

# Hitachi Storage Plug-in for Prometheus

Version 1.3.0

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## Quick Reference Guide

This document provides information for installing and configuring Hitachi Storage Plug-in for Prometheus.

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## Preface

This document describes and provides instructions for using the provisioning software to configure and perform operations on Hitachi storage systems.

Please read this document carefully to understand how to use these products, and maintain a copy for your reference.

### Intended audience

This document is intended for system administrators, Hitachi Vantara representatives, and authorized service providers who install, configure, and operate Hitachi storage systems.

Readers of this document should be familiar with the following:

- Data processing and RAID storage systems and their basic functions.
- Hitachi storage systems.

### Release notes

Read the release notes before installing and using this product. They may contain requirements or restrictions that are not fully described in this document or updates or corrections to this document. Release notes are available on the Hitachi Vantara Support Website: <https://knowledge.hitachivantara.com/Documents>.

Related documents for storage adapters and drivers are available at [https://knowledge.hitachivantara.com/Documents/Adapters\\_and\\_Drivers/Storage\\_Adapters\\_and\\_Drivers](https://knowledge.hitachivantara.com/Documents/Adapters_and_Drivers/Storage_Adapters_and_Drivers).




### Document conventions




This document uses the following typographic conventions:

| Convention  | Description  |
|-------------|--|
| <b>Bold</b> | <ul style="list-style-type: none"><li>▪ Indicates text in a window, including window titles, menus, menu options, buttons, fields, and labels. Example:<br/>Click <b>OK</b>.</li><li>▪ Indicates emphasized words in list items.</li></ul> |

| Convention          | Description   |
|---------------------|---|
| <i>Italic</i>       | <ul style="list-style-type: none"> <li>Indicates a document title or emphasized words in text.</li> <li>Indicates a variable, which is a placeholder for actual text provided by the user or for output by the system. Example: <pre>pairdisplay -g group</pre> <p>(For exceptions to this convention for variables, see the entry for angle brackets.)</p> </li> </ul> |
| Monospace           | Indicates text that is displayed on screen or entered by the user.<br>Example: <code>pairdisplay -g oradb</code>  |
| < > angle brackets  | Indicates variables in the following scenarios: <ul style="list-style-type: none"> <li>Variables are not clearly separated from the surrounding text or from other variables. Example: <pre>Status-&lt;report-name&gt;&lt;file-version&gt;.csv</pre> </li> <li>Variables in headings.</li> </ul>  |
| [ ] square brackets | Indicates optional values. Example: [ a   b ] indicates that you can choose a, b, or nothing.   |
| { } braces          | Indicates required or expected values. Example: { a   b } indicates that you must choose either a or b.   |
| vertical bar        | Indicates that you have a choice between two or more options or arguments. Examples:<br>[ a   b ] indicates that you can choose a, b, or nothing.<br>{ a   b } indicates that you must choose either a or b.  |

This document uses the following icons to draw attention to information:

| Icon  | Label     | Description   |
|---|-----------|---|
|  | Note      | Calls attention to additional information.  |
|  | Tip       | Provides helpful information, guidelines, or suggestions for performing tasks more effectively. |
|  | Important | Highlights information that is essential to the completion of a task.                           |

| Icon  | Label   | Description  |
|---|---------|--|
|  | Caution | Warns the user of adverse conditions and/or consequences (for example, disruptive operations, data loss, or a system crash). |
|  | CAUTION | Warns the user of a hazardous situation that, if not avoided, could result in major or minor injury.                         |
|  | WARNING | Warns the user of a hazardous situation which, if not avoided, could result in death or serious injury.                      |

## Conventions for storage capacity values

Physical storage capacity values (for example, disk drive capacity) are calculated based on the following values:

| Physical capacity unit | Value                       |
|------------------------|-----------------------------|
| 1 kilobyte (KB)        | 1,000 ( $10^3$ ) bytes      |
| 1 megabyte (MB)        | 1,000 KB or $1,000^2$ bytes |
| 1 gigabyte (GB)        | 1,000 MB or $1,000^3$ bytes |
| 1 terabyte (TB)        | 1,000 GB or $1,000^4$ bytes |
| 1 petabyte (PB)        | 1,000 TB or $1,000^5$ bytes |
| 1 exabyte (EB)         | 1,000 PB or $1,000^6$ bytes |

