



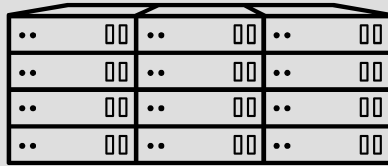
# Red Hat OpenStack Platform

Rafał Szmigiel <[rafal@redhat.com](mailto:rafal@redhat.com)>  
Specialist Solution Architect  
Zagreb, 9-11 June 2016

# IT Operations is Being Challenged



Internal Business



IT Operation  
Challenges



Developers

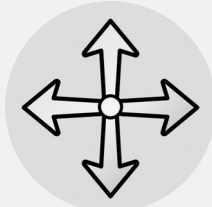
# Modern Apps & IaaS Enable the Digital Business



Streamlined and  
automated



Orchestration,  
configuration  
management



Elastic and scalable



Massive, fault-  
tolerant  
infrastructure



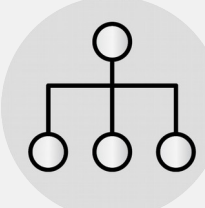
Agile and  
responsive



Rapid deployment



Utility-like



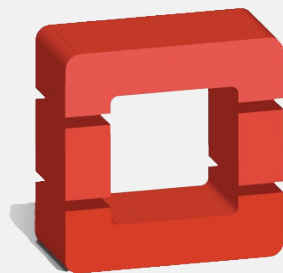
Managed, policy  
driven, & always  
on

# Why This Evolution?

Existing infrastructure is not designed to cope with the demand

- Data is too large
  - We're producing vast amounts of unstructured data
  - Scaling UP no longer works. Scaling OUT is a necessity
- Too many service requests
  - More client devices coming online – Laptops, tablets, phones, watches, etc...
  - BYOD generation is here
- Applications and infrastructure were not designed for this level of demand
  - Traditional capabilities are being exhausted

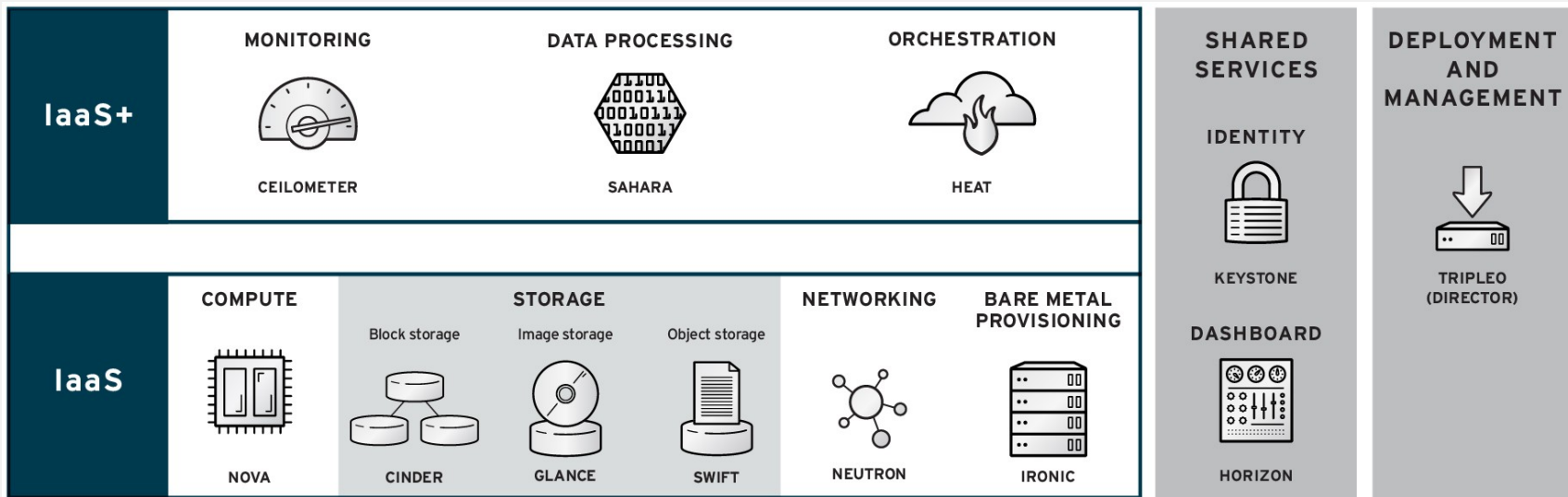
# What is OpenStack?



openstack™  
CLOUD SOFTWARE

# Cloud Infrastructure for Cloud Workloads

- Modular architecture
- Designed to easily scale out
- Based on (continuously growing) set of core services



# Compute (Nova)

Similar to Amazon EC2

Boot an instance of a selected flavor (vCPU, RAM, disk size), OS image (from Glance), SSH keypair, host-aggregate or availability zone (AZ), custom metadata, user-data, security-groups, with/without ephemeral disk.

