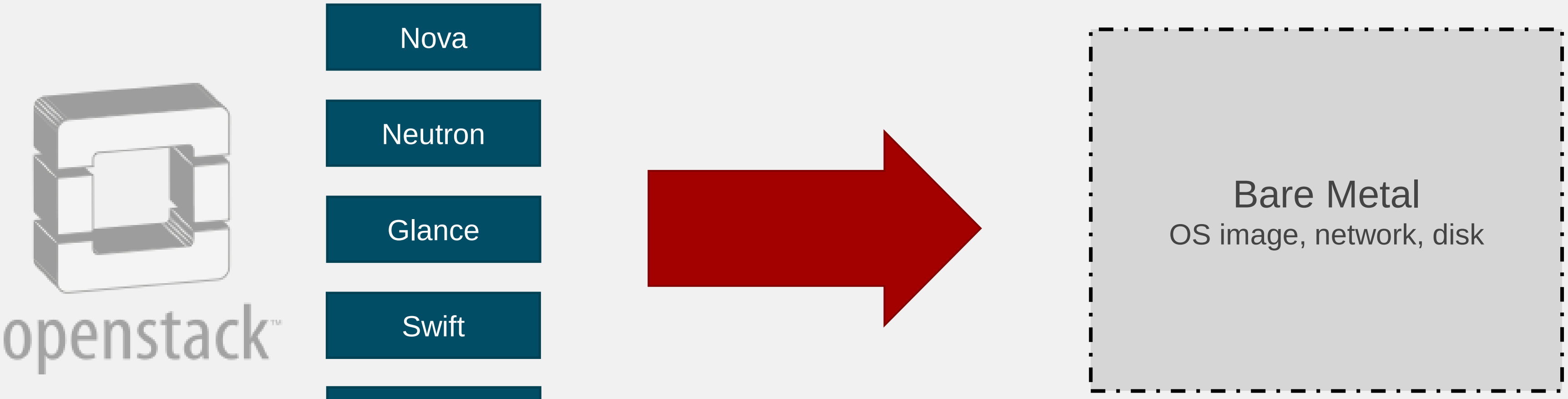
RHEL OpenStack Platform director is providing a solution which is:

- solving for complete OpenStack **lifecycle**,
- built on top of previous **experience**,
- part of upstream OpenStack **community**,
- rich on **partner ecosystem**,
- solving for deployments in **scale**,
- strong in community & product **support**.

TripleO Concept

The Concept of TripleO

Re-uses OpenStack components to deploy OpenStack on **hardware**

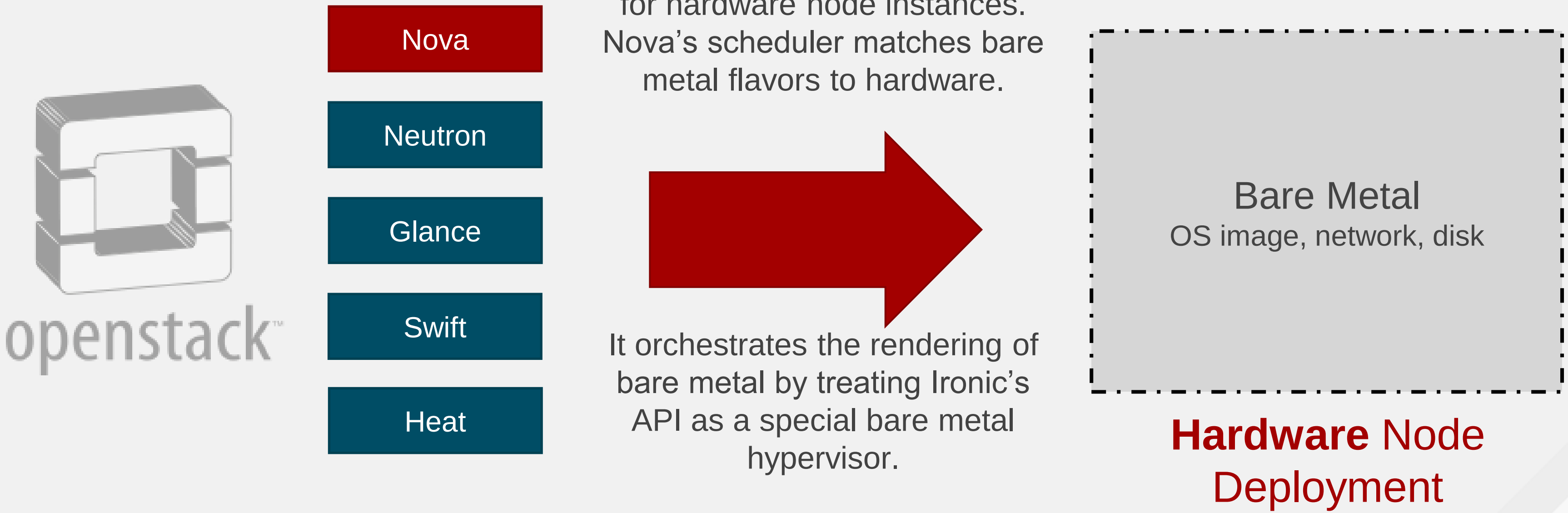


Hardware Node Deployment

*Only a select subset of OpenStack components are shown here.

OpenStack - **Nova**, Glance & Heat

TripleO uses Nova and Ironic to deploy to hardware



Nova

Neutron

Glance

Swift

Heat

Nova provides control services for hardware node instances. Nova's scheduler matches bare metal flavors to hardware.

It orchestrates the rendering of bare metal by treating Ironic's API as a special bare metal hypervisor.

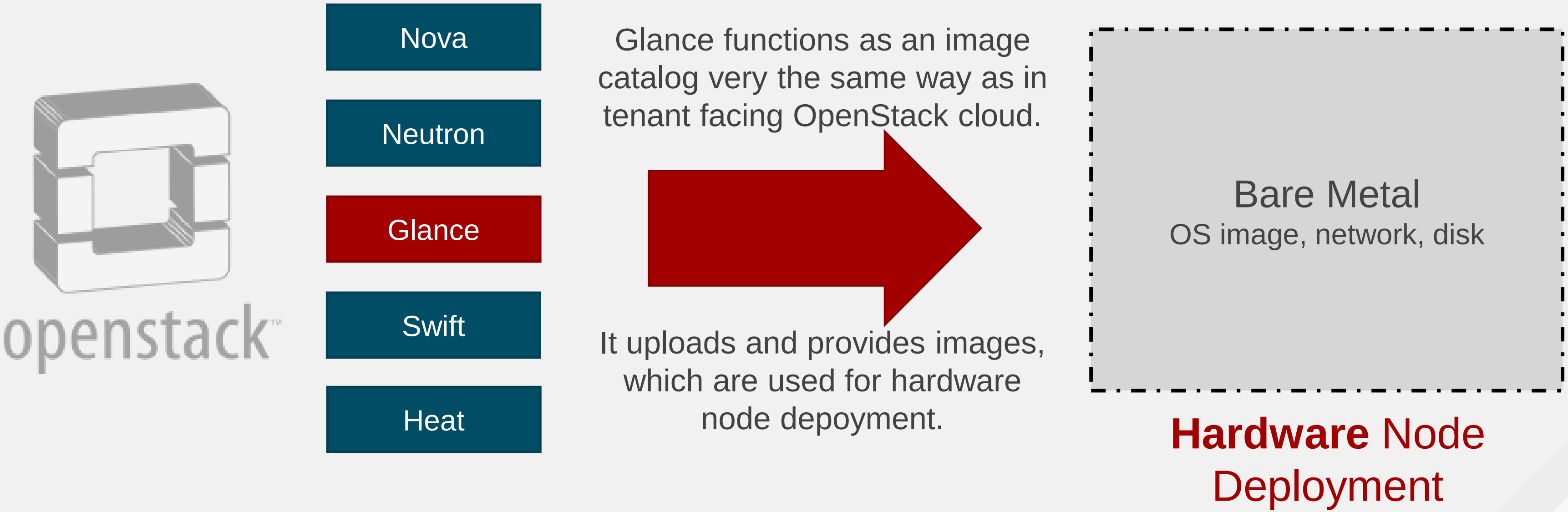
Bare Metal
OS image, network, disk

Hardware Node Deployment

*Only a select subset of OpenStack components are shown here.

OpenStack - Nova, **Glance** & Heat

TripleO uses Glance to uploading and accessing deployment images



Nova

Neutron

Glance

Swift

Heat

Glance functions as an image catalog very the same way as in tenant facing OpenStack cloud.

It uploads and provides images, which are used for hardware node depoyment.