Logical capacity values (for example, logical device capacity, cache memory capacity) are calculated based on the following values:

| Logical capacity unit | Value  |
|-----------------------|--|
| 1 block               | 512 bytes  |
| 1 cylinder            | Mainframe: 870 KB<br>Open-systems:<br><ul style="list-style-type: none"> <li>▪ OPEN-V: 960 KB</li> <li>▪ Others: 720 KB</li> </ul> |
| 1 KB                  | $1,024 (2^{10})$ bytes   |
| 1 MB                  | 1,024 KB or $1,024^2$ bytes  |

| Logical capacity unit | Value                                |
|-----------------------|--------------------------------------|
| 1 GB                  | 1,024 MB or 1,024 <sup>3</sup> bytes |
| 1 TB                  | 1,024 GB or 1,024 <sup>4</sup> bytes |
| 1 PB                  | 1,024 TB or 1,024 <sup>5</sup> bytes |
| 1 EB                  | 1,024 PB or 1,024 <sup>6</sup> bytes |

## Accessing product documentation

Product user documentation is available on the Hitachi Vantara Support Website: <https://knowledge.hitachivantara.com/Documents>. Check this site for the most current documentation, including important updates that may have been made after the release of the product.

## Comments

Please send comments to [doc.comments@hitachivantara.com](mailto:doc.comments@hitachivantara.com). Include the document title and number, including the revision level (for example, -07), and refer to specific sections and paragraphs whenever possible. All comments become the property of Hitachi Vantara LLC.

**Thank you!**

## Getting help

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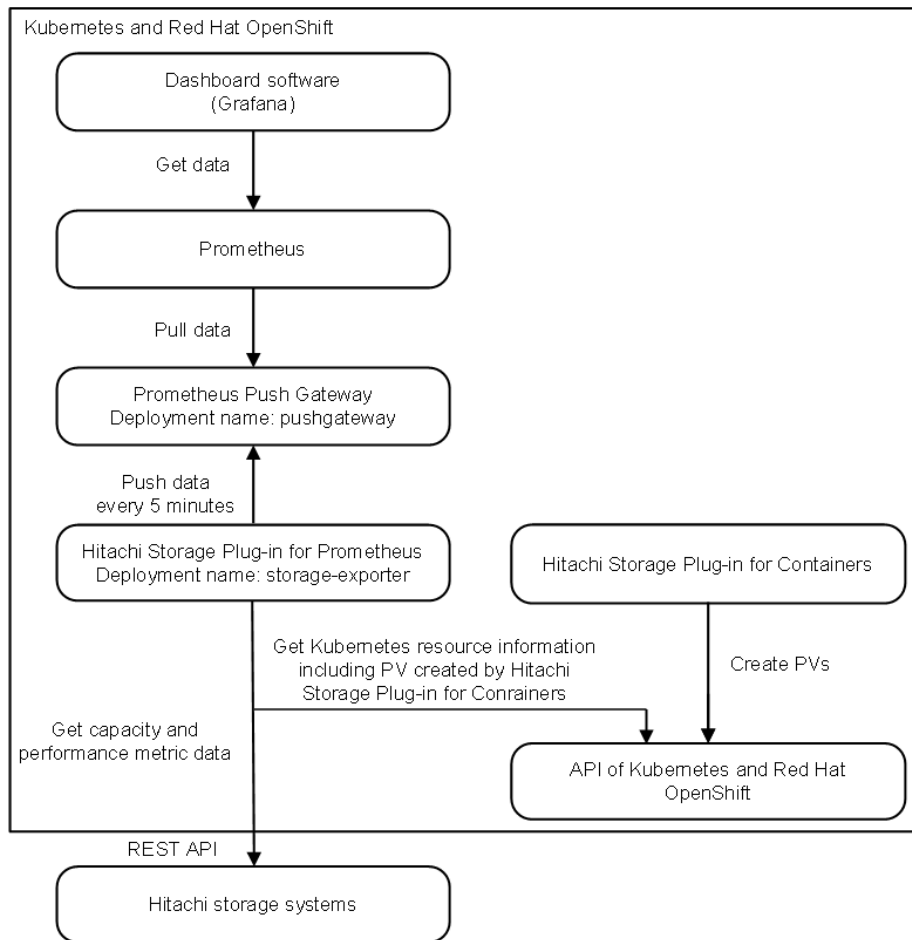
## Chapter 1: Overview

