

Dell EMC Ready Bundle for Red Hat OpenStack Platform

**Performance Monitoring and Analytics Installation Guide
Version 10.0.1**



Dell EMC Converged Platforms and Solutions

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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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Chapter 1

Overview

Topics:

- [*Intended Audience*](#)
- [*About This Document*](#)
- [*Architecture*](#)
- [*Monitoring Server System Requirements*](#)
- [*Network Requirements*](#)

This guide provides instruction for adding performance monitoring capability into the Dell EMC Ready Bundle for Red Hat OpenStack Platform. This Performance Monitoring and Analytics solution is used internally by Dell EMC and therefore verified to function appropriately.

Intended Audience

This guide assumes that the administrator is familiar with:

- Red Hat OpenStack Platform
- Red Hat Enterprise Linux Server 7.3
- Monitoring and analytics concepts

About This Document

This document contains code and configuration samples in mono-space fonts. While it is tempting for the user to copy and paste those values from this document into their OpenStack environment, 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.

Architecture

The three primary components that comprise this solution is include:

- **Collectd** — a daemon which collects system performance statistics, and provides mechanisms to store values in a variety of ways. This service is configured on each of the nodes to be monitored and will send data to the monitoring server.
- **InfluxDB** — a highly scalable, open source database designed to handle time series data with high availability and high performance requirements. This database is configured on the monitoring server, and stores the performance data sent from the nodes.
- **Grafana** — a web-based, graphical interface that displays the performance data contained within the InfluxDB database.

A separate monitoring server is configured to handle the performance collection and analysis. This server is connected to the provisioning VLAN of the Dell EMC Ready Bundle for Red Hat OpenStack Platform, where it will have access to all the nodes sending out the performance data through `collectd`.

Figure 1: Monitoring and Analytics Solution Cluster Network Architecture on page 9 displays the logical cluster network architecture for this monitoring and analytics solution.

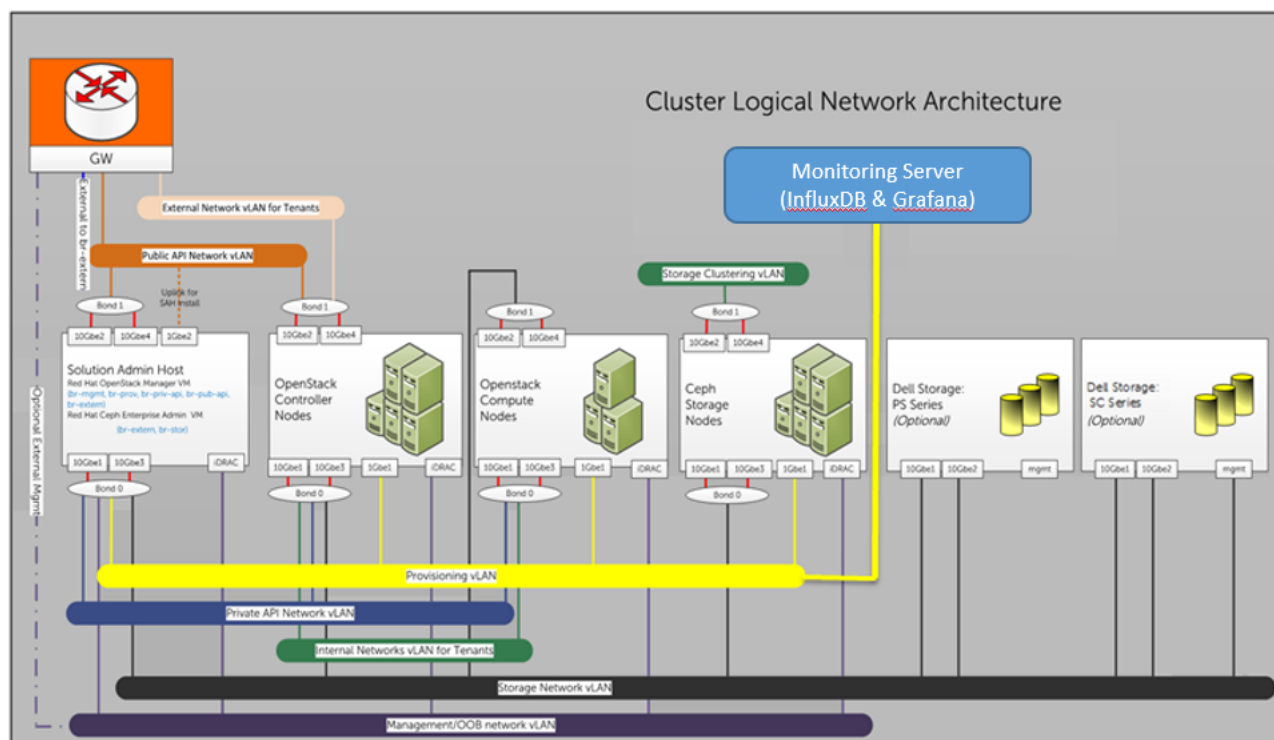


Figure 1: Monitoring and Analytics Solution Cluster Network Architecture

Monitoring Server System Requirements

The requirements of the monitoring server vary based upon:

- The quantity of nodes being monitored
- The amount of instances monitored (i.e., # VOLs, # LUNs, # LIFs, etc.)
- The frequency of monitoring

This document includes a basic installation capable of servicing approximately 75,000 metric updates per minute. A typical monitored node might submit anywhere from 500 to 5,000 metrics per polling interval, typically one (1) minute or five (5) minutes. The basic installation requirements include:

- **OS** — RHEL 7.3
- **CPU** — 1 vCPU
- **Memory** — GB RAM
- **Disk capacity** — 2.5-5 GB per monitored node
- **Disk performance** — 20-200 random IOPs per monitored node

Additionally, software packages are required from:

- RHEL
- Red Hat package repository (Install ISO or Red Hat package repository)
- Python PIP package repository
- Github
- Grafana package repository

Network Requirements

The monitoring server will require access to the OpenStack provisioning VLAN. When configuring InfluxDB and Grafana, firewall ports may need to be opened up if the system has a firewall enabled. For more information about firewall settings see [Install InfluxDB](#) on page 16.

Chapter 2

Installation

Topics:

- [*Registering Overcloud Nodes with CDN*](#)
- [*Install collectd on Overcloud Nodes*](#)
- [*Install the Monitoring Server*](#)

This chapter describes the procedures used to install the Performance Monitoring and Analytics solution on the Dell EMC Ready Bundle for Red Hat OpenStack Platform.

Registering Overcloud Nodes with CDN

If your environment requires the ability to update the Overcloud nodes' software packages, you must first register them with the Red Hat Content Delivery Network (CDN). Overcloud nodes include:

- Controller Nodes
- Compute Nodes
- Red Hat Ceph Storage Nodes

The RHEL repositories listed in [Table 1: Overcloud Nodes CDN Registration Parameters](#) on page 12 are those necessary for updating the RPMs that are installed on the nodes, if required in your environment. Although permissible, you do not need to modify the repository values.

Registering Overcloud Nodes

To register the Overcloud nodes:

1. Edit the `~/pilot/subscription.json` file, changing any applicable values listed in [Table 1: Overcloud Nodes CDN Registration Parameters](#) on page 12.
 - a. If you would rather not put CDN and/or proxy credentials into the JSON file, you can alternatively pass them in on the command line. See [Passing CDN and Proxy Credentials via the Command Line](#) on page 14.
 - b. If you are using a proxy, be sure to remove the leading underscore from "`_proxy_credentials`" in the `~/pilot/subscription.json` file. See [Example subscription.json File](#) on page 13.

Table 1: Overcloud Nodes CDN Registration Parameters

Parameter	Value
CDN Credentials	
cdn_username	CDN username
cdn_password	CDN password
Proxy Credentials	
proxy_url	Proxy hostname:port
proxy_username	Proxy username
proxy_password	Proxy password
Roles	
control	
pool_ids	Pool ID (requires a Red Hat OpenStack Platform subscription and a Red Hat Ceph Storage subscription)

Parameter	Value
repos	RHEL repositories: <ul style="list-style-type: none"> • rhel-7-server-rpms • rhel-7-server-extras-rpms • rhel-7-server-rh-common-rpms • rhel-ha-for-rhel-7-server-rpms • rhel-7-server-openstack-10-rpms • rhel-7-server-openstack-10-devtools-rpms • rhel-7-server-rhceph-2-mon-rpms • rhel-7-server-rhceph-2-tools-rpms
compute	
pool_ids	Pool ID (requires a Red Hat OpenStack Platform subscription)
repos	RHEL repositories: <ul style="list-style-type: none"> • rhel-7-server-rpms • rhel-7-server-extras-rpms • rhel-7-server-rh-common-rpms • rhel-ha-for-rhel-7-server-rpms • rhel-7-server-openstack-10-rpms • rhel-7-server-openstack-10-devtools-rpms • rhel-7-server-rhceph-2-tools-rpms
ceph-storage	
pool_ids	Pool ID (requires a Red Hat OpenStack Platform subscription and a Red Hat Ceph Storage subscription)
repos	RHEL repositories: <ul style="list-style-type: none"> • rhel-7-server-rpms • rhel-7-server-extras-rpms • rhel-7-server-rh-common-rpms • rhel-ha-for-rhel-7-server-rpms • rhel-7-server-openstack-10-rpms • rhel-7-server-openstack-10-devtools-rpms • rhel-7-server-rhceph-2-osd-rpms