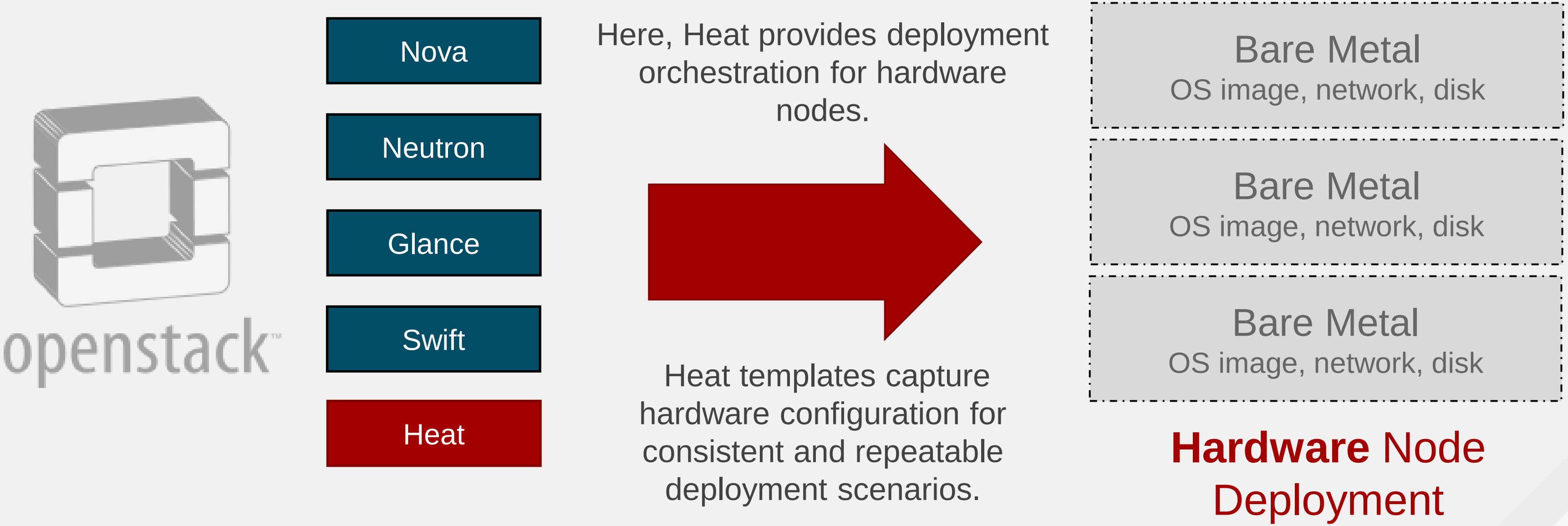
Bare Metal
OS image, network, disk

Hardware Node Deployment

*Only a select subset of OpenStack components are shown here.

OpenStack - Nova, Glance & **Heat**

Heat templates encapsulate the equivalent of a cloud resource reference architecture



Here, Heat provides deployment orchestration for hardware nodes.

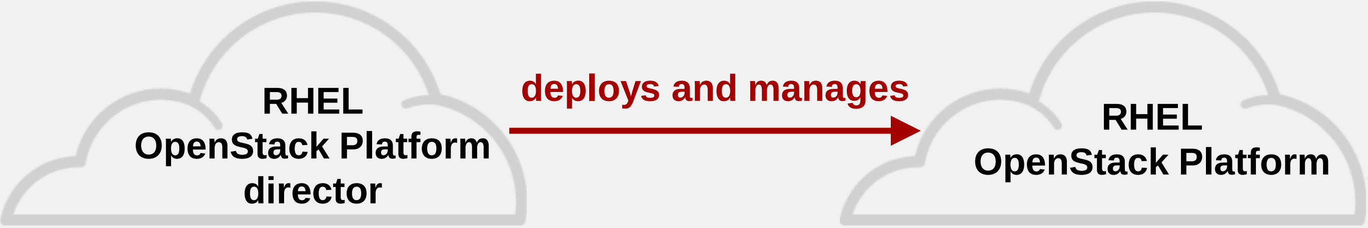
Heat templates capture hardware configuration for consistent and repeatable deployment scenarios.

Hardware Node Deployment

*Only a select subset of OpenStack components are shown here.

Deployment Flow

Key Concept: We Have Two Clouds



RHEL
OpenStack Platform
director

deploys and manages

RHEL
OpenStack Platform

Deployment and management cloud

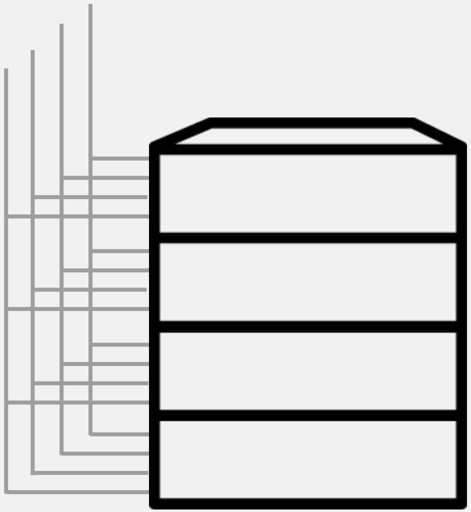
- Infrastructure command and control
- Cloud operator visibility only
- Also known as the “Undercloud”

Production, tenant facing cloud

- The OpenStack you know and love
- The cloud that your tenants will use
- Also known as the “Overcloud”

Deployment Flow

New hardware, racked and wired



Deployment Flow

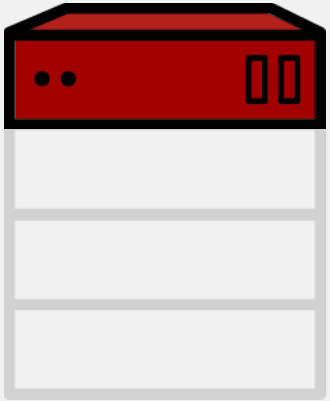
Identified management node

Deployment Flow

Installed RHEL OpenStack Platform director

Deployment Flow

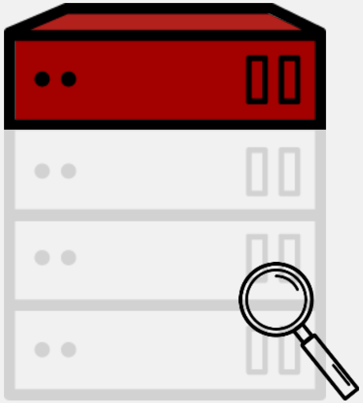
Registered hardware



director

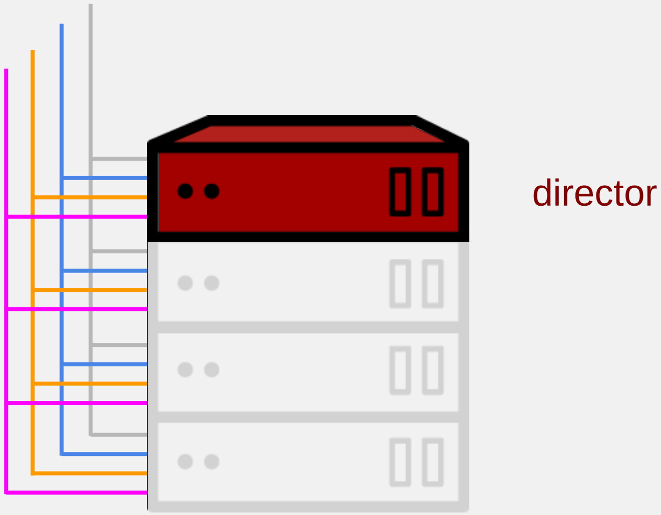
Deployment Flow

Hardware introspected for more detailed specification



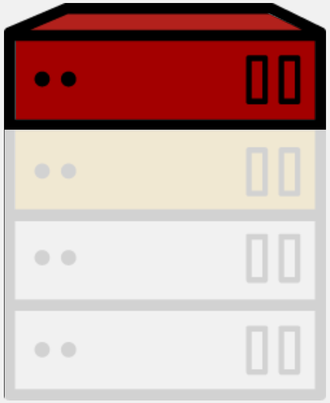
Deployment Flow

Defined networking



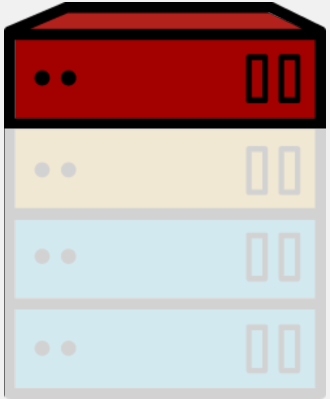
Deployment Flow

Defined controller node



Deployment Flow

Defined resource nodes (Compute, Object Storage, Block Storage, Ceph)



director

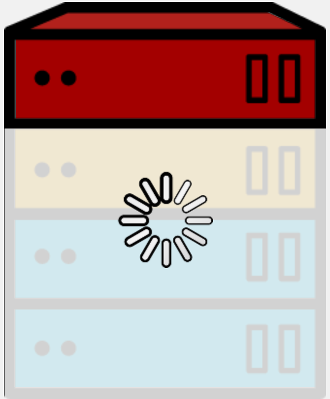
Controller Node

Resource Node (Compute)

Resource Node (Compute)

Deployment Flow

Validating and deploying infrastructure



director

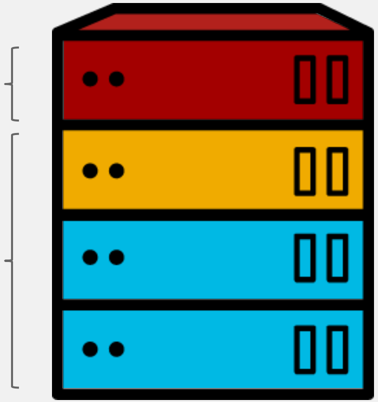
Controller Node

Resource Node (Compute)

Resource Node (Compute)

Deployment Flow

Deployed RHEL OpenStack Platform



Undercloud (management)

