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# **PowerMax for Splunk Documentation**

***Release 3.0.0.0***

**Dell**

**Sep 04, 2022**



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## **ABOUT THE POWERMAX FOR SPLUNK ADD-ON AND APP**

PowerMax for Splunk provides Splunk users with a backend Technology Add-on (TA) and frontend app to simplify interaction with Splunk Enterprise environments.

The Splunk Technology Add-on for PowerMax allows a Splunk Enterprise administrator to collect inventory, performance information, alert, and audit log information from VMAX/PowerMax storage arrays. The TA is a wrapper around the opensource library [PyU4V](#), providing programmatic access to the Unisphere for PowerMax REST API. You can directly analyse data use it as a contextual data feed to correlate with other operational or security data in Splunk Enterprise.

The Splunk App for Dell EMC PowerMax allows a Splunk Enterprise administrator to data from PowerMax arrays through the TA and present them in pre-built dashboards, tables, and time charts for in-depth analysis.

The TA and App can be downloaded from the links below:

- [Dell EMC PowerMax Add-on for Splunk Enterprise](#)
- [Dell EMC PowerMax App for Splunk Enterprise](#)

From the PowerMax for Splunk 3.x release code for both the TA and app will be actively managed and maintained from the public Dell GitHub repo. The source for both code can be viewed and downloaded from the links below:

- [Dell EMC PowerMax Add-on for Splunk Enterprise source](#)
- [Dell EMC PowerMax App for Splunk Enterprise source](#)



## WHAT'S NEW IN POWERMAX FOR SPLUNK 3.0

- New categories have been added:
  - Masking View
  - IP Interface
  - iSCSI Target
  - Snapshot Policies
  - RDF Groups
  - Metro DR
  - Audit Logs
- The TA has been completely overhauled to integrate PyU4V to provide all required Unisphere for PowerMax REST API functionality.
- Users can now specify if they want to collect all metrics, key-performance indicator (KPI) metrics, or a custom set of metrics for each supported category in the PowerMax for Splunk TA.
- The now retired VMAX for Splunk sizer has been removed as a standalone script from the PowerMax for Splunk TA in favour of integrating its functionality directly into the TA. Now when a collection run exceeds the interval set for a given data input a warning message will appear in the logs along with a recommended interval to set.
- The TA has multiple code efficiency improvements to move to hash lookups over list iterations and use dictionaries and sets over lists where possible.
- The TA now has a full suite of unit tests and CI tests with full coverage of all code to improve reliability of submitted code and any future fixes.
- The TA now conforms to PEP8 and PyLint industry Python coding standards.
- The App has been redesigned so it will run entirely on KPI metrics. This is to cut down on the amount of data ingested into Splunk without impacting the functionality of the front end app.
- The App dashboard filter parameters are now bi-directional, they can be selected in any order and all other filter options will update accordingly to keep searches valid for your environment.
- The App dashboard charts have been set to use logarithmic scale on the y-axis instead of linear, this allows for better visualisation of results when there is a wide range on the y-axis.
- Documentation has had a complete redesign and is now also hosted on readthedocs.io.





## CONTACT

For all issues or queries please contact `powermax.splunk.support@dell.com`. When contacting please include the following information:

- Detailed information about the problem you are having
- PowerMax for Splunk version
- Unisphere version
- Splunk Enterprise version
- Splunk Operating system version
- PowerMax for Splunk TA logs and splunkd logs if required

Starting in PowerMax for Splunk 3.x you can open GitHub issues or discuss topics related to PowerMax and Splunk. Feel free to open issues or topics if this is your preferred method of communication. You can find out more support information including where to get logs in [Support](#).



## **HOURS OF OPERATION**

Working Hours - Ireland (GMT+00:00):

Monday	08:00 - 16:30
Tuesday	08:00 - 16:30
Wednesday	08:00 - 16:30
Thursday	08:00 - 16:30
Friday	08:00 - 15:30
Saturday	Closed
Sunday	Closed

Holidays Observed 2021:

New Year's Day	1st January
Saint Patrick's Day	17th March
Easter Monday	5th April
May Bank Holiday	3rd May
June Bank Holiday	7th June
August Bank Holiday	2nd August
October Bank Holiday	25th October
Christmas Day	25th December
Saint Stephen's Day	26th December



## INSTALLATION

### 5.1 Supported Versions

<b>PowerMax for Splunk</b>	3.0
<b>Technology Add-On</b>	3.0.0.0
<b>App</b>	3.0.0.0
<b>Minimum Unisphere Version</b>	9.2.0.0
<b>Array Model</b>	VMAX-3, VMAX AFA, PowerMax
<b>Array uCode</b>	HyperMax OS, PowerMax OS
<b>Minimum Splunk Version</b>	Splunk Enterprise 8.1
<b>Platforms</b>	Linux, Windows
<b>Python</b>	Splunk Native 3.7

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**Note:** To get full support of all features in PowerMax for Splunk 3.x you will need to have your array u-code at level 5978.7xx.xxx (Hickory SR) or newer and use both Solutions Enabler 9.2.1 and Unisphere for PowerMax 9.2.1. PowerMax for Splunk uses new efficiency statistics which are only available in the Hickory SR release. If your array is lower than 5978.7xx.xxx then these statistics will not be reported on in PowerMax for Splunk.

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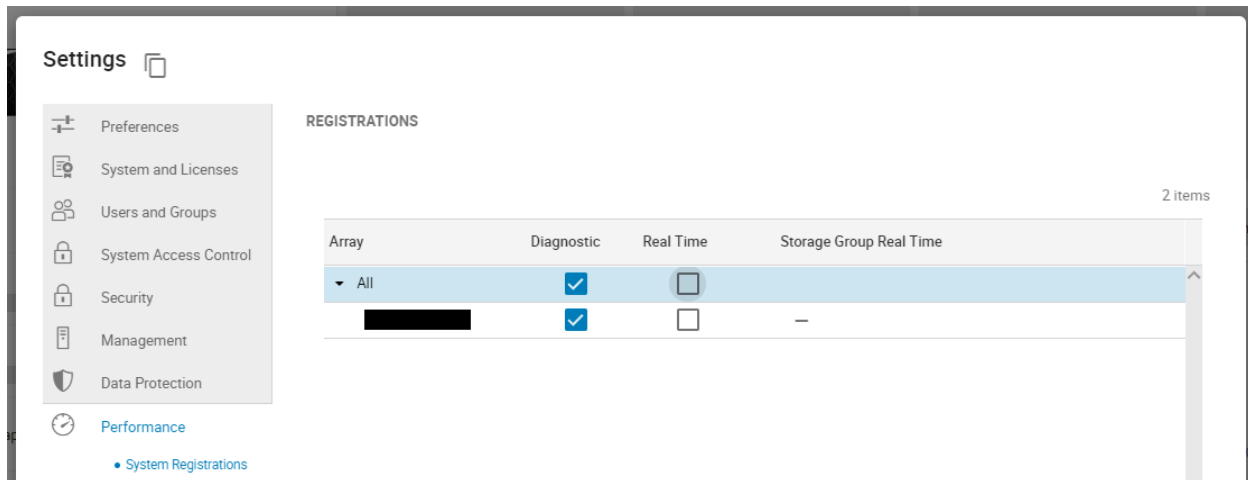
**Note:** PowerMax for Splunk has been tested and verified only against Python 3.x. There is **no** support for Python 2.x, it reached end-of-life in January 2020.

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### 5.2 Enable Unisphere Performance Metric Collection

To enable Splunk to gather performance data on the array(s) in your environment it is necessary to first enable performance metrics for the given array(s) by registering the system to collect performance data. To register your array(s) follow these steps:

1. Log in to Unisphere and navigate to **Settings > Performance > System Registrations**.
2. Beside **All** click the arrow to reveal the local arrays to that instance of Unisphere.
3. For each array that you want to register for performance metrics check the box under **Diagnostic**.



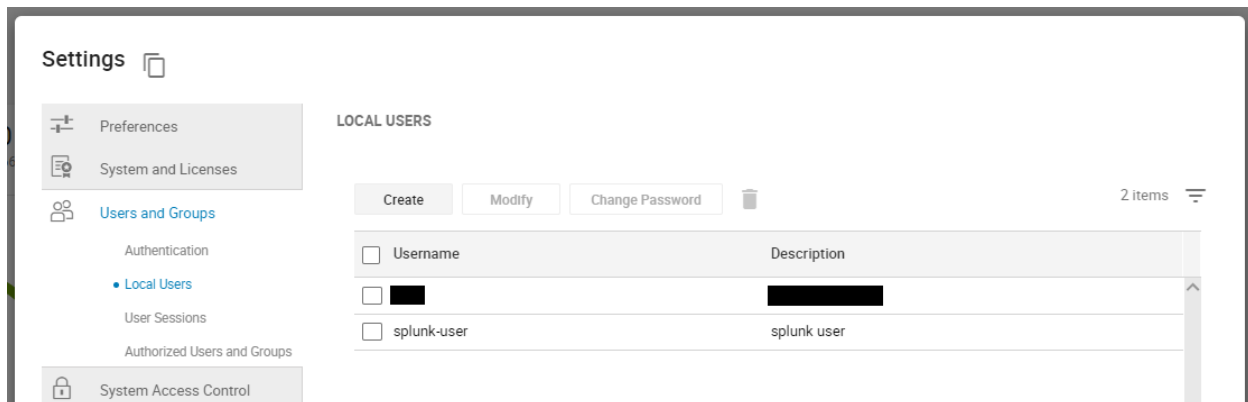
5. Click **Apply** to apply the changes.
4. With the registration process complete after 30 minutes Unisphere will start recording performance metrics which can be ingested into Splunk.

For more information on Unisphere for PowerMax performance registrations please consult the official guide via the Unisphere UI in **Help Options > Online Help**.

## 5.3 Setup Unisphere User Account

It is highly recommended that before using PowerMax for Splunk to capture data a Splunk specific user profile is created in Unisphere with the required read-only roles.

1. Navigate to **Settings > Users and Groups > Local Users**, click **Create** to create a new user.



2. Set the **Username** and **Password** as standard, select the array you want to collect data for in Splunk under the **System** heading.
3. Set the following roles only; **Auditor**, **Monitor**, and **PerfMonitor**. PowerMax for Splunk does not require any further roles.

**Create Local User**

Username \*  
splunk-user

Description  
user profile for splunk metrics collection

Password \*  
...

Confirm Password \*  
...

System	Roles
[Redacted]	<input type="checkbox"/> Admin <input type="checkbox"/> SecurityAdmin <input type="checkbox"/> StorageAdmin <input checked="" type="checkbox"/> Auditor <input checked="" type="checkbox"/> PerfMonitor <input type="checkbox"/> DSA Fast Hinting
	<input type="checkbox"/> Local Replication <input type="checkbox"/> Remote Replication <input type="checkbox"/> Device Management <input checked="" type="checkbox"/> Monitor <input type="checkbox"/> None

4. Click OK to create the user. It is now ready for use in Splunk data input configuration.

## 5.4 SSL Configuration

SSL is enabled by default in the TA when adding inputs. In order to retrieve the required certificate from Unisphere follow the following steps:

1. Get the CA certificate of the Unisphere server. This pulls the CA cert file and saves it as .pem file:

```
$ openssl s_client -showcerts -connect {unisphere_host}:8443 \
  </dev/null 2> /dev/null|openssl x509 -outform PEM > unisphere.pem
```

Where {unisphere\_host} is the hostname or IP address of your Unisphere for PowerMax server. By default Unisphere uses port 8443 so you will need to change this if not using the default Unisphere port.

**Note:** Step 2 is optional, if you prefer you can specify the path to the certificate when configuring your data inputs in Splunk. If you prefer this method please skip to step 3.

2. OPTIONAL STEP: If you want to add the cert to the system certificate bundle so no certificate path is specified in the PowerMax data input, copy the .pem file to the system certificate directory as a .crt file:

```
$ sudo cp unisphere.pem /usr/share/ca-certificates/unisphere.crt
```

Update CA certificate database with the following commands:

```
$ sudo dpkg-reconfigure ca-certificates
$ sudo update-ca-certificates
```

Check that the new `unisphere.crt` certificate will activate by selecting `ask` in the new dialog window. If it is not enabled for activation, use the up and down keys to select, and the space key to enable or disable.

3. If step 2 is skipped, the cert from step 1 will remain in a local directory on the Splunk host. You can specify the location of the `.pem` cert in the TA data input setting `SSL Cert Location`. Otherwise, leave `SSL Cert Location` blank and `Enable SSL` enabled to use the cert from the system certificate bundle configured in step 2.

## 5.5 Installing the TA and App

The PowerMax for Splunk TA can be installed from the Unisphere UI in two ways:

1. Installed from local copies of the TA and App `.spl` files downloaded from Splunk Base.

or...

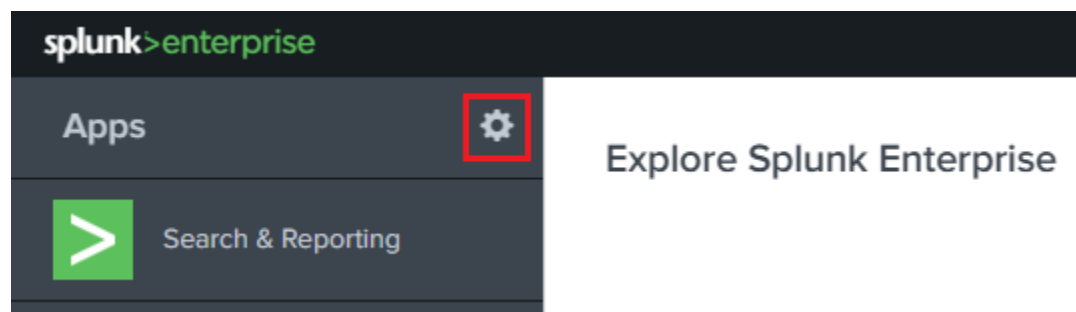
2. Installed directly from the Splunk Enterprise UI via **Find More Apps** and searching for PowerMax. The TA and App will appear in the search, simply click install for the add-on to install it in your Splunk environment. You will need to restart to complete the installation process.

For the remainder of this section the process of installing from a local file will be detailed.

1. Download the TA and App from Splunk Base.

- [Dell EMC PowerMax Add-on for Splunk Enterprise](#)
- [Dell EMC PowerMax App for Splunk Enterprise](#)

2. From your Splunk home screen, click the cog icon beside **Apps** to navigate to the Apps section.



3. Within the Apps section, click the button **Install App from file** in the top right corner of the page.

4. Click **Choose File**, select the PowerMax Add-on for Splunk, and click **Upload**.

5. Once the upload is complete you will be prompted to restart Splunk to complete the installation, click **Restart now**. When Splunk restarts, navigate back to the home screen and you will now see a dashboard panel for the PowerMax for Splunk TA.

6. Repeat steps 2 to 4 to install the PowerMax for Splunk App, you will not be prompted to restart on this occasion as the App does not require it.

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**Note:** The process for adding arrays to the Splunk environment is detailed in the [Configuration](#) section of this documentation.

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**Note:** There is an additional configuration step required for the App to function correctly if using indexes other than the Splunk default index, this is detailed in the [Configuration](#) section of this documentation.

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## CONFIGURATION

Once the PowerMax for Splunk TA and App are installed the next step is to configure them for use in your environment. Both the TA and App have individual configuration steps so each will be detailed separately.

### 6.1 Configuring the TA

From the home dashboard of your Splunk Enterprise UI select the PowerMax for Splunk Add-On from the app list on the left-side App navigation menu.

The **Inputs** view that opens is the list of all VMAX or PowerMax arrays registered with this instance of Splunk Enterprise. To add an array to the Splunk environment click the green button in the top-right corner of the UI **Create New Input**.

To add an array to Splunk, you must enter a number of details into Splunk including:

- Unisphere instance & user details
- Array details
- SSL details
- Reporting metrics configuration


The tables below lists each option, its default value if there is one, and a description of the option. Once all options are set, click **Add** to add the array as a data input to Splunk.

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**Note:** Configuration options are split into multiple tables for readability, they all apply to the same process of adding a new array as a data input to Splunk.

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#### 6.1.1 Splunk Config

Name *	<input type="text" value="PowerMax8000-RoomA"/>	
	Enter a unique name for the data input	
Interval *	<input type="text" value="600"/>	
	Time interval of input in seconds.	
Index *	<input type="text" value="default"/>	


Input	Default	Description
Name	None	The name of the input as it will appear in Splunk.
Interval	300	The metrics collection interval. This should be set in increments of 300s as this is the reporting interval of performance metrics in Unisphere.
Index	Default Splunk Index	The index to which data from Unisphere for this VMAX will be written.

## 6.1.2 Unisphere Config

Unisphere IP Address \*

Unisphere Port \*   
Unisphere default port is 8443

Unisphere Username \*

Unisphere Password \*  

Array ID \*   
This is the 12-digit array ID

Enable SSL ☒  
Enable SSL communication between Splunk and Unisphere

SSL Cert Location   
(Optional) Leave this blank if the Unisphere SSL certificate is loaded into the system, otherwise you can specify the direct path to the .pem certificate

REST Request Timeout   
(Optional) Default REST request timeout value in seconds, default is 60, for more information please consult the TA user guide

Input	Default	Description
Unisphere IP Address	None	Unisphere IP address or hostname.
Unisphere Port	8443	Unisphere port.
Unisphere Username	None	Unisphere username.
Unisphere Password	None	Unisphere password.
Array ID	None	The 12-digit numerical PowerMax ID.
Enable SSL	True	If you require end-to-end SSL communication between Splunk and Unisphere. Uncheck to disable SSL entirely. See ‘SSL Configuration’ section in ‘Installation’ for more information on SSL set-up.
SSL Cert Location	None	If ‘Enable SSL’ is enabled, this option has two behaviours: 1. If left blank, Splunk will search the system certs bundle for a valid Unisphere cert. 2. If a local path is provided, this is the path Splunk will use to access the Unisphere cert independently of the system certs bundle.
REST Request Timeout	60	The amount of time Splunk will wait for a response from Unisphere for any given call before timing out and logging an error.

6.1.3 Metrics Collection Configuration

**Note:** For a list of valid metrics for each performance category below please see the the *Unisphere for PowerMax Performance Metrics* section of this documentation. The metrics **must** be in the CamelCase format used in the Unisphere for PowerMax REST API.

**Note:** If all custom metrics provided for a given category are invalid, the TA will default to querying only KPI performance metrics for that category.

**Note:** The PowerMax for Splunk TA is configured to run entirely from KPI metrics, if you do not need any further functionality from the TA and App other than to use the App for PowerMax monitoring then you only need to set each performance category to collect KPI metrics.

Array

KPIs Only

Collect Array level information

Array Custom Metrics

(Optional) For custom Array reporting metrics please define comma separated list of metrics here.

SRP

Custom Metrics

Collect Storage Resource Pool level information

SRP Custom Metrics

HostIOs, HostMBReads

(Optional) For custom SRP reporting metrics please define comma separated list of metrics here

Storage Group

KPIs Only

Collect Storage Group level information

Input	Default	Description
Array	Off	Collect all/kpi/custom Array level metrics or disable entirely.
Array Custom Metrics	None	Comma separated list of Array metrics if custom metrics selected.
SRP	Off	Collect all/kpi/custom SRP level metrics or disable entirely.

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Table 1 – continued from previous page

SRP Custom Metrics	None	Comma separated list of SRP metrics if custom metrics selected.
Storage Group (SG)	Off	Collect all/kpi/custom SG level metrics or disable entirely.
SG Custom Metrics	None	Comma separated list of SG metrics if custom metrics selected.
Director	Off	Collect all/kpi/custom Director level metrics or disable entirely.
FE Director Metrics	None	Comma separated list of FE Director metrics if custom Director metrics selected.
BE Director Metrics	None	Comma separated list of BE Director metrics if custom Director metrics selected.
RDF Director Metrics	None	Comma separated list of RDF Director metrics if custom Director metrics selected.
IM Director Metrics	None	Comma separated list of IM Director metrics if custom Director metrics selected.
EDS Director Metrics	None	Comma separated list of EDS Director metrics if custom Director metrics selected.

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Table 1 – continued from previous page

Port	Off	Collect all/kpi/custom Port level metrics or disable entirely.
FE Port Metrics	None	Comma separated list of FE Port metrics if custom Port metrics selected.
BE Port Metrics	None	Comma separated list of BE Port metrics if custom Port metrics selected.
RDF Port Metrics	None	Comma separated list of RDF Port metrics if custom Port metrics selected.
Port Group (PG)	Off	Collect all/kpi/custom PG level metrics or disable entirely.
PG Custom Metrics	None	Comma separated list of PG metrics if custom metrics selected.
iSCSI	Off	Collect all/kpi/custom iSCSI level metrics or disable entirely.
IP Interface Metrics	None	Comma separated list of IP Interface metrics if custom iSCSI metrics selected.
iSCSI Target Metrics	None	Comma separated list of iSCSI Target metrics if custom iSCSI metrics selected.
Host	Off	Collect all/kpi/custom Host level metrics or disable entirely.

continues on next page



Table 1 – continued from previous page

Host Custom Metrics	None	Comma separated list of Host metrics if custom metrics selected.
Masking View (MV)	Off	Collect all/kpi/custom MV level metrics or disable entirely.
MV Custom Metrics	None	Comma separated list of MV metrics if custom metrics selected.
Initiator	Off	Collect all/kpi/custom Initiator level metrics or disable entirely.
Initiator Custom Metrics	None	Comma separated list of Initiator metrics if custom metrics selected.
RDF Group	Off	Collect all/kpi/custom RDF Group level metrics or disable entirely.
RDF/S Group Custom Metrics	None	Comma separated list of RDF/S Group metrics if custom RDF metrics selected.
RDF/A Group Custom Metrics	None	Comma separated list of RDF/A Group metrics if custom RDF metrics selected.
Metro DR	Off	Collect Metro Disaster Recovery level information or disable entirely.
Snapshot Policy	Off	Collect Snapshot Policy level information or disable entirely.

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Table 1 – continued from previous page

Audit Logs	Off	Collect Audit Log information or disable entirely.
Alerts	Off	Collect Alerts information or disable entirely.

## 6.2 Usage Considerations

When using PowerMax for Splunk for performance metrics collection there are a number of usage considerations that you should keep in mind:

- The PowerMax for Splunk TA is configured to run entirely from KPI metrics, if you do not need any further functionality from the TA and App other than to use the App for PowerMax monitoring then you only need to set each performance category to collect KPI metrics.
- If defining a list of custom metrics for a performance category, the format of those metrics should be in CamelCase exactly as they are in the Unisphere for PowerMax official documentation performance section. More information available below in the section [Performance Metrics Definitions](#).
- After enabling Unisphere for performance metrics collection allow Unisphere 30 minutes to gather enough data before adding the array to Splunk as a data input.
- The most granular time available with Unisphere diagnostic performance metrics collection is 300 seconds, reporting intervals cannot be set lower than 300 seconds.
- If you are collecting metrics from multiple arrays it may take longer than 300 seconds to complete an entire collection run. If this does happen you will see warning messages in your TA logs along with a recommendation on what interval should be set.
- If the Unisphere last available performance timestamp is not recent as of 5-10 minutes ago there is a strong likelihood that your instance of Unisphere has gone into catch-up mode and is processing a backlog of performance data. It will resume normal operations once this backlog processing is complete.
- When querying a single instance of Unisphere for performance metrics across a multiple arrays be careful on the load placed on Unisphere, more arrays equates to more Unisphere REST API calls.

Lastly, and most importantly, *with great power comes great responsibility*. PowerMax for Splunk provides you with the ability to query every performance metric for a wide range of performance categories. It is important to remember that the more assets you have created on an array, the more REST calls that are required to collect information on all of those assets. Multiply that by the interval set and it can quickly result in a very large volume of calls to Unisphere.

Instead of gathering everything possible, be resourceful with your calls and only query what is needed. This will ensure PowerMax for Splunk is performant and helps reduce network load and the Unisphere for PowerMax user experience is not negatively affected by excessive REST API calls. If you are only interested in querying for KPIs, you can specify that only KPI metrics are returned, but better still only query for a subset of metrics that you are interested in if you do not require the full suite of dashboards available in the PowerMax for Splunk App.

## 6.3 Where to find logs

If you are having issues with the TA or want to check on the performance of metric collection runs you will need to look at the TA specific log file. The default location for this log file is:

- `{splunk_install_dir}/var/log/splunk/ta_dellemc_vmax_inputs.log`

The second important log is the `splunkd` log file. If there is issues initialising the TA and nothing is appearing in the TA log, the `splunkd` logs may provide some answers. When Splunk is starting up there should be warning or error messages for the TA indicating why there is initialisation issues. The default location for this log file is:

- `{splunk_install_dir}/var/log/splunk/splunkd.log`

## 6.4 Configuring the App

After configuring the PowerMax for Splunk TA with your data inputs, if you have selected a target index for the inputs other than the default index used by Splunk you will need to reconfigure the PowerMax for Splunk App search macros.

**Note:** Search macros are reusable blocks of Search Processing Language (SPL) that you can insert into other searches. They are used when you want to use the same search logic on different parts or values in the data set dynamically.

For each of the performance and reporting categories supported by PowerMax for Splunk TA and App there is an associated search macro that points to a particular index to retrieve PowerMax data.

Navigate to the installation directory of the PowerMax for Splunk App which contains all default configuration files. Copy the `macros.conf` file from the App default config directory to the App local config directory:

```
$ cd {splunk_dir}/etc/apps/Dell-EMC-app-VMAX
$ cp default/macros.conf local/macros.conf
```

Edit the newly copied version of `macros.conf` in the local directory so that each `index=` key/value pair represents the indexes in use in your environment. Each reporting level ingested by the PowerMax for Splunk TA corresponds to a macro in `macros.conf` so all will need updated.

Example:

```
[powermax_array]
definition = index=main sourcetype=dellemc:vmax:rest reporting_level="Array"
iseval=0

[powermax_srp]
definition = index=main sourcetype=dellemc:vmax:rest reporting_level="SRP"
iseval=0
```

Becomes..

```
[powermax_array]
definition = index=powermax sourcetype=dellemc:vmax:rest reporting_level="Array"
iseval=0

[powermax_srp]
definition = index=powermax sourcetype=dellemc:vmax:rest reporting_level="SRP"
iseval=0
```

Once all the macros have been updated to reflect the indexes in use, save the file and return to Splunk UI. It is advisable here to restart your Splunk Enterprise server here so changes made here are applied.

## 6.5 Splunk Source Type

The PowerMax for Splunk TA provides the index-time and search-time knowledge for inventory, performance metrics, summary, alert and audit log information. By default, all array data is indexed into the default Splunk index, this is the main index unless changed by the splunk admin.

The source type used for the PowerMax for Splunk TA is `dellemc:vmax:rest`. All events are in `snake_case` key/value pair formats. All events have an assigned `reporting_level` which indicates the level at which the event details, along with the associated `array_id` & if reporting at lower levels, the object ID e.g. `storage_group_id`, `director_id`, `host_id`.

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**Note:** `vmax` is still used in `dellemc:vmax:rest` instead of `powermax` so reporting on historical data ingested into earlier releases of VMAX for Splunk is not broken. This may change in a future release but for now it is staying the same.

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The TA collects many different kinds of events for VMAX/PowerMax. Depending on the activity of the Hosts & Initiators in your environment, there may be events where there are no performance metrics collected. This can be confirmed if there is a metric present in the event named `{reporting_level}_perf_details` with a value of `False` (where `reporting_level` is the reporting level of the event itself). For more information see the section [Active vs. Inactive Objects](#).

## 6.6 Active vs. Inactive Objects

To limit the amount of data collected and stored on an array, only active Hosts and Initiators are reported against for performance metrics. Inactivity is determined by no activity being recorded by performance monitors for a specified amount of time.

This is not enforced by Splunk but is the behaviour of the VMAX/PowerMax, recording zero values for every Host and Initiator in an environment could potentially very quickly fill databases with useless data.

When the TA is collecting information on the Hosts or Initiators in your environment, it will first obtain a list of all objects and performance key timestamps for each. Using these lists, REST calls will be made to Unisphere for performance metrics for each where a performance key timestamp exists, if an object is inactive no performance call will be made and no metrics returned. This new approach which differs from older releases cuts down on the amount of calls required, it is not necessary to query for performance data if we know in advance that a host or initiator is inactive.

If a host or initiator is inactive you will see the following key/value pairs in the event data:

Format:

```
{reporting_level}_perf_details: false
{reporting_level}_perf_message: No active {reporting_level} performance data available
```

Example:

```
host_perf_details: false
host_perf_message: No active Host performance data available
```

## 6.7 Performance Metrics Definitions

The PowerMax for Splunk TA ingests a wide range of metrics across each of the reporting levels. To get detailed definitions of each please consult the official Unisphere for PowerMax documentation available through the Unisphere UI in [Help Options > Online Help](#).

When in the official documentation performance metrics can be found in the section [Performance Management > Performance Management Metrics](#). From there you can select the performance category you want to see available metrics for.

Unfortunately this list does not provide users with the format required for each of these performance categories when querying for data via REST. To assist with this process there is a list of REST API valid metrics available in the section [Unisphere for PowerMax Performance Metrics](#).

To get further information on the Unisphere for PowerMax REST API you can now visit the [Dell API Marketplace](#).



## UNISPHERE FOR POWERMAX PERFORMANCE METRICS

The PowerMax for Splunk TA ingests a wide range of metrics across each of the reporting levels. To get detailed definitions of each please consult the official Unisphere for PowerMax documentation available through the Unisphere UI in **Help Options > Online Help**.

When in the official documentation performance metrics can be found in the section **Performance Management > Performance Management Metrics**. From there you can select the performance category you want to see available metrics for.

Unfortunately this list does not provide users with the format required for each of these performance categories when querying for data via REST. To assist with this process there is a list of REST API valid metrics available in the various performance category links below. Tables within contain the each supported metric in the CamelCase format required for Unisphere (& custom metrics list), the formatted snake\_case metric as seen in Splunk, and if the metric is a KPI or not.

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**Note:** Whilst the Unisphere metrics are all in CamelCase format, the PowerMax for Splunk TA will convert them all to snake\_case so all keys in Splunk PowerMax events have consistent formatting.

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**Note:** When defining custom lists of metrics for a given performance category in PowerMax for Splunk data input configuration, metrics **must** be in CamelCase format. These are required for the REST requests to the Unisphere REST API, the conversion to snake\_case happens after this data has been retrieved.

---

### 7.1 Array Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
AllocatedCapacity	allocated_capacity	True
AllocatedCapacityTB	allocated_capacity_tb	True
AvgFallThruTime	avg_fall_through_time	False
AvgOptimizedReadMissSize	avg_optimized_read_miss_size	False
BEIOs	be_ios	True
BEReadReqs	be_read_reqs	False
BEReqs	be_reqs	False
BEUtilization	be_utilization	True
BEWriteReqs	be_write_reqs	False
Cache_Balance	cache_balance	True
CapacityHS	capacity_hs	False

continues on next page

Table 1 – continued from previous page

CopySlotCount	copy_slot_count	False
CriticalAlertCount	critical_alert_count	False
DA_Balance	da_balance	True
DX_Balance	dx_balance	True
DeviceWPEvents	device_wp_events	False
DiskUtilization	disk_utilization	True
EFD_Balance	efd_balance	True
FC_Balance	fc_balance	True
FEHitReqs	fe_hit_reqs	False
FEReadHitReqs	fe_read_hit_reqs	False
FEReadMissReqs	fe_read_miss_reqs	False
FEReadReqs	fe_read_reqs	False
FEReqs	fe_reqs	False
FEUtilization	fe_utilization	True
FEWriteHitReqs	fe_write_hit_reqs	False
FEWriteMissReqs	fe_write_miss_reqs	False
FEWriteReqs	fe_write_reqs	False
FE_Balance	fe_balance	True
HWConfigHS	hw_config_hs	False
HardwareHealthScore	hardware_health_score	False
HostIOs	host_ios	True
HostMBReads	host_mb_reads	False
HostMBWritten	host_mb_written	False
HostMBs	host_mbs	True
HostReads	host_reads	False
HostWrites	host_writes	False
InfoAlertCount	info_alert_count	False
OptimizedMBReadMisses	optimized_mb_read_misses	False
OptimizedReadMisses	optimized_read_misses	False
OverallCompressionRatio	overall_compression_ratio	True
OverallEfficiencyRatio	overall_efficiency_ratio	False
OverallHealthScore	overall_health_score	False
PercentCacheWP	percent_cache_wp	True
PercentEffectiveUsedCapacity	percent_effective_used_capacity	False
PercentHit	percent_hit	True
PercentMetaBEUsed	percent_meta_be_used	True
PercentMetaFEUsed	percent_meta_fe_used	True
PercentMetaRepUsed	percent_meta_rep_used	True
PercentMetaSystemUsed	percent_meta_system_used	True
PercentReads	percent_reads	True
PercentSnapshotSaved	percent_snapshot_saved	False
PercentSubscribedCapacity	percent_subscribed_capacity	False
PercentVPSaved	percent_vp_saved	False
PercentWrites	percent_writes	True
PrefetchedTracks	prefetched_tracks	False
QueueDepthUtilization	queue_depth_utilization	False
RDFA_WPCount	rdfa_wp_count	False
RDFUtilization	rdf_utilization	True
RDF_Balance	rdf_balance	True
ReadResponseTime	read_response_time	True

continues on next page



Table 1 – continued from previous page

SATA_Balance	sata_balance	True
SCM_Balance	scm_balance	True
SloHealthScore	slo_health_score	False
SnapCapGB	snap_cap_gb	False
SnapCapTB	snap_cap_tb	True
SnapModifiedCapGB	snap_modified_cap_gb	False
SnapModifiedCapTB	snap_modified_cap_tb	True
SnapshotCompressionRatio	snapshot_compression_ratio	False
SnapshotEfficiencyRatio	snapshot_efficiency_ratio	False
SnapshotSharedRatio	snapshot_shared_ratio	False
SoftwareHealthScore	software_health_score	False
SubscribedAllocatedCapGB	subscribed_allocated_cap_gb	False
SubscribedAllocatedCapTB	subscribed_allocated_cap_tb	True
SubscribedCapacity	subscribed_capacity	False
SubscribedCapacityTB	subscribed_capacity_tb	True
SystemMaxWPLimit	system_max_wp_limit	True
SystemWPEvents	system_wp_events	True
UsableCapacity	usable_capacity	False
UsableCapacityTB	usable_capacity_tb	True
UsedUsableCapGB	used_usable_cap_gb	False
UsedUsableCapTB	used_usable_cap_tb	True
VPCompressionRatio	vp_compression_ratio	False
VPEfficiencyRatio	vp_efficiency_ratio	False
VPSharedRatio	vp_shared_ratio	False
WPCount	wp_count	True
WarningAlertCount	warning_alert_count	False
WriteResponseTime	write_response_time	True

## 7.2 SRP Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
BEMBReads	be_mb_reads	False
BEMBTransferred	be_mb_transferred	True
BEMBWritten	be_mb_written	False
BEReadReqs	be_read_reqs	False
BEReqs	be_reqs	True
BEWriteReqs	be_write_reqs	False
HostIOs	host_ios	True
HostMBReads	host_mb_reads	False
HostMBWritten	host_mb_written	False
HostMBs	host_mbs	True
HostReads	host_reads	False
HostWrites	host_writes	False
OverallCompressionRatio	overall_compression_ratio	False
OverallEfficiencyRatio	overall_efficiency_ratio	False
PercentSnapshotSaved	percent_snapshot_saved	False
PercentVPSaved	percent_vp_saved	False
ReadResponseTime	read_response_time	False
ResponseTime	response_time	True
SnapshotCompressionRatio	snapshot_compression_ratio	False
SnapshotEfficiencyRatio	snapshot_efficiency_ratio	False
SnapshotSharedRatio	snapshot_shared_ratio	False
TotalSRPCapacity	total_srp_capacity	False
TotalSnapshotAllocatedCapacity	total_snapshot_allocated_capacity	False
UsedSRPCapacity	used_srp_capacity	False
VPCompressionRatio	vp_compression_ratio	False
VPEfficiencyRatio	vp_efficiency_ratio	False
VPSharedRatio	vp_shared_ratio	False
WriteResponseTime	write_response_time	False

## 7.3 Storage Group Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
AllocatedCapacity	allocated_capacity	False
AvgIOSize	avg_io_size	False
AvgQOSDelayPerIO	avg_qos_delay_per_io	True
AvgReadResponseTime6	avg_read_response_time_1	False
AvgReadResponseTime7	avg_read_response_time_2	False
AvgReadSize	avg_read_size	False
AvgWritePacedDelay	avg_write_paced_delay	True
AvgWriteResponseTime6	avg_write_response_time_1	False
AvgWriteResponseTime7	avg_write_response_time_2	False
AvgWriteSize	avg_write_size	False
BEDiskReadResponseTime	be_disk_read_response_time	False
BEMBReads	be_mb_reads	False
BEMBTransferred	be_mb_transferred	False

continues on next page

Table 2 – continued from previous page

BEMBWritten	be_mb_written	False
BEPercentReads	be_percent_reads	False
BEPercentWrites	be_percent_writes	False
BEPrefetchedMBs	be_prefetched_mbs	False
BEPrefetchedTrackUsed	be_prefetched_track_used	False
BEPrefetchedTrackss	be_prefetched_tracks	False
BEReadReqs	be_read_reqs	True
BEReadRequestTime	be_read_request_time	False
BEReadTaskTime	be_read_task_time	False
BEReqs	be_reqs	True
BEWriteReqs	be_write_reqs	True
BlockSize	block_size	False
CompressedTracks	compressed_tracks	False
CompressionRatio	compression_ratio	False
CriticalAlertCount	critical_alert_count	False
HostHits	host_hits	True
HostIOLimitPercentTimeExceeded	host_io_limit_percent_time_exceeded	True
HostIOs	host_ios	True
HostMBReads	host_mb_reads	True
HostMBWritten	host_mb_written	True
HostMBs	host_mbs	True
HostMisses	host_misses	True
HostReadHits	host_read_hits	False
HostReadMisses	host_read_misses	False
HostReads	host_reads	True
HostWriteHits	host_write_hits	False
HostWriteMisses	host_write_misses	False
HostWrites	host_writes	True
IODensity	io_density	False
InfoAlertCount	info_alert_count	False
MaxWPThreshold	max_wp_threshold	False
PPAvgResponseTime	pp_avg_response_time	False
PPObservedDeltaRT	pp_observed_delta_rt	False
PPReadRespTime	pp_read_resp_time	False
PPRelativeRT	pp_relative_rt	False
PPWriteRespTime	pp_write_resp_time	False
PercentCompressedTracks	percent_compressed_tracks	False
PercentHit	percent_hit	True
PercentMisses	percent_misses	True
PercentRandomIO	percent_random_io	False
PercentRandomReadHit	percent_random_read_hit	False
PercentRandomReadMiss	percent_random_read_miss	False
PercentRandomReads	percent_random_reads	False
PercentRandomWriteHit	percent_random_write_hit	False
PercentRandomWriteMiss	percent_random_write_miss	False
PercentRandomWrites	percent_random_writes	False
PercentRead	percent_read	True
PercentReadHit	percent_read_hit	False
PercentReadMiss	percent_read_miss	False
PercentSeqIO	percent_seq_io	False

continues on next page

Table 2 – continued from previous page

PercentSeqRead	percent_seq_read	False
PercentSeqReadHit	percent_seq_read_hit	False
PercentSeqReadMiss	percent_seq_read_miss	False
PercentSeqWriteHit	percent_seq_write_hit	False
PercentSeqWriteMiss	percent_seq_write_miss	False
PercentSeqWrites	percent_seq_writes	False
PercentVPSSpaceSaved	percent_vp_space_saved	False
PercentWrite	percent_write	True
PercentWriteHit	percent_write_hit	False
PercentWriteMiss	percent_write_miss	False
RDFRewrites	rdf_rewrites	False
RDFS_WriteResponseTime	rdfs_write_response_time	True
RandomIOs	random_ios	False
RandomReadHits	random_read_hits	False
RandomReadMisses	random_read_misses	False
RandomReads	random_reads	False
RandomWriteHits	random_write_hits	False
RandomWriteMisses	random_write_misses	False
RandomWrites	random_writes	False
RdfMBRead	rdf_mb_read	False
RdfMBWritten	rdf_mb_written	False
RdfReads	rdf_reads	False
RdfResponseTime	rdf_response_time	True
RdfWrites	rdf_writes	False
ReadMissResponseTime	read_miss_response_time	False
ReadResponseTime	read_response_time	True
ReadResponseTimeCount1	read_response_time_1	False
ReadResponseTimeCount2	read_response_time_2	False
ReadResponseTimeCount3	read_response_time_3	False
ReadResponseTimeCount4	read_response_time_4	False
ReadResponseTimeCount5	read_response_time_5	False
ReadResponseTimeCount6	read_response_time_6	False
ReadResponseTimeCount7	read_response_time_7	False
ResponseTime	response_time	True
SRDFA_MBSent	srdfa_mb_sent	False
SRDFA_WriteReqs	srdfa_write_reqs	False
SRDFS_MBSent	srdfs_mb_sent	False
SRDFS_WriteReqs	srdfs_write_reqs	False
SeqIOs	seq_ios	False
SeqReadHits	seq_read_hits	False
SeqReadMisses	seq_read_misses	False
SeqReads	seq_reads	False
SeqWriteHits	seq_write_hits	False
SeqWriteMisses	seq_write_misses	False
SeqWrites	seq_writes	False
Skew	skew	False
TotalResponseTime	total_response_time	False
TotalTracks	total_tracks	False
VAAITotalCommandCount	vaai_total_command_count	True
VAAITotalTime	vaai_total_time	False

continues on next page

Table 2 – continued from previous page

VAAIUnmapCommandCount	vaa_i_unmap_command_count	False
VAAIUnmapKB	vaa_i_unmap_kb	False
VAAIUnmapMB	vaa_i_unmap_mb	False
VAAIWriteSameCommandCount	vaa_i_write_same_command_count	False
VAAIWriteSameKB	vaa_i_write_same_kb	False
VAAIWriteSameMB	vaa_i_write_same_mb	False
VAAIXCopyCommandCount	vaaix_copy_command_count	False
VAAIXCopyKB	vaaix_copy_kb	False
VAAIXCopyMB	vaaix_copy_mb	False
WPCount	wp_count	True
WarningAlertCount	warning_alert_count	False
WriteMissResponseTime	write_miss_response_time	False
WritePacedDelay	write_paced_delay	True
WriteResponseTime	write_response_time	True
WriteResponseTimeCount1	write_response_time_count_1	False
WriteResponseTimeCount2	write_response_time_count_2	False
WriteResponseTimeCount3	write_response_time_count_3	False
WriteResponseTimeCount4	write_response_time_count_4	False
WriteResponseTimeCount5	write_response_time_count_5	False
WriteResponseTimeCount6	write_response_time_count_6	False
WriteResponseTimeCount7	write_response_time_count_7	False

## 7.4 FE Director Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
AvgOptimizedReadMissSize	avg_optimized_read_miss_size	False
AvgQueueDepthRange0	avg_queue_depth_range_0	False
AvgQueueDepthRange1	avg_queue_depth_range_1	False
AvgQueueDepthRange2	avg_queue_depth_range_2	False
AvgQueueDepthRange3	avg_queue_depth_range_3	False
AvgQueueDepthRange4	avg_queue_depth_range_4	False
AvgQueueDepthRange5	avg_queue_depth_range_5	False
AvgQueueDepthRange6	avg_queue_depth_range_6	False
AvgQueueDepthRange7	avg_queue_depth_range_7	False
AvgQueueDepthRange8	avg_queue_depth_range_8	False
AvgQueueDepthRange9	avg_queue_depth_range_9	False
AvgRDFSWriteResponseTime	avg_rdfs_write_response_time	False
AvgReadMissResponseTime	avg_read_miss_response_time	False
AvgReadRT0To1	avg_read_rt_0_to_1	False
AvgReadRT16To32	avg_read_rt_16_to_32	False
AvgReadRT1To2	avg_read_rt_1_to_2	False
AvgReadRT2To4	avg_read_rt_2_to_4	False
AvgReadRT32To64	avg_read_rt_32_to_64	False
AvgReadRT4To8	avg_read_rt_4_to_8	False
AvgReadRT8To16	avg_read_rt_8_to_16	False
AvgReadRTOver64	avg_read_rt_over_64	False
AvgTimePerSyscall	avg_time_per_sys_call	False
AvgWPDiscTime	avg_wp_disc_time	False

continues on next page

Table 3 – continued from previous page

AvgWriteRT0To1	avg_write_rt_0_to_1	False
AvgWriteRT16To32	avg_write_rt_16_to_32	False
AvgWriteRT1To2	avg_write_rt_1_to_2	False
AvgWriteRT2To4	avg_write_rt_2_to_4	False
AvgWriteRT32To64	avg_write_rt_32_to_64	False
AvgWriteRT4To8	avg_write_rt_4_to_8	False
AvgWriteRT8To16	avg_write_rt_8_to_16	False
AvgWriteRTOver64	avg_write_rt_over_64	False
DeviceWPEvents	device_wp_events	False
HitReqs	hit_reqs	False
HostIOLimitIOs	host_io_limit_ios	True
HostIOLimitMBs	host_io_limit_mbs	True
HostIOs	host_ios	True
HostMBs	host_mbs	True
MissReqs	miss_reqs	False
OptimizedMBReadMisses	optimized_mb_read_misses	False
OptimizedReadMisses	optimized_read_misses	False
PercentBusy	percent_busy	True
PercentBusyLogicalCore_0	percent_busy_logical_core_0	True
PercentBusyLogicalCore_1	percent_busy_logical_core_1	True
PercentHitReqs	percent_hit_reqs	False
PercentReadReqHit	percent_read_req_hit	False
PercentReadReqs	percent_read_reqs	False
PercentWriteReqHit	percent_write_req_hit	False
PercentWriteReqs	percent_write_reqs	False
QueueDepthCountRange0	queue_depth_count_range_0	False
QueueDepthCountRange1	queue_depth_count_range_1	False
QueueDepthCountRange2	queue_depth_count_range_2	False
QueueDepthCountRange3	queue_depth_count_range_3	False
QueueDepthCountRange4	queue_depth_count_range_4	False
QueueDepthCountRange5	queue_depth_count_range_5	False
QueueDepthCountRange6	queue_depth_count_range_6	False
QueueDepthCountRange7	queue_depth_count_range_7	False
QueueDepthCountRange8	queue_depth_count_range_8	False
QueueDepthCountRange9	queue_depth_count_range_9	False
QueueDepthUtilization	queue_depth_utilization	True
ReadHitReqs	read_hit_reqs	False
ReadMissReqs	read_miss_reqs	False
ReadRTCountRange0To1	read_rt_count_range_0_to_1	False
ReadRTCountRange16To32	read_rt_count_range_16_to_32	False
ReadRTCountRange1To2	read_rt_count_range_1_to_2	False
ReadRTCountRange2To4	read_rt_count_range_2_to_4	False
ReadRTCountRange32To64	read_rt_count_range_32_to_64	False
ReadRTCountRange4To8	read_rt_count_range_4_to_8	False
ReadRTCountRange8To16	read_rt_count_range_8_to_16	False
ReadRTCountRangeover64	read_rt_count_range_over_64	False
ReadReqs	read_reqs	False
ReadResponseTime	read_response_time	True
Reqs	reqs	False
SlotCollisions	slot_collisions	False

continues on next page

Table 3 – continued from previous page

SyscallCount	sys_call_count	True
SyscallRemoteDirCounts	sys_call_remote_dir_counts	False
Syscall_RDF_DirCounts	sys_call_rdf_dir_counts	False
SystemWPEvents	system_wp_events	False
TotalReadCount	total_read_count	False
TotalWriteCount	total_write_count	False
WriteHitReqs	write_hit_reqs	False
WriteMissReqs	write_miss_reqs	False
WriteRTCountRange0To1	write_rt_count_range_0_to_1	False
WriteRTCountRange16To32	write_rt_count_range_16_to_32	False
WriteRTCountRange1To2	write_rt_count_range_1_to_2	False
WriteRTCountRange2To4	write_rt_count_range_2_to_4	False
WriteRTCountRange32To64	write_rt_count_range_32_to_64	False
WriteRTCountRange4To8	write_rt_count_range_4_to_8	False
WriteRTCountRange8To16	write_rt_count_range_8_to_16	False
WriteRTCountRangeover64	write_rt_count_range_over_64	False
WriteReqs	write_reqs	False
WriteResponseTime	write_response_time	True

## 7.5 BE Director Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
AvgTimePerSyscall	avg_time_per_sys_call	False
CompressedMBs	compressed_mbs	False
CompressedReadMBs	compressed_read_mbs	False
CompressedReadReqs	compressed_read_reqs	False
CompressedReqs	compressed_reqs	False
CompressedWriteMBs	compressed_write_mbs	False
CompressedWriteReqs	compressed_write_reqs	False
IOs	ios	True
MBRead	mb_read	True
MBWritten	mb_written	True
MBs	mbs	True
PercentBusy	percent_busy	True
PercentBusyLogicalCore_0	percent_busy_logical_core_0	False
PercentBusyLogicalCore_1	percent_busy_logical_core_1	False
PercentNonIOBusy	percent_non_io_busy	True
PercentNonIOBusyLogicalCore_0	percent_non_io_busy_logical_core_0	False
PercentNonIOBusyLogicalCore_1	percent_non_io_busy_logical_core_1	False
PercentReadReqs	percent_read_reqs	False
PercentWriteReqs	percent_write_reqs	False
PrefetchedTracks	prefetched_tracks	False
ReadReqs	read_reqs	True
Reqs	reqs	True
SyscallCount	sys_call_count	True
SyscallRemoteDirCount	sys_call_remote_dir_count	False
Syscall_RDF_DirCount	sys_call_rdf_dir_count	False
WriteReqs	write_reqs	True

## 7.6 RDF Director Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
AsyncMBSent	async_mb_sent	False
AsyncWriteReqs	async_write_reqs	False
AvgIOServiceTime	avg_io_service_time	True
AvgIOSizeReceived	avg_io_size_received	False
AvgIOSizeSent	avg_io_size_sent	False
AvgTimePerSyscall	avg_time_per_sys_call	False
CompressedMBReceived	compressed_mb_received	False
CompressedMBSent	compressed_mb_sent	False
CompressedMBSentAndReceived	compressed_mb_sent_and_received	False
CopyIOs	copy_ios	True
CopyMBs	copy_mbs	True
IOs	ios	True
MBRead	mb_read	True
MBSentAndReceived	mb_sent_and_received	True
MBWritten	mb_written	True
NumberOfCompressedLinks	number_of_compressed_links	False
NumberOfLinks	number_of_links	False
PercentBusy	percent_busy	True
PercentCompressedMBReceived	percent_compressed_mb_received	False
PercentCompressedMBSent	percent_compressed_mb_sent	False
PercentCompressedMBSentAndReceived	percent_compressed_mb_sent_and_received	False
Reqs	reqs	False
Rewrites	rewrites	False
SyncMBSent	sync_mb_sent	False
SyncWrites	sync_writes	False
SyscallCount	sys_call_count	False
SyscallRemoteDirCount	sys_call_remote_dir_count	False
SyscallTime	sys_call_time	False
Syscall_RDF_DirCounts	sys_call_rdf_dir_counts	False
TracksReceivedPerSec	tracks_received_per_sec	False
TracksSentPerSec	tracks_sent_per_sec	False
WriteReqs	write_reqs	True

## 7.7 IM Director Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
PercentBusy	percent_busy	True



## 7.8 EDS Director Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
PercentBusy	percent_busy	True
RandomReadMissMBs	random_read_miss_mbs	False
RandomReadMisses	random_read_misses	False
RandomWriteMissMBs	random_write_miss_mbs	False
RandomWriteMisses	random_write_misses	False

## 7.9 FE Port Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
AvgIOSize	avg_io_size	True
IOs	ios	True
MBRead	mb_read	True
MBWritten	mb_written	True
MBs	mbs	True
MaxSpeedGBs	max_speed_gbps	False
PercentBusy	percent_busy	True
ReadResponseTime	read_response_time	True
Reads	reads	True
ResponseTime	response_time	True
SpeedGBs	speed_gbs	True
WriteResponseTime	write_response_time	True
Writes	writes	True

## 7.10 BE Port Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
AvgIOSize	avg_io_size	True
IOs	ios	True
MBRead	mb_read	True
MBWritten	mb_written	True
MBs	mbs	True
MaxSpeedGBs	max_speed_gbps	False
PercentBusy	percent_busy	True
Reads	reads	True
Writes	writes	True

## 7.11 RDF Port Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
AvgIOSize	avg_io_size	True
IOs	ios	True
MBRead	mb_read	True
MBWritten	mb_written	True
MBs	mbs	True
MaxSpeedGBs	max_speed_gbps	False
PercentBusy	percent_busy	True
Reads	reads	True
SpeedGBs	speed_gbs	True
Writes	writes	True

## 7.12 Host Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
BandwidthLimit	bandwidth_limit	False
BandwidthLimitExceededSecs	bandwidth_limit_exceeded_secs	False
HostIOs	host_ios	True
HostMBReads	host_mb_reads	True
HostMBWrites	host_mb_writes	True
MBs	mbs	True
ReadResponseTime	read_response_time	True
Reads	reads	True
ResponseTime	response_time	True
SyscallCount	sys_call_count	True
WriteResponseTime	write_response_time	True
Writes	writes	True

## 7.13 Initiator Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
BandwidthLimitExceededSecs	bandwidth_limit_exceeded_secs	False
HostIOs	host_ios	True
HostMBReads	host_mb_reads	True
HostMBWrites	host_mb_writes	True
MBs	mbs	True
ReadResponseTime	read_response_time	True
Reads	reads	True
ResponseTime	response_time	True
SyscallCount	sys_call_count	True
WriteResponseTime	write_response_time	True
Writes	writes	True

## 7.14 Port Group Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
AvgIOSize	avg_io_size	True
IOs	ios	True
MBRead	mb_read	True
MBWritten	mb_written	True
MBs	mbs	True
PercentBusