



Red Hat Insights 2023

Assessing and Monitoring RHEL Resource Optimization with Insights for Red Hat Enterprise Linux

Understanding RHEL resource-usage statistics

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Abstract

Install and begin using the Insights for RHEL resource optimization service. This new service helps manage your public cloud systems. 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.

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CHAPTER 1. GETTING STARTED WITH THE RESOURCE OPTIMIZATION SERVICE FOR PUBLIC CLOUD SYSTEMS

The Red Hat Insights for Red Hat Enterprise Linux resource optimization service enables RHEL customers to assess and monitor their public RHEL cloud usage and optimization. The service shows metrics for the following:

- CPU
- Memory
- Disk-usage

It analyzes those metrics and compares them to resource limits recommended by your public cloud provider. Leveraging data from the past day, the resource optimization service considers each resource parameter in several distinct ways and returns actionable data. This data enables better resource allocation and helps you to save money on your public cloud investment.

Features

The service reveals the following information:

- Utilization and optimization data for existing systems in the Insights for Red Hat Enterprise Linux inventory.
- Range of systems running in the public cloud.
- Overview of system characteristics.
- Highlights potential issues.
- Formulates suggestions for issue resolution.

CHAPTER 2. RESOURCE OPTIMIZATION SERVICE CORE CONCEPTS

2.1. THE RESOURCE OPTIMIZATION SERVICE PERFORMANCE RULES

Use the resource optimization service to view performance metrics from your managed hosts that run in the supported public cloud, Amazon Web Services (AWS). The service uses a framework called the Performance Co-Pilot (PCP) toolkit, to record performance metrics. These metrics empower you to make better business decisions.

Insights performance rules

The performance rules are sets of conditions that are applied to the data collected by PCP. They identify the following system states:

- **Undersized.** The undersized state is determined by examining CPU, RAM and disk input/output (I/O) usage, and combining that with CPU idle time, over a period of 24 hours. If that results in a high score, the resource optimization service labels the system too small for its workload. A system will be reported as undersized whenever any of the dimensions are undersized.
- **Oversized.** The oversized state is determined by examining CPU, RAM and disk I/O usage, and combining that with CPU idle time, over a period of 24 hours. If that results in a low score, the resource optimization service labels the system as too big for its workload. A system will be reported as oversized only if all of the dimensions are oversized.
- **Idling.** The idling state is determined by examining CPU, RAM and disk I/O usage, and combining that with CPU idle time, over a period of 24 hours. If that results in very low utilization, the resource optimization service labels the system appropriate for its workload but underused. The idling condition can be viewed as a needs improvement scenario.
- **Optimized.** The optimized state is determined by examining CPU, RAM and disk I/O usage, and combining that with CPU idle time, over a period of 24 hours. If that results in a middle point, the resource optimization service labels the system as optimized.
- **Under pressure.** This state is only active when Kernel Pressure Stall Information (PSI) has been enabled. Systems are labeled as under pressure when they are optimized utilization-wise, but some pressure condition persists.

The resource optimization service measures the system's state and the desired performance criteria that you have set, in order to assign a score to the system.

Additional resources

For more information about the PCP toolkit and registering PAYG visit the following links:

PCP toolkit website: [PCP website](#)

Monitoring performance with PCP toolkit: [Monitoring performance with PCP](#)

How does PCP toolkit compare with sysstat: [PCP and sysstat comparison](#)

Registering PAYG instances [How to register a Red Hat Enterprise Linux system running on AWS to Insights](#)

2.2. DATA SECURITY GUARANTEE FOR THE RESOURCE OPTIMIZATION SERVICE

The resource optimization service adheres to the data and application security practices for Insights for Red Hat Enterprise Linux application services. For more details see [Security](#).

2.3. PERFORMANCE METRICS FOR RESOURCE OPTIMIZATION

The resource optimization service installs the **pcp** package on your system and runs two services, **pmcd** and **pmlogger**. Both are part of the Performance Co-Pilot (PCP) toolkit, which monitor and process specific metrics on your system. Metrics are stored in an archive, which the Insights client uploads to Red Hat Insights for Red Hat Enterprise Linux.

2.4. ACCESS USAGE METRICS FOR THE RESOURCE OPTIMIZATION SERVICE

The resource optimization service captures data from the previous day and provides system utilization metrics after 24 hours. By default, the archive is uploaded to Insights for Red Hat Enterprise Linux at 12:00am +/- 1 hour, local system time. However, the time that this data is uploaded can be configured in the Performance Co-Pilot (PCP) toolkit configuration.