Overcloud (workload)

director

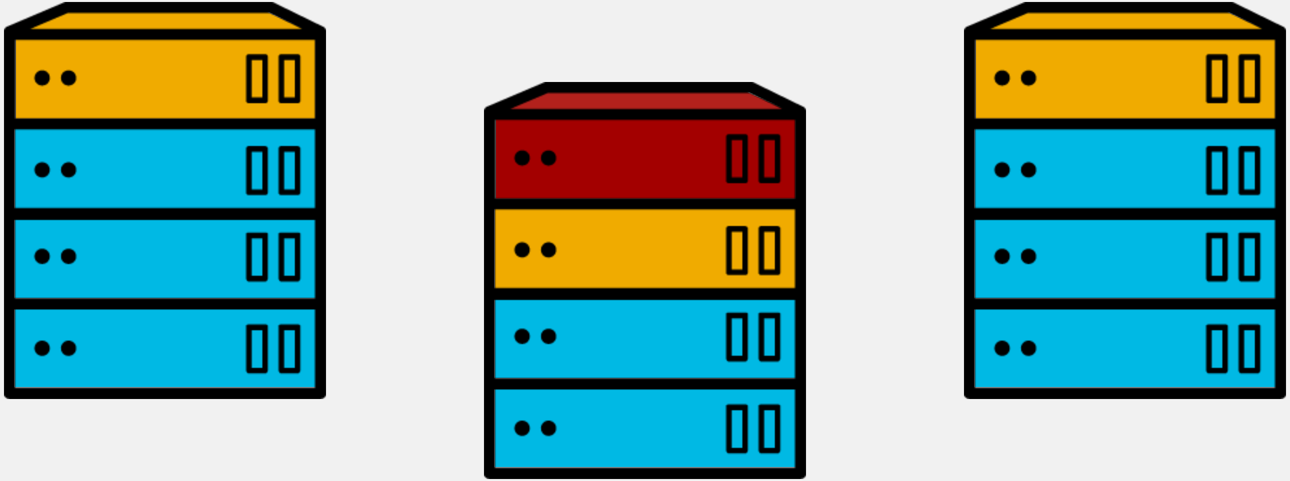
Controller Node

Resource Node (Compute)

Resource Node (Compute)

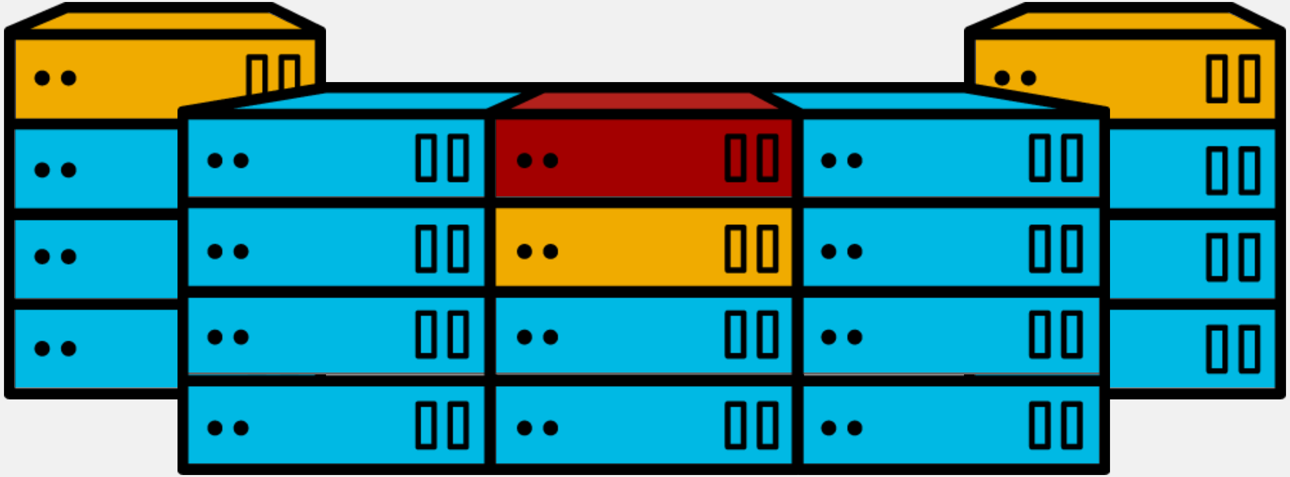
Deployment Flow

Scalable and high available architecture



Deployment Flow

Even for large and distributed data-centers



RHEL OpenStack Platform director Current Features

Built for the Enterprise - I

Features in the latest RHEL OpenStack Platform director 7.2

- APIs for deployment and management
- CLI operations
- Ready state configuration for select hardware (RAID, BIOS, Network)
- Automatically selects appropriate nodes from hardware inventory
- Ability to validate installation post deployment using Tempest
- Automatic HA configuration using Pacemaker
- Scaling resource capacity

Built for the Enterprise - II

Features in the latest RHEL OpenStack Platform director 7.2

- Ceph server deployment and configuration support for storage backends
- Ability to hook to existing Ceph deployments [7.1]
- External hardware load balancer support [7.1]
- Supported partner hardware integration (Ironic)
  - Cisco UCS, Dell, Intel, HP, Fujitsu, SeaMicro, and Open CloudServer
- Supported partner service integration
  - Cisco Nexus 1000v (networking)
  - Netapp Data ONTAP (Cinder storage)

Additional Bare Metal Features (via Ironic)

director’s use of Ironic provides additional features for managing hardware

- Maturing and increased **driver support**:
  - Dell, HP, Open CloudServer, SeaMicro, Cisco UCS, Fujitsu, AMT
  - Specific driver enhancements:
    - HP (iLO): UEFI secure boot
    - Fujitsu Primergy: booting from virtual media using NFS or CIFS supported
- **Node tagging** and associated API extensions allows tags to be used to build arbitrary groups of machines

Notable Optimizations, Enhancements & Fixes

- **VXLAN** is now the default overlay network
  - VXLAN has better performance (20-25% better)
  - NICs with VXLAN offload are more common
  - OSP 5/6 had VXLAN as a recommended tunnel type
- **Nova** compute optimizations
  - Memory commit ratio is now set to 1:1, previously was 1:5.
- **MariaDB** and **RabbitMQ** optimizations
  - MariaDB’s maximum number of connections now scales with the number of CPU cores in the controller nodes
  - RabbitMQ’s file descriptor limits can now be set from director

Partner Integration

Partner Integration Support - I

New artifacts for integrating third party components into RHEL OpenStack Platform deployed by director

RHEL OpenStack Platform director **partner integration guide** covers:

- Architecture - an overview of relevant components for partner integration
- Overcloud Images - provides guidance on how to modify image for software inclusion
- Configuration - guidance on using Puppet for service configuration
- Orchestration - covers custom environment variables and Heat templates
- Integration Points - guidance on upstream inclusion and packaging
- Integration Examples - practical examples of partner integration work

Partner Integration Support - II

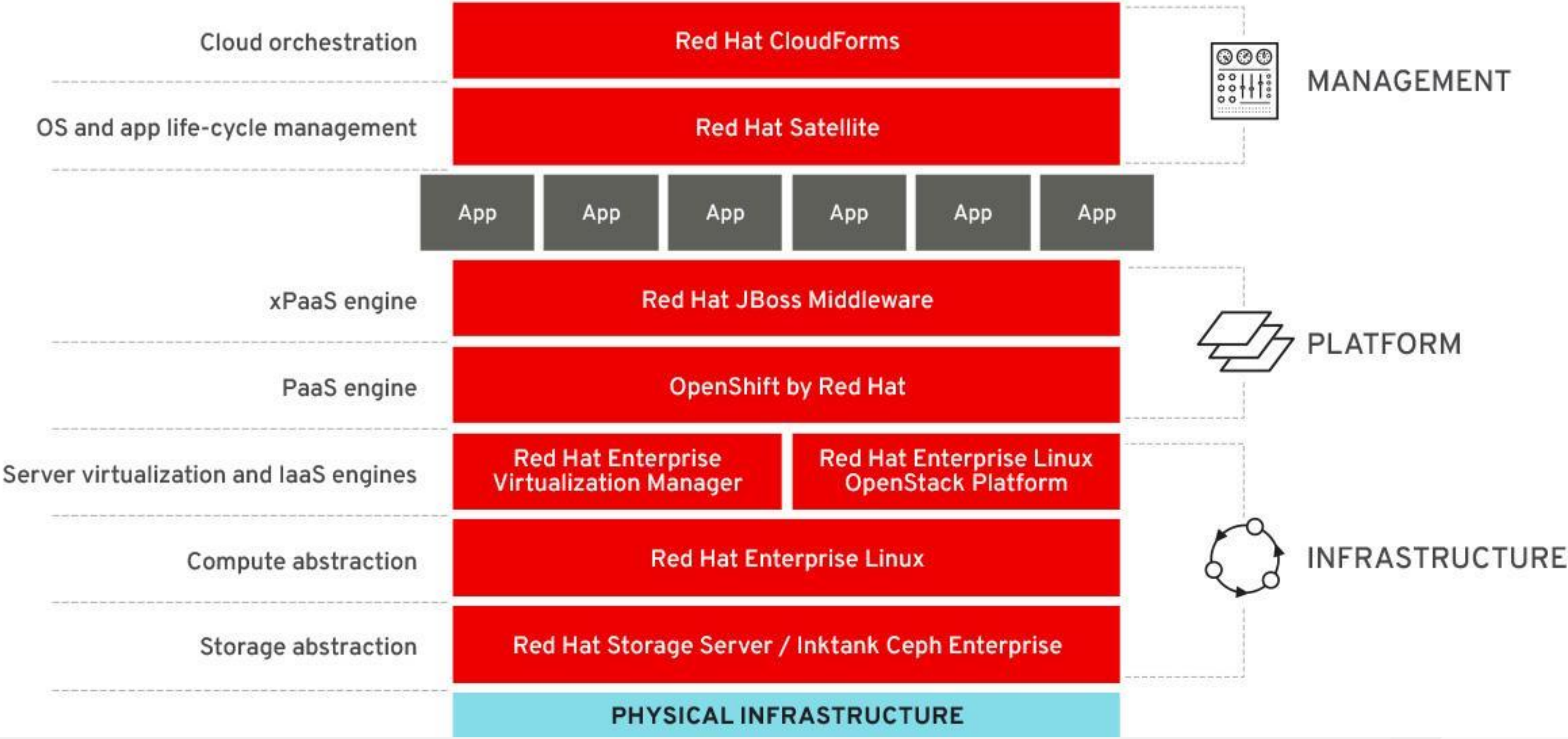
New artifacts for integrating third party components into RHEL OpenStack Platform deployed by director

