# Setting Up Virtual Host Metrics Daemon on SUSE Linux Enterprise Server

vhostmd is a host-side daemon that collects performance and resource metrics from a virtualization host and securely shares them with resident guest virtual machines on SUSE Linux Enterprise Server. By writing periodic host resource usage data to a designated metrics disk, vhostmd enables guest administrators to analyze performance bottlenecks and monitor host-level health without exposing sensitive administrative control or compromising host security.

**Prerequisites**

- A running instance of SUSE Linux Enterprise Server
- Virtual machines running on the host instance

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# 1 What is a virtual host metrics daemon aka `vhostmd`?

`vhostmd` is a daemon that runs in a host environment and provides a metrics communication channel between the host and guest machines. The daemon provides the guest machine administrator with a limited set of host resource usage data (usually in read-only mode), to help analyze issues with the guest machine.

`vhostdmd` periodically writes metrics to a disk. The metrics to be collected, along with the frequency and storage location of the data, are configurable parameters.

# 2 Getting `vhostmd`

By default, `vhostmd` is not included in the delivered images. Therefore, you must install it before using it:

1. Install the daemon by running:

   ```
   > sudo transactional-update pkg install vhostmd
   ```

2. Reboot your system to switch to the new snapshot.

3. Start the daemon by running:

   ```
   > sudo vhostmd OPTIONS
   ```

   You can use the following options to modify the command behavior:

   - `-v` — for a verbose output
   - `--connect URI`—to pass the URI of the `libvirt` daemon to establish connections to the daemon
   - `-f FILE_PATH` — to pass an alternative configuration file. For details regarding configuration, refer to *Section 4, "Configuration of `vhostmd`"*.
   - `-p PID_FILE` — to create an alternative PID file. The default is `/var/run/vhostmd.pid`.
   - `-u USERNAME` — to use a non-privileged user

You can also run `vhostmd` as `systemd` service:

```
> sudo systemctl enable --now vhostmd
```



### Note: Service restart needed after configuration changes

Whenever you perform changes to configuration as described in *Section 4, "Configuration of vhostmd"*, restart the `vhostmd` service as follows:

```
> sudo systemctl restart vhostmd
```

## 3 Providing collected metrics to a virtual machine

You can make the collected metrics visible to particular virtual machines for further use or just for reading. There are two ways to achieve this. You can either attach the metrics disk using the **`virsh`** command or adjust the domain configuration.

To attach the metrics disk in a read-only mode, run **`virsh`** as follows:

```
> sudo virsh attach-disk VIRTUAL_MACHINE \
  PATH_TO_METRICS_DISC --driver tap \
  --subdriver aio --type disk --mode readonly
```

To change the domain configuration, proceed as follows:

1. Run the command

   ```
   > sudo virsh edit
      GUEST_NAME
   ```

2. Update the `<devices>` section by adding the following snippet:

   ```
   <disk type='block' device='disk'>
     <source dev='/dev/shm/vhostmd0'/>
     <target dev='hdb' bus='ide'/>
     <readonly/>
   </disk>
   ```

   Adjust the `dev` and `dbus` values of the target.

# 4 Configuration of vhostmd

The default configuration file of vhostmd is located in /etc/vhostmd/vhostmd.conf. You can adjust this file to suit your needs. The configuration file is an XML file that must include the <vhostmd> element. <vhostmd> then includes <globals> and <metrics> that are described in the following sections. Use the default configuration file as a reference for custom changes.

## 4.1 The <globals> element

The <globals> element defines the disk storage location, data update frequency and the method of transporting data to guest machines. It contains the following elements:

<disk>
: The element is used to define the path of the disk where metrics data is stored and also the size of the disk. It may contain the following elements:

  - <name> — defines the name of the disk
  - <path> — an absolute path where the disk is mounted
  - <size> — using the unit attribute, specify the maximum size of the metrics. Use k for KB, m for MB.

<update_period>
: Defines how often the metrics are updated. The value is in seconds.

<transport>
: Specifies how the metrics are transported to guest machines. In the case of SUSE Linux Enterprise Server, use the default of virtio.

<virtio>
: Here you can use the following elements:

  - <max_channels>—specifies the maximum number virtion can use between the host and guest systems.
  - <expiration_time>—defines the time interval after which a virtio channel of a virtual machine is closed when being idle. The default value is three times the <update_period>.

## 4.2 The <metrics> element

The <metrics> element contains a list of metrics to be collected. Each metric has two attributes:

type
: Describes the metrics value data type. Possible values are the following: int32, uint32, int64, uint64, real32, real64, string, group and xml.
Use group when a metric returns several values. xml is a versatile form when the metric returns a valid XML.

context
: Defines where the particular metric is collected. Possible values are:

- host for metrics collected on the host machine
- vm for metrics collected on the guest machine

Each metric must have a unique name and a command to run to record the metrics. The following list describes possible elements to define a metric:

<name>
: Defines the unique variable name. If the metric is collected on a virtual machine, you can use the following values here: NAME, ID and UUID. Those values are then replaced with the actual ones of the virtual machine currently being checked.

<action>
: Specifies a command or script to run to collect a metric. For example, to gather total CPU time, use:

```
<action>virsh dominfo NAME | sed 's/: */:/' | \
    gawk -F: '/CPU time/ {print $2;}'<action>
```

<variable>
: if an action retuns a group of values, define variables that store particular data. The element needs to have the following attributes defined:

- name — specify the name of a variable
- type — specify the data type of the variable

# 5 How are the collected metrics stored?

`vhostmd` stores the collected metrics data on the metrics disk in a raw format. The disk contains a 32-byte header followed by the metrics data in XML format.

## 5.1 Metrics XML format

The collected metrics results are similar to the configured metrics definition. The `<metric>` element can have the following attributes:

`type`
: Denotes the data type of the particular metric, for example, `string`.

`context`
: Identifies whether the metric is collected on the host (`host`) or on a virtual machine (`vm`).

`id`
: Used in the `vm` context. Conveys the ID number of the virtual machine.

`uuid`
: Used in the `vm` context. Conveys the Universally Unique Identifier of the virtual machine.

The `<metric>` element contains the following elements:

`<name>`
: Conveys the metric name.

`<value>`
: Conveys the metrics actual value.



### Note: No multiple values within one metric

When the `group` type of a metric has been configured, each configured `<variable>` is stored as a separate metric in the result. For example, the following configuration snippet:

```
<metric type="group" context="host">
  <name>PageRates</name>
  <action>pagerate.pl</action>
  <variable name="PageInRate" type="uint64"/>
```

```
  <variable name="PageFaultRate" type="uint64"/>
</metric>
```

Results in the following snippet:

```
<metric type='uint64' context='host'>
  <name>PageInRate</name>
  <value>0.000000</value>
</metric>
<metric type='uint64' context='host'>
  <name>PageFaultRate</name>
  <value>0.000000</value>
</metric>
```

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