

Application Portability and Interoperability with Red Hat Cloud Infrastructure

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Introductions

Agenda

- Overview
 - What is application portability and interoperability?
 - What is RHCI?
 - Why is it important?
 - How does it all fit together?
- Infrastructure
 - Architecture Overview
 - Satellite 6
 - RHEV
 - RHEL OSP
 - CloudForms
 - OpenShift Enterprise 2.2
- Demo
- Summary
- Q&A

Overview

What is application portability and interoperability?

- Application portability and interoperability can mean many things depending on the context.
- For the purpose of this session/discussion, it is framed simply as the ability to deploy multi-node/multi-app systems on top of Red Hat Cloud Infrastructure.
- A fully integrated, open source solution stack built on industry leading technologies.

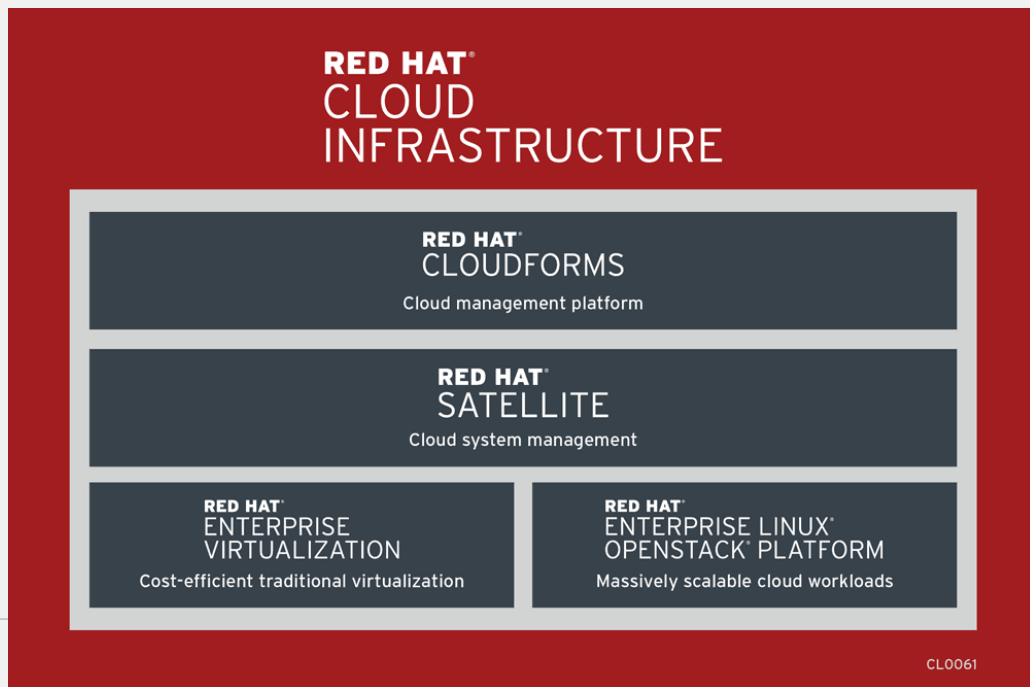
What is RHCI?

Red Hat Cloud Infrastructure is a flexible, integrated private cloud Infrastructure-as-a-Service solution consisting of the following Red Hat products:

- **Red Hat Satellite Server** - providing lifecycle, configuration, management, and deployment capabilities
- **Red Hat Enterprise Virtualization** - a complete virtualization solution for servers and desktops
- **Red Hat OpenStack Platform** - Infrastructure-as-a-Service allowing for agile deployments employing the benefits of security and support from Red Hat Enterprise Linux
- **Red Hat CloudForms** - an industry leading Cloud Management Platform transforming traditional virtualization environments into both private and hybrid cloud environments

What is RHCI? (con't)

By combining the features of Red Hat Satellite, Red Hat Enterprise Virtualization, Red Hat OpenStack Platform, and Red Hat CloudForms, Red Hat Cloud Infrastructure provides an industry leading Infrastructure-as-a Service platform powerful enough to meet any demand.



Why is it important?