RHEL OpenStack Platform director **certification** process enhancements

- Scenario based testing (Rally)
- DCI support

Red Hat Portfolio Integration

OPEN HYBRID CLOUD



Cloud orchestration	Red Hat CloudForms	MANAGEMENT
OS and app life-cycle management	Red Hat Satellite	
	App / App / App / App / App / App	
xPaaS engine	Red Hat JBoss Middleware	PLATFORM
PaaS engine	OpenShift by Red Hat	
Server virtualization and IaaS engines	Red Hat Enterprise Virtualization Manager Red Hat Enterprise Linux OpenStack Platform	INFRASTRUCTURE
Compute abstraction	Red Hat Enterprise Linux	
Storage abstraction	Red Hat Storage Server / Inktank Ceph Enterprise	
	PHYSICAL INFRASTRUCTURE	

Ceph Integration

Red Hat Ceph has been the default block storage solution for RHEL OpenStack Platform with **built-in support** from the director. RHEL OpenStack Platform director:

- **deploys** one Ceph cluster as the default back-end for Cinder, Glance and shared storage for Compute nodes, (monitor nodes are collocated with controller nodes),
- supports minor **upgrades** of the Ceph cluster as per the deployment profile described above,
- supports **integration** of **externally** configured Ceph clusters (director does not manage these clusters).

CloudForms Integration

Integration with CloudForms is done on two layers:

- **OpenStack management** (w/ RHEL OpenStack Platform)
    - admin/tenant facing
- **OpenStack infrastructure management** (w/ director)
    - operator facing
    - correlation with RHEL OpenStack Platform deployment
        - deployment details, service monitoring, drift history
    - scaling
        - power of combining policies and infrastructure management

Satellite Integration

Integration with Satellite enables advanced management of node content (packages):

- **subscription** management,
- review of **content** (packages) on nodes,
- new content notification, **errata** overview,
- management of packages which are **available** to nodes.

Concluding Remarks

Deployment Resources

- Deploying OSP 3 with Packstack

https://access.redhat.com/articles/455603

- Highly Available OpenStack with OSP 4

https://www.redhat.com/en/resources/high-availability-red-hat-enterprise-linux-openstack-platform-4

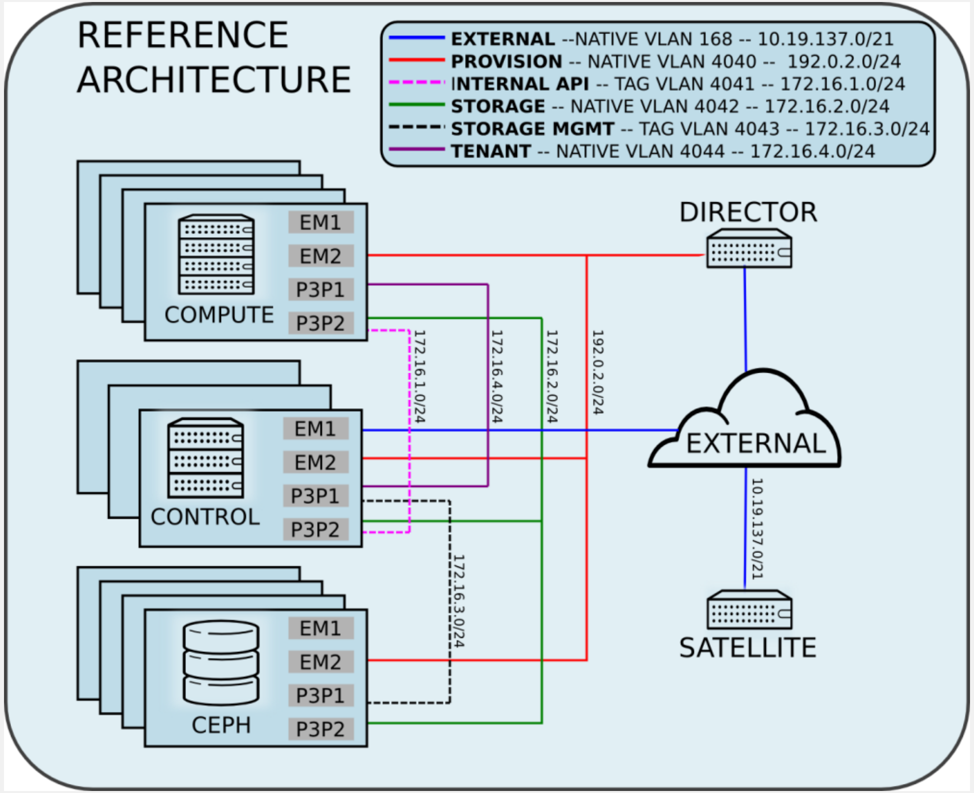
- Deploying OSP 7.1 with OSP Director

https://access.redhat.com/articles/1370143

- Scaling and Performance (OSP 6)

https://access.redhat.com/articles/1507893

Example Deployment



REFERENCE ARCHITECTURE

EXTERNAL --NATIVE VLAN 168 -- 10.19.137.0/21
PROVISION -- NATIVE VLAN 4040 -- 192.0.2.0/24
INTERNAL API -- TAG VLAN 4041 -- 172.16.1.0/24
STORAGE -- NATIVE VLAN 4042 -- 172.16.2.0/24
STORAGE MGMT -- TAG VLAN 4043 -- 172.16.3.0/24
TENANT -- NATIVE VLAN 4044 -- 172.16.4.0/24

So, why would you choose Red Hat?

- Red Hat brings what’s **needed** to the OpenStack Community & Project
  - A vendor to provide the **entire stack**
    - Tight **integration** of **OpenStack**, **Linux**, **KVM**, **Ceph (Storage)** and **Open vSwitch (Networking)**
  - Support from the **#1 contributors** to OpenStack **and** Linux
    - Who best to **support** your cloud?
  - A **predictable, believable,** and **proven** enterprise lifecycle and roadmap
  - The **richest** 3rd party certification matrix - including **guest certification**
  - Focus on integrating **emerging** technologies like **Docker** (**Containers**) and **PaaS**
  - Building next-generation **deployment**, **configuration**, and **management** tools

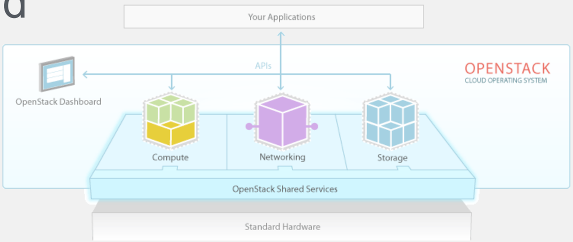
QUESTIONS?

Thank you!

Supporting materials

Undercloud vs Overcloud

- RHEL OpenStack Platform “Production cloud”
  - The OpenStack you know and love
  - The Cloud that your tenants will use
  - Also known as the “Overcloud”

