A guide to OpenStack logging and monitoring tools

OpenStack Team
rhos-docs@redhat.com
Abstract

This guide provides information on configuring logging and monitoring for a Red Hat OpenStack Platform environment.
# Table of Contents

MAKING OPEN SOURCE MORE INCLUSIVE .................................................. 3

PROVIDING FEEDBACK ON RED HAT DOCUMENTATION .......................... 4

CHAPTER 1. INTRODUCTION TO RED HAT OPENSTACK PLATFORM MONITORING TOOLS ........................................... 5
   1.1. SUPPORT STATUS OF MONITORING COMPONENTS ................. 5

CHAPTER 2. MONITORING ARCHITECTURE ........................................... 6
   2.1. CENTRALIZED LOGGING ...................................................... 6
   2.2. AVAILABILITY MONITORING .............................................. 6

CHAPTER 3. INSTALLING THE CLIENT-SIDE TOOLS .............................. 10
   3.1. SETTING CENTRALIZED LOGGING CLIENT PARAMETERS ............ 10
   3.2. SETTING MONITORING CLIENT PARAMETERS ......................... 10
   3.3. COLLECTING DATA THROUGH AMQ INTERCONNECT ................. 12
   3.4. COLLECTD PLUGIN CONFIGURATIONS ................................ 13
      3.4.1. amqp1 ................................................................. 13
      3.4.2. cpu ................................................................. 14
      3.4.3. ovs_stats ......................................................... 15
      3.4.4. mcelog ............................................................ 15
      3.4.5. pcie_errors ...................................................... 16
      3.4.6. virt ................................................................. 16
      3.4.7. write_http ....................................................... 17
   3.5. YAML FILES ............................................................... 18
Red Hat is committed to replacing problematic language in our code, documentation, and web properties. We are beginning with these four terms: master, slave, blacklist, and whitelist. Because of the enormity of this endeavor, these changes will be implemented gradually over several upcoming releases. For more details, see our CTO Chris Wright’s message.
PROVIDING FEEDBACK ON RED HAT DOCUMENTATION

We appreciate your input on our documentation. Tell us how we can make it better.

Using the Direct Documentation Feedback (DDF) function

Use the Add Feedback DDF function for direct comments on specific sentences, paragraphs, or code blocks.

1. View the documentation in the Multi-page HTML format.
2. Ensure that you see the Feedback button in the upper right corner of the document.
3. Highlight the part of text that you want to comment on.
4. Click Add Feedback.
5. Complete the Add Feedback field with your comments.
6. Optional: Add your email address so that the documentation team can contact you for clarification on your issue.
7. Click Submit.
CHAPTER 1. INTRODUCTION TO RED HAT OPENSTACK
PLATFORM MONITORING TOOLS

Monitoring tools are an optional suite of tools designed to help operators maintain an OpenStack environment. The tools perform the following functions:

- Centralized logging: Gather logs from all components in the OpenStack environment in one central location. You can identify problems across all nodes and services, and optionally, export the log data to Red Hat for assistance in diagnosing problems.

- Availability monitoring: Monitor all components in the OpenStack environment and determine if any components are currently experiencing outages or are otherwise not functional. You can also configure the system to alert you when problems are identified.

1.1. SUPPORT STATUS OF MONITORING COMPONENTS

Use this table to view the support status of monitoring components in Red Hat OpenStack Platform.

Table 1.1. Support status

<table>
<thead>
<tr>
<th>Component</th>
<th>Fully supported since</th>
<th>Deprecated in</th>
<th>Removed since</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aodh</td>
<td>OSP 9</td>
<td>OSP 15</td>
<td></td>
<td>Used for auto scaling in 16.1</td>
</tr>
<tr>
<td>Ceilometer</td>
<td>OSP 4</td>
<td></td>
<td></td>
<td>Used for auto scaling in 16.1</td>
</tr>
<tr>
<td>Collectd</td>
<td>OSP 11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gnocchi</td>
<td>OSP 9</td>
<td>OSP 15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panko</td>
<td>OSP 11</td>
<td>OSP 12, not installed by default since OSP 14</td>
<td>OSP 16.1</td>
<td>Required for Cloudforms until 16.1</td>
</tr>
<tr>
<td>osops-tools-monitoring-oscheck</td>
<td>OSP 14</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER 2. MONITORING ARCHITECTURE

Monitoring tools use a client-server model with the client deployed onto the Red Hat OpenStack Platform overcloud nodes. The Rsyslog service provides client-side centralized logging (CL) and the collectd with enabled sensubility plugin provides client-side availability monitoring (AM).