One word.....DevOps

- Closer integration between operations and development engineers
- Agile process from application development to deployment
- Convergence of infrastructure
- Reduction in development times

How does it all fit together?

Combining the strengths of Red Hat Cloud Infrastructure (IaaS) with Red Hat OpenShift Enterprise (PaaS) allows for creating a powerful on-premise, private cloud providing:

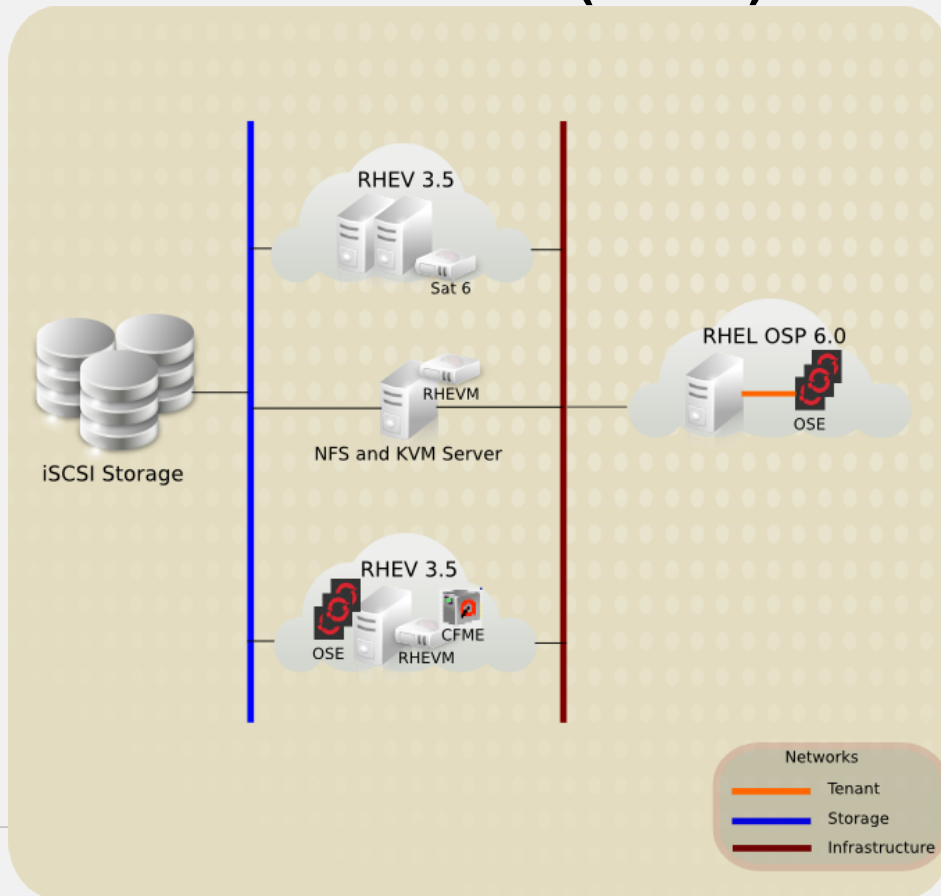
- An open source, integrated, solution stack (every component has an upstream project)
- Application portability across providers
- Cloud management
- Customizable deployments
- Lifecycle management
-and many more capabilities

Infrastructure

Architecture Overview

- Two Red Hat Enterprise Virtualization environments
- A single Satellite 6 server providing PXE, TFTP, DNS, DHCP and puppet
- A single KVM host also providing NFS storage for self-hosted RHEV
- One CloudForms Management Engine hosted from RHEV
- iSCSI storage supporting RHEV data domains and NFS storage backing
- Multiple OpenShift Enterprise virtual machines and instances
- RHEL OSP single node configuration
- A dedicated network for iSCSI storage
- A dedicated network for infrastructure
- A tenant network for OpenStack instances

Architecture (con't)



Satellite

Satellite 6

Satellite 6 is configured to support the deployment and management for the Red Hat Cloud Infrastructure components to also include OpenShift Enterprise.