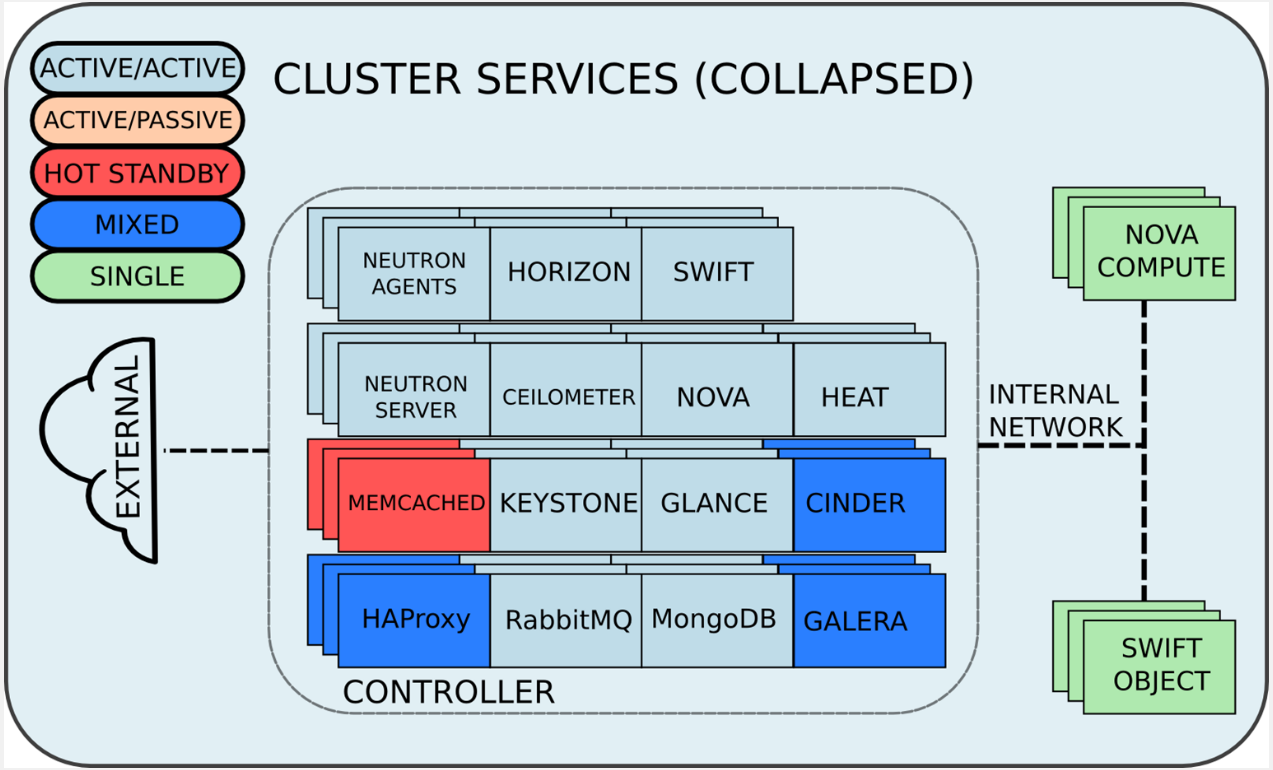


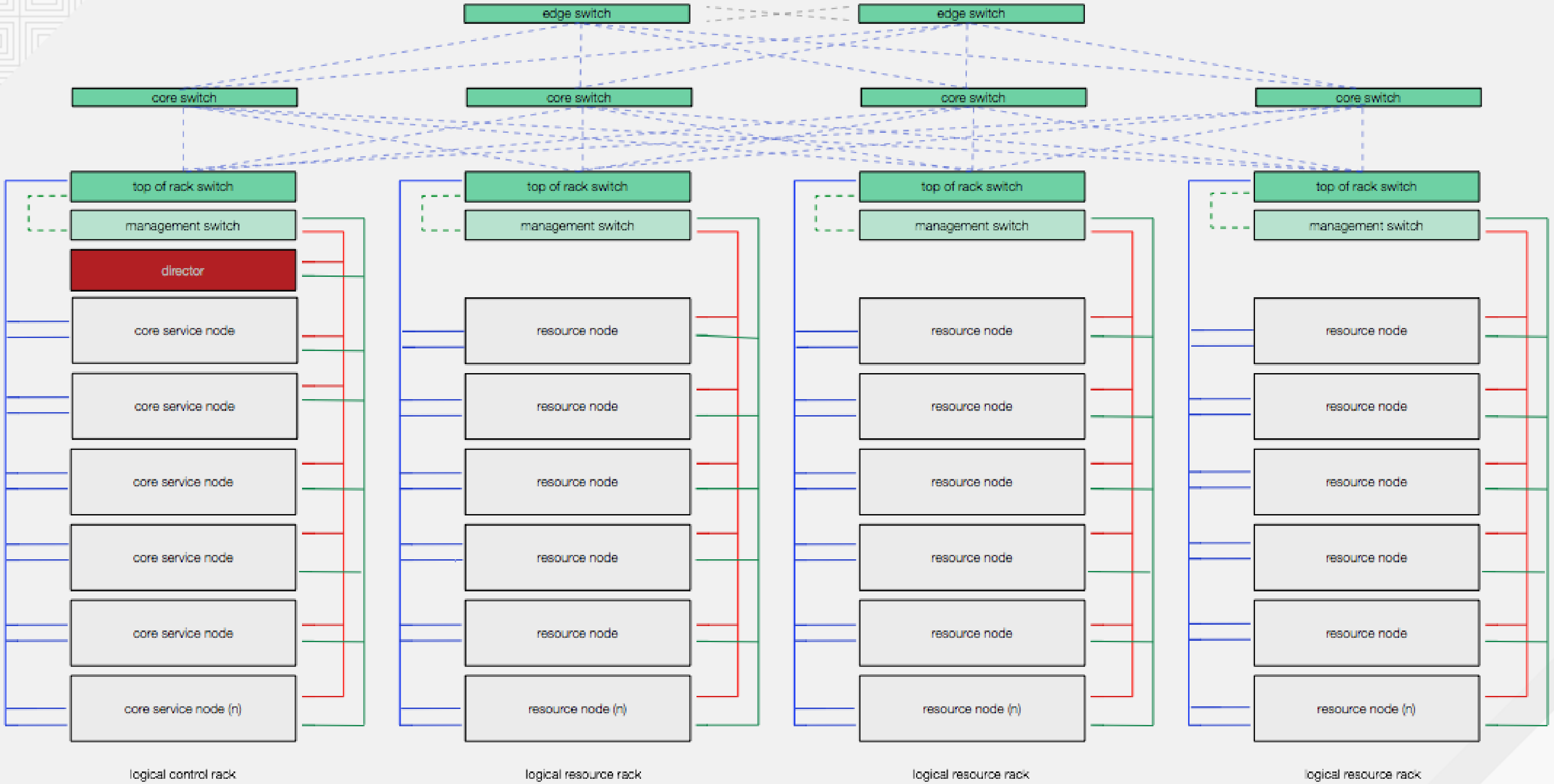
- RHEL OSP director is the Deployment and Management Application
  - Command and Control cloud (director)
  - Only for Cloud Operator use.
  - Also known as the “Undercloud”

OSP-d as Deployment
and Management Tool

openstack

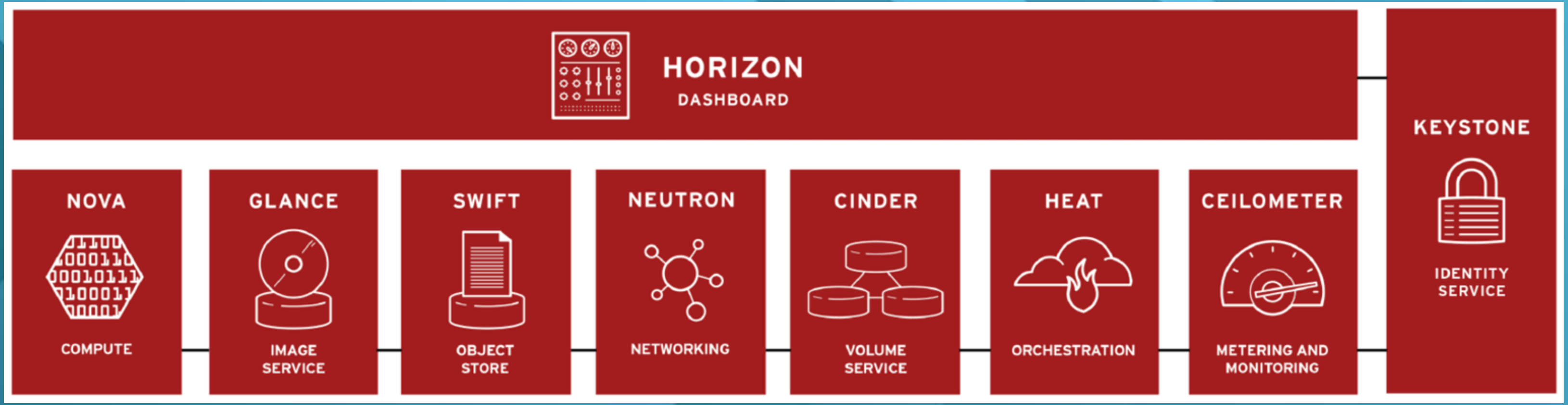
OSP 7 HA architecture




edge switch
edge switch
core switch
core switch
core switch
core switch
top of rack switch
management switch
director
core service node
core service node
core service node
core service node
core service node
core service node (n)
logical control rack
top of rack switch
management switch
resource node
resource node
resource node
resource node
resource node
resource node (n)
logical resource rack
top of rack switch
management switch
resource node
resource node
resource node
resource node
resource node
resource node (n)
logical resource rack
top of rack switch
management switch
resource node
resource node
resource node
resource node
resource node
resource node (n)
logical resource rack

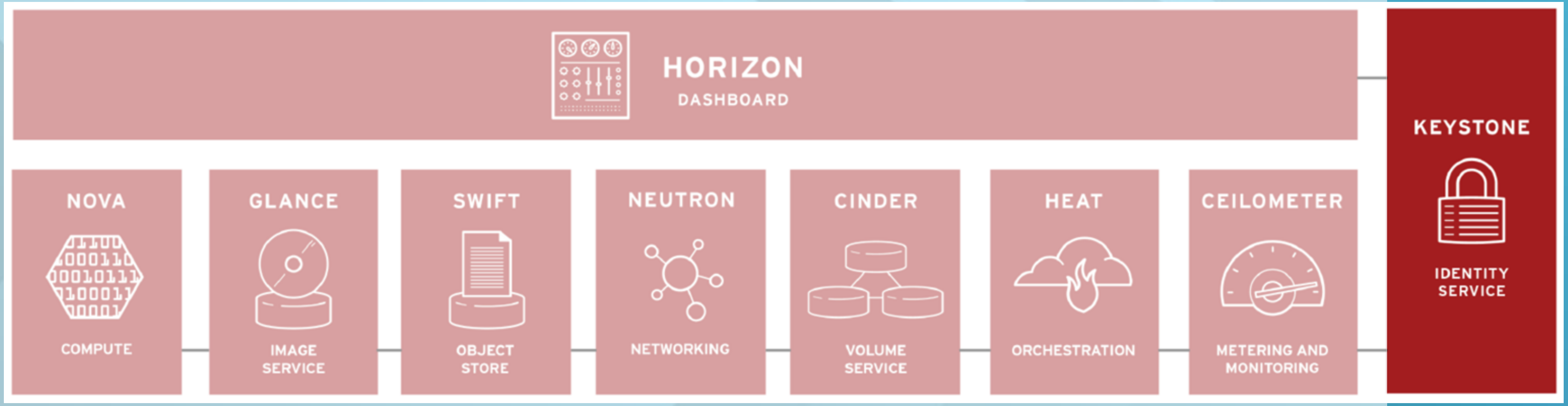
redhat.