2.1. CENTRALIZED LOGGING

In your Red Hat OpenStack environment, collecting the logs from all services in one central location simplifies debugging and administration. These logs come from the operating system, such as syslog and audit log files, infrastructure components such as RabbitMQ and MariaDB, and OpenStack services such as Identity, Compute, and others.

The centralized logging toolchain consists of the following components:

- Log Collection Agent (Rsyslog)
- Data Store (Elasticsearch)
- API/Presentation Layer (Kibana)

**NOTE**

Red Hat OpenStack Platform director does not deploy the server-side components for centralized logging. Red Hat does not support the server-side components, including the Elasticsearch database and Kibana.

2.2. AVAILABILITY MONITORING

With availability monitoring, you have one central place to monitor the high-level functionality of all components across your entire OpenStack environment.

The availability monitoring toolchain consists of several components:

- Monitoring Agent (collectd with enabled sensubility plugin)
- Monitoring Relay/Proxy (RabbitMQ)
- Monitoring Controller/Server (Sensu server)
- API/Presentation Layer (Uchiwa)

**NOTE**

Red Hat OpenStack Platform director does not deploy the server-side components for availability monitoring. Red Hat does not support the server-side components, including Uchiwa, Sensu Server, the Sensu API plus RabbitMQ, and a Redis instance running on a monitoring node.

The availability monitoring components and their interactions are laid out in the following diagrams:

**NOTE**

Items shown in blue denote Red Hat-supported components.
Figure 2.1. Availability monitoring architecture at a high level

- **Monitoring Relay / Proxy**
  - Sends/receives checks

- **Monitoring Controller / Server**
  - Stores data
  - Reads data from

- **Data store**

- **API / Presentation**
  - Views/interacts with system

- **OpenStack Operator**

- **Monitoring Agent**
Figure 2.2. Single-node deployment for Red Hat OpenStack Platform
Figure 2.3. HA deployment for Red Hat OpenStack Platform
CHAPTER 3. INSTALLING THE CLIENT-SIDE TOOLS

Before you deploy the overcloud, you need to determine the configuration settings to apply to each client. Copy the example environment files from the heat template collection and modify the files to suit your environment.

3.1. SETTING CENTRALIZED LOGGING CLIENT PARAMETERS

For more information, see Enabling centralized logging during deployment in the Logging, Monitoring, and Troubleshooting guide.

3.2. SETTING MONITORING CLIENT PARAMETERS

The monitoring solution collects system information periodically and provides a mechanism to store and monitor the values in a variety of ways using a data collecting agent. Red Hat supports collectd as a collection agent. Collectd-sensubility is an extension of collectd and communicates with Sensu server side through RabbitMQ. You can use Service Telemetry Framework (STF) to store the data, and in turn, monitor systems, find performance bottlenecks, and predict future system load. For more information about Service Telemetry Framework, see the Service Telemetry Framework guide.

To configure collectd and collectd-sensubility, complete the following steps:

1. Create `config.yaml` in your home directory, for example, `/home/templates/custom`, and configure the `MetricsQdrConnectors` parameter to point to STF server side:

   ```yaml
   MetricsQdrConnectors:
   - host: qdr-normal-sa-telemetry.apps.remote.tld
     port: 443
     role: inter-router
     sslProfile: sslProfile
     verifyHostname: false
   MetricsQdrSSLProfiles:
   - name: sslProfile
   ``

2. In the `config.yaml` file, list the plugins you want to use under `CollectdExtraPlugins`. You can also provide parameters in the `ExtraConfig` section. By default, collectd comes with the `cpu, df, disk, hugepages, interface, load, memory, processes, tcpconns, unixsock, and uptime` plugins. You can add additional plugins using the `CollectdExtraPlugins` parameter. You can also provide additional configuration information for the `CollectdExtraPlugins` using the `ExtraConfig` option. For example, to enable the `virt` plugin, and configure the connection string and the hostname format, use the following syntax:

   ```yaml
   parameter_defaults:
   CollectdExtraPlugins:
   - disk
   - df
   - virt

