Integrating CloudForms 4.1 and OpenShift 3.2 in the Dell Red Hat OpenStack Cloud Solution - Version 5.0

Contents

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Notes, Cautions, and Warnings

A **Note** indicates important information that helps you make better use of your system.

A **Caution** indicates potential damage to hardware or loss of data if instructions are not followed.

A **Warning** indicates a potential for property damage, personal injury, or death.

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Executive Summary

This document builds on the Dell Red Hat OpenStack Cloud Solution, version 5.0. It instructs the administrator how to setup a comprehensive solution by deploying and integrating CloudForms and OpenShift Container Platform by Red Hat. The award-winning OpenShift is Red Hat's container and application delivery platform that allows developers to quickly develop, build, deploy, and manage containerized services and applications in a cloud environment. CloudForms provides a robust system of inventory, monitoring, automation, charge-back, and billing, and fine grained roles based access controls to create flexible user organizations that can control and manage the entire solution: hardware, virtual, private, public cloud, and container infrastructures.

Intended Audience

This technical guide will show the solution administrator how to deploy Red Hat® CloudForms and OpenShift in their Dell Red Hat OpenStack Cloud Solution. The end users are not directly addressed in the technical documentation. End users may consist of Cloud Administrators, Application Developers, and Application Administrators, in any configuration of responsibilities and authorizations the organization might desire.

Find out more about managing, operating, and billing clouds with CloudForms at *https://access.redhat.com/documentation/en/red-hat-cloudforms?version=4.0/*.

Find out more about developing and managing the OpenShift Container Platform at *https://docs.openshift.com/enterprise/3.2/dev_guide/index.html*.

Solution Summary

In order to meet the demands put on an organization by customers, developers need a way to provision environments and build and deploy applications with their components in a self-service fashion. IT Operations needs to be able to provide this with a secure, enterprise-grade environment. With this solution, they can have policy based control for automation of cluster services, scheduling and orchestration of the applications. By incorporating an OpenShift container management and OpenStack virtual machine clusters, these demands can be met quickly and effectively. Red Hat CloudForms provides a unified tool to manage the entire environment.

The configuration described in this document consists of three OpenShift masters and four OpenShift nodes. Any appropriate number of nodes is supported, up to the advertised maximum of 300 nodes that Red Hat advertises. In addition to the configuration, operational management tasks are shown to demonstrate functionality. This version of the documentation introduces High Availability features of OpenShift Container Platform 3.2, to a robust, production-ready deployment of OpenShift on OpenStack.

About This Document

This document contains code and configuration samples in monospace fonts. While it is tempting for the user to copy and paste those values from this document into their system, it is inadvisable and not supported. While we make every effort to ensure that the documentation is correct and complete, documents rendered via some client applications make unpredictable changes to the actual spacing of the data elements, and lose fidelity to what a proper code or configuration setting should actually be to work properly. We see very impactful changes, for example, between the Firefox PDF display and the Adobe Acrobat reader PDF display.

Copy and paste from this document only with full understanding of the necessary formatting changes that you'll have to make. We have made efforts to provide online verbatim copies of the essential data, as well as pointing the user to appropriate external documentation to achieve the proper formatting.

About Red Hat CloudForms

Red Hat CloudForms is the "Hybrid Cloud Management That Evolves." Managing a complex, hybrid IT environment can require multiple management tools, redundant policy implementations, and extra staff to handle the operations. Red Hat CloudForms simplifies this, providing unified management and operations in a hybrid environment. As your IT infrastructure progresses from traditional virtualization toward an Infrastructure-as-a-Service (IaaS) and Platform-as-a-Service (PaaS) model, CloudForms evolves, protecting your investments and providing consistent user experience and functionality.

CloudForms provides comprehensive cloud management that accelerates service delivery and reduces operational costs. It has a self-service portal and catalog with automatic provisioning, workload life-cycle management, including reconfiguration and retirement. It also includes resource quota enforcement, cost allocation, and chargeback capabilities. CloudForms will help you improve operational visibility and control through continuous discovery, monitoring, and tracking of resource usage. It focuses on optimization, and capacity planning through entity relationship planning with timelines and events. CloudForms helps you ensure compliance and governance by providing automated policy enforcement and remediation. Its segmented user access with approval workflows make for easy configuration auditing, change tracking, and drift analysis.

About OpenShift

Red Hat OpenShift Container Platform 3.2 is a Platform As A Service (PaaS) product. Its developer-centric approach enables developers to create and deploy applications with more predictability, greater ease, and less operator intervention. It manages deployments and provides application scalability services. In the data center, OpenShift Container Platform 3.2 is deployed on Dell Red Hat OpenStack Cloud Solution and Red Hat Enterprise Linux Server 7. It is comprised of: application containers powered by Docker, and orchestration and management provided by Kubernetes.

Integration of OpenShift with OpenStack allows the organization to leverage existing operational techniques and organizational policies, adding a layer of deployment and redeployment flexibility not common in non-virtual deployments. This solution system provides high-performance, failure-tolerant, OpenShift Container Platform 3.2 on a robust OpenStack infrastructure.

OpenShift Container Platform 3.2 is hosted at *http://www.openshift.com/*. It is based on OpenShift Origin, the open source software project hosted at *http://www.openshift.org/*.

Architecture

This topic provides high-level information about the Solution architecture and its configuration.

Note: This integration document does not stand on it's own as a complete solution. Rather, it is referenced in the two dependant technical guides: Technical Guide - Deploying OpenShift Container Platform 3.2 in the Dell Red Hat OpenStack Cloud Solution - Version 5.0 and the Technical Guide – Deploying CloudForms 4.1 in the Dell Red Hat OpenStack Cloud Solution - Version 5.0. This guide is especially important with regard to configuring DNS and networking. Ensure that you refer to this document during OpenShift and CloudForms installation.

OpenStack and Red Hat Ceph Storage

The Dell Red Hat OpenStack Cloud Solution version 5.0 is used as indicated in the Dell Red Hat OpenStack Cloud Solution Reference Architecture Guide. Some detailed modifications of the software configuration will be made in explicit detail here, and in the other installation guides.

The total solution will deployed on OpenStack managed VMs and Red Hat Ceph Storage. No other storage was tested at the time of this writing.

DNS

This version of the OpenShift deployment automation creates its own DNS server on the "OpenShift Infrastructure VM". The DNS server is BIND, the Berkeley Internet Naming Daemon.

Forward requests for OpenShift applications from your users to this DNS server. The OpenShift solution uses a wildcard DNS entry on this DNS server to point all naming requests for apps on this OpenShift cluster to the load balancer in front of the OpenShift masters. The OpenShift masters reply with name lookup success or failure, through the DNS server.

Deployment Planning

These are the major steps used to deploy the Solution:

- Install OpenShift as a cluster of cooperative cloud services on the Dell Red Hat OpenStack Cloud Solution
- Launch an application on OpenShift
- Install and Configure the CloudForms for OpenStack VM on OpenStack
- Configure CloudForms to manage the Dell Red Hat OpenStack Cloud Solution Undercloud and Overcloud
- Configure CloudForms to manage OpenShift