OpenStack Architecture



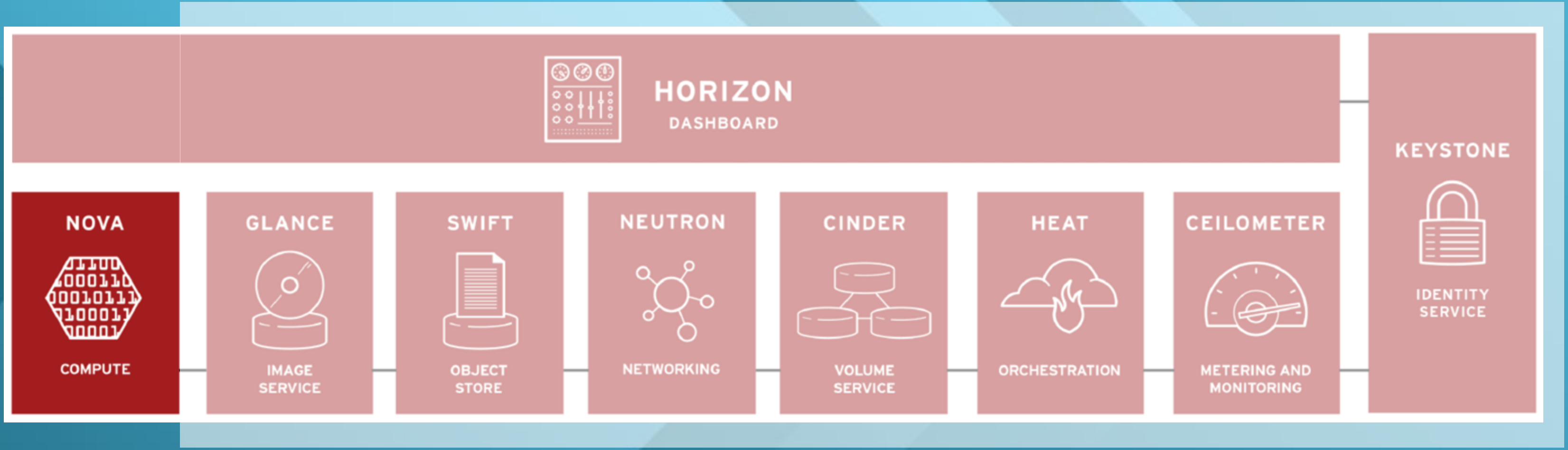
- OpenStack is made up of individual autonomous components
- All of which are designed to scale-out to accommodate throughput and availability
- OpenStack is considered more of a **framework**, that relies on **drivers** and **plugins**
- Largely written in Python and is heavily dependent on Linux

OpenStack Identity Service (Keystone)



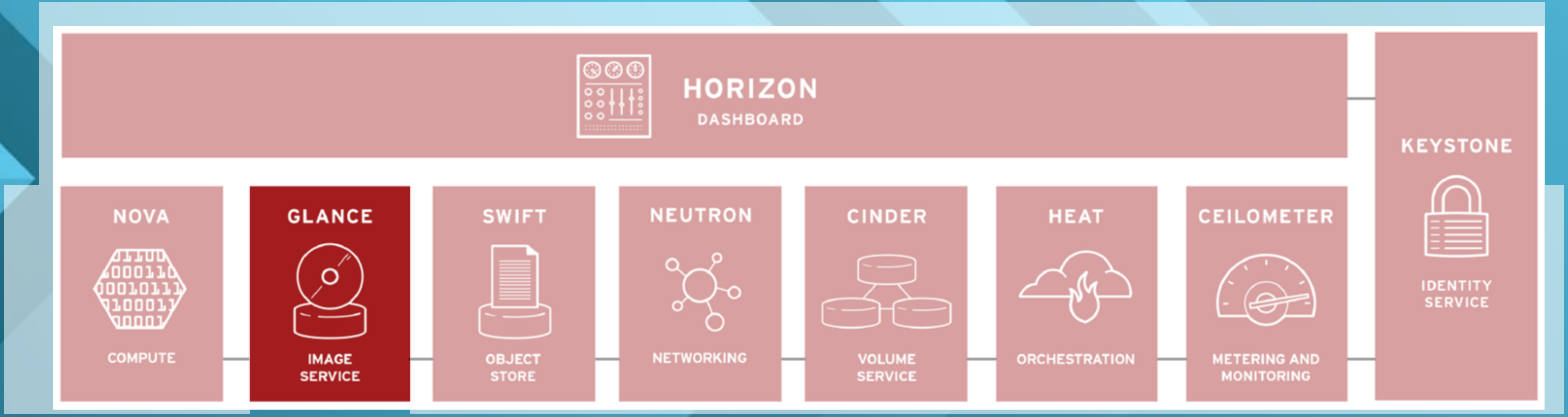
- **Keystone** provides a common **authentication** and **authorisation** store for OpenStack
- Responsible for **users**, their **roles**, and to which **project(s)** they belong to
- Provides a **catalogue** of all other OpenStack services
- All OpenStack services typically rely on Keystone to **verify** a user’s request

OpenStack Compute (Nova)



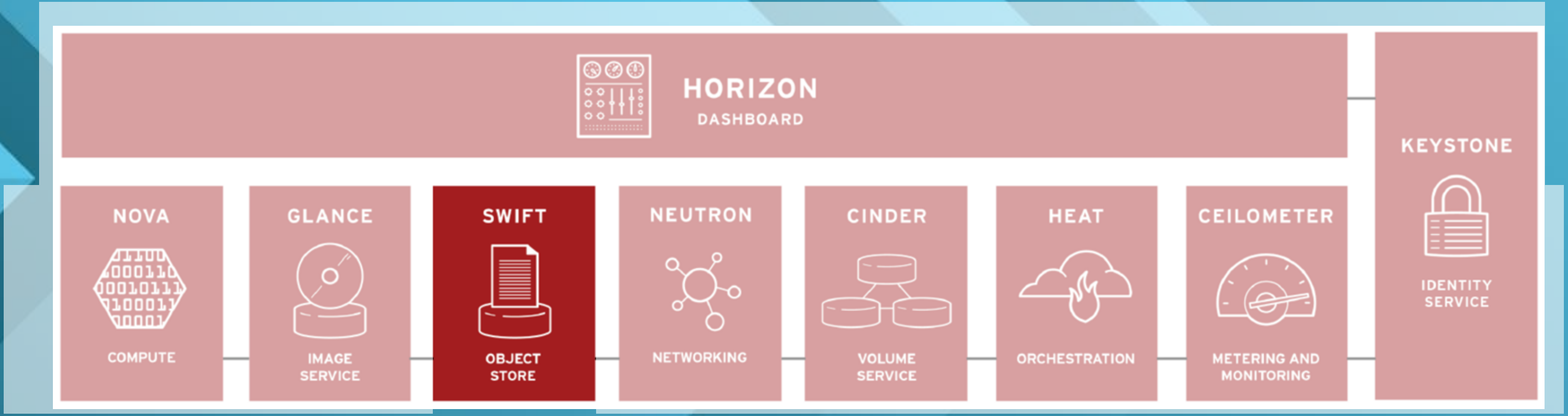
- **Nova** is responsible for the lifecycle of running **instances** within OpenStack
- Manages multiple different hypervisor types via **drivers**, e.g-
    - Red Hat Enterprise Linux (+KVM)
    - VMware vSphere

OpenStack Image Service (Glance)



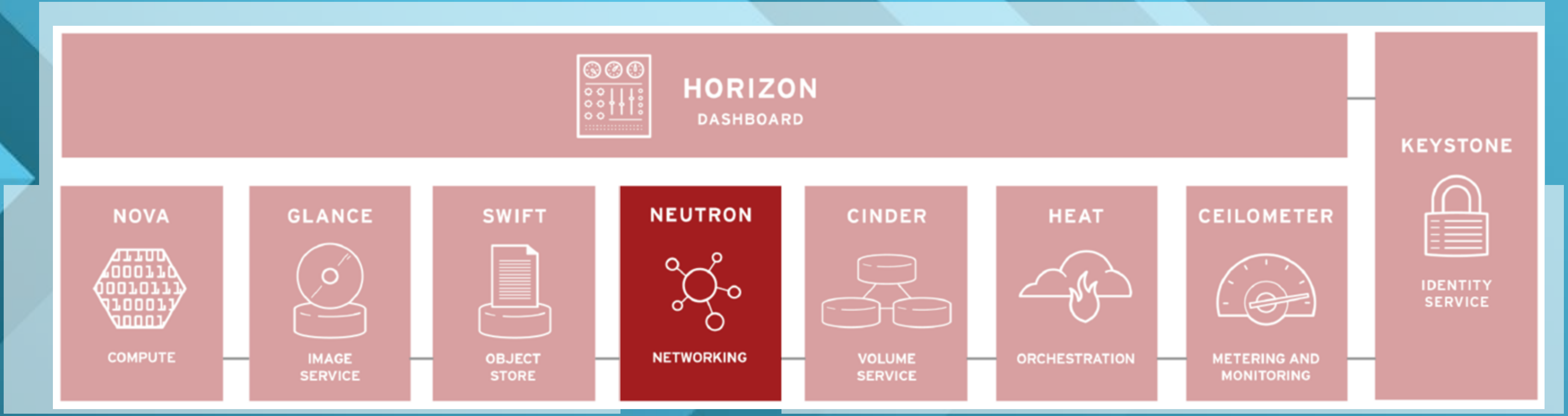
- **Glance** provides a mechanism for the **storage** and **retrieval** of disk **images/templates**
- Supports a wide variety of image formats, including qcow2, vmdk, ami, and ovf
- Many different backend storage options for images, including **Swift**…