2. Navigate to the `~/pilot` directory:

```
# cd ~/pilot
```

3. Register the Overcloud nodes by executing the following command:

```
# ./register_overcloud.py
```

Example subscription.json File

```
{
  "cdn_credentials": {
    "cdn_username": "CHANGE_ME_username",
    "cdn_password": "CHANGE_ME_password"
  },
}
```

```

    "_comment": [ "If using a proxy, remove the leading underscore from",
                  "_proxy_credentials below and fill in the following proxy",
                  "information." ],
    "_proxy_credentials": {
        "proxy_url": "CHANGE_ME_hostname:CHANGE_ME_port",
        "proxy_username": "CHANGE_ME_username",
        "proxy_password": "CHANGE_ME_password"
    },
    "roles": {
        "control": {
            "pool_ids": [ "CHANGE_ME_openstack_pool_id",
                          "CHANGE_ME_ceph_pool_id" ],
            "repos": [ "rhel-7-server-rpms",
                       "rhel-7-server-extras-rpms",
                       "rhel-7-server-rh-common-rpms",
                       "rhel-ha-for-rhel-7-server-rpms",
                       "rhel-7-server-openstack-10-rpms",
                       "rhel-7-server-openstack-10-devtools-rpms",
                       "rhel-7-server-rhceph-2-mon-rpms",
                       "rhel-7-server-rhceph-2-tools-rpms" ]
        },
        "compute": {
            "pool_ids": [ "CHANGE_ME_openstack_pool_id" ],
            "repos": [ "rhel-7-server-rpms",
                       "rhel-7-server-extras-rpms",
                       "rhel-7-server-rh-common-rpms",
                       "rhel-ha-for-rhel-7-server-rpms",
                       "rhel-7-server-openstack-10-rpms",
                       "rhel-7-server-openstack-10-devtools-rpms",
                       "rhel-7-server-rhceph-2-tools-rpms" ]
        },
        "ceph-storage": {
            "pool_ids": [ "CHANGE_ME_openstack_pool_id",
                          "CHANGE_ME_ceph_pool_id" ],
            "repos": [ "rhel-7-server-rpms",
                       "rhel-7-server-extras-rpms",
                       "rhel-7-server-rh-common-rpms",
                       "rhel-ha-for-rhel-7-server-rpms",
                       "rhel-7-server-openstack-10-rpms",
                       "rhel-7-server-openstack-10-devtools-rpms",
                       "rhel-7-server-rhceph-2-osd-rpms" ]
        }
    }
}

```

Passing CDN and Proxy Credentials via the Command Line

To pass CDN and/or proxy credentials via the command line:

1. Navigate to the ~/pilot directory:

```
# cd ~/pilot
```

2. Register the Opencloud nodes by executing the following command:

```
# ./register_overcloud.py
```

- a. Optional arguments to register_overcloud.py include:

- --cdn_username <username>
- --cdn_password <password>
- --proxy_url <host>:<port>
- --proxy_username <username>

- `--proxy_password <password>`

Install collectd on Overcloud Nodes

By default, `collectd` is not installed on the Overcloud nodes. It must be installed and configured on **every** node for which you require performance monitoring.

To install `collectd` on the Overcloud nodes:

1. Initiate an SSH session to an Overcloud node, as the *root* user.
2. Install the `wget` utility:

```
# yum install wget -y
```

3. Download and install the EPEL (Extra Packages for Enterprise Linux) package, which contains `collectd`:

```
# wget http://dl.fedoraproject.org/pub/epel/7/x86_64/e/epel-release-7-9.noarch.rpm
```

4. Install `collectd`:

```
# yum install collectd -y
```

5. Repeat this procedure for each Overcloud node.

Install the Monitoring Server

The following procedures must be performed, in the order listed, to install the monitoring server:

1. [Install Docker](#) on page 15
2. [Install InfluxDB](#) on page 16
3. [Install Grafana](#) on page 17

Install Docker

To install Docker:

1. Add the `docker` repository:

```
# tee /etc/yum.repos.d/docker.repo <<-'EOF'
[dockerrepo]
name=Docker Repository
baseurl=https://yum.dockerproject.org/repo/main/centos/7/
enabled=1
gpgcheck=1
gpgkey=https://yum.dockerproject.org/gpg
EOF
```

2. Install the `docker` package:

```
# yum install docker-engine
```

3. Enable and start the `docker` service:

```
# systemctl enable docker.service
# systemctl start docker
```

4. Test the Docker installation:

```
# docker run --rm hello-world
```

The output should show a test *hello world* container deployed.