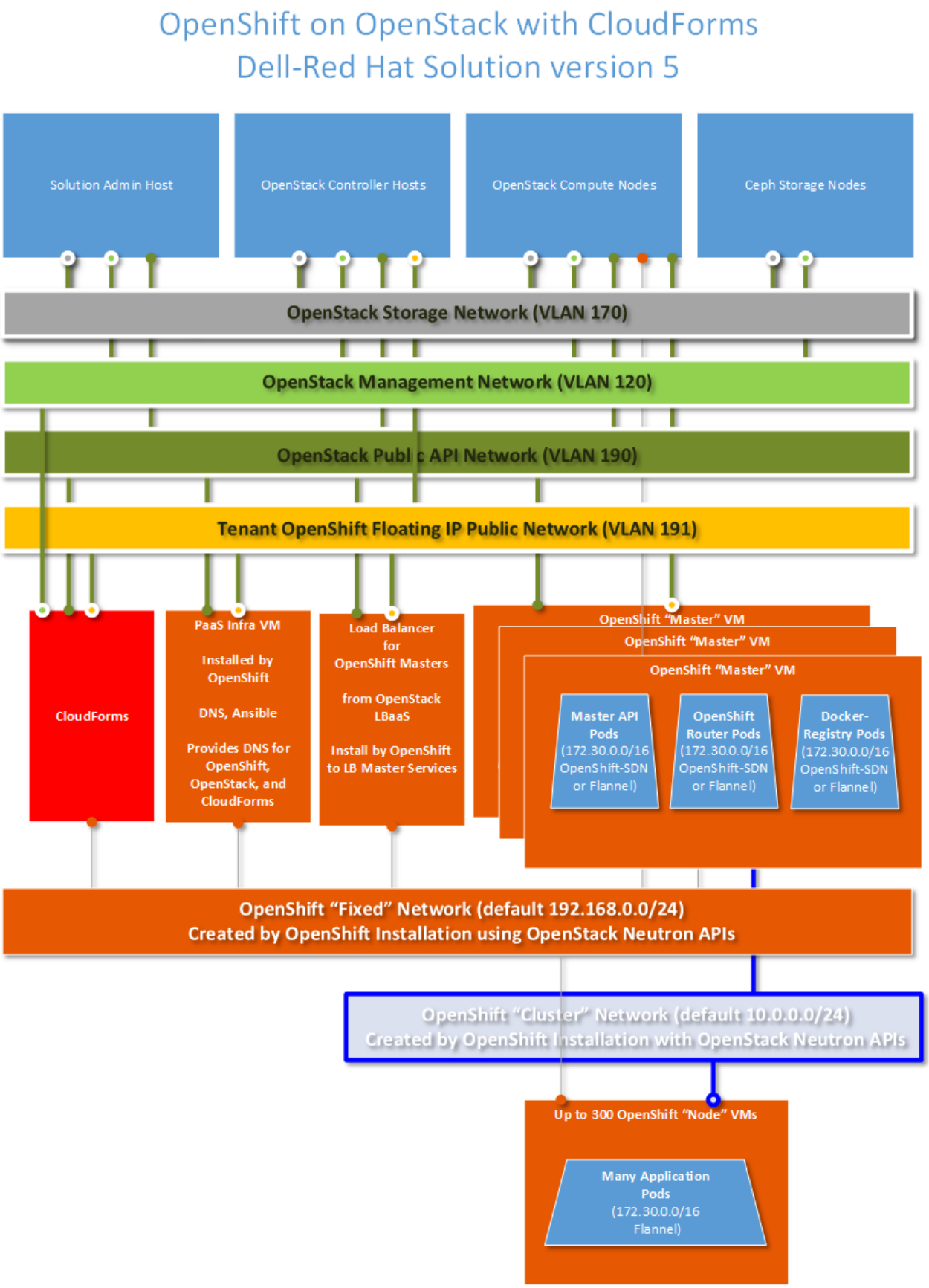

Figure 1: Solution Diagram

Network Requirements

This solution requires the following IP networks:

Internet Access Network

The Dell Red Hat OpenStack Cloud Solution requires a network with external Internet access, to enable VMs to:

- Register with Red Hat Network via Subscription Manager
- Download packages
- Use Red Hat Insights
- Get test applications

This network is already configured, as part of the standard Dell Red Hat OpenStack Cloud Solution.

OpenStack API Networks

CloudForms requires a network with access to both the Undercloud and the Overcloud OpenStack API networks, as described in *Table 1: OpenStack API Networks* on page 10:

Table 1: OpenStack API Networks

Network	vLAN	Access/Host
Overcloud OpenStack API	190	Virtual IP - may point to any Controller Node
Undercloud OpenStack API	120	Hosted on the Director Node

To configure this, perform the following procedure on **each** Controller Node:

1. Open the */etc/sysconfig/network-scripts/route-vlan190* file in a text editor.
2. Edit the file so that it appears as follows:

```
192.168.191.0/24 via 192.168.190.1 dev vlan190
```

3. Enable the route by performing **one** of the following actions:
   - Reboot the Controller, if you'd like to test power-restore situations.
   - Restart networking by executing the `systemctl restart network` command
   - Add the route by executing the `ip r add 192.168.191.0/24 via 192.168.190.1 dev vlan190` command

Undercloud Hosts Network

CloudForms requires access to the Undercloud.

In the Dell Red Hat OpenStack Cloud Solution Reference Architecture Guide Version 5.0, there is a management network, on vLAN 120. Ensure that your CloudForms VM will be capable of addressing all the Overcloud nodes deployed by the Undercloud, in order to inventory them properly.

Configure CloudForms and OpenShift Integration

Follow these procedures to configure the CloudForms and OpenShift integration:

1. *Configure DNS* on page 11
2. *Connect CloudForms to OpenShift* on page 12

Configure DNS

This procedure is to be performed during the install of CloudForms. After completing this procedure, return to *Set CloudForms Hostname* in the Technical Guide – Deploying CloudForms 4.1 in the Dell Red Hat OpenStack Cloud Solution - Version 5.0.