Reboot, stop, resize, terminate

See the console log of his instance, open VNC/RDP session, change VM root password (if OS supports)

Reserve, assign and release floating Ips

Manage keypairs and security-groups

Check quota usage

Select which Neutron network or port

Other Neutron/Cinder shortcuts for network and volume management

No need to manage hypervisors individually, due to distributed design of OpenStack.

Supports KVM and VMWare (vCenter)

Defines which choices are available to tenants: flavors offering specific capabilities and carefully planned capacity and overcommit ratios.

Easier maintenance and operations with support for node evacuation, mark “host down” and instance live-migration.

Define host-aggregates and AZs with specific meta-data to allow advanced scheduling and request filtering.

Set NFV specific flavors including vCPU pinning, Large pages, vCPU, RAM, and I/O device NUMA awareness, SR-IOV/PCI Passthrough

[Instance HA](#), transparent to tenants, if enabled

# Object Storage (Swift)

Similar to Amazon S3 (a modern version of FTP, WebDAV)

CRUD objects in containers, per account

Ideal to store static objects (media, web files, email)

Only useful if the application understands the Swift/S3 API

Also useful to store Glance image backups

Not meant to be used as POSIX filesystem

Very few dependencies with other OpenStack modules, mostly Keystone for RBAC

Scales horizontally up to petabytes

Replication for global clusters

Advanced Swift features: middleware for API processing, temporary URLs, URL rewrite

Swift requires its own storage space, not integrated with Ceph

Future: automatic install of Ceph RadosGW, which exposes a Swift/S3 API

Reduced availability for further storage efficiency with Erasure Coding\* (*Tech Preview*)

*\*Tech Preview features are subject to change in GA release*



# VM Image Storage (Glance)

Similar to Amazon AMIs

CRUD images (VM templates, a bootable OS) and snapshots (VM snapshot)

Private or public images

Upload from file or from URL

Metadata can host any key-value pair, useful to document OS version, date...

Multiple disk-formats (QCOW2, RAW, ISO, VDI, VMDK) and container-format (bare, OVF, AMI, ARI)

Checksum and signature verification

If not using Ceph, OSP-D configures Swift as a Glance image store.

If using Ceph, Glance will leverage advanced RBD features (cache, thin-provisioning, immediate snapshot)

# Block Storage (Cinder)

Similar to Amazon EBS

CRUD additional hard drives to an instance

Persistent storage, can be cloned, snapshotted, replicated or imported/exported to another AZ

Block volumes: require tenant VMs to format with a filesystem.

Encryption available via LUKS (if enabled by ops)

Hot-unplug from one instance and re-attach to another instance

Non-disruptive and Incremental snapshot: ideal for backup/restore and DR use-cases

QoS available (total IOPS)

If exposed, vendor-specific features (mirroring, compression, replication, thin provisioning)

Uses Red Hat Ceph storage as default

**Multiple backends**(LVM, iSCSI, NFS, ScaleIO, etc) including proprietary ones with more specific features

Faster provisioning via over-subscription, thin-provisioning and Generic image cache

iSCSI multi-path support for extra reliability

Private volume types for premium levels of service (SSD, thick\_provisioned)

Simplified operations, DR and backup with Generic Volume Migration & replication (sync/async, with N number of replicas) between different storage backends

Storage Policies for simpler management

# Networking (Neutron)

Similar to Amazon VPC, ELB

Create, Remove, Update, Delete (CRUD) networks, subnets and ports, for basic L2 and L3 with IP Address Management (DHCP)

Define a tenant network (overlay)

Additionally:

- Provider networks
- Quotas
- Security Groups (per port)
- East/West L3 routing with tenant-defined routers
- External gateway, NAT, floating IPs
- Load balancing, VPN and Firewall

IPv6 tenant network management

QoS (rate limit policies) per port, per network

RBAC for granular sharing of tenant networks

Defines provider networks, manually set-up in Neutron by the operator, representing a pre-existing network - Useful to point to corporate DNS or Gateways with multiple routes

Multiple simultaneous L2 technologies on a single installation via ML2

Default OpenVSwitch, or choose from dozens of commercial SDN vendors

Configures SSL/TLS backend for LBaaS

Define floating IP ranges, normally for publicly routable IPv4 addresses

Offer/ delegate IPv6 tenant networks (SLAAC, DHCP)

Define and enforce QoS metrics (currently only egress flows)

VXLAN offloading to HW available (up to 4x throughput)

L2Pop and Responder to mitigate ARP flooding at scale

# Orchestration engine (Heat)

Similar to Amazon Cloudformations, and ELB CRUD templates (stacks), that can be stopped and resumed.

