Dell EMC Ready Bundle for Red Hat OpenStack Platform

Deploying CloudForms 4.2

Version 10.0.1

DELLEMC

Dell EMC Converged Platforms and Solutions

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Trademarks

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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Chapter
1

Executive Summary

Topics:

- *About the Dell EMC Ready Bundle for Red Hat OpenStack Platform*
- *About Red Hat CloudForms*
- *Background*
- *About This Document*
- *Intended Audience*

This document guides the administrator through deploying and configuring Red Hat CloudForms 4.2, and integrating CloudForms and OpenShift Container Platform 3.4, into their Dell EMC Ready Bundle for Red Hat OpenStack Platform environment.

CloudForms provides advanced multi-cloud management capabilities to the administrator of the Ready Bundle, while providing a self-service catalog for the end user. For more information, see *About Red Hat CloudForms* on page 9.

About the Dell EMC Ready Bundle for Red Hat OpenStack Platform

The Dell EMC Ready Bundle for Red Hat OpenStack Platform is an integrated hardware and software solution for OpenStack cloud that has been jointly designed and validated by Dell EMC and Red Hat. The Ready Bundle enables organizations to easily and rapidly deploy a highly reliable, optimized, and scalable Infrastructure as a Service (IaaS) cloud solution.

The Ready Bundle architecture is built on Dell EMC PowerEdge servers for the Controller, Compute, and Storage nodes, with Red Hat OpenStack Platform and Red Hat Ceph Storage software, plus a number of validated extensions to the core architecture to enable capabilities such as Platform as a Service (PaaS), Containers as a Service (CaaS), and cloud native development and operations. This release of the Ready Bundle is based on Red Hat OpenStack Platform 10 (RHOSP 10), which is the OpenStack release called Newton.

About Red Hat CloudForms

Red Hat CloudForms is a cloud management platform for hybrid and multi-cloud environments. 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.

More information on CloudForms can be found on the Red Hat website, at *https://www.redhat.com/en/ technologies/management/cloudforms*.

Background

CloudForms is delivered as a VM designed specifically for OpenStack. It is initially configured via a simple command line interface. The running product is accessed through a web GUI. It will be loaded into Glance and launched by Nova to provide control features to OpenStack tenants. It can help manage the Undercloud and the Overcloud of your RHOSP deployment. It will also manage:

* Your OpenShift deployment
* Amazon EC2 and Azure clouds
* VMware ESX Server
* Microsoft HyperV

CloudForms requires access to the Nova API network (normally VLAN 190 in our solution). As an added bonus, access to the provisioning network will allow CloudForms to interrogate all of the Undercloud

servers in depth. It will also need access to any private tenant network or floating IP networks that the customer intends to manage with CloudForms.

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.

This guide is especially important with regard to configuring DNS and networking. Ensure that you refer to this document during OpenShift and CloudForms installation.

Intended Audience

This guide provides a simple system for an introudction and training of an CloudForms systems administrator. The end users (other cloud administrators, tenants and customers) are not directly addressed in this document.

This guide assumes that the administrator is familiar with:

• Red Hat OpenStack Platform
• Red Hat CloudForms
• Chargeback accounting and reporting practices
• OpenShift Container Platform

Find out more about developing and managing CloudForms by accessing the Red Hat documentation here: *https://access.redhat.com/documentation/en/red-hat-cloudforms/*.

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

Chapter
2

Deploy CloudForms 4.2

Topics:

This chapter discusses the procedures used to plan, deploy, install, and configure CloudForms 4.2 on the Dell EMC Ready Bundle for Red Hat OpenStack Platform, version 10.0.1.

CloudForms Deployment Planning

> **Note:** If you will also be installing OpenShift in this OpenStack deployment, deploy OpenShift first. OpenShift creates an Infrastructure node with DNS that will be useful to the CloudForms deployment.

To enable easy upgrade of CloudForms, this solution uses a mix of ephemeral storage and persistent storage. It uses ephemeral storage for the CloudForms executables and underlying OS; and a separate, persistent Red Hat Ceph Storage volume for the database.

Before deploying CloudForms, planning the size and scale of the deployment is important. Depending upon the requirements of the OpenStack cluster, the CloudForms database must be appropriately sized. Additionally, numerous CloudForms instances may need to be deployed to support larger workloads.

CloudForms VM Requirements

Each instance of CloudForms requires at a minimum:

- 8 GB RAM
- 4 vCPUs
- 44 GB ephemeral storage

Database Sizing

The number of VMs in the cluster is the most important driver of database size over time. *Table 1: Database Sizing* on page 12 is a guideline for minimum sizing requirements for the database.

Table 1: Database Sizing

Virtual Machine Count	One Year Database Size (GB)	Two Year Database Size (GB)
100	3.5	5
500	17	25
5000	173	251

If Capacity & Utilization is enabled to gather metrics data required for chargeback reporting, the size must account for the additional data. With metrics data enabled, as a general guideline, plan for a growth rate of 2 MB/day/VM in the cluster. For example, a cluster with 500 VMs collecting metrics data would require 2 MB x 500 VMs = 1,000 MB per day.

The metrics data is kept for six months, so plan accordingly for six months worth of growth.