The required customization to support the deployment and management include:

- Custom provisioning templates
- Custom products and repositories to support OpenShift Origin puppet modules
- Custom content views
- Custom activation keys
- Custom host groups

Satellite 6 - RHEV provisioning templates

- The following customizations are made to the provisioning templates for each deployed host:
 - RHEV self-hosted install - hypervisor
<provision>
yum group install -y 'Server with GUI'
yum install -y ovirt-hosted-engine-setup
 - RHEV self-hosted install - engine
<provision>
yum install -y rhevm

Satellite 6 - RHEL OSP provisioning template

- The following customizations are made to the provisioning templates for the RHEL OSP host:
 - RHEL OSP
 - <provision>
No puppet (conflicts with puppet used by RHEL OSP)
 - <snippet>
yum -t -y -e 0 install rhel-osp-installer

Satellite 6 - Custom Products and Repos

- To support the deployment of OpenShift Enterprise is it necessary to import the OpenShift Origin puppet modules into Satellite. To complete this task create a new product and repository.

The screenshot displays the Satellite 6 web interface. On the left, a sidebar titled 'Products' contains a search bar and a list of products. The 'openshift' product is highlighted. The main content area shows the 'Product openshift' details, with tabs for 'Details', 'Repositories', and 'Tasks'. The 'Repositories' tab is active, showing a table with one repository named 'openshift' of type 'puppet'.

Name	Type
openshift	puppet

Satellite 6 - Custom Products and Repos

- Import the OpenShift Origin puppet modules. From the Satellite server:

Edit */etc/puppet/rack/config.ru*

#Ensure UTF-8 is our default (sadly Ruby 1.9 sets to US-ASCII)

Encoding.default_external = Encoding::UTF_8 if defined? Encoding

big_hammer.sh

puppet module install openshift-openshift_origin

cd /etc/puppet/modules

```
for i in `ls`; do cd /etc/puppet/modules/$i && puppet module build; done
find /etc/puppet/modules/ -wholename '*pkg/*.tar.gz' -exec hammer -v
repository upload-content --product=openshift --name=openshift --path={}
--organization="Systems Engineering" \;
```

Satellite 6 - Content Views

- Several content views are created to support the needed content for deployed hosts to include:
 - RHEV
 - RHEL OSP
 - OpenShift
 - CloudForms

Each content view contains necessary supporting repositories ranging from the operating system and specific product packages to supporting puppet modules.

Satellite 6 - Activation Keys

- Activation keys are created for the hosts deployed and associated to the appropriate content views. Activation keys include:
 - CloudForms
 - OpenShift
 - RHEL OSP
 - RHEV Hypervisor
 - RHEV Manager

Satellite 6 - Host Groups

- A host group is configured for each of the deployed systems to include:
 - OpenShift Broker
 - OpenShift Node
 - RHEL OSP
 - RHEV Hypervisor
 - RHEV Manager

Each host group is mapped to an activation key, which maps to a content view and a Lifecycle environment. Provisioning templates are linked to each host group along with assigned puppet classes.

All of these options combined make for an industry leading deployment and configuration management solution.

Red Hat Enterprise Virtualization

Red Hat Enterprise Virtualization - Self Hosted

- A self-hosted Red Hat Enterprise Virtualization configuration is deployed from Satellite.

RHEV is configured as follows:

- Single hypervisor
 - Single iSCSI backed Data domain
 - An Export domain used to import the CloudForms appliance
 - A single network
 - A single cluster
 - A single datacenter
-
- A NFS share is hosted from an external machine providing storage space for the self-hosted engine.

Red Hat Enterprise Virtualization - Self Hosted (con't)

- Post deployment, RHEV is added as a compute resource to Satellite and is used to deploy OpenShift Enterprise components.
- A “golden” image is created within RHEV to support deployment of OpenShift Enterprise components from CloudForms.
- An external RHEL OSP provider is added for Glance images

Red Hat Enterprise Virtualization - Self Hosted (con't)

Data Centers		Clusters	Hosts	Networks	Storage	Disks	Virtual Machines	Pools	Templates					
New VM	Edit	Remove	Clone VM	Run Once					Migrate	Cancel Migration	Make Template	Export	Create Snapshot	Change Cl...
		Name		Host	IP Address	FQDN	Cluster	Data Center						
		HostedEngine		rhci-rhev			Default	Default						
		osebroker-refarc...		rhci-rhev			Default	Default						
		osenode1-refarc...		rhci-rhev			Default	Default						
		osenode2-refarc...		rhci-rhev			Default	Default						
		osenode3-refarc...		rhci-rhev			Default	Default						
		rhci-cf		rhci-rhev	10.19.11.101	rhci-cf.refarch.bo...	Default	Default						

Red Hat Enterprise Virtualization

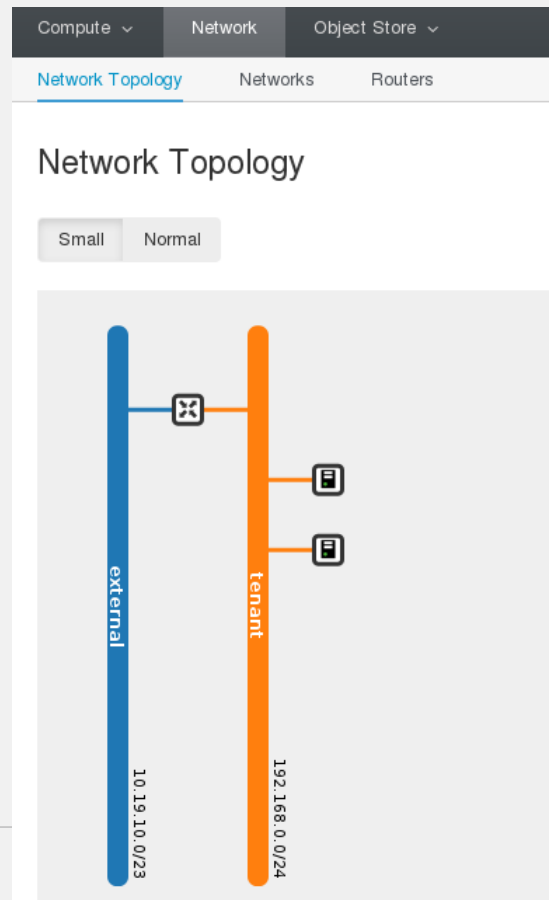
- An existing Red Hat Enterprise Virtualization environment is used to host the Satellite server and is configured as follows:
 - Multiple hypervisors
 - Multiple iSCSI backed Data domains
 - An Export domain
 - An ISO domain
 - Multiple clusters
 - Multiple datacenters
 - Multiple networks (a single network is used for the Satellite server)

Red Hat OpenStack Platform

Red Hat OpenStack Platform


- A single RHEL OSP instance is deployed from Satellite and is configured as follows:
 - Two networks configured; one for infrastructure and one tenant
 - A single router configured for communication between networks
 - A range of floating IP's configured for the infrastructure network
 - A custom RHEL 6.6 image to support RHEL OSP deployment
 - A single security group supporting communication for deployed instances


Red Hat OpenStack Platform - Network Topology





Red Hat OpenStack Platform - Satellite


- The deployed RHEL OSP host appears as non-managed in Satellite. This is due to puppet not being deployed however the host is subscribed to Satellite and is able to receive updates as needed.


<input type="checkbox"/>	<input checked="" type="checkbox"/> rhci-rhelosp-inst.refarch.b...	 RedHat 7.1	KT_RHSE_RHE...		RHEL OSP 6
--------------------------	--	--	----------------	--	------------