Instructs OpenStack to automate deployment of resources as defined in HOT or CloudFormations (CFN) language

Very useful when combined with Ceilometer and LBaaS. **Example use-case** is instance auto-scaling, by creating another VM when cluster load reaches 80% CPU.

Heat may require minor tuning to ensure enough CPU and RAM is assigned to it

Can offer shared templates, approved by IT

Excellent integration with CloudForms to create a advanced service catalog, with policies and complex quotas.

# Bare-metal provisioning (Ironic)

Similar to Amazon Dedicated EC2 Servers  
Nova commands are used against a existing baremetal Host-Aggregate  
After Ironic reserves a baremetal node, Nova is used to provision the instance  
Only works with glance images tagged "hypervisor\_type=ironic"  
Can deploy Linux or Windows VMs (requires extra steps)

Allocates a set of nodes to be entirely allocated to certain tenants, on demand  
Defines Host-Aggregates with key-value "baremetal"  
Defines Nova flavor with key hypervisor\_type="ironic"  
Quotas and capacity planning are needed  
**Good integration** (but not certified) with most hardware vendors: Dell, Cisco, HP...  
Introspection process to detect hardware capabilities  
Requires many Nova and Neutron changes (i.e. Flat Networking for PXE provisioning)

# Telemetry (Ceilometer)

Similar to Amazon CloudWatch

Metrics (CPU, RAM usage) and Events (e.g instance is created) can be only be listed.

Alarms (e.g CPU threshold reached) can also be triggered. Alarm threshold can be custom-defined.

Querying for historical values are available.

Ceilometer does require tuning at scale, when lots of tenants are polling historical values. MongoDB is the preferred backend.

Future: Gnocci and AODH for separation of metrics and alarms in separate time-series databases, for performance and scalability

Connects with CloudForms for Capacity monitoring and management.

Tenant view

Operator view

# Identity and RBAC (Keystone)

Similar to Amazon IAM

Authenticates and gives Authorization to users. Provides them session tokens that will be used for all OpenStack actions

CRUD user, tenants (project), roles (as long as Operator allows it)

Change password, also download credentials file (RC) with EC2 keys

Discover OpenStack endpoints via catalog

Kerberos for SSO in both Web (Horizon) and in CLI on client systems with SSSD

CRUD user, tenants (project), roles, and domains (for v3) without limitations

SAML Federation for authentication with external providers or other clouds

Multiple identity backends: LDAP, ActiveDirectory, FreeIPA, PAM, etc

Preferred authorization backend is MariaDB

Logs in standard CADF auditable format

Public endpoint protection with SSL/TLS

Tenant view

Operator view

# OpenStack: optional services

Horizon - dashboard

Trove – database as a service

Sahara – Big Data (Hadoop)

Zaqar – Messaging-as-a-service

Manila – Shared Filesystems

Designate – DNS-as-a-Service

Barbican – Key management

Magnum - Containers

Murano – Application Catalog

Congress – Governance (Policy-as-a-Service)



# OpenStack Powers Digital Business

## OpenStack meets the demands of “scale-out” digital business

- Brings public cloud-like capabilities into your datacenter
- Provides massive on-demand (scale-out) capacity  
1,000's → 10,000's → 100k's of VMs
- Removes vendor lock-in
  - Open source provides high-degree of flexibility to customize and interoperate
- Community development = higher “feature velocity”
  - Features and functions you need, faster to market over proprietary software
- Greater automation, resource provisioning, and scaling