CloudForms Capacity Considerations

As a general rule, there should be one CloudForms instance for every 400 VMs deployed in the cluster. Multiple CloudForms instances may be attached to the same cluster and database. This helps balance the workload requirements across the different CloudForms instances, so as not to impact performance.

When another CloudForms instance is added to the system, the existing database may be imported during the initial configuration. Once installed, configuration options are available which set the various roles of that particular instance. Instances can have dedicated roles - such as those for database operations or metrics collection - or may encompass multiple roles.

Configuring multiple CloudForms instances is beyond the scope of this document, but for more information on the topic, see *High Availability with Red Hat CloudForms Using Multiple Appliances*.

Deploy CloudForms on the Solution Admin Host

This section describes the procedures required to install CloudForms on the SAH.

Create a Ceph Storage Block Device

The CloudForms database will require a Ceph Storage block device attached to the VM. This must be performed on the SAH node before the VM is created. The required steps include:

1. *Prepare the SAH Node with Ceph Storage Utilities* on page 13
2. *Create a New Ceph Storage Pool* on page 13
3. *Create a Ceph Storage Block Device Image* on page 13

Prepare the SAH Node with Ceph Storage Utilities

1. Log into the SAH node as the *root* user.
2. Install the required Ceph Storage packages:

```
# yum install ceph-common
```

Create a New Ceph Storage Pool

To create a new Ceph Storage pool, and copy Ceph Storage files from a Controller node:

1. After the installation is complete, log into the Director Node VM as the *admin* user.
2. Source the `overcloudrc` file:

```
$ source ~/overcloudrc
```

3. Connect via `ssh` to a Controller node:

```
$ ssh cntl0
```

4. Change to the *root* user:

```
$ sudo -i
```

5. Create a new Ceph Storage pool for the CloudForms block device with `ceph osd pool create <pool_name> <placement_groups>`:

```
# ceph osd pool create cf_pool 256
```

   a. The output will appear similar to this example:

```
pool 'cf_pool' created
```

> **Note:** The recommended minimum number of placement groups is 256, as seen in the example above. For more information on placement groups in Ceph Storage pools, see *Placement Groups*.

6. Copy the *admin* keyring and configuration files from the Controller node to the SAH node:

```
# scp /etc/ceph/ceph.client.admin.keyring root@<sah_ip_address>:/etc/ceph/
# scp /etc/ceph/ceph.conf root@<sah_ip_address>:/etc/ceph/
```

Create a Ceph Storage Block Device Image

To create a Ceph Storage block device image and map it on the SAH node:

1. Log into the SAH node as the *root* user.
2. Create a block device image, using the pool name created earlier with rbd create `<pool_name>/` `<image_name> --size <size_in_MB>`:

```
# rbd create cf_pool/cf_image --size 102400
```

> **Note:** The size of the block device should be driven by the recommendations in *CloudForms Deployment Planning* on page 12.

3. Map the image to a block device with `rbd map <pool_name>/<image_name>`:

```
# rbd map cf_pool/cf_image
```

   a. The output will appear similar to this example:

```
/dev/rbd0
```

4. Confirm the block device is properly mapped:

```
# rbd showmapped
```

   a. The output will appear similar to this example:

```
id pool image snap device
0 cf_pool cf_image - /dev/rbd0
```

   The device `/dev/rbd0` is now ready to be attached during the creation of the CloudForms VM.

5. Edit the `rbdmap` configuration file to have the block device mapped every time the SAH reboots:

```
# cat /etc/ceph/rbdmap
```

   a. Add a line in `/etc/ceph/rbdmap` that is formatted as `<pool_name>/<image_name>`:

```
# RbdDevice Parameters
#poolname/imagename id=client,keyring=/etc/ceph/ceph.client.keyring
cf_pool/cf_image
```

6. Enable the `rbdmap` service to make sure the mapping happens on the SAH boot:

```
# /sbin/chkconfig rbdmap on
```

Deploy the CloudForms VM

To deploy the CloudForms VM:

1. Log onto the SAH node as the *root* user.
2. Download the **CFME OpenStack Virtual Appliance** `qcow2` image from *https://access.redhat.com/downloads/content/167/ver=/cf-me---4.2/4.2/x86_64/product-software*.

> **Note:** The image version validated and recommended by Dell EMC is **5.7.3.2**.

3. Place the downloaded image in */var/lib/libvirt/images*.
4. Create the CloudForms VM by executing the following command:

```
# virt-install --name <vm_name> --ram 8192 --vcpus 4 --os-type linux --os-
variant rhel7 \
--disk path=/var/lib/libvirt/images/<cloudforms_image_name> \
--disk path=/dev/rbd0 \
--autostart --noautoconsole --graphics spice --import \
--network bridge=br-pub-api --network bridge=br-prov
```

a. For example:

```
# virt-install --name CloudForms --ram 8192 --vcpus 4 --os-type linux --
os-variant rhel7 \
--disk path=/var/lib/libvirt/images/cfme-rhos-5.7.3.2-1.x86_64.qcow2 \
--disk path=/dev/rbd0 \
--autostart --noautoconsole --graphics spice --import \
--network bridge=br-pub-api --network bridge=br-prov
```

b. The output will appear similar to this example:

```
Starting install...
Creating domain... | 0 B 00:00:00
Domain creation completed.
```

> **Note:** The `/dev/rbd0` Ceph Storage block device referenced in the command was created in *Create a Ceph Storage Block Device Image* on page 13. This will attach the device to the VM during its creation.