   ExtraConfig:
   collectd::plugin::virt::connection: "qemu:///system"
   collectd::plugin::virt::hostname_format: "hostname uuid"
   ```
NOTE

Do not remove the **unixsock** plugin. Removal results in the permanent marking of the collectd container as unhealthy.

3. Optional: To collect metric and event data through AMQ Interconnect, add the line **MetricsQdrExternalEndpoint: true** to the **config.yaml** file:

```yaml
parameter_defaults:
  MetricsQdrExternalEndpoint: true
```

4. To enable collectd-sensubility, add the following environment configuration to the **config.yaml** file:

```yaml
parameter_defaults:
  CollectdEnableSensubility: true

# Use this if there is restricted access for your checks by using the sudo command.
# The rule will be created in /etc/sudoers.d for sensubility to enable it calling restricted
# commands via sensubility executor.
  CollectdSensubilityExecSudoRule: "collectd ALL = NOPASSWD: <some command or ALL for all commands>"

# Connection URL to Sensu server side for reporting check results.
  CollectdSensubilityConnection: "amqp://sensu:sensu@<sensu server side IP>:5672//sensu"

# Interval in seconds for sending keepalive messages to Sensu server side.
  CollectdSensubilityKeepaliveInterval: 20

# Path to temporary directory where the check scripts are created.
  CollectdSensubilityTmpDir: /var/tmp/collectd-sensubility-checks

# Path to shell used for executing check scripts.
  CollectdSensubilityShellPath: /usr/bin/sh

# To improve check execution rate use this parameter and value to change the number of
goroutines spawned for executing check scripts.
  CollectdSensubilityWorkerCount: 2

# JSON-formatted definition of standalone checks to be scheduled on client side. If you
need to schedule checks
# on overcloud nodes instead of Sensu server, use this parameter. Configuration is compatible with Sensu check definition.
# For more information, see https://docs.sensu.io/sensu-core/1.7/reference/checks/#check-definition-specification
# There are some configuration options which sensubility ignores such as: extension, publish, cron, stdin, hooks.
  CollectdSensubilityChecks:
    example:
      command: "ping -c1 -W1 8.8.8.8"
      interval: 30

# The following parameters are used to modify standard, standalone checks for monitoring
container health on overcloud nodes.
# Do not modify these parameters.
5. Deploy the overcloud. Include `config.yaml`, `collectd-write-qdr.yaml`, and one of the `qdr-* .yaml` files in your overcloud deploy command:

```bash
$ openstack overcloud deploy
   -e  /home/templates/custom/config.yaml
   -e tripleo-heat-templates/environments/metrics/collectd-write-qdr.yaml
   -e tripleo-heat-templates/environments/metrics/qdr-form-controller-mesh.yaml
```

6. Optional: To enable overcloud RabbitMQ monitoring, include the `collectd-read-rabbitmq.yaml` file in the `overcloud deploy` command.

Additional resources

- For more information about the YAML files, see Section 3.5, “YAML files”.
- For more information about collectd plugins, see Section 3.4, “Collectd plugin configurations”.
- For more information about Service Telemetry Framework, see the Service Telemetry Framework guide.

### 3.3. COLLECTING DATA THROUGH AMQ INTERCONNECT

To subscribe to the available AMQ Interconnect addresses for metric and event data consumption, create an environment file to expose AMQ Interconnect for client connections, and deploy the overcloud.

**NOTE**

The Service Telemetry Operator simplifies the deployment of all data ingestion and data storage components for single cloud deployments. To share the data storage domain with multiple clouds, see Configuring multiple clouds in the Service Telemetry Framework guide.

**WARNING**

It is not possible to switch between QDR mesh mode and QDR edge mode, as used by the Service Telemetry Framework (STF). Additionally, it is not possible to use QDR mesh mode if you enable data collection for STF.
Procedure

1. Log on to the Red Hat OpenStack Platform undercloud as the stack user.

2. Create a configuration file called `data-collection.yaml` in the `/home/stack` directory.

3. To enable external endpoints, add the `MetadataQdrExternalEndpoint: true` parameter to the `data-collection.yaml` file:

   ```yaml
   parameter_defaults:
   MetadataQdrExternalEndpoint: true
   ```

4. To enable collectd and AMQ Interconnect, add the following files to your Red Hat OpenStack Platform director deployment:

   - the `data-collection.yaml` environment file
   - the `qdr-form-controller-mesh.yaml` file that enables the client side AMQ Interconnect to connect to the external endpoints

   ```bash
   openstack overcloud deploy <other arguments>
   --templates /usr/share/openstack-tripleo-heat-templates
   --environment-file <...other-environment-files...>
   --environment-file /home/stack/data-collection.yaml
   ```

5. Optional: To collect Ceilometer and collectd events, include `ceilometer-write-qdr.yaml` and `collectd-write-qdr.yaml` file in your `overcloud deploy` command.