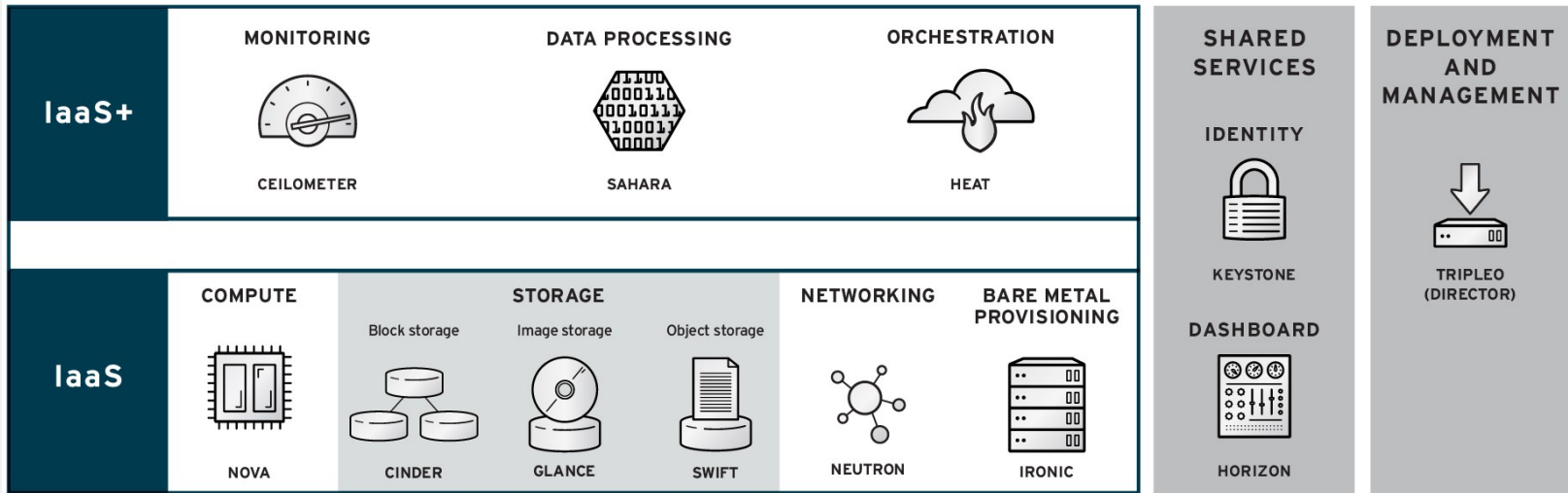
# Am I Ready for OpenStack?

TRADITIONAL: SCALE UP (RHEV)	CLOUD: SCALE OUT (OpenStack)	MIXED/HYBRID
Big stateful VM	Small stateless VMs	Combination of traditional scale-up and cloud scale-out workloads.
1 Application → 1 VM	1 Application → Many VMs	
Lifecycle in years	Lifecycle hours to months	For example: Database may be hosted on traditional workloads, web front-end and logic layers on cloud workloads.
Increased user demand = Scale up (VM gets bigger)	Increased user demand = Scale out (add VMs)	
Not designed to tolerate failure of VM, so you need features that keep VMs up	If a VM dies, application kills it and creates a new one, app stays up	
Application SLA requires enterprise virtualization features (migration, HA, etc.) to keep applications available	Application SLA requires adding/removing VM instances to application cloud to maintain application availability	



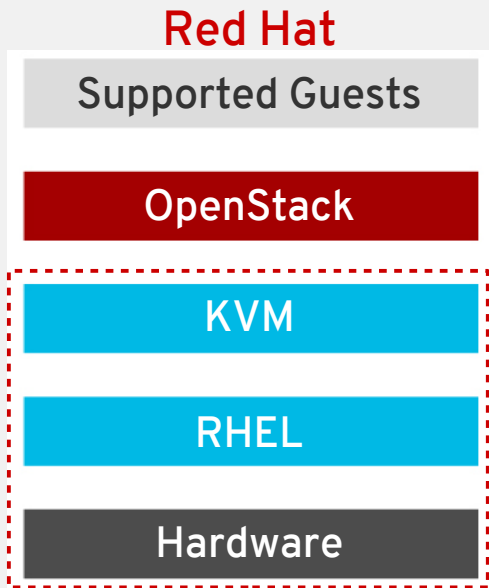
Why Red Hat?

# OpenStack: Framework for the Cloud



- Needs to access hardware resources
- Needs an operating environment, hypervisor, services
- Leverages existing code libraries for functionality

# The Importance of Integration with Linux



A typical OpenStack cloud is made up of at least 9 core services + plugins to interact with 3rd party systems

- These services run on top of a Linux distribution with a complex set of user space integration dependencies
- OpenStack cannot be productized as a stand alone layer
- A supported, stable platform requires integration and testing of each of the components

*“If your Windows virtual machine hosted by a KVM hypervisor running on an IBM blade, connecting to an EMC storage array through an Emulex HBA has issues with storage corruption, who do you call?”*

# Largest Certified Partner Ecosystem

- Over 350+ members since launch in April 2013
- Over 900 certified solutions in partner Marketplace
- Over 4,000 RHEL certified compute servers

OEMs, IHVs, ISVs



Channel Partners

System Integrators



Cloud Service Providers

Managed Service Providers

# Red Hat Cloud Services

- **Training**

- [CL210 Red Hat OpenStack Administration](#)
- [CL220R Red Hat CloudForms Administration](#)