Container monitoring is required for stable service operation because networks, servers, and storage systems can cause performance bottlenecks. The Kubernetes administrator must troubleshoot problems when they occur, but to do so they must monitor both the Kubernetes resources and the hardware resources. Even though these resources have independent monitoring, the Kubernetes administrator had no way to monitor both with a single tool, forcing them to use multiple tools to monitor the Kubernetes resources and the Hitachi storage system resources. The Hitachi Storage Plug-in for Prometheus - a Prometheus exporter for Hitachi storage systems - dramatically reduces the troubleshooting effort because this single tool enables the Kubernetes administrator to monitor metrics of both the Kubernetes resources and the Hitachi storage system resources. Hitachi Storage Plug-in for Prometheus uses Prometheus to collect metrics from Kubernetes resources and the Hitachi storage system resources. Then, it uses Grafana to visualize those metrics for easy evaluation by the Kubernetes administrator. Prometheus collects storage system metrics such as capacity, IOPS, and transfer rate in five-minute intervals. For a complete list of all the metrics collected, see [Metric List \(on page 19\)](#).

The following diagram illustrates the flow of metric collection using Storage Plug-in for Prometheus.



**Note:** The collection of metrics of Stretched PVC of Hitachi Storage Plug-in for Containers is not supported.



## Supported Platforms

For details on supported platforms, see the Hitachi Storage Plug-in for Prometheus Release Notes.



**Note:** Storage Plug-in for Prometheus does not support working with Hitachi Ops Center Analyzer.

## Container orchestrators to be supported

| Container orchestrator               | Remarks |
|--------------------------------------|---------|
| Red Hat OpenShift Container Platform | —       |
| Kubernetes                           | —       |

For details on supported versions, see the Release Notes.

---

## Chapter 2: Installing Storage Plug-in for Prometheus

Install Storage Plug-in for Prometheus and Prometheus Pushgateway. Storage Plug-in for Prometheus and Prometheus Pushgateway are containers that are installed as a Kubernetes Deployment.

### Before you begin

- Download the Storage Plug-in for Prometheus installation media kit from the Hitachi Support Connect Portal: <https://support.hitachivantara.com/en/user/home.html>. A Hitachi login credential is required.
- Install the Kubernetes or Red Hat OpenShift Container Platform.
- Install Hitachi Storage Plug-in for Containers in Kubernetes or Red Hat OpenShift Container Platform.
- Configure StorageClass for Hitachi Storage Plug-in for Containers in Kubernetes or Red Hat OpenShift Container Platform.

### Procedure

1. Get the Hitachi Storage Plug-in for Prometheus package.
2. Load the Storage Plug-in for Prometheus image into your local environment:

```
$ docker load -i program/storage-exporter.tar
```

3. Rename and push the Storage Plug-in for Prometheus image into your container registry. For *<Container Registry>*, specify your registry host name and port. For *<version>*, specify your version of Storage Plug-in for Prometheus. When specifying the version, add *v* before the number (for example, if the version number is 1.0.0, specify *v1.0.0*).

```
$ docker tag localhost/hitachi/storage-plugin-for-prometheus:<version>  
<Container Registry>/hitachi/storage-plugin-for-prometheus:<version>  
$ docker push <Container Registry>/hitachi/storage-plugin-for-  
prometheus:<version>
```

4. Replace *<Container Registry>* in the `exporter.yaml` path with your registry host name and port.

```
$ sed -i.bak -e "s/__REGISTRY__/<Container Registry>/g" yaml/exporter.yaml
```

5. Modify the values of the `secret-sample.yaml` file for your environment.

For details, see [Configuring Storage Plug-in for Prometheus using the YAML file \(on page 16\)](#).

```
apiVersion: v1
kind: Secret
metadata:
  name: storage-exporter-secret
  namespace: hspc-monitoring-system
type: Opaque
stringData:
  storage-exporter.yaml: |-
    storages:
    - serial: 54321
      url: http://172.16.1.1
      user: MaintenanceUser
      password: Password
```

**6. Create the namespace `hspc-monitoring-system` for Storage Plug-in for Prometheus:**

```
$ kubectl apply -f yaml/namespace.yaml
```

**7. Install Storage Plug-in for Prometheus and Prometheus Pushgateway.**

```
$ kubectl apply -f yaml/secret-sample.yaml -f yaml/exporter.yaml
```

---

## Chapter 3: Deploying and configuring Prometheus and Grafana

After installing Storage Plug-in for Prometheus and Prometheus Pushgateway, you must deploy and configure Prometheus and Grafana. Prometheus is monitoring software that collects metrics for Storage Plug-in for Prometheus via Prometheus Pushgateway. Grafana is dashboard software that visualizes metrics in Prometheus.