☐  osenode2.refarch.bos.redhat.com

☐  osenode3.refarch.bos.redhat.com


☐  rhci-cf.refarch.bos.redhat.com

☒  rhci-rhelosp-
inst.refarch.bos.redhat.com >

☐  rhci-rhev-host.refarch.bos.redhat.com


Subscriptions

Subscription Status



 valid

Auto-Attach

Yes



Service Level

Activation Key

RHEL OSP

Red Hat CloudForms

CloudForms





- CloudForms is deployed into the self-hosted RHEV environment via a template imported from the Export domain.
- To support the deployment of OpenShift Enterprise, CloudForms is configured as follows:
 - Single network for the CloudForms appliance attached to the infrastructure network
 - Deploy the oo-install-ose tool
 - Automation Engine role enabled
 - Create OSE Policy and Status tags
 - Create OpenShift Service Catalog items for both RHEV and RHEL OSP

CloudForms (con't)

Catalog Items

- ▼ All Catalog Items
 - ▶ Unassigned
 - ▶ OpenShift Enterprise


All Service Catalog Items

		Name	Description	Type	Display in Catalog	Catalog
<input type="checkbox"/>		OSE Broker RHEV	OpenShift Enterprise Broker	Item	No	
<input type="checkbox"/>		OSE for DevOps	OSE for DevOps	Bundle	Yes	OpenShift Enterprise
<input type="checkbox"/>		OSE Node RHELOSP	OpenShift Enterprise Node	Item	No	
<input type="checkbox"/>		OSE Node RHEV	OpenShift Enterprise Node	Item	No	

Service Catalogs

- ▼ All Services
 - ▶ OpenShift Enterprise
 - ▶ OSE for DevOps

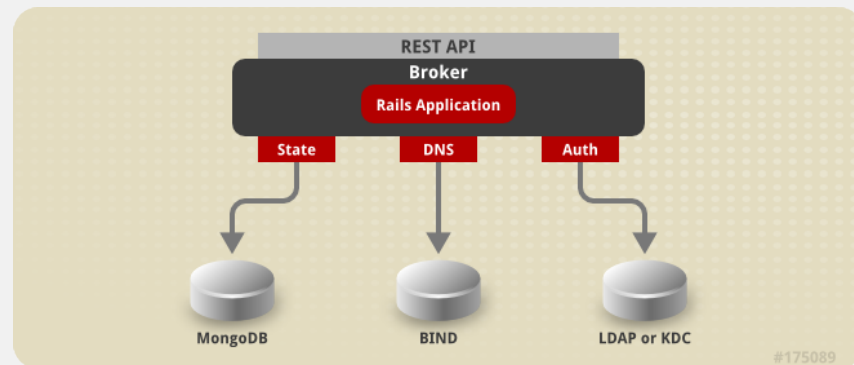
All Services

	Name
	OSE for DevOps

OpenShift Enterprise 2.2

OpenShift Enterprise Broker

- The Broker Host Group includes
 - OpenShift Broker and Console
 - Bind DNS Server
 - MongoDB Storage
 - ActiveMQ Message Bus
 - All components can be distributed and/or made highly available



OpenShift Enterprise Nodes

- The Node host group includes multiple hosts with:
 - OpenShift Node Frontend and Messaging Clients
 - Desired OpenShift Cartridges (ie: php5.4, mysql5.5, jbosseap, etc)
 - Matching nodes form `districts`; use a hostgroup per district to ensure uniform config
 - Applications are portable within nodes in a district

OpenShift Applications

- Applications consist of one or more 'gears'
- Gears are based on cartridges
 - Web - php, perl, python, jboss, etc
 - Utilities - cron
 - DB - mysql, mongodb, etc
 - Custom cartridges
- Applications updated with a simple git push

The diagram illustrates the OpenShift architecture. A central 'Node Host' contains three 'Gears': Gear 3 (MyDB MySQL), Gear 2 (NotMyApp JBoss EAP), and Gear 1 (MyApp Apache PHP). Each gear has a local loopback address (127.0.3.1, 127.0.2.1, and 127.0.1.1 respectively). A 'Reverse-Proxy Server' (Apache with mod_proxy) is also present, containing 'Front-end Server Plugin' (MyApp, NotMyApp). The Node Host is connected to a 'Network Interface' via an 'IPTable Block' and a 'Port Proxy (iptables)'. The Network Interface has a 'Node_Host_IP_Address' and a 'JDBC (or other)' connection. A 'DNS' server maps 'MyApp.rhcloud.com' and 'NotMyApp.rhcloud.com' to the Node_Host_IP_Address. An 'App User Host' (Web Browser) connects to the DNS and the Node_Host_IP_Address via 'HTTP'. The diagram is labeled '#268474'.