OpenStack Object Store (Swift)



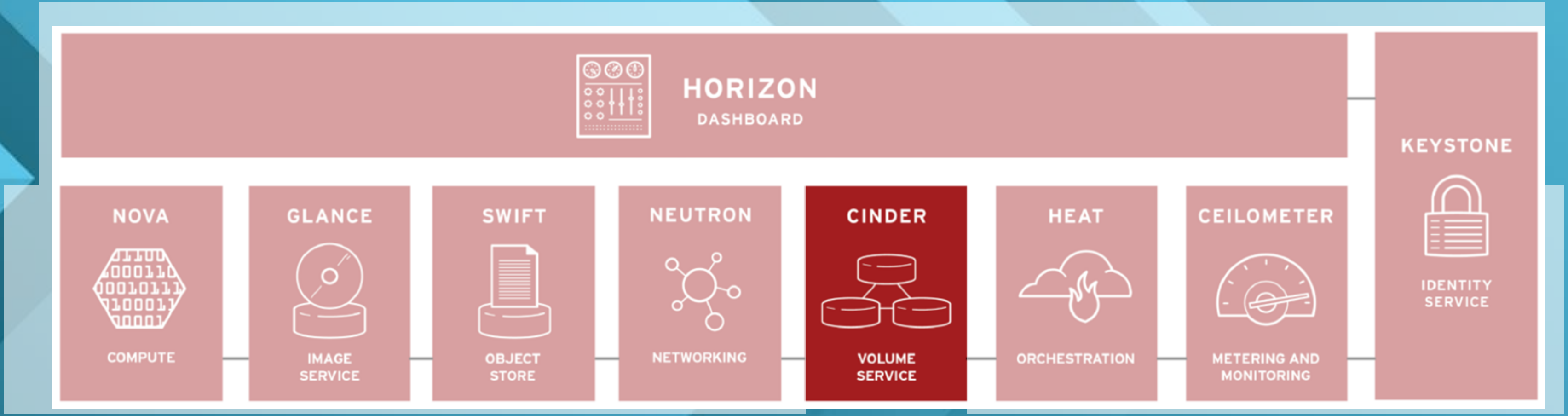
- **Swift** provides a mechanism for storing and retrieving arbitrary unstructured data
- Provides an **object** based interface via a **RESTful**/HTTP-based API
- Highly **fault-tolerant** with **replication**, **self-healing**, and **load-balancing**
- Architected to be implemented using commodity compute and storage

OpenStack Networking (Neutron)



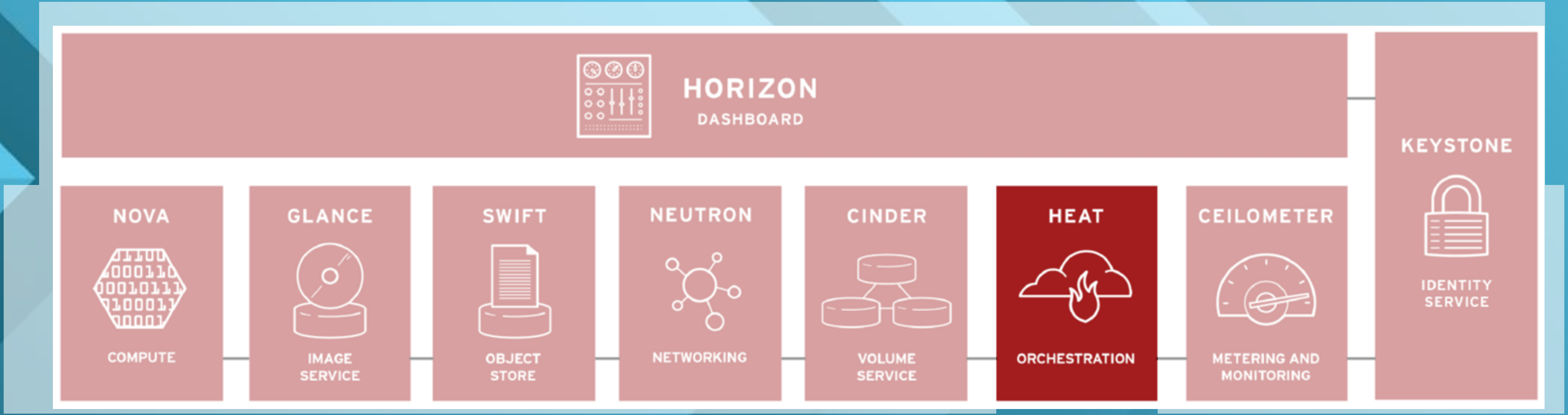
- **Neutron** is responsible for providing networking to running instances within OpenStack
- Provides an API for defining, configuring, and using networks
- Relies on a **plugin** architecture for implementation of networks, examples include-
    - Open vSwitch (default in Red Hat’s distribution)
    - Cisco, PLUMgrid, VMware NSX, Arista, Mellanox, Brocade, etc.

OpenStack Volume Service (Cinder)



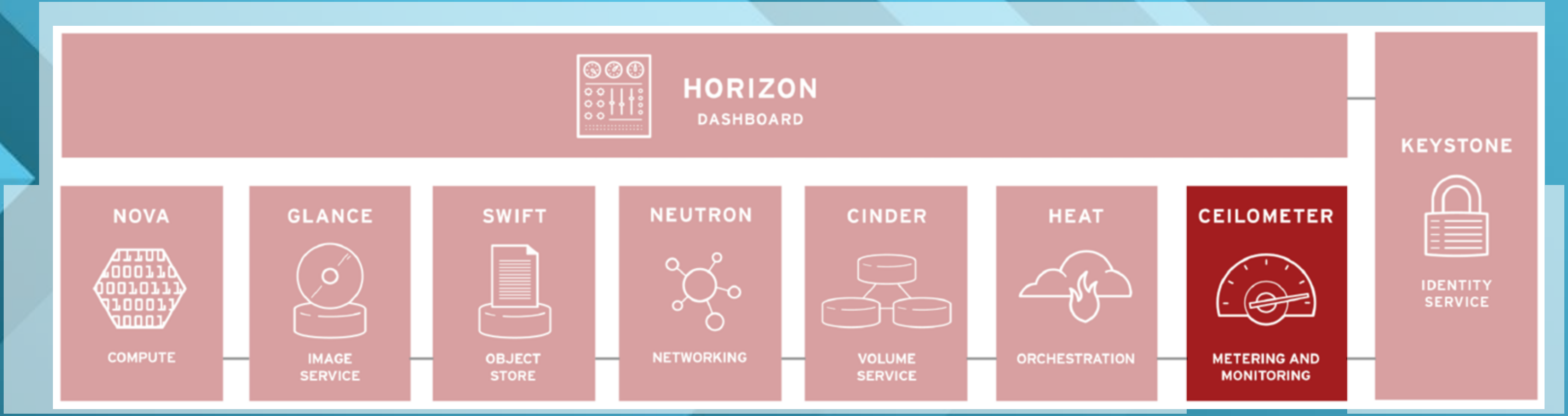
- **Cinder** provides **block storage** to instances running within OpenStack
- Used for providing **persistent** and/or **additional** storage
- Relies on a **plugin/driver** architecture for implementation, examples include-
  - Red Hat Storage (GlusterFS, **Ceph**), IBM XIV, HP Leftland, 3PAR, etc.

OpenStack Orchestration (Heat)



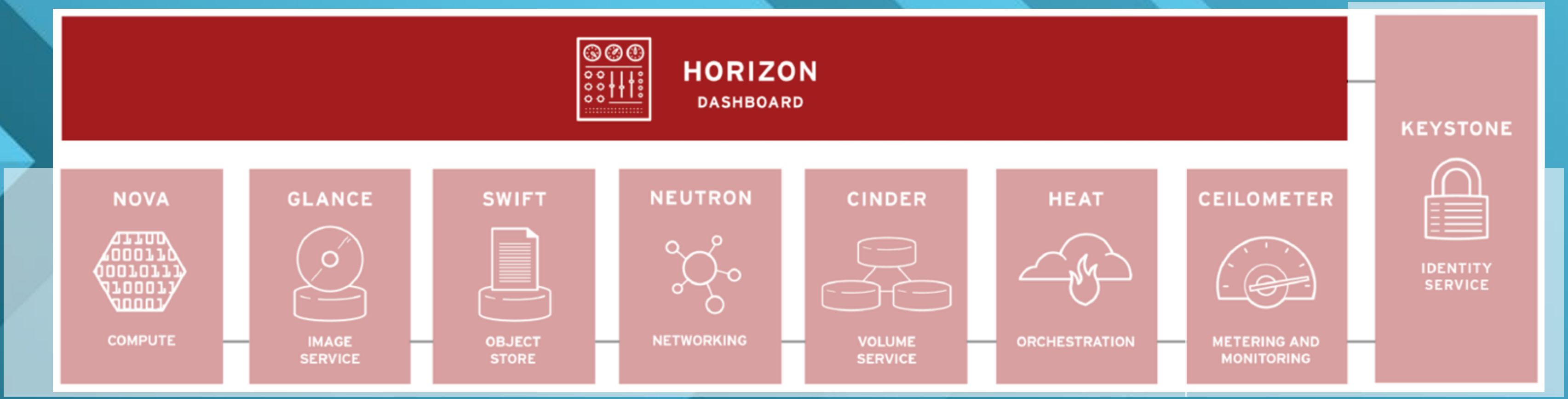
- **Heat** facilitates the creation of ‘**application stacks**’ made from multiple resources
- Stacks are imported as a descriptive **template** language
- Heat manages the **automated** orchestration of resources and their **dependencies**
- Allows for dynamic **scaling** of applications based on configurable **metrics**

OpenStack Telemetry (Ceilometer)



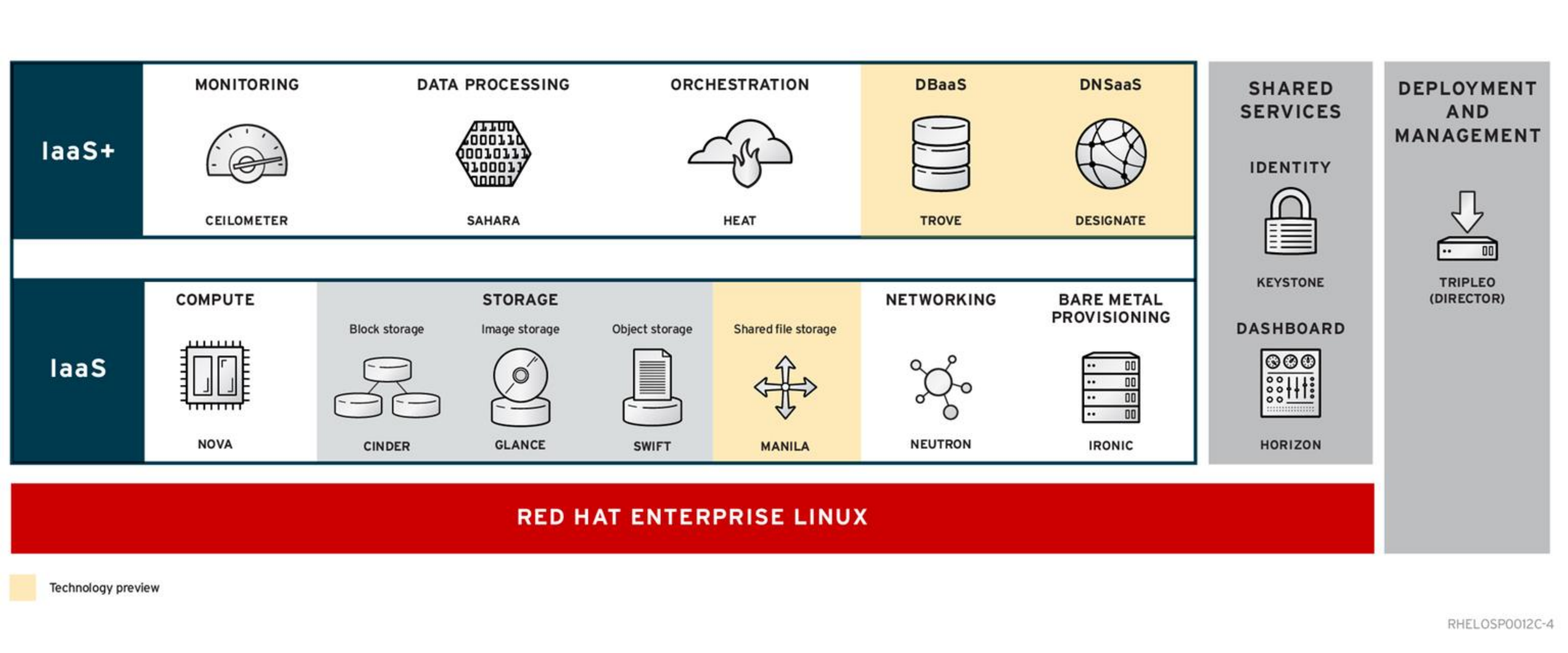
- **Ceilometer** is a central collection of metering and monitoring data
- Primarily used for **chargeback** of resource usage
- Ceilometer consumes data from the other components - e.g. via agents
- Architecture is completely **extensible** - meter what you want to - expose via **API**

OpenStack Dashboard (Horizon)



- **Horizon** is OpenStack’s web-based self-service portal
- Sits on-top of all of the other OpenStack components via API interaction
- Provides a **subset** of underlying functionality
- Examples include: instance creation, network configuration, block storage attachment
- Exposes an **administrative** extension for basic tasks, e.g. user creation

IaaS+ Components



Why does the world need OpenStack?

- Cloud is widely seen as the **next-generation** IT delivery model
  - Agile & Flexible
  - Utility-based on-demand consumption
  - Self-service driving down administrative overhead and maintenance

- Public clouds are setting the benchmark of how IT could be delivered to users
  - **Not all organisations are ready for public cloud**

- Applications are being written differently today-
  - More tolerant of failure
  - Making use of scale-out architecture

Major issues with traditional infrastructure…

- **Our data is too large**
  - Volumes of data are being generated at unprecedented levels
  - Most of this data is **unstructured**

- **Service requests are too large**
  - More and more devices are coming online
  - Tablets, phones, laptops, BYOD generation…

- **Crucially, applications weren't written to cope with the demand!**
  - Traditional infrastructure capabilities are being exhausted
  - Service uptime, QoS, KPI's and SLA's are slipping

Workloads are evolving…

Traditional Workloads

- Typically each tier resides on a **single machine**
- Doesn’t tolerate any downtime
- Relies on **underlying infrastructure** for availability
- Applications **scale-up**, not out

Cloud-enabled Workloads

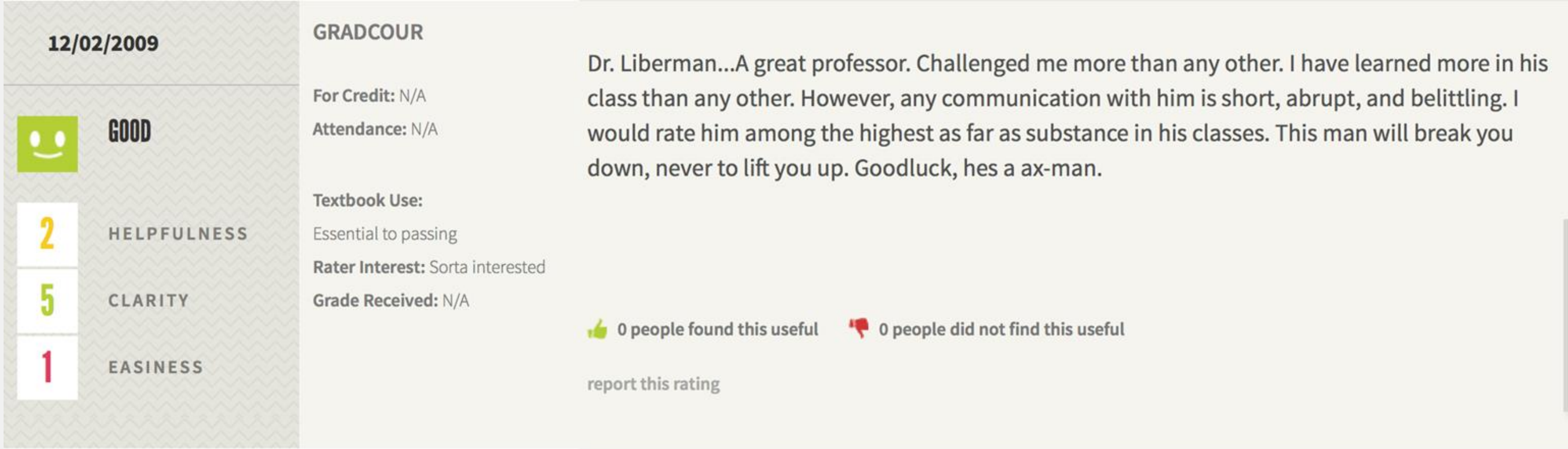
- Workload resides across **multiple machines**
- Applications built to **tolerate failure**
- Does not rely on underlying infrastructure
- Applications **scale-out**, not up

So, how does OpenStack fit in?

OpenStack is typically suitable for the following use cases —

- A **public cloud-like** Infrastructure-as-a-Service cloud platform
  - Internal “Infrastructure on Demand” - private cloud
  - Test and Development environments - e.g. sandbox
  - Cloud service provider platform - reselling compute, network & storage

- Building a **scale-out platform** for cloud-enabled workloads
  - Web-scale applications, e.g. “NetFlix-like”, photo/video-streaming
  - Academic or pharma workloads, e.g. genetic sequencing, HPC/Scientific Computing



12/02/2009

GOOD

2 HELPFULNESS

5 CLARITY

1 EASINESS

GRADCOUR

For Credit: N/A

Attendance: N/A

Textbook Use:

Essential to passing

Rater Interest: Sorta interested

Grade Received: N/A

Dr. Liberman...A great professor. Challenged me more than any other. I have learned more in his class than any other. However, any communication with him is short, abrupt, and belittling. I would rate him among the highest as far as substance in his classes. This man will break you down, never to lift you up. Goodluck, hes a ax-man.

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