You can deploy Prometheus and Grafana to your production environment or a test environment.

### Deploying Prometheus and Grafana to a production environment

You can deploy Prometheus and Grafana to your production environment.

For more information, see <https://prometheus.io/> and <https://grafana.com/>.

#### Before you begin

Download and deploy Prometheus and Grafana software to your production environment. For more information, see <https://prometheus.io/> and <https://grafana.com/>.

#### Procedure

1. Connect Prometheus to Pushgateway. In the `prometheus.yml` file, locate `scrape_configs`, and then add the following:

```
scrape_configs:
- job_name: 'hspc_monitoring_job'
  scrape_interval: 1m
  honor_labels: true
  static_configs:
  - targets:
    - pushgateway.hspc-monitoring-system.svc.cluster.local:9091
```

2. Import sample dashboard JSON file `grafana/sample.json` to Grafana.



**Note:** This sample dashboard was exported from Grafana 7 and it may not be compatible with other Grafana versions.

## Deploying Prometheus and Grafana to a test environment

You can deploy Prometheus and Grafana to a test environment with sample manifests. This procedure is only for testing or demo purposes.

For deploying to a production environment, see [Deploying Prometheus and Grafana to a production environment \(on page 12\)](#).

### Procedure

1. In the `grafana-prometheus-sample.yaml` file, replace `StorageClass` of with your own `StorageClass`.

```
$ sed -i.bak -e "s/sc-sample/<StorageClass>/g" yaml/grafana-prometheus-sample.yaml
```

2. (Optional) Modify the Grafana service.

The `grafana-prometheus-sample.yaml` file exposes Grafana as a NodePort with a random node port. If you want to expose Grafana in a different way, modify the `grafana-prometheus-sample.yaml` file.

3. (For Red Hat OpenShift Container Platform only) Create security context constraints (SCC):

```
$ oc apply -f yaml/scc-for-openshift.yaml
```

4. Deploy Grafana and Prometheus.

```
$ kubectl apply -f yaml/grafana-prometheus-sample.yaml
```

5. Access Grafana.

If you use NodePort, access Grafana with `<Your Node IP Address>:<Grafana Port>`. You can identify `<Grafana Port>` by using the following command.

```
$ kubectl get svc -n hspc-monitoring-system
```

If you expose the Grafana, please get endpoint by yourself. The Grafana user/password are admin/secret.

## Set up logging

Logs can help you for debugging problems and monitoring. Redirect the Storage Plug-in for Prometheus logs to any files or logging backend.

For more details, see <https://kubernetes.io/docs/concepts/cluster-administration/logging/>.

---

## Chapter 4: Configuring Storage Plug-in for Prometheus

You can configure Storage Plug-in for Prometheus by modifying the environment variables or modifying the parameters in the `storage-exporter.yaml` file.

### Configuring Storage Plug-in for Prometheus using environment variables

Configure Storage Plug-in for Prometheus (Deployment name: `storage-exporter`) with the following environment variables.

| Environment variable           | Default value                                      | Description   |
|--------------------------------|--|---|
| SPC_PUSHGATEWAY_URL            | http://pushgateway:9091                            | Prometheus Pushgateway URL.   |
| SPC_JOB_NAME                   | hspc_monitoring_job                                | Prometheus job name. For details, see <a href="https://prometheus.io/docs/concepts/jobs_instances/">https://prometheus.io/docs/concepts/jobs_instances/</a> .   |
| SPC_CONF_PATH                  | /spc/storage-exporter/config/storage-exporter.yaml | Configuration file path of Storage Plug-in for Prometheus.  |
| SPC_VERIFY_CERTIFICATE         | false  | If true, Storage Plug-in for Prometheus verifies the TLS certificate.   |
| SPC_ENABLE_DEBUG_LOG           | false  | If true, Storage Plug-in for Prometheus logs the debug level. This is set as true in the <code>exporter.yaml</code> file. If the log becomes too long, reset this value to false.   |
| SPC_INTERVAL                   | 300  | Data collection interval in seconds. Available values are 300-600. See <a href="#">Troubleshooting data collection issues (on page 25)</a> .  |
| SPC_DISABLE_METRIC_NAME_PREFIX | false  | If true, the prefix "spc_" is deleted from the metric name. This environment variable is for preserving backwards compatibility. For details, see <a href="#">Upgrading Storage Plug-in for Prometheus (on page 17)</a> . |
| TZ                             | UTC  | Timezone for logging. For example, Asia/Tokyo.  |

## Configuring Storage Plug-in for Prometheus using the YAML configuration file

Configure Storage Plug-in for Prometheus with the YAML file as Secret. The configuration file is defined in `yaml/secret-sample.yaml` as Secret. Then, mount it to Storage Plug-in for Prometheus. The environment variable `SPC_CONF_PATH` defines the mount path.

The following table describes the `storage-exporter.yaml` parameters.

| Parameter                      | Description   |
|--------------------------------|---|
| <code>storages</code>          | List of storage system settings.  |
| <code>storages.serial</code>   | Storage system serial number.   |
| <code>storages.url</code>      | Storage system API URL.<br>Use the IP address of the SVP for VSP 5000 series. Use the IP address of the storage controller for the following: VSP E series, VSP F350, F370, F700, F900, and VSP G350, G370, G700, G900. |
| <code>storages.user</code>     | User name for the storage system. The user must belong to the Administrator user group.   |
| <code>storages.password</code> | Password for user.  |



**Note:** All storage system resources must be made available to Storage Plug-in for Prometheus. For details, see [Managing resource groups](#).

The following is a sample of Secret configuration file:

```
apiVersion: v1
kind: Secret
metadata:
  name: storage-exporter-secret
  namespace: hspc-monitoring-system
type: Opaque
stringData:
  storage-exporter.yaml: |-
    storages:
    - serial: 54321
      url: http://172.16.1.1
      user: MaintenanceUser
      password: Password
```

---

## Chapter 5: Upgrading Storage Plug-in for Prometheus

You can upgrade Storage Plug-in for Prometheus and Prometheus Pushgateway.

### Before you begin

Upgrade Hitachi Storage Plug-in for Containers.



**Note:** In version 1.2.0 and later, by default the prefix "spc\_" is attached to all metric names. If you want to use a metric name from version 1.1.0 or earlier, set the environment variable `SPC_DISABLE_METRIC_NAME_PREFIX` of Deployment `storage-exporter` to `true`.

### Procedure

1. Get the Hitachi Storage Plug-in for Prometheus package.
2. Load the Storage Plug-in for Prometheus image into your local environment:

```
$ docker load -i program/storage-exporter.tar
```

3. Rename and push the Storage Plug-in for Prometheus image into your container registry. For `<Container Registry>`, specify your registry host name and port. For `<version>`, specify your version of Storage Plug-in for Prometheus. When specifying the version, add `v` before the number (for example, if the version number is 1.0.0, specify `v1.0.0`).

```
$ docker tag localhost/hitachi/storage-plugin-for-prometheus:<version>
<Container Registry>/hitachi/storage-plugin-for-prometheus:<version>
$ docker push <Container Registry>/hitachi/storage-plugin-for-
prometheus:<version>
```

4. Replace `<Container Registry>` in the `exporter.yaml` path with your registry host name and port.

```
$ sed -i.bak -e "s/___REGISTRY___/<Container Registry>/g" yaml/exporter.yaml
```

5. Upgrade Storage Plug-in for Prometheus and Prometheus Pushgateway.

```
$ kubectl apply -f yaml/exporter.yaml
```

---

## Chapter 6: Uninstalling Storage Plug-in for Prometheus

Uninstalling Storage Plug-in for Prometheus deletes the Storage Plug-in for Prometheus and Prometheus Pushgateway. The data collected by Storage Plug-in for Prometheus is not deleted if you deploy the Prometheus in a different namespace from the hspc-monitoring-system.

Run the following command to uninstall Storage Plug-in for Prometheus.

```
$ kubectl delete -f yam1/
```

---

## Chapter 7: Metric List

Hitachi Storage Plug-in for Prometheus uses Prometheus to collect metrics from Kubernetes resources and the Hitachi storage system resources. The following is the list of collected metrics. By setting the environment variable `SPC_DISABLE_METRIC_NAME_PREFIX` to true, you can disable the prefix "spc\_" of each metric name.

| Metric                                 | Description   | Labels   |
|--|---|--|
| spc_volume_total_capacity              | Total volume capacity.  | persistentvolume,<br>persistentvolumeclaim,<br>namespace, storageclass,<br>serial_id, ldev_id_dec,<br>ldev_id_hex, pool_id |
| spc_volume_used_capacity               | Used volume capacity. There is a difference between capacity from the storage system and capacity from the OS. You must also verify the capacity from the OS. |  |
| spc_volume_free_capacity               | Free volume capacity. There is difference between capacity from the storage system and capacity from the OS. You must also verify the capacity from the OS.   |  |
| spc_volume_used_capacity_rate          | Used volume capacity rate. There is a difference between capacity from storage system and OS. You must also verify the capacity from OS.                      |  |
| spc_volume_total_read_iops             | Sum of the random and sequential read IOPS for volume.  |  |
| spc_volume_random_read_iops            | Random read IOPS for volume.  |  |
| spc_volume_sequential_read_iops        | Sequential read IOPS for volume.  |  |
| spc_volume_total_write_iops            | Sum of random and sequential write IOPS for volume.   |  |
| spc_volume_random_write_iops           | Random write IOPS for volume.   |  |
| spc_volume_sequential_write_iops       | Sequential write IOPS for volume.   |  |
| spc_volume_average_write_response_time | Average write response time (micro sec).  |  |
| spc_volume_average_read_response_time  | Average read response time (micro sec).   |  |

| Metric                                    | Description   | Labels  |
|---|---|---|
| spc_volume_total_read_transfer_rate       | Sum of random and sequential read transfer rate for volume (bytes/sec).   |   |
| spc_volume_random_read_transfer_rate      | Random read transfer rate for volume (bytes/sec).   |   |
| spc_volume_sequential_read_transfer_rate  | Sequential read transfer rate for volume (bytes/sec).   |   |
| spc_volume_total_write_transfer_rate      | Sum of random and sequential write transfer rate for volume (bytes/sec).  |   |
| spc_volume_random_write_transfer_rate     | Random write transfer rate for volume (bytes/sec).  |   |
| spc_volume_sequential_write_transfer_rate | Sequential write transfer rate for volume (bytes/sec).  |   |
| spc_volume_read_cache_hit_rate            | Read cache hit rate for volume.   |   |
| spc_pod_volume_total_capacity             | Total volume capacity with pod name.  | persistentvolume, persistentvolumeclaim, namespace, storageclass, serial_id, ldev_id_dec, ldev_id_hex, pool_id, pod |
| spc_pod_volume_used_capacity              | Used volume capacity with pod name. There is a difference between capacity from storage system and from OS. You must also verify the capacity from OS.      |   |
| spc_pod_volume_free_capacity              | Free volume capacity with pod name. There is a difference between capacity from storage system and from OS. You must also verify the capacity from OS.      |   |
| spc_pod_volume_used_capacity_rate         | Used volume capacity rate with pod name. There is a difference between capacity from storage system and from OS. You must also verify the capacity from OS. |   |
| spc_pod_volume_total_read_iops            | Sum of random and sequential read IOPS for volume with pod name.  |   |

| Metric  | Description  | Labels |
|---|--|--------|
| spc_pod_volume_random_read_iops               | Random read IOPS for volume with pod name.   |        |
| spc_pod_volume_sequential_read_iops           | Sequential read IOPS for volume with pod name.   |        |
| spc_pod_volume_total_write_iops               | Sum of random and sequential write IOPS for volume with pod name.                      |        |
| spc_pod_volume_random_write_iops              | Random write IOPS for volume with pod name.  |        |
| spc_pod_volume_sequential_write_iops          | Sequential write IOPS for volume with pod name.  |        |
| spc_pod_volume_average_write_response_time    | Average write response time for volume with pod name (micro sec).                      |        |
| spc_pod_volume_average_read_response_time     | Average read response time for volume with pod name (micro sec).                       |        |
| spc_pod_volume_total_read_transfer_rate       | Sum of random and sequential read transfer rate for volume with pod name (bytes/sec).  |        |
| spc_pod_volume_random_read_transfer_rate      | Random read transfer rate for volume with pod name (bytes/sec).                        |        |
| spc_pod_volume_sequential_read_transfer_rate  | Sequential read transfer rate for volume with pod name (bytes/sec).                    |        |
| spc_pod_volume_total_write_transfer_rate      | Sum of random and sequential write transfer rate for volume with pod name (bytes/sec). |        |
| spc_pod_volume_random_write_transfer_rate     | Random write transfer rate for volume with pod name (bytes/sec).                       |        |
| spc_pod_volume_sequential_write_transfer_rate | Sequential write transfer rate for volume with pod name (bytes/sec).                   |        |