5. Log into the CloudForms VM with `virsh console <vm_name>`. Credentials are:

   - User: *root*
   - Password: *smartvm*

6. Edit `/etc/sysconfig/network` with the default gateway for external access:

```
# cat /etc/sysconfig/network

# Created by anaconda
GATEWAY=10.148.44.254
```

7. Set an appropriate name server in `/etc/resolv.conf`:

```
# cat /etc/resolv.conf

# Generated by NetworkManager
nameserver 10.148.44.11
```

8. Change to the network scripts directory to configure network interfaces for the three networks:

   - External
   - Provisioning
   - Public API

```
# cd /etc/sysconfig/network-scripts
```

9. Edit the `ifcfg-eth0` and `ifcfg-eth1` files to assign IP addresses on the provisioning and public API networks, respectively.

> **Note:** The `ifcfg-eth0` and `ifcfg-eth1` files may need to be created if they do not exist.

Here is an example configuration for the `ifcfg-eth1` file:

```
NAME="eth1"
ONBOOT="yes"
NETBOOT="yes"
IPV6INIT="no"
BOOTPROTO="static"
IPADDR=192.168.120.74
TYPE="Ethernet"
DEFROUTE="yes"
PEERDNS="yes"
PEERROUTES="yes"
```

```
IPV4_FAILURE_FATAL="no"
DEVICE=eth1
```

> ◢ **Note:** See *Example Network Configuration Files* on page 33 for a full example of network configuration files.

10. Once the files are configured, restart the network service:

```
# systemctl restart network
```

11. Verify the network interfaces are properly configured:

```
# ip a
```

a. The output will appear similar to this example:

```
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN qlen
 1
link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
inet 127.0.0.1/8 scope host lo
valid_lft forever preferred_lft forever
inet6 ::1/128 scope host
valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast
 state UP qlen 1000
link/ether 52:54:00:e3:55:12 brd ff:ff:ff:ff:ff:ff
inet 10.148.44.85/8 brd 10.255.255.255 scope global eth0
valid_lft forever preferred_lft forever
inet6 fe80::5054:ff:fee3:5512/64 scope link
valid_lft forever preferred_lft forever
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast
 state UP qlen 1000
link/ether 52:54:00:36:19:f7 brd ff:ff:ff:ff:ff:ff
inet 192.168.120.74/24 brd 192.168.120.255 scope global eth1
valid_lft forever preferred_lft forever
inet6 fe80::5054:ff:fe36:19f7/64 scope link
valid_lft forever preferred_lft forever
```

The VM is now ready to proceed to *Install and Configure CloudForms* on page 16.

Install and Configure CloudForms

This section describes the procedures to configure CloudForms in the Dell EMC Ready Bundle for Red Hat OpenStack Platform.

Set the CloudForms VM Hostname

To set the CloudForms VM's hostname:

1. On the CloudForms VM, execute the following command:

```
# hostnamectl set-hostname cloudforms
```

2. Log out and log back in, to ensure that the hostname was set properly. It should appear on your command prompt, instead of the IP address as in Step 1 above.

```
# logout
Connection to 192.168.75.53 closed.
# ssh root@192.168.75.53
root@192.168.75.53's password:
```

```
Last login: Wed Feb 8 14:29:14 2017 from 192.168.75.50
Welcome to the Appliance Console

For a menu, please type: appliance_console
#
```

Deploy DNS (Optional)

CloudForms can be configured with DNS. This solution requires some specific DNS entries. Please see the following notes to ensure that DNS is configured correctly for this solution.

Some important points about deploying DNS:

- If you **plan to install** OpenShift, then you should do so now before proceeding further in this document.
- If OpenShift is **already deployed**, see *DNS Configuration* in Integrating CloudForms 4.2 and OpenShift 3.4 in the Dell EMC Ready Bundle for Red Hat OpenStack Platform - Version 10.0.1.

  - Execute those commands for setting up the DNS properly.
  - Skip *Configure dnsmasq* on page 17 in this document; return at *Set the CloudForms VM Hostname* on page 16, and proceed from there.

- If you have installed DNS as a Service in OpenStack (codename Designate,) please configure it appropriately based on the DNS record settings detailed below for dnsmasq.
- If you **do not** plan to install OpenShift, proceed to *Configure dnsmasq* on page 17 .

Configure dnsmasq

The CloudForms VM requires DNS resolution to manage assets.

To configure dnsmasq network services:

1. Gather some information about your systems, from the Director Node:

   a. Get the Undercloud OpenStack AUTH URL from the */root/stackrc* file.
   b. Get the Overcloud OpenStack AUTH_URL from the */home/osp_admin/overcloudrc* file.

2. Create a file called */etc/dnsmasq.d/00-example.conf*.

   a. Use the settings below.

      > **Note:** Be sure to add the external IP address for this node.

```
strict-order
domain-needed
local=/example.com/
bind-dynamic
resolv-file=/etc/resolv.conf.upstream
address=/cloudforms.example.com/<cloudforms external IP>
address=/undercloud.example.com/<IP address of the UnderCloud OpenStack
 AUTH URL>
address=/overcloud.example.com/<IP address of the OverCloud OpenStack AUTH
 URL>
log-queries
```

3. Enable the dnsmasq service:

```
# systemctl enable dnsmasq
Created symlink from /  etc/systemd/system/multi-user.target.wants/
dnsmasq.service to /usr/lib/systemd/system/dnsmasq.service.
# ^enable^start^
# systemctl start dnsmasq
```

4. Set */etc/hosts* to reflect the known hosts, the *resolv.conf*, and *resolve.conf.upstream*:

```
# cp /etc/resolv.conf /etc/resolve.conf.upstream
```

5. Edit the */etc/resolv.conf* file to prefer localhost's `dnsmasq`, by replacing the file's contents with this:

```
search example.com
nameserver 127.0.0.1
```

6. Write-protect the */etc/resolv.conf* file from DHCP client overwrites:

```
# chattr +i /etc/resolv.conf
```

Complete the Installation

To complete the CloudForms installation:

1. From the CloudForms VM, execute the following command:

```
# appliance_console
```

2. Select `"8) Configure Database"`.
3. Select `"1) Create Internal Database"`.
4. Select the proper mount point (i.e., `/dev/vdb`).
5. Select `N` for `"Configure this server as a dedicated database instance?"`.

> **Note:** In configurations with multiple CloudForms instances, Dell EMC recommends creating a dedicated database instance. However, that is beyond the scope of this document.

6. Enter `1` for `region number`.
7. Enter the database password.
8. Once configuration is complete, Select `"19) Start EVM Server Processes"` to start the service from the main menu.

CloudForms is now configured, and is ready for web access on its external IP address, using these credentials:

- Username - *admin*
- Password - *smartvm*

> **Note:** If creating a database for the first time, there may be a prompt to create or fetch an encryption key. Select **1) Create Key** to create a key.

Enter Red Hat Subscription Information (Optional)

If you need to configure your platform to receive updates from Red Hat, use the procedure below.

> **Note:** The CloudForms version referenced in this document was validated by Dell EMC. Applying updates is beyond the scope of that validation.

To enter your Red Hat Subscription Management (RHSM) information:

1. From the CloudForms web interface, click on **Administrator** in the top right, and then click on **Configuration**.
2. Select **Settings** -> **CFME Region: Region 1** -> **Red Hat Updates**.
3. Select **Edit Registration**.
4. At the bottom of the page, enter your **RHSM username and password** to log into the Red Hat Subscription Management service.

   a. If the response is `Customer Information Successfully Saved`, then you can proceed to the next step.

    b. If the response is `Error 70`, then do you do not have a subscription for CloudForms. Contact Red Hat to obtain that subscription, then try again.

5. On the page that next displays, select the check box next to the **EVM Appliance**, and then click on **Register**.

Update the Platform

Now that your Red Hat subscription information has been successfully entered you can update the platform with the latest Red Hat updates:

1. Wait for a few minutes for the registration to complete.

2. Refresh the display.

3. When you see a `Platform Update Available` message, update the platform as instructed.

You can now proceed to *Configure CloudForms to Manage Providers* on page 19.

Configure CloudForms to Manage Providers

This section describes the procedures you can use to configure CloudForms to manage infrastructure and cloud providers:

1. *Configure the Infrastructure Provider Undercloud* on page 19

2. *Configure the Cloud Provider Overcloud* on page 20

Configure the Infrastructure Provider Undercloud

To configure the Undercloud as an infrastructure provider, follow this procedure:

• *Add the Undercloud as an Infrastructure Provider* on page 19

Add the Undercloud as an Infrastructure Provider

To add the Undercloud as an infrastructure provider:

1. Open the CloudForms web GUI.

2. Navigate to **Compute** > **Infrastructure** > **Providers** > **Configuration** > **Add New Infrastructure Provider**.

3. Select **OpenStack Platform Director**, and enter the required information:

    • **Name** — UnderCloudDellOSS

    • **Type** — OpenStack Platform Director

    • **API Version** — Keystone v2

    • **Zone** — Default

4. Go through the tabs in turn, entering the appropriate information, and clicking on **Validate** before moving to the next:

    • **Default Tab** — UnderCloud

        • **Hostname** — undercloud.example.com, or IP address

        • **API Port** — 5000

        • **Security Protocol** — Non-SSL

        • **Username** — Undercloud username from `stackrc` on the Director Node.

        • **Password** — Undercloud password from `stackrc` on the Director Node. Execute the `sudo hiera admin_password` command, if it is found in the file, to obtain the proper password.

        • **Confirm Password** — Undercloud password from `stackrc` on the Director Node.

        • Click on **Add**. The data for the Undercloud may take 5-10 minutes to propagate to the CloudForms web interface.

- **Events Tab**

  - Select **ceilometer**.
- **RSA Key Pair Tab**

  - The *heat-admin* user's `ssh` keys.

    1. Copy, via `scp`, from the Director Node's */home/osp_admin/.ssh/id_rsa* file, to your bastion host.
    2. Upload it through the CloudForms web GUI.
    3. Click on **Add**.