- **Certification**

- [Red Hat Certified Engineer in Red Hat OpenStack](#)
- [Red Hat Certified System Administrator in Red Hat OpenStack](#)
- [Red Hat Certificate of Expertise in Hybrid Cloud Management](#)
- [Red Hat Certificate of Expertise in Platform-as-a-Service](#)
- [Red Hat Certificate of Expertise in Hybrid Cloud Storage](#)
- [Red Hat Certified Virtualization Administrator \(RHCVA\)](#)
- [Red Hat Certificate of Expertise in Deployment and Systems Management](#)
- [Red Hat Certificate of Expertise in Configuration Management](#)



- **Consulting**

- [Advanced identity management for OpenStack](#)
- [Red Hat Consulting Discovery Session: Cloud Strategy](#)
- [Red Hat Consulting Assessment: Infrastructure-as-a-Service](#)
- [Red Hat Consulting Smart Start: Infrastructure-as-a-Service](#)
- [Red Hat Consulting Guided Transition: Cloud Management](#)

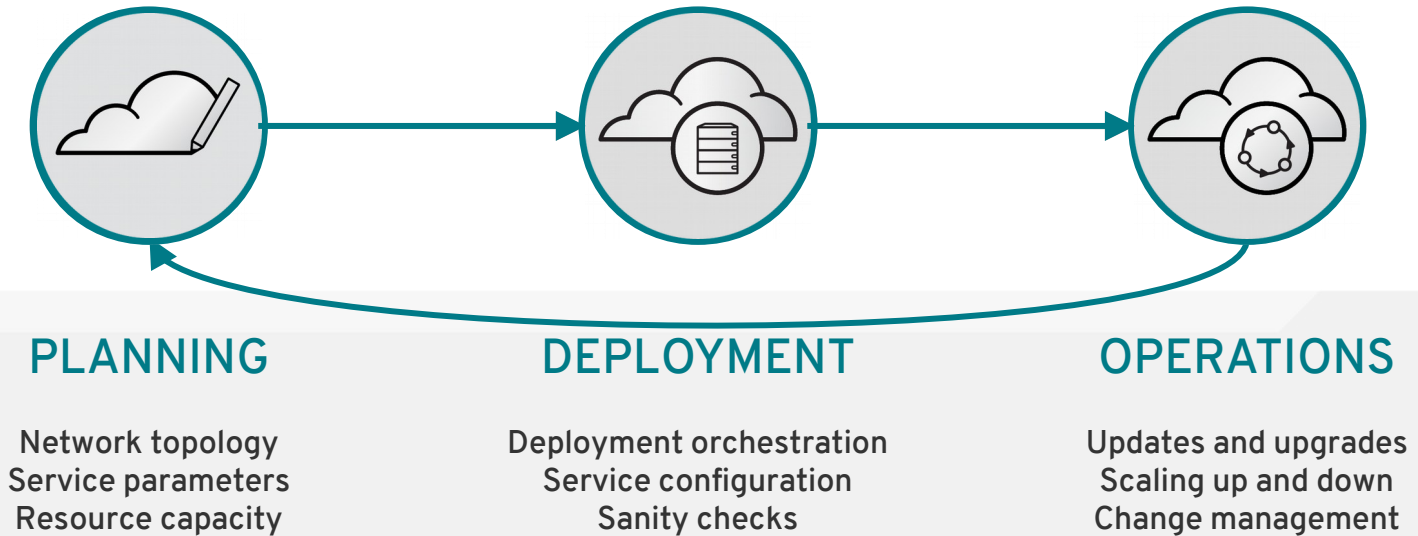
# Why Red Hat OpenStack Platform

- Enterprise hardened, optimized production-ready code
- Co-engineered and integrated with Red Hat Enterprise Linux
- Integrated deployment, orchestration, & management tools (director)
- Included operational, lifecycle, and analytics tool (Red Hat CloudForms)
- Foundation for private or public cloud, as well as network functions virtualization (NFV)
- Worlds largest OpenStack partner ecosystem
- Global, production-level support, training, certification, and professional services
- Integrated with a trusted & proven solution stack
  - Red Hat Enterprise Linux
  - Red Hat CloudForms
  - Red Hat Storage (Ceph and Gluster)
  - OpenShift by Red Hat (PaaS)
  - Red Hat Enterprise Virtualization



# Red Hat OpenStack Platform Director

## OpenStack Orchestration



# Red Hat OpenStack Platform Director

- Automated upgrades
  - Users can upgrade major releases (e.g. 7.0 → 8.0)
- Automated live updates
  - Users can update minor releases (e.g. 8.0 → 8.1)
- Expanded APIs for deployment and management
- CLI operations or CloudForms for “day 2” management
- Support for IPv6 in “undercloud” as well as production “overcloud” (single stack)
- Support for external or pre-existing Ceph deployments
- Deployment validations: pre, during, & post deployment (Tempest)
- Expanded hardware driver support (Ironic)

# Reference architecture

2 set of templates as reference:

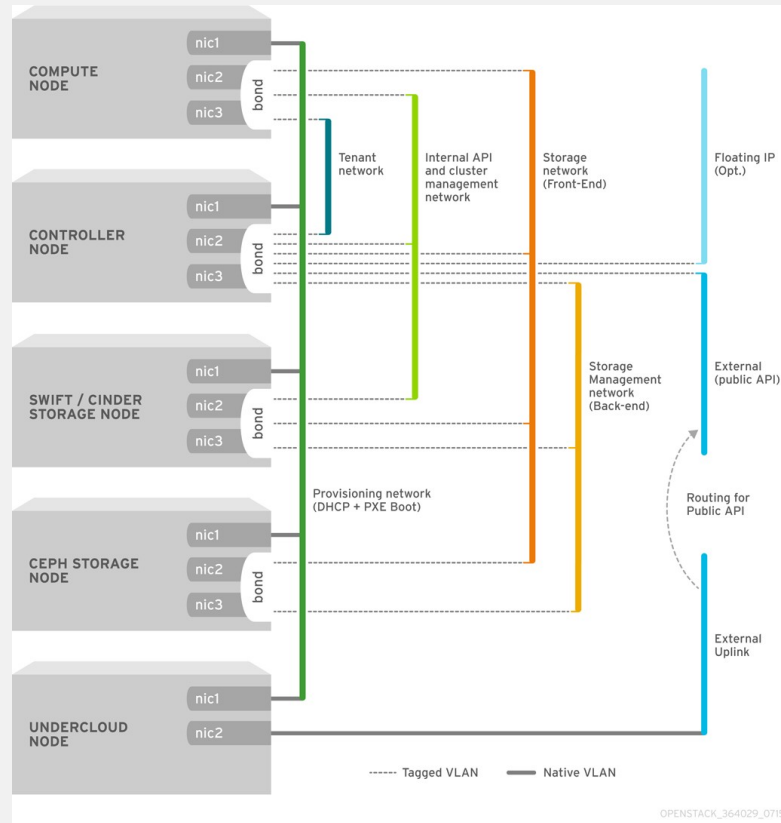
- 1 controllers, N compute, no ceph (external NFS), VLAN networks
- 3 controllers, N compute, 3+ ceph (Mon+OSD), VXLAN networks

Operators can easily  
**customize and override with their own templates**

Underlying puppet modules can also be  
customized

Further tuning available as post-installation  
scripts

Future: other setups (Hyper Converged  
Infrastructure, Active/Passive HA)



# Red Hat OpenStack Platform 8

## Hypervisor Support

### Red Hat Enterprise Virtualization Hypervisor

#### *\*Red Hat Enterprise Linux KVM*

- Lightweight / small footprint
  - Less overhead
  - Smaller attack surface
- Cost effective
- Closer to operating system DNA
- Provides massive scale-out capabilities
- Maximum benefit with virtualized Linux



### VMware vSphere

#### *\*vCenter Driver*

- Co-exist with existing infrastructure assets
- Provides a seamless path to future migration to OpenStack
- Uses NSX<sup>1</sup> plugin for Neutron

<sup>1</sup>NSX is only supported in production environments, per VMware's support requirements

vmware

# Red Hat OpenStack Platform 8

## Virtual Guest Support

- Red Hat Enterprise Linux 3
- Red Hat Enterprise Linux 4
- Red Hat Enterprise Linux 5
- Red Hat Enterprise Linux 6
- Red Hat Enterprise Linux 7
- Red Hat Enterprise Linux Atomic Host

*\*32 and 64 bit for all versions of RHEL*

**RED HAT®**  
ENTERPRISE LINUX®

- SUSE Linux Enterprise Server 10
- SUSE Linux Enterprise Server 11
- SUSE Linux Enterprise Server 12

*\*32 and 64 bit for all versions*



- Windows 7<sup>2</sup>
- Windows 8<sup>2</sup>
- Windows 8.1<sup>2</sup>
- Windows 10<sup>2</sup>

### Microsoft SVVP Certified

- Windows Server 2008<sup>2</sup>
- Windows Server 2008 R2<sup>1</sup>
- Windows Server 2012<sup>1</sup>
- Windows Server 2012 R2<sup>1</sup>

<sup>1</sup> 64 bit only

<sup>2</sup> 32 and 64 bit



# RHOSP8: What is new?

# Tech Preview

Features available with manual configuration

Most are in Tech Preview, only Sahara is fully supported

Database as a Service\*

**Trove**

**Sahara**

Big Data as a Service

File Share as a Service\*

**Manila**

**Designate**

DNS as a Service\*

*\*Tech Preview features are subject to change in GA release*

# Trove\*, Sahara, Manila\*, Designate\*

Tenant view

Similar to Amazon RDS, EMR, EFS, Route53

As a tenant, I can have my own clusters

- Database as a Service: relational or NoSQL (*Tech Preview*)
- Big Data as a Service: elastic data processing (Hadoop/Yarn, Storm)
- Fileshare as a Service: networked filesystem shared amongst VMs (*Tech Preview*)
- DNS as a Service (*Tech Preview*)

Nova instances, Neutron networks and Cinder volumes will be automatically created, populated with those services, with advanced features (HA, replication, etc)

Each service requires their own fine-tuning, and vendor-specific configuration (or license)

Requires network and storage planning

Very useful services when tenants require standardized service offerings and a seamless user experience

Drastically reduce service requests (happier developers)

**Trove:** MariaDB/MySQL, MongoDB (future)

**Sahara backends:** Cloudera or Hortonworks. Datasources either Swift or HDFS

Manila backends: NFS, Samba (CIFS), EMC VNX, NetApp, etc.

Designate backends: PowerDNS, BIND

Operator view



# Neutron features in Tech Preview

Neutron features available with manual configuration

Not fully supported yet

## Distributed Virtual Router

Enhanced north-south traffic, avoids congestion at L3 gateway

DVR

## Firewall - aaS

On-demand L3/L4 iptables-based gateway with custom firewall policies at the edge  
Re-implemented in DVR

FWaaS

## Virtual Private Networks - aaS

On-demand IPSec/IKE policies, tunnel configuration based on LibreSWAN

VPNaaS

## DPDK-accelerated OVS

User-space implementation, requires dedicated CPU and NIC

OVS+DPDK

*\*Tech Preview features are subject to change in GA release*

# Operational Tools

## Centralized Logging Suite

- Centralized EFK Stack: Fluentd, Kibana and ElasticSearch
- All nodes with a **fluentd** log collection agent

## Availability Monitoring Suite

- Sensu (for alert monitoring) and Uchiwa (for web UI)
- Redis and RabbitMQ as backends
- All nodes with a **Sensu** monitoring agent
- Better alternative to Nagios+NRPE (which are also supported)

## Performance Monitoring Suite

- Graphite (for metric collection) and grafana (for web UI)
- All nodes with a **collectd** agent

Not yet installed by OSP-Director, **requires manual setup**

Recommended to be hosted on a management server outside of the OpenStack installation

A low-angle, upward-looking perspective of several modern skyscrapers. The image is heavily stylized with a vibrant red overlay that covers most of the frame. The buildings feature glass facades and geometric patterns. The sky is visible in the upper left corner, showing a grey, overcast sky. The text "Integrated Cloud Solutions..." is centered in the image in a white, sans-serif font.

Integrated Cloud Solutions...

# Red Hat CloudForms

## Unified Management for OpenStack



**UNIFIED  
MANAGEMENT  
AND  
OPERATIONS**



**COMPLETE  
LIFECYCLE  
MANAGEMENT**



**VISIBILITY  
AND  
ANALYTICS**



**COMPLIANCE  
AND  
GOVERNANCE**



**INTEGRATION  
AND  
COMPOSABILITY**

# Red Hat CloudForms

## Management for Red Hat OpenStack Platform

- **Workload Management:** Complete lifecycle management over OpenStack workloads; from provisioning through to retirement.
- **Infrastructure Management:** Management over OpenStack infrastructure resources, including both the under-cloud (management), as well as the over-cloud (production cloud).
- **Catalog of Services:** powerful catalog of services to provision single or multiple workloads and Heat Templates from a single click.
- **Orchestration:** orchestrate complex workflows within OpenStack and external third party solution such as CMDB, ITSM tool, and more.
- **Heat Template Management:** manage full life cycle of Heat templates in an intuitive graphical user interface.
- **User Management:** Delegate certain management roles or actions to end users and administrators (RBAC).
- **Monitoring & Reporting:** Monitor and track deployed workloads and resources, recording resource usage, ensuring that requestors don't use beyond their quotas.
- **Scale Control:** Scale out automatically, based on policies, or manually as needed.
- **Financial Management:** chargeback and showback