To configure DNS:

1. Initiate a `ssh` session from your bastion host to the PaaS Infrastructure VM.
2. Open the */var/named/openshift-cluster.zone* configuration file in a text editor.
3. Increment by one the numeric value next to `Serial`, each time you make a change to the file.
4. Replace the values between angle brackets (< >) with the IP addresses from your deployment of OpenStack and CloudForms:
   a. CloudForms Floating IP
   b. Overcloud OpenStack API VIP
   c. Undercloud OpenStack API IP

   Note: If you are copy/pasting the below configuration data, ensure that it's correct. The following configuration data is in the BIND zone file format, as documented here: https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/3/html/Reference_Guide/s1-bind-zone.html

```
$TTL 1d
@               IN      SOA     delloss-infra openshift (
                                1467127738      ; Serial (To be fixed before
 2039)
                                12h     ; Refresh
                                3m      ; Retry
                                4w      ; Expire
                                3h      ; TTL for negative replies
                        )

    IN NS delloss-infra
delloss-infra  IN A  192.168.9.4
delloss-openshift-master-0  IN A  192.168.9.5
delloss-openshift-master-1  IN A  192.168.9.6
delloss-openshift-node-025hzih1  IN A  192.168.9.10
delloss-openshift-node-6033jc3s  IN A  192.168.9.9
delloss-openshift-node-pgsis138  IN A  192.168.9.8
delloss-lb  IN A  192.168.191.30
*.cloudapps IN A 192.168.191.20
cloudforms IN A <CloudForms VM Floating IP Address>
undercloud IN A <IP address of the UnderCloud OpenStack AUTH URL>
overcloud IN A <IP address of the OverCloud OpenStack AUTH URL>
```

5. Save the file.
6. Reload the DNS configurations by executing the following command:

```
systemctl reload named
```

Connect CloudForms to OpenShift

Perform the following procedures to connect CloudForms to OpenShift:

1. *Obtain an OpenShift Management-Admin Token* on page 12
2. *Create a CloudForms "Containers Provider" for OpenShift* on page 12
3. *Refresh OpenShift Items and Relationships* on page 13

For more information, see *https://access.redhat.com/documentation/en/red-hat-cloudforms/4.1/managing-providers/chapter-4-containers-providers*.

Obtain an OpenShift Management-Admin Token

You must obtain an Admin Token from OpenShift, to allow CloudForms to access it, collect information, and take action. Admin tokens are long strings of text that need to be cut and pasted carefully. They are the shared keys of a privileged user in OpenShift.

To obtain a Management-Admin token:

1. Log into a Master OpenShift server.
2. Execute the following command:

```
$ oc sa get-token -n management-infra management-admin
```

The output token will appear similar to this:

```
eyJhbGciOiJSUzI1NiIsInR5cCI6IkpXVCJ9.eyJpc3MiOiJrdWJlcm5ldGVzL3NlcnZpY2VhY2N
vdW50Iiwia3ViZXJuZXRlcy5pby9zZXJ2aWNlYWNjb3VudC9uYW1lc3BhY2UiOiJtYW5hZ2VtZW5
0LWluZnJhIiwia3ViZXJuZXRlcy5pby9zZXJ2aWNlYWNjb3VudC9zZWNyZXQubmFtZSI6Im1hbmF
nZW1lbnQtYWRtaW4tdG9rZW4tZmN4ZXMiLCJrdWJlcm5ldGVzLmlvL3NlcnZpY2VhY2NvdW50L3N
lcnZpY2UtYWNjb3VudC5uYW1lIjoibWFuYWdlbWVudC1hZG1pbiIsImt1YmVybmV0ZXMuaW8vc2V
ydmljZWFjY291bnQvc2VydmljZS1hY2NvdW50LnVpZCI6IjZhYTc2MjliLTNkNDgtMTFlNi1iYWF
iLWZhMTYzZTdjMWY0NCIsInN1YiI6InN5c3RlbTpzZXJ2aWNlYWNjb3VudDptYW5hZ2VtZW50LWl
uZnJhOm1hbmFnZW1lbnQtYWRtaW4ifQ.oUBOZ-QtVAk67L7q63NXGyOlo55yNMF8GLLvvNG-_CgS
BX2MeQ36Vxi2w-0SuSROCU7EKKaFWhQXI791aPQGlSC49dys9O7NE_h1mVD0OSmjBL9chM9f4iVW
1tDkC2d1MUgY6Ldx_9fPFIScA-BLEmMOysY60mejq2iMl9M5zK7taExBQ3TMlwdpncCUF_SbMEQE
BbqbmKTdp6szj0jdWLrEMa-ulFSQwtkhhKGdiZduJR4VkprieOVG323nm6ymWoIXjKrmJhXhY6tZ
v4cqDn2Eg8LztQkr6qDXhZqGv799zetB-x_fyKfHYJ4voags7qPBVfwveNn5K0nJLJH3vA
```

Create a CloudForms "Containers Provider" for OpenShift

To create a Containers Provider for OpenShift:

1. Log into the Cloud Forms Console with username *admin* and password *smartvm*. If you have not already, it is recommended that you change the password by following the link on the Cloud Forms Console login page.
2. Navigate to **Containers > Providers > Configuration > Add New Containers Provider**.
3. Enter the following information:
   a. **Name**: *DellOSSOpenShift1*
   b. **Type**: *OpenShift Enterprise*
   c. **Host Name**: The FQDN of the Load Balancer of OpenShift Masters. For example, *delloss-lb.example.com*.
   d. **Token**: Paste in the token created in *Obtain an OpenShift Management-Admin Token* on page 12.
4. Click on **Validate** to test the token's validity.