6. Deploy the overcloud.

Additional resources

- For more information about the YAML files, see Section 3.5, "YAML files".

### 3.4. COLLECTD PLUGIN CONFIGURATIONS

There are many configuration possibilities of Red Hat OpenStack Platform director. You can configure multiple collectd plugins to suit your environment. Each documented plugin has a description and example configuration. Some plugins have a table of metrics that you can query for from Grafana or Prometheus, and a list of options that you can configure, if available.

Additional resources

To view a complete list of collectd plugin options, see `collectd plugins` in the Service Telemetry Framework guide.

#### 3.4.1. amqp1

Use the `amqp1` plugin to write values to an amqp1 message bus, for example, AMQ Interconnect.

Example configuration

```yaml
Parameter_defaults:
```
CollectdExtraPlugins:
- amqp1

ExtraConfig:
collectd::plugin::amqp1::send_queue_limit: 50

3.4.2. cpu

Use the `cpu` plugin to monitor the amount of time spent by the CPU in various states, for example, executing user code, executing system code, waiting for IO-operations, and being idle. The `cpu` plugin does not collect percentages. It collects *jiffies*, which are units of scheduling. On many Linux systems, there are approximately 100 jiffies in one second, but this does not mean that you get a percentage value. Depending on system load, hardware, whether or not the system is virtualized, and other factors, there can be more or less than 100 jiffies in one second. There is no guarantee that all states add up to 100, which is a requirement for percentages.

Table 3.1. cpu metrics

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Query</th>
</tr>
</thead>
<tbody>
<tr>
<td>idle</td>
<td>Amount of idle time</td>
<td><code>collectd_cpu_total[...type_instance=idle]</code></td>
</tr>
<tr>
<td>interrupt</td>
<td>CPU blocked by interrupts</td>
<td><code>collectd_cpu_total[...type_instance=interrupt]</code></td>
</tr>
<tr>
<td>nice</td>
<td>Amount of time running low priority processes</td>
<td><code>collectd_cpu_total[...type_instance=nice]</code></td>
</tr>
<tr>
<td>softirq</td>
<td>Amount of cycles spent in servicing interrupt requests</td>
<td><code>collectd_cpu_total[...type_instance=waitirq]</code></td>
</tr>
<tr>
<td>steal</td>
<td>The percentage of time a virtual CPU waits for a real CPU while the hypervisor is servicing another virtual processor</td>
<td><code>collectd_cpu_total[...type_instance=steal]</code></td>
</tr>
<tr>
<td>system</td>
<td>Amount spent on system level (kernel)</td>
<td><code>collectd_cpu_total[...type_instance=system]</code></td>
</tr>
<tr>
<td>user</td>
<td>Jiffies used by user processes</td>
<td><code>collectd_cpu_total[...type_instance=user]</code></td>
</tr>
<tr>
<td>wait</td>
<td>CPU waiting on outstanding I/O request</td>
<td><code>collectd_cpu_total[...type_instance=wait]</code></td>
</tr>
</tbody>
</table>

Options

- `collectd::plugin::cpu::reportbystate`
- `collectd::plugin::cpu::valuespercentage`
- `collectd::plugin::cpu::reportbycpu`
- `collectd::plugin::cpu::reportnumcpu`
3.4.3. ovs_stats

Use the ovs_stats plugin to collect statistics of OVS connected interfaces. This plugin uses the OVSDB management protocol (RFC7047) monitor mechanism to get statistics from OVSDB.

Options

- collectd::plugin::ovs_stats::address
- collectd::plugin::ovs_stats::bridges
- collectd::plugin::ovs_stats::port
- collectd::plugin::ovs_stats::socket

Example configuration

```
parameter_defaults:
  CollectdExtraPlugins:
    - ovs_stats
  ExtraConfig:
    collectd::plugin::ovs_stats:
```

Additional resources

- For more information about configuring the ovs_stats plugin, see the plugin manpages.

3.4.4. mcelog

Use the mcelog plugin to send notifications and statistics relevant to Machine Check Exceptions when they occur. Configure mcelog to run on the platform in daemon mode and ensure that logging capabilities are enabled.

Example configuration
parameter_defaults:
CollectdExtraPlugins: mcelog
CollectdEnableMcelog: true

Additional resources

- For more information about configuring the `mcelog` plugin, see the plugin manpages.

3.4.5. pcie_errors

Use the `pcie_errors` plugin to poll PCI config space for baseline and Advanced Error Reporting (AER) errors, and to parse syslog for AER events. Errors are reported through notifications.

Options

- collectd::plugin:pcie_errors::reportbystate
- collectd::plugin:pcie_errors::source
- collectd::plugin:pcie_errors::access
- collectd::plugin:pcie_errors::reportmasked
- collectd::plugin:pcie_errors::persistentnotifications

Example configuration

parameter_defaults:
CollectdExtraPlugins:
  - pcie_errors

Additional resources

- For more information about configuring the `pcie_errors` plugin, see the plugin manpages.

3.4.6. virt

Use the `virt` plugin to collect CPU, disk, network load, and other metrics for virtual machines on the host. Metrics are collected through the `libvirt` API.

Options

- collectd::plugin:virt::connection
- collectd::plugin:virt::refresh_interval
- collectd::plugin:virt::domain
- collectd::plugin:virt::block_device
- collectd::plugin:virt::interface_device
- Collectd::plugin::virt::ignore_selected
Example configuration

```
ExtraConfig:
    collectd::plugin::virt::plugin_instance_format: name
```

Additional resources

For more information about configuring the `virt` plugin, see the plugin manpages.

3.4.7. write_http

This output plugin submits values to an HTTP server using POST requests and encoding metrics with JSON or using the PUTVAL command.

Options

- `collectd::plugin::write_http::url`
- `collectd::plugin::write_http::password`
- `collectd::plugin::write_http::username`
- `collectd::plugin::write_http::verifypeer`
- `collectd::plugin::write_http::verifyhost`
- `collectd::plugin::write_http::cacert`
- `collectd::plugin::write_http::capath`
- `collectd::plugin::write_http::clientkey`
- `collectd::plugin::write_http::clientcert`
- `collectd::plugin::write_http::clientkeypass`
- `collectd::plugin::write_http::header`
- `collectd::plugin::write_http::sslversion`
- `collectd::plugin::write_http::format`
- `collectd::plugin::write_http::attribute`
- `collectd::plugin::write_http::ttl`
- `collectd::plugin::write_http::prefix`
collectd::plugin::write_http::metrics
collectd::plugin::write_http::notifications
collectd::plugin::write_http::storerates
collectd::plugin::write_http::buffersize
collectd::plugin::write_http::lowspeedlimit
collectd::plugin::write_http::timeout
collectd::plugin::write_http::loghttperror

Example configuration

```yaml
parameter_defaults:
  CollectdExtraPlugins:
    - write_http
  ExtraConfig:
    collectd::plugin::write_http::nodes:
      collectd:
        url: "http://collectd.tld.org/collectd"
        metrics: true
        header: "X-Custom-Header: custom_value"
```

Additional resources

- For more information about configuring the `write_http` plugin, see the plugin manpages.

3.5. YAML FILES

You can include the following YAML files in your `overcloud deploy` command when you configure collectd:

- `collectd-read-rabbitmq.yaml`: Enables and configures `python-collect-rabbitmq` to monitor the overcloud RabbitMQ instance.

- `collectd-write-qdr.yaml`: Enables collectd to send telemetry and notification data through AMQ Interconnect.

- `qdr-edge-only.yaml`: Enables deployment of AMQ Interconnect. Each overcloud node has one local qdrouterd service running and operating in edge mode. For example, sending received data straight to defined `MetricsQdrConnectors`.

- `qdr-form-controller-mesh.yaml`: Enables deployment of AMQ Interconnect. Each overcloud node has one local qdrouterd service forming a mesh topology. For example, AMQ Interconnect routers on controllers operate in interior router mode, with connections to defined `MetricsQdrConnectors`, and AMQ Interconnect routers on other node types connect in edge mode to the interior routers running on the controllers.

Additional resources

For more information about configuring collectd, see Section 3.2, “Setting monitoring client parameters”.

18