Install InfluxDB

To install InfluxDB:

1. Create and work in a central location:

```
# mkdir -p ~/influxdb
# cd ~/influxdb
```

2. Pull the Docker image and create the initial configuration:

```
# docker pull influxdb
# docker run --rm influxdb:1.1 influxd config > influxdb.conf
```

3. Open influxdb.conf in a text editor.

4. Enable the collectd plugin and the admin interface:

```
[[collectd]]
  enabled = true

[[admin]]
  enabled = true
```

5. Fetch collectd's types.db:

```
# wget https://raw.githubusercontent.com/collectd/collectd/master/src/types.db
```

6. Open firewall ports, if the system has firewall enabled:

a. Configure collectd's network plugin (mandatory):

```
# firewall-cmd --zone=public --add-port=25826/udp --permanent
```

b. Configure InfluxDB's HTTP API (optional - should only be required if Grafana is running on an external machine):

```
# firewall-cmd --zone=public --add-port=8086/tcp --permanent
```

c. Configure InfluxDB's admin port:

```
# firewall-cmd --zone=public --add-port=8083/tcp --permanent
```



Caution: The service must be accessed *from the local machine hosting the container*.

d. Reload the firewall's configuration:

```
# firewall-cmd --reload
```

7. Create and start the InfluxDB container:

```
# docker create --name influxdb \
  -p 8083:8083 -p 8086:8086 -p 25826:25826/udp \
  -v $PWD/influxdb:/var/lib/influxdb \
  -v $PWD/influxdb.conf:/etc/influxdb/influxdb.conf:ro \
  -v $PWD/types.db:/usr/share/collectd/types.db:ro \
  influxdb
```



```
# docker start influxdb
```

Install Grafana

To install Grafana:

1. Create and work in a central location:

```
# mkdir -p ~/grafana
# cd ~/grafana
```

2. Pull the Docker image:

```
# docker pull grafana/grafana
```

3. Open firewall ports, if necessary:

```
# firewall-cmd --zone=public --add-port=443/tcp --permanent
# firewall-cmd --reload
```

4. Create and start the Grafana container:

```
# docker create --name grafana \
-e "GF_SERVER_PROTOCOL=https" \
-e "GF_SERVER_CERT_FILE=/etc/grafana/cert.pem" \
-e "GF_SERVER_CERT_KEY=/etc/grafana/cert.key" \
-p 443:3000 \
-v $PWD/grafana:/var/lib/grafana \
-v $PWD/cert.pem:/etc/grafana/cert.pem \
-v $PWD/cert.key:/etc/grafana/cert.key \
--link influxdb \
grafana/grafana

# docker start grafana
```

Chapter

3

Configuration

Topics:

- [*Configure the Monitoring Server*](#)
- [*Configure collectd for Monitoring*](#)

This chapter describes the procedures used to configure the Performance Monitoring and Analytics solution on the Dell EMC Ready Bundle for Red Hat OpenStack Platform.

Configure the Monitoring Server

The following procedures must be performed, in the order listed, to configure the monitoring server:

1. [Configure InfluxDB](#) on page 19
2. [Configure Grafana](#) on page 19

Configure InfluxDB

InfluxDB uses `collectd`'s `network` plugin, which sends telemetry in UDP packets. Dell EMC recommends increasing the amount of memory set aside for UDP buffers. See <https://github.com/influxdata/influxdb/blob/master/services/udp/README.md#a-note-on-udpip-os-buffer-sizes>.