   The message returned should indicate that the token validated successfully. If the validation fails, ensure that you have no extra or missing characters in your token.

5. Click on **Add** to add OpenShift to CloudForms.

Refresh OpenShift Items and Relationships

Now that OpenShift is added to CloudForms, you can have CloudForms interrogate OpenShift for items and relationships:

1. Navigate to **Configuration > Refresh Items and Relationships**.

   The Summary section will momentarily update to reflect what has been allocated to OpenShift by OpenStack.
2. Refresh the page to request results.

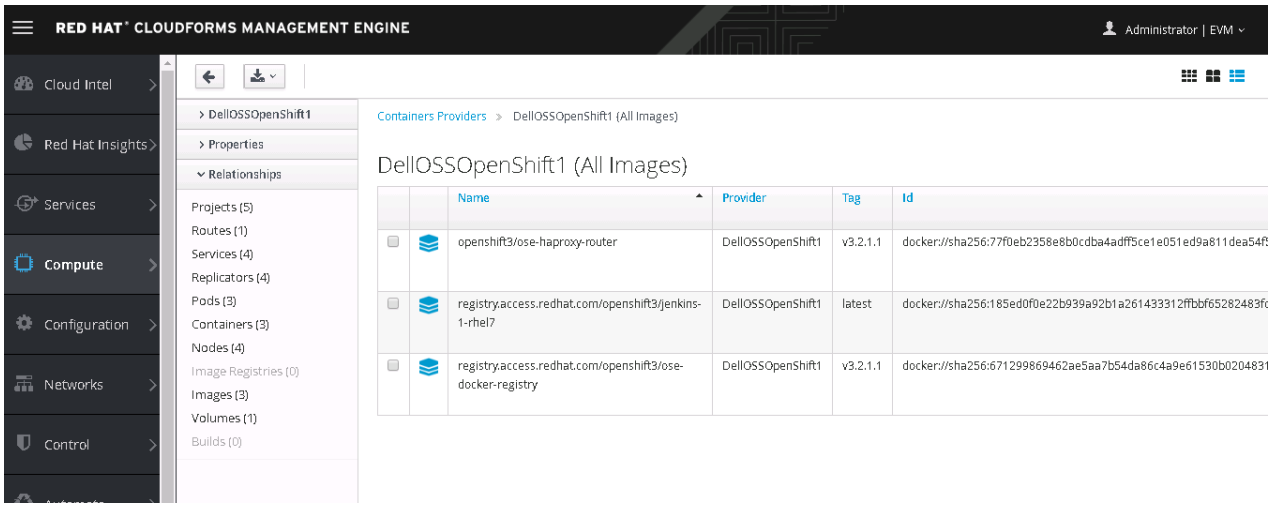

Figure 2: Containers Providers

Your deployment of OpenShift 3.2 on the Dell Red Hat OpenStack Cloud Solution, version 5.0, is now complete.

It is recommended that you immediately secure your fully integrated solution by creating specific users for the different CloudForms "Infrastructure Provider" and "Cloud Provider" needs.

Getting Help

This appendix details contact and reference information for the Dell Red Hat® OpenStack Cloud Solution with Red Hat OpenStack Platform.

Contacting Dell

For customers in the United States, call 800-WWW-DELL (800-999-3355).

Note: If you do not have an active Internet connection, you can find contact information on your purchase invoice, packing slip, bill, or Dell product catalog.

Dell provides several online and telephone-based support and service options. Availability varies by country and product, and some services may not be available in your area. To contact Dell for sales, technical support, or customer service issues:

1. Visit *dell.com/support*.
2. Click your country/region at the bottom of the page. For a full listing of country/region, click **All**.
3. Click **All Support** from the **Support** menu.
4. Select the appropriate service or support link based on your need.
5. Choose the method of contacting Dell that is convenient for you.

References

Additional information can be obtained at *http://www.dell.com/en-us/work/learn/openstack-cloud* or by e-mailing *openstack@dell.com*.

If you need additional services or implementation help, please contact your Dell sales representative.

To Learn More

For more information on the Dell Red Hat® OpenStack Cloud Solution visit *http://www.dell.com/learn/us/en/04/solutions/red-hat-openstack*.