CHAPTER 3. ENABLING THE RESOURCE OPTIMIZATION SERVICE

Table 3.1. Compatibility information

RHEL Versions	Cloud Provider	Resource Optimization Compatibility
8.x-9.x	AWS	Yes (x86_64 and ARM 64-bit)
7.7-7.9	AWS	Yes (x86_64 and ARM 64-bit)
7.0-7.6	AWS	No
6.x	AWS	No

Prerequisites

The following applications and configurations need to be installed or confirmed before the resource optimization service can be used:

- Cloud marketplace RHEL instance is configured.
- The Insights client is installed on the system and is operational.
- If you want to use Ansible to install or uninstall the resource optimization service:
 - The Ansible repository is enabled and the Ansible client is installed on each system.
 - The system administrator can run Ansible Playbooks.

3.1. OVERVIEW OF THE RESOURCE OPTIMIZATION SERVICE INSTALLATION PROCESS

Installing resource optimization involves installing packages, configuring settings and enabling local services. This can be done manually, or with an Ansible playbook provided by Red Hat.



NOTE

Pay as you go (PAYG) customers need to configure the insights-client to use basic authentication. Reference the [Configuring Basic Authentication for Red Hat Insights](#) documentation for more details. If your RHEL system is using a subscription, you may use basic authentication, but it is not required: the Insights client can use the already-existing RHSM data.

3.1.1. Using Ansible to install the resource optimization

The use of Ansible is recommended to expedite the installation process. This procedure will install the Ansible client, and run the Ansible Playbook on your system.

Cloud marketplace images on Amazon Web Services (AWS) are configured to use repositories hosted by the cloud provider. Currently, these repositories do not contain the Ansible client, so you must

perform the following steps to enable the Ansible repository on your cloud marketplace - managed RHEL system.

Procedure on RHEL 8

1. Install Ansible:

```
# yum install ansible -y
```

Procedure on RHEL 7

1. Enable the Subscription-Manager repository and register the system

```
# subscription-manager config --rhsm.manage_repos=1  
# subscription-manager register
```

2. Optionally, attach your system to a subscription pool

```
# subscription-manager attach --pool xxxxxxxx
```

3. Enable the required Ansible repository.

```
# subscription-manager repos --enable=rhel-7-server-ansible-2.9-rpms
```

4. Install Ansible:

```
# yum install ansible -y
```

5. If you are using RHEL PAYG and want to use RHUI update servers only, disable the Subscription-Manager repository:

```
# subscription-manager config --rhsm.manage_repos=0
```

3.1.2. Installing the resource optimization service once Ansible is established

Once Ansible is installed, proceed to complete the installation of the resource optimization service.

Procedure

1. Download the Ansible Playbook with the following command:

```
$ curl -O https://raw.githubusercontent.com/RedHatInsights/ros-backend/v1.0/ansible-playbooks/ros_install_and_set_up.yml
```

2. Set localhost in Ansible inventory by appending the line **localhost** to **/etc/ansible/hosts**.
3. Run the Ansible Playbook:

```
# ansible-playbook -c local ros_install_and_set_up.yml
```

The system will show in Insights immediately in a "Waiting for data" state, and data and suggestions will be available the day after registering.

Verification step

Data files with a timestamp will appear under `/var/log/pcp/pmlogger/ros` and after a few minutes, you can verify metrics are being collected:

```
$ ls -l /var/log/pcp/pmlogger/ros
$ pmlgsummary /var/log/pcp/pmlogger/ros/
```

3.1.3. Manually installing the resource optimization service without the use of Ansible

Procedure

If you choose not to utilize Ansible for installation, use the following manual installation procedure:

1. Ensure the latest version of `insights-client` is installed

```
$ yum update insights-client
```

2. Set `core_collect=True` in `/etc/insights-client/insights-client.conf`

3. Install the Performance Co-Pilot (PCP) toolkit.

```
$ sudo yum install pcp
```

4. Create the PCP configuration file `/var/lib/pcp/config/pmlogger/config.ros` with this content:

```
log mandatory on default {
  hinv.ncpu
  mem.physmem
  mem.util.available
  disk.dev.total
  kernel.all.cpu.idle
  kernel.all.pressure.cpu.some.avg
  kernel.all.pressure.io.full.avg
  kernel.all.pressure.io.some.avg
  kernel.all.pressure.memory.full.avg
  kernel.all.pressure.memory.some.avg
}
[access]
disallow .* : all;
disallow .* : all;
allow local:* : enquire;
```

5. To configure `pmlogger` to gather the metrics required by resource optimization, add this line to `/etc/pcp/pmlogger/control.d/local`:

```
LOCALHOSTNAME n y PCP_LOG_DIR/pmlogger/ros -r -T24h10m -c config.ros -v 100Mb
```

6. Start and enable the required PCP services.

```
$ sudo systemctl enable pmcd pmlogger
$ sudo systemctl start pmcd pmlogger
```

7. Re-register insights-client and upload the archive. The system will show in Insights immediately in a "Waiting for data" state, and data and suggestions will be available the day after registering.

```
$ sudo insights-client --register
```

Verification step

Data files with a timestamp will appear under **/var/log/pcp/pmlogger/ros** and after a few minutes, you can verify metrics are being collected:

```
$ ls -l /var/log/pcp/pmlogger/ros  
$ pmllogsummary /var/log/pcp/pmlogger/ros/
```

3.1.4. Enabling Kernel Pressure Stall Information (PSI)

PSI provides a canonical way to see resource pressure increases as they develop. There are pressure metrics for three major resources—memory, CPU, and input/output (I/O). It is available on RHEL 8 and newer versions and is disabled by default.