- #redhat #rhsummit



OpenShift Origin Puppet Module

- Originally developed to run OpenShift Online
- Supported by Red Hat starting with OSE 2.2 starting with module version 4.1.0
- Available via puppet forge
 - *puppet module install openshift_origin*
- Tested with Puppet 2.7+, Puppet Enterprise, and Satellite 6

OpenShift Enterprise Broker

```
class { 'openshift_origin' :  
  roles          => ['msgserver','datastore','nameserver','broker'],  
  ose_version    => '2.2',  
  node_ip_addr   => $::ec2_public_ipv4,  
  bind_key       => 'yV9qIn/Ku...P//D0TteLc3f1N2g==',  
  domain         => 'example.com',  
  dns_infrastructure_zone => 'openshift.local',  
}
```

- One common class
- node_ip_addr uses Puppet's ec2_public_ipv4 fact to configure services to use the external IP in public/private ip deployments (OpenStack, AWS, etc)
- Additional class parameters available, see manifests/init.pp

OpenShift Enterprise Nodes

```
class { 'openshift_origin' :  
  roles                => ['node'],  
  ose_version          => '2.2',  
  node_ip_addr         => $::ec2_public_ipv4,  
  domain               => 'example.com',  
  dns_infrastructure_zone => 'openshift.local',  
  install_cartridges   => ['nodejs', 'php', 'mysql'],  
  node_profile          => 'small',  
  node_limits_nproc    => 250,  
}
```

- Allows you to specify which cartridges to install
- All node resource limits tunable, see manifests/init.pp

Puppet Module Best Practices

- In Satellite 6 set 'safemode_render' => false
- Define a Satellite host group per district
- domain => 'example.com'
- dns_infrastructure_zone => 'hosts.example.com'
 - broker.\${dns_infrastructure_zone}
 - ns1.\${dns_infrastructure_zone}
 - msgserver.\${dns_infrastructure_zone}
 - mongodb.\${dns_infrastructure_zone}
- register_host_with_nameserver => true
- ose_version=> '2.2' -- enforces OSE supported configurations

Demos

Deploying OpenShift Enterprise from Satellite 6 to Red Hat Enterprise Virtualization

Deploying OpenShift Enterprise from CloudForms as a Service Catalog

Summary

Summary

- What, why and how RHCI can meet the needs and demand for IaaS with PaaS capabilities
 - Integration
 - Interoperability
-allowing for consumption of OpenShift Enterprise providing:
 - Application Portability
 - Configurable Deployments to Support Enterprise Requirements
 - Accelerated Application Service Delivery
 - One Click Deploy
 -and much more

Q&A

Resources

Resources

- Reference Architectures:
 - **Red Hat Cloud Infrastructure: Deploying an On-Premise IaaS Private Cloud with PaaS Integration**
 - <https://access.redhat.com/articles/1434843>
- Product Documentation:
 - **OpenShift Enterprise 2.2 - Puppet Deployment Guide**
 - https://access.redhat.com/documentation/en-US/OpenShift_Enterprise/2/html/Puppet_Deployment_Guide/index.html
 - **Deploying OpenShift Enterprise with Red Hat CloudForms**
 - https://access.redhat.com/documentation/en-US/Red_Hat_CloudForms/3.2/html/Deploying_OpenShift_Enterprise_with_Red_Hat_CloudForms/index.html

Resources (con't)

- Additional Resources
 - **oo-install-ose:**
 - <https://install.openshift.com/>
 - <https://install.openshift.com/portable/oo-install-ose.tgz>
 - **Integrating RHEL OSP glance with RHEV:**
 - <https://access.redhat.com/articles/1321523>
 - https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Virtualization/3.5/html/Administration_Guide/Configuring_the_Location_of_a_Keytone_Endpoint_for_OpenStack_Providers.html

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