Configure the Cloud Provider Overcloud

To configure the Overcloud as a cloud provider, follow this procedure:

Add the Overcloud as a Cloud Provider

To add the Overcloud as a cloud provider:

1. Open the CloudForms web GUI.
2. Navigate to **Compute** > **Clouds** > **Providers** > **Configuration** > **Add New Cloud Provider**.
3. Select **OpenStack**, and enter the required information:

   - **Name** — OverCloudDellOSS
   - **Type** — OpenStack
   - **API Version** — Keystone v2
   - **Region** — (Leave blank)
   - **OpenStack Infra Provider** — UnderCloudDellOSS
   - **Zone** — Default
4. Go through the tabs in turn, entering the appropriate information, and clicking on **Validate** before moving to the next:

   - **Default Tab** — You can get all of these settings from the `overcloudrc` file on the Director Node.

     - **Hostname** — overcloud.example.com, or IP address
     - **API Port** — 5000
     - **Security Protocol** — Non-SSL
     - **Username** — `OS_USERNAME` from *overcloudrc* on the Director Node
     - **Password** — `OS_PASSWORD` from *overcloudrc* on the Director Node
     - **Confirm Password** — `OS_PASSWORD` from *overcloudrc* on the Director Node
   - **Events Tab**

     - Select **ceilometer**.
5. **Validate** these credentials:

   - *Admin* (Overcloud OpenStack admin user and password)
   - *AMPQ* (guest user and password)
6. Click on **Add**.

Red Hat CloudForms is now deployed in the Dell EMC Ready Bundle for Red Hat OpenStack Platform.

Next Steps

Now that CloudForms is deployed in the Dell EMC Ready Bundle for Red Hat OpenStack Platform, follow the instructions in *Configure CloudForms for Chargeback Reporting* on page 21.

Chapter

3

Configure CloudForms for Chargeback Reporting

Topics:

- *Collect Usage Metrics*
- *To Add New Chargeback Rates*
- *Fixed versus Variable Rates*
- *Generate Chargeback Reports*
- *Next Steps*

This chapter discusses the procedures used to configure CloudForms for chargeback reporting. CloudForms manages container, virtual, private, and public cloud infrastructures by providing a robust system of inventory, monitoring, automation, chargeback, and billing.

Collect Usage Metrics

This section describes the procedure used by the administrator to configure usage metrics collection.

To Collect Usage Metrics

CloudForms, by default, is not configured to collect the metrics data required to use the chargeback feature. To enable this, Capacity and Utilization must be configured within CloudForms.

To configure Capacity and Utilization:

1. Log into the CloudForms Web interface.
2. In the top right, click on **Administrator**, and then select **Configuration** from the drop-down menu.
3. Click on **Settings** -> **CFME Region: Region 1** (or the applicable region), and then on the **C & U Collection** tab.
4. Enable the **Collect for All Deployment Roles** option, as displayed in *Figure 1: C & U Collection Tab* on page 22.
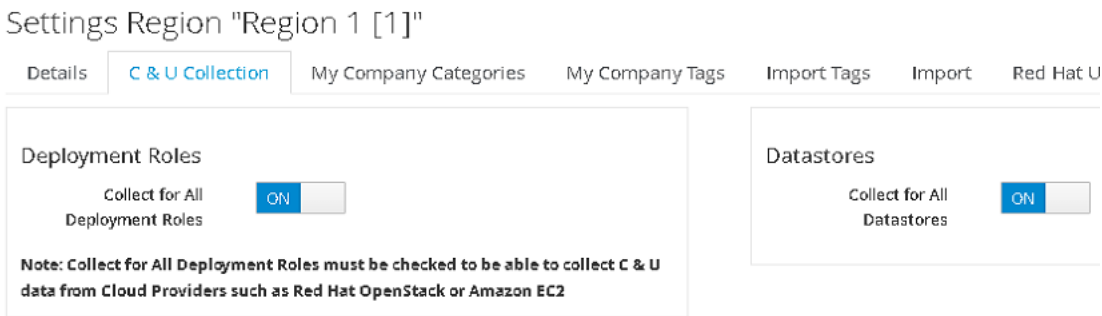

Figure 1: C & U Collection Tab

5. Click on the **Save** button.
6. In the left-hand menu, select the server underneath the zone for the CloudForms appliance, as displayed in *Figure 2: Server Zone* on page 22.
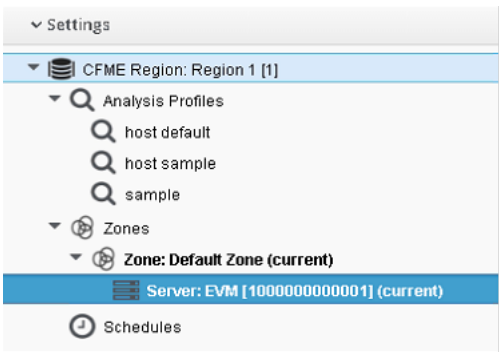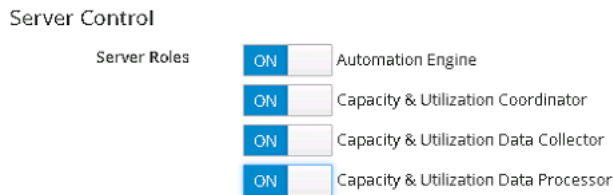

Figure 2: Server Zone

7. Turn on **all** of the Capacity & Utilization roles from the **Server Roles** section, as displayed in *Figure 3: Server Roles* on page 23

Figure 3: Server Roles

8. Click on the **Save** button.

The appliance is now configured to collect metrics data. It will take 24 hours for the data to begin populating in the CloudForms database.