To configure InfluxDB:

1. Increase the memory size to the recommended value of 25 MB:



```
# echo "net.core.rmem_max=26214400" >> /etc/sysctl.conf
# echo "net.core.rmem_default=26214400" >> /etc/sysctl.conf
# sysctl -p /etc/sysctl.conf
```

2. Create the `collectd` database (per the line that states `database = "collectd"` in the `influxdb.conf` file):
 - a. Browse to `http://<IP_address_of_docker_host>:8083`, which should display a simple web page with just a few GUI elements.
 - b. Enter the following command in the query box to create the database:

```
CREATE DATABASE "collectd"
```

Configure Grafana

To configure Grafana:

1. Log into the Grafana web interface at `https://<IP_address_of_docker_host>`, with the default `admin/admin` credentials.
2. Click on the **orange wheel** in the upper-left corner, and select *DataSources*.
3. Click on the **Add** button, and configure the data source as follows:
 - a. **Name** — *InfluxDB*
 - b. **Type** — *InfluxDB*
 - c. **URL** — *http://influxdb:8086*
 -  **Note:** Do not modify the *HTTP Auth* items.
 - d. **Database** — *collectd*
 -  **Note:** Do not modify the *User/Password* items.
4. Create a dashboard which will display metrics of interest. One can be created from scratch or imported as a JSON file.
 - a. To import a dashboard, click on the **orange wheel** in the upper-left corner, and select *Dashboards > Import*.

Configure collectd for Monitoring

Once the packages are installed and configured on the monitoring server, the final step is to configure `collectd` on all the monitored nodes.

To configure `collectd` for monitoring:

1. Configure the network plugin for `collectd`, so the metrics data gets properly routed to the monitoring server, by adding the following to `/etc/collectd.conf`:

```
LoadPlugin network
<Plugin network>
    Server "<IP_address_of_docker_host_running_InfluxDB">
    MaxPacketSize 1452
</Plugin>
```

2. Restart the `collectd` service:

```
# systemctl restart collectd.service
```

The metrics will soon begin populating in the Grafana dashboard.

Additional plugins may be added to the `collectd.conf` file for collecting specific metrics, such as process-specific data. See [Example Compute Node collectd Configuration File](#) on page 22 and [Example Storage Node collectd Configuration File](#) on page 22 for examples of configuration files for different types of nodes.

Also, see [OpenStack General System Performance](#) for more information about collecting metrics specific for OpenStack configurations.

Appendix

A

Example collectd Configuration Files

Topics:

- [*Example Compute Node collectd Configuration File*](#)
- [*Example Storage Node collectd Configuration File*](#)

This appendix presents examples of `collectd` configuration files for different types of nodes.

Example Compute Node collectd Configuration File

The following is an example of a collectd configuration file for a Compute node:

```

Hostname overcloud-compute-0
FQDNLookup false
LoadPlugin syslog
<plugin syslog>
LogLevel info
</plugin>
LoadPlugin cpu
LoadPlugin disk
LoadPlugin interface
LoadPlugin load
LoadPlugin memory
LoadPlugin swap
LoadPlugin df
LoadPlugin processes
LoadPlugin write_graphite
LoadPlugin libvirt
<Plugin libvirt>
Connection "qemu:///system"
RefreshInterval 60
# Domain "name"
# BlockDevice "name:device"
# InterfaceDevice "name:device"
# IgnoreSelected false
HostnameFormat name
</Plugin>
LoadPlugin "aggregation"
<Plugin "aggregation">
<Aggregation>
Plugin "cpu"
Type "cpu"
SetPlugin "cpu"
SetPluginInstance "%{aggregation}"
GroupBy "Host"
GroupBy "TypeInstance"
CalculateAverage true
</Aggregation>
</Plugin>
<Plugin processes>
Process "name"
</Plugin>

```

Example Storage Node collectd Configuration File

The following is an example of a collectd configuration file for a Storage node:

```

Hostname overcloud-cephstorage-0
FQDNLookup false
LoadPlugin syslog
<plugin syslog>
LogLevel info
</plugin>
LoadPlugin cpu
LoadPlugin disk

```

```

LoadPlugin interface
LoadPlugin load
LoadPlugin memory
LoadPlugin swap
LoadPlugin write_graphite
LoadPlugin df
<Plugin df>
MountPoint "/var/lib/ceph/osd/ceph-2"
FSType xfs
IgnoreSelected true
</Plugin>

LoadPlugin "aggregation"
<Plugin "aggregation">
<Aggregation>
Plugin "cpu"
Type "cpu"
SetPlugin "cpu"
SetPluginInstance "%{aggregation}"
GroupBy "Host"
GroupBy "TypeInstance"
CalculateAverage true
</Aggregation>
</Plugin>
LoadPlugin processes
<Plugin processes>
Process "name"
</Plugin>
<Plugin "disk">
Disk "sda"
Disk "/^sd/"
IgnoreSelected false
</Plugin>

```

Appendix

B

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>.

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