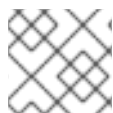
When PSI is enabled, the resource optimization service can augment its findings and provide more details and better suggestions. Enabling PSI is strongly recommended to identify peaks.

Procedure

1. Edit the **/etc/default/grub** file and append **psi=1** at the end of the GRUB_CMDLINE_LINUX line (mind the quotes).
2. Regenerate the grub configuration file.

```
$ sudo grub2-mkconfig -o /boot/grub2/grub.cfg
```

3. Reboot the system.



NOTE

Enabling PSI incurs in a slight (<1%) performance hit.

Verification step

When PSI is enabled, files for CPU, memory and IO will appear under **/proc/pressure**.

CHAPTER 4. VIEWING RESOURCE OPTIMIZATION REPORTS

Historical data reports are available to help you assess your level of optimization over time, in order to make informed decisions about your future public cloud investment.

4.1. VIEWING RESOURCE OPTIMIZATION HISTORICAL UTILIZATION DATA

The resource optimization service enables you to see how your system utilization scores have been trending over the last 7-45 days. The service displays a bar chart that indicates **CPU Utilization** and **Memory Utilization** percentages on a daily basis.

Complete the following steps to view, filter, and sort system historical utilization data:

Procedure

1. Navigate to the [Red Hat Enterprise Linux > Resource Optimization](#) page. The system states screen opens.
2. Click on the **Name** header on the left side of the page, to filter by **Name, State or Operating system**. Use the sort arrow to the right of each column name to sort by **OS, CPU, Memory Utilization, I/O Output, Suggestions, State** and **Last Reported**. Clicking once will sort the column so that optimized systems are displayed first. Clicking a second time will sort the column so that systems categorized as **Waiting for data** are displayed first.
3. Systems that have been analyzed will render in blue. Click on the blue system name for a more detailed view.
4. Click on the **Actions** dropdown to see the system's **properties in Inventory**, such as operating system, infrastructure, configuration, BIOS and other data.
5. By default, 7 days of utilization results will be displayed. Click on the dropdown labeled **Last 7 Days** to view 45 days of utilization data. Pan and zoom across the bar chart using the mouse wheel and buttons to view specific days and the utilization scores for those days.
6. Scroll down to see specific suggestions for that system.

CHAPTER 5. DOWNLOAD RESOURCE OPTIMIZATION SERVICE REPORTS

You can download the resource optimization reports for all registered systems. The report identifies the following data gathered over the last 7- 45 days:

- **Registered systems.** This section details the number of systems that are optimal, non-optimal, and stale. The optimized state is determined by examining CPU, RAM, and disk I/O usage, combined with CPU idle time, over a period of 24 hours. If the calculation, based on the examination of the three factors, results in a middle point, the resource optimization service labels the system as optimized. A stale system is defined as one that has not submitted data to the resource optimization service in 7 days.
- **Kernel pressure stall information (PSI)** This is an analysis of the number of systems that have PSI enabled and the number of systems that have NOT enabled PSI. PSI allows you to receive better system recommendations since it can identify resource pressure increases as they develop.
- **System performance issues.** Specific performance issues such as RAM or CPU related peaks are identified along with the number of occurrences.
- **Most used current instance types** The service will evaluate and display your top 5 most frequently used instance types across all registered systems.
- **Suggested instance types.** The service identifies the top 5 frequently suggested instance types based on the most recent utilization metrics. This may indicate that a change is necessary for better resource allocation.
- **Suggested instance types in 45 days** This metric displays the top 5 frequently suggested instance types based on 45 days of historical data. You can also view the effectiveness of changes you have made in the recent past.

Prerequisites

The following prerequisites and conditions must be met to create a PDF of the executive report:

- The Insights client is installed on the system and is operational.
- Performance Co Pilot is installed and correctly configured.
- At least 1 system is registered and sending data to the resource optimization.



NOTE

The longer your systems have been sending information to the resource optimization, the more accurate and valuable the recommendations will be.