To Add New Chargeback Rates

To add new chargeback rates:

1. Log into the CloudForms Web interface.
2. In the left-hand menu, select **Cloud Intel** -> **Chargeback**.
3. Select **Rates**, and then click on **Compute**. The default rate are displayed in *Figure 4: Compute Chargeback Rates* on page 23.
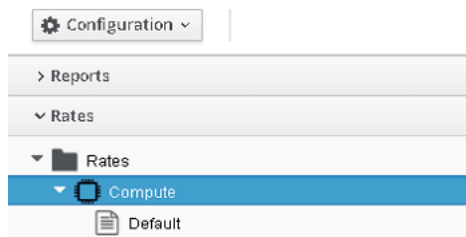
Figure 4: Compute Chargeback Rates

4. Click on **Configuration** -> **Add a new Chargeback Rate** to add a new rate.
5. Fill out a description, which will serve as the name of the new rate.
6. Select a currency to be used for the charges.
7. Input fixed and/or variable rates for each metric (CPU, Disk I/O, etc.). These rates will be charged per the selected interval for that particular metric.

   For example, an instance that used 200 GB of storage with a variable rate of $0.10/GB/hour would cost:

   ```
   200 GB x $0.10 x 24 hours = $480 per day
   ```

   For more information regarding setting rates, see *Fixed versus Variable Rates* on page 24.
8. Click on **Add** to save the rate.
9. Repeat steps 3-8, but for the **Storage** category, as displayed in *Figure 5: Storage Chargeback Rates* on page 24.
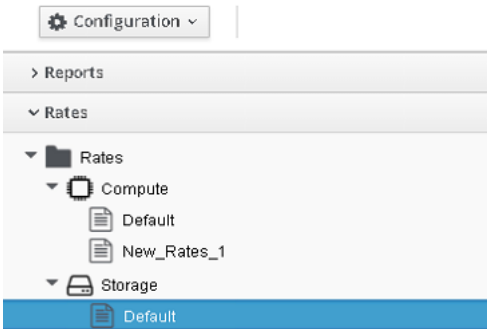
Figure 5: Storage Chargeback Rates

10. Click on **Assignments** -> **Compute** to assign the new rates, as displayed in *Figure 6: Chargeback Rate Assignments* on page 24.
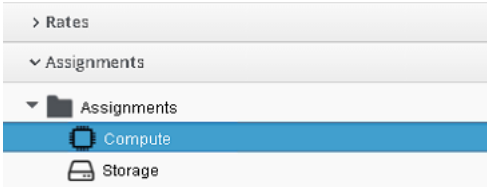

Figure 6: Chargeback Rate Assignments

11. Under **Basic Info**, assign to **Tenants** and then select the new rate under **Selections**, as displayed in *Figure 7: Tenants Selections* on page 24.

Figure 7: Tenants Selections

12. Click on the **Save** button.
13. Repeat steps 10-12 for the **Storage** category.

Fixed versus Variable Rates

A fixed rate will charge that amount per the selected interval, regardless of usage. For example, a fixed rate for "Allocated CPU Count" of $1/hour/day would equal:

```
$1 x 24 hours = $24 per day
```

This is the charge regardless of how many CPUs were allocated per instance.

In contrast, for an instance with 4 vCPUs, a variable rate of $1/hour/day would equal:

```
$1 x 24 hours x 4 vCPUs = $96 per day
```

Fixed and variable rates can be combined by populating both fields for the same metric.

Generate Chargeback Reports

This section describes the procedure used by the administrator to generate chargeback reports.

To Generate Chargeback Reports

Once the rates are created and assigned, a chargeback report can be generated.

To generate a chargeback report:

1. Log into the CloudForms Web interface.
2. In the left-hand menu, select **Cloud Intel** -> **Reports**.
3. Click on **Reports** -> **Configuration** -> **Add a new Report**, as displayed in *Figure 8: Add a New Report* on page 25.
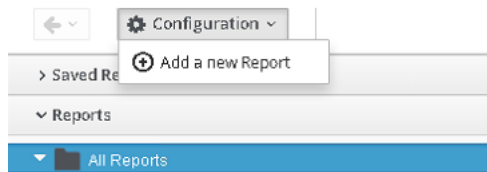
Figure 8: Add a New Report

4. Input a **Menu Name** and **Title** for the report.
5. From **Base the report on**, select **Chargeback for Vms**.
6. From the list of available fields, select any field corresponding to the rates assigned previously and click on the **down arrow** to add them to the report.

   For example, select **Disk I/O Used** and **Disk I/O Cost**, and then click on the **down arrow** to add them. This will show the Disk I/O used per VM and the cost, based on the assigned rate.
7. Click on the **Formatting** tab and make any changes, if required.
8. Click on the **Filter** tab and select **Tenant** under **Show Costs by**.
9. Select the **company name** under **Tenant**. The default is **My Company**.
10. Make further adjustments to the chargeback interval, as required.
11. Click on the **Preview** tab, and then click on the arrows next to **Generate Report Preview**.