| Metric                             | Description                                   | Labels                           |
|------------------------------------|---|----------------------------------|
| spc_pod_volume_read_cache_hit_rate | Read cache hit rate for volume with pod name. |                                  |
| spc_sc_pool_used_capacity_rate     | Used pool capacity rate.                      | storageclass, serial_id, pool_id |
| spc_sc_pool_total_capacity         | Total capacity of storage pool (MiB).         |                                  |
| spc_sc_pool_free_capacity          | Free capacity of storage pool (MiB).          |                                  |
| spc_sc_pool_used_capacity          | Used capacity of storage pool (MiB).          |                                  |

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## Chapter 8: Troubleshooting

Use the logs and suggested procedures to troubleshoot issues with Storage Plug-in for Prometheus.

### Logs and Information

The following table lists logs and information that are helpful when troubleshooting.

| Log / Information                            | Description  |
|--|--|
| Kubernetes and OpenShift cluster information | To view Kubernetes version, node, logs, and so on.<br>Command example:<br><pre>\$ kubectl cluster-info dump --all-namespaces &gt; dump.txt</pre> |
| Version of Storage Plug-in for Prometheus    | The version of Storage Plug-in for Prometheus is listed at the head of the <code>storage-exporter</code> log file.                               |
| storage-exporter log                         | To verify Deployment <code>storage-exporter</code> logs.<br>Command example:<br><pre>\$ kubectl logs -n hspc-monitoring-system</pre>             |

| Log / Information   | Description   |
|---|---|
|   | storage-exporter-79fb7c4459-qwgdv   |
| Pod, PersistentVolumeClaim, and StorageClass that are not collecting data | <p>Command examples.</p> <pre>\$ kubectl get pod -o yaml &lt;Pod&gt;</pre> <pre>\$ kubectl get pvc -o yaml &lt;PVC&gt;</pre> <pre>\$ kubectl get sc -o yaml &lt;SC&gt;</pre>  |
| storage-exporter configuration file                                       | The storage-exporter configuration file is named <code>storage-exporter.yaml</code> in Secret and <code>storage-exporter-secret</code> by default setting.  |
| Version of Storage Plug-in for Containers                                 | For details, see Hitachi Storage Plug-in for Containers Quick Reference Guide.  |
| Logs of hspc-csi-controller   | For details, see Hitachi Storage Plug-in for Containers Quick Reference Guide.  |
| Logs of hspc-csi-node   | For details, see Hitachi Storage Plug-in for Containers Quick Reference Guide.  |
| Storage dump log  | If a Service Processor (SVP) is used, get the normal dump file. If an SVP is not used, get the system dump with Maintenance utility. For details see, <a href="#">Hitachi Virtual Storage Platform System Administrator Guide</a> . |

## Troubleshooting memory limits issue

When the pod status of `storage-exporter` or `pushgateway` is OOMKilled, adjust the memory limits. For details, see <https://kubernetes.io/docs/tasks/configure-pod-container/assign-memory-resource/>.

## Troubleshooting data collection issues

Data refresh happens every five minutes, but it might take longer depending on the number of storage system resources. If the data does not refresh every five minutes and you want to keep the collection interval constant, then extend the collection interval using the `SPC_INTERVAL` environment variable.

If data collection takes more than eleven minutes in a large-scale environment, the IOPS, Transfer Rate, and Cache Hit Rate data become unavailable because Storage Plug-in for Prometheus cannot ensure the calculation results of these metrics. The time required for data collection mainly depends on the number of PersistentVolumeClaim (PVC) files. Remove any unused PVC files to shorten the data collection time.

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