Procedure

- Navigate to [Red Hat Enterprise Linux > Resource Optimization](#) .
- In the top right corner, click on **Download executive report**.
- You will see a dialog box with the message, **Export successful** and notice the PDF file in your taskbar.

Additional Resources

- See section 3.5 Enabling Kernel Pressure Stall Information (PSI)
- PCP toolkit website: [PCP website](#)

CHAPTER 6. ENABLING NOTIFICATIONS AND INTEGRATIONS IN THE RESOURCE OPTIMIZATION SERVICE

You can enable the notifications service on Red Hat Hybrid Cloud Console to send notifications whenever the resource optimization service detects an issue and generates a suggestion. Using the notifications service frees you from having to continually check the Red Hat Insights for Red Hat Enterprise Linux dashboard for recommendations.

For example, you can configure the notifications service to automatically send an email message whenever the resource optimization service generates a suggestion.

Enabling the notifications service requires three main steps:

- First, an Organization Administrator creates a User access group with the Notifications administrator role, and then adds account members to the group.
- Next, a Notifications administrator sets up behavior groups for events in the notifications service. Behavior groups specify the delivery method for each notification. For example, a behavior group can specify whether email notifications are sent to all users, or just to Organization administrators.
- Finally, users who receive email notifications from events must set their user preferences so that they receive individual emails for each event.

In addition to sending email messages, you can configure the notifications service to pull event data in other ways:

- Using an authenticated client to query Red Hat Insights APIs for event data.
- Using webhooks to send events to third-party applications that accept inbound requests.
- Integrating notifications with applications such as Splunk to route resource optimization recommendations to the application dashboard.

Additional resources

- For more information about how to set up notifications for resource optimization recommendations, see [Configuring notifications and integrations on the Red Hat Hybrid Cloud Console](#).

CHAPTER 7. DISABLING THE RESOURCE OPTIMIZATION SERVICE

7.1. USING ANSIBLE TO DISABLE THE RESOURCE OPTIMIZATION SERVICE

Perform the following steps on each system to disable and uninstall the Insights for Red Hat Enterprise Linux resource optimization service.

Procedure

1. Download the Ansible Playbook with the following command:

```
$ curl -O https://raw.githubusercontent.com/RedHatInsights/ros-backend/v1.0/ansible-playbooks/ros_disable.yml
```

2. Run the Ansible Playbook using command:

```
# ansible-playbook -c local ros_disable_and_clean_up.yml
```

Uninstalling the playbook does not stop or remove the Performance Co-Pilot (PCP) toolkit. Note that PCP may support multiple applications. If you are using PCP exclusively for the resource optimization service, and desire to remove PCP as well, there are a couple options. You can stop and disable the **pmlogger** and **pmcd** services, or remove PCP completely by uninstalling the **pcp** package from the system.

7.2. MANUALLY DISABLING THE RESOURCE OPTIMIZATION SERVICE WITHOUT THE USE OF ANSIBLE

The use of Ansible is recommended to expedite the uninstallation process. If you choose to not use Ansible, use the manual procedure that follows:

Procedure

1. Disable resource optimization service metrics collection by removing this line from **/etc/pcp/pmlogger/control.d/local**

```
LOCALHOSTNAME n y PCP_LOG_DIR/pmlogger/ros -r -T24h10m -c config.ros -v 100Mb
```

2. Restart PCP so that resource optimization service metrics collection is effectively stopped:

```
$ sudo systemctl pmcd pmlogger
```

3. Remove the resource optimization service configuration file

```
$ sudo rm /var/lib/pcp/config/pmlogger/config.ros
```

4. Remove the resource optimization data from the system

```
$ sudo rm -rf /var/log/pcp/pmlogger/ros
```

5. If you are not using PCP for anything else, you can remove it from your system

```
$ sudo yum remove pcp
```

7.3. DISABLING KERNEL PRESSURE STALL INFORMATION (PSI)

Procedure

1. Edit the **/etc/default/grub** file and remove **psi=1** from the GRUB_CMDLINE_LINUX line.
2. Regenerate the grub configuration file.

```
$ sudo grub2-mkconfig -o /boot/grub2/grub.cfg
```

3. Reboot the system.

Verification step

When PSI is disabled, **/proc/pressure** does not exist.

PROVIDING FEEDBACK ON RED HAT DOCUMENTATION

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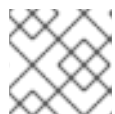
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Procedure

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1. Click the **Feedback** button in the top-right corner of the document to see existing feedback.



NOTE

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2. Highlight the section of the document where you want to provide feedback.
3. Click the **Add Feedback** pop-up that appears near the highlighted text.
A text box appears in the feedback section on the right side of the page.
4. Enter your feedback in the text box and click **Submit**.
A documentation issue is created.
5. To view the issue, click the issue link in the feedback view.