**RED HAT®**  
**CLOUDFORMS**

# Red Hat Ceph Storage

Powerful, production-grade, distributed storage for OpenStack

- Open, massively scalable, and software-defined
- Flexible, scale-out architecture on clustered commodity hardware
- Specifically designed for cloud infrastructure and emerging workloads
- Self-managing, self-healing, and highly efficient
- Seamlessly integrate with OpenStack's modular architecture and components for ephemeral and persistent storage

**RED HAT®**  
**CEPH STORAGE**

# Deeply Integrated Storage for OpenStack

Powerful, virtual, production-grade, distributed storage

- Single efficient platform to support all OpenStack storage needs
  - Block (ephemeral and persistent, Object, and file storage on COTS)
- Tightly integrated with Red Hat OpenStack Platform services
  - Nova, Cinder, Glance, Keystone, and Swift
  - Manilla (tech preview)
- User-driven storage lifecycle management with 100% API coverage

**RED HAT®**  
**CEPH STORAGE**

# How Are Customers Deploying It?



# Customer Example

*“The i2 programme enabled by OpenStack is a massive part of the business and impacts millions of active customers on a daily basis“*

*- Paul Cutter, CTO, Betfair*

- World's largest online betting exchange, migrated off VMware
- 1300 hypervisors
- 120M+ daily transactions
- 2.7B+ daily API calls
- Using CloudForms to manage



- Red Hat OpenStack Platform
- Red Hat Enterprise Linux
- Red Hat Enterprise Virtualization
- Red Hat CloudForms
- Red Hat Consulting Services

# Customer Example

“An open hybrid cloud, based on Red Hat OpenStack Platform and CloudForms, enabled us to create a multi-tier architecture that could support our continuous integration and DevOps model.”

*-Odd Wallér, Manager, Java Hosting Service Design, Volvo IT*

- Runs OpenShift on Red Hat OpenStack Platform
- Uses CloudForms to manage their stack of Red Hat and Microsoft cloud
- Their success was dependent on integrated consistency through product stack
- Capability to provide support across the different layers of the stack (PaaS, IaaS, management, OS, etc)



## Red Hat Cloud Infrastructure

- Red Hat Enterprise Linux
- Red Hat OpenStack Platform
- OpenShift Enterprise by Red Hat
- Red Hat CloudForms

# Customer Example

“FICO has reduced time to value for developing analytic solutions by up to 70%...”

*-Tony McGivern, CIO, FICO*

- Runs FICO analytic cloud in hybrid mode, using OpenShift Enterprise and OpenShift online
- Runs all OpenShift on Red Hat Enterprise Linux OpenStack Platform
- Leverages CloudForms for hybrid operations management



- Red Hat Enterprise Linux
- Red Hat OpenStack Platform
- OpenShift Enterprise by Red Hat
- Red Hat CloudForms
- Red Hat Consulting

# Customer Example

“Red Hat is an open source and OpenStack leader and its enterprise-class cloud solutions are widely used in the market...

...it strongly supports our strategy to smoothly transition proven carrier-grade core software applications to NFV OpenStack cloud environments.“

*- Michael Clever, Sr VP of Core at Nokia Networks*

- Using Red Hat Enterprise Linux OpenStack platform to enable efficient operation of the Nokia virtualized core network functions and management systems
- Moving “Liquid Core” application suite from existing hardware and software stack to a fully software-defined networking (SDN) solution

# NOKIA

- Red Hat OpenStack Platform
- Red Hat Enterprise Linux

# How Can I Get It?

Offering choice based on your needs...

## Standalone offering with complete management

- Red Hat Enterprise Linux
- Red Hat OpenStack Platform director
- Red Hat CloudForms<sup>1</sup>
- Red Hat Ceph Storage (64TB)<sup>2</sup>

**RED HAT®**  
OPENSTACK  
PLATFORM

## Integrated suite for private cloud

- Red Hat Enterprise Linux
- Red Hat Enterprise Virtualization
- Red Hat Satellite
- Red Hat Insights

**RED HAT®**  
CLOUD  
INFRASTRUCTURE

## Integrated suite for DevOps

- OpenShift Enterprise
- Red Hat Enterprise Linux
- Red Hat Enterprise Virtualization
- Red Hat Satellite
- Red Hat Insights

**RED HAT®**  
CLOUD SUITE

<sup>1</sup>Limited to management over Red Hat OpenStack Platform only. Additional providers sold separately

<sup>2</sup>Additional capacity sold separately



redhat.

# THANK YOU



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