   Figure 9: Example Report Preview on page 25 displays an example report preview.

Report Preview (up to 50 rows)

Date Range	VM Name	CPU Total Cost	CPU Total	Memory Allocated Cost	Memory Allocated over Time Period	Storage Allocated Cost	Storage Allocated
02/05/2017	cirros_1	$24.00	4	$3.84	8 GB	$24.00	80 GB
02/05/2017	cirros_testing	$24.00	4	$3.84	8 GB	$24.00	130 GB

Figure 9: Example Report Preview

12. Click on the **Save** button if no changes are required.
13. Click on **Reports** and locate the name of the newly-created report.
14. To generate the report, click on the **name** and select **Queue** from the top.

Next Steps

Now that CloudForms is configured for chargeback reporting, follow the instructions in *Integrate CloudForms 4.2 with OpenShift 3.4* on page 27.

Chapter

4

Integrate CloudForms 4.2 with OpenShift 3.4

Topics:

* *Solution Summary*
* *Architecture*
* *Configure CloudForms and OpenShift Integration*

This chapter builds on the Dell EMC Ready Bundle for Red Hat OpenStack Platform, version 10.0.1. 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.

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 3.4, to a robust, production-ready deployment of OpenShift on OpenStack.

About OpenShift

Red Hat OpenShift Container Platform 3.4 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 3.4 is deployed on Dell EMC Ready Bundle for Red Hat OpenStack Platform and Red Hat Enterprise Linux Server 7.3. 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 3.4 on a robust OpenStack infrastructure.

OpenShift Container Platform 3.4 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.

OpenStack and Red Hat Ceph Storage

The Dell EMC Ready Bundle for Red Hat OpenStack Platform version 10.0.1 is used as indicated in the following guides:

- Dell EMC Ready Bundle for Red Hat OpenStack Platform - Dell EMC PowerEdge R-Series Architecture Guide
- Dell EMC Ready Bundle for Red Hat OpenStack Platform - PowerEdge FX 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 publication time.

DNS

This version of the OpenShift Heat deployment uses an external DNS service which is defined as an Ansible playbook. This playbook creates a Heat stack that implements the network and the host instances for the DNS service. For more information, see:

- Dell EMC Ready Bundle for Red Hat OpenStack Platform Deploying OpenShift Container Platform 3.4 Version 10.0.1
- *Deploying Red Hat OpenShift Container Platform 3.4 on Red Hat OpenStack Platform 10*

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 EMC Ready Bundle for Red Hat OpenStack Platform
- Launch an application on OpenShift
- Install and Configure the CloudForms VM on the Solution Admin Host (SAH) node
- Configure CloudForms to manage the Dell EMC Ready Bundle for Red Hat OpenStack Platform Undercloud and Overcloud
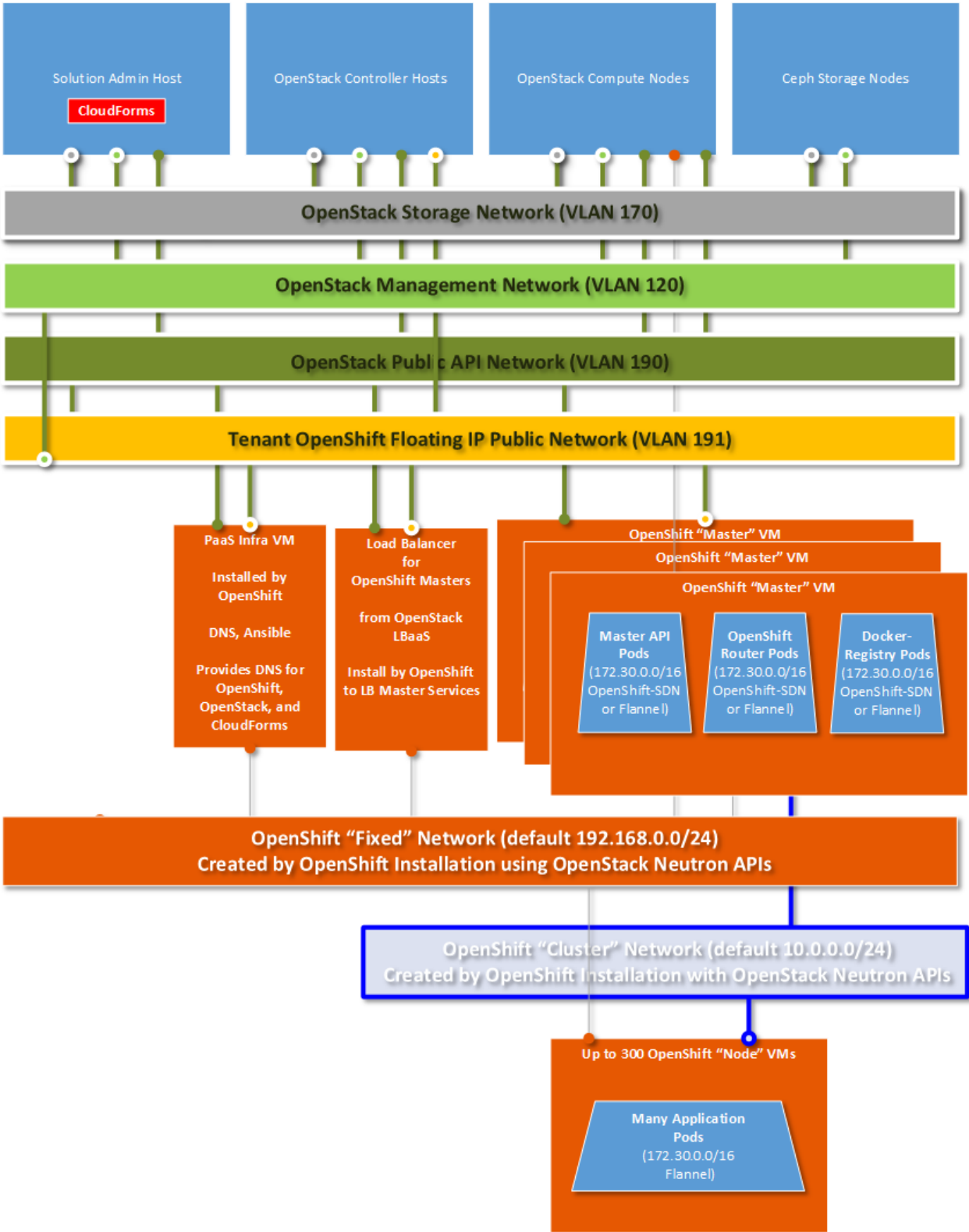- Configure CloudForms to manage OpenShift

Figure 10: OpenShift on the Dell EMC Ready Bundle for Red Hat OpenStack Platform with CloudForms Solution Diagram

Configure CloudForms and OpenShift Integration

This topic describes the procedures used to configure the CloudForms and OpenShift integration.

Connect CloudForms to OpenShift

Perform the following procedures to connect CloudForms to OpenShift:

1. *Obtain an OpenShift Management-Admin Token* on page 31
2. *Create a CloudForms Containers Provider for OpenShift* on page 31
3. *Refresh OpenShift Items and Relationships* on page 32

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 CloudForms 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 CloudForms 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**: Either the load balancer IP address, **or** the FQDN of the Load Balancer of OpenShift Masters. For example, *ocp3-devs-r11b-oss.labs*.

   > **Note:** To use the FQDN, add the load balancer IP address and domain name to the */etc/hosts* file in the CloudForms VM.

      d. **Token**: Paste in the token created in *Obtain an OpenShift Management-Admin Token* on page 31.

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 11: Containers Providers

Your deployment of OpenShift 3.4 on the Dell EMC Ready Bundle for Red Hat OpenStack Platform, version 10.0.1, is now complete.

Dell EMC recommends that you immediately secure your fully integrated solution by creating specific users for the different CloudForms "Infrastructure Provider" and "Cloud Provider" needs.

Appendix

A

Example Network Configuration Files

Topics:

- *Example ifcfg-eth0 File*
- *Example ifcfg-eth1 File*

This appendix provides the following examples of network configuration files required for this solution.

Example ifcfg-eth0 File

```
TYPE=Ethernet
BOOTPROTO=none
DEFROUTE=yes
IPV4_FAILURE_FATAL=no
IPV6INIT=no
NAME=eth0
UUID=912b7194-7264-43dc-af9c-d4a614aee9e5
DEVICE=eth0
ONBOOT=yes
IPADDR=10.148.44.85
PREFIX=24
```

Example ifcfg-eth1 File

```
NAME="eth1"
ONBOOT="yes"
NETBOOT="yes"
IPV6INIT="no"
BOOTPROTO="static"
IPADDR=192.168.120.74
TYPE="Ethernet"
DEFROUTE="yes"
PEERDNS="yes"
PEERROUTES="yes"
IPV4_FAILURE_FATAL="no"
DEVICE=eth1
```

Appendix

B

Known Anomalies

Topics:

- *Chargeback Reporting Known Anomalies*

This section describes currently-known defects for Chargeback Reporting in CloudForms 4.2 for the Dell EMC Ready Bundle for Red Hat OpenStack Platform, version 10.0.1. Workarounds are provided whenever possible.

Chargeback Reporting Known Anomalies

Subscriptions are required to view Red Hat Bugzilla and Dell EMC JIRA defect tracking systems.

Table 2: Chargeback Reporting in CloudForms 4.2 Defects

Issue	Component	Tracking No.	Workaround
The *CPU Used* chargeback rate is not currently supported by the solution. The reported value always displays *zero*.	Red Hat CloudForms Management Engine	Red Hat Bugzilla *1369257*	None.

Appendix
C

Getting Help

Topics:

- *Contacting Dell EMC*
- *References*

This appendix details contact and reference information for the Dell EMC Ready Bundle for Red Hat OpenStack Platform.

Contacting Dell EMC

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 EMC product catalog.

Dell EMC 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 EMC 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 EMC 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 EMC sales representative.

To Learn More

For more information on the Dell EMC Ready Bundle for Red Hat OpenStack Platform visit *http://www.dell.com/learn/us/en/04/solutions/red-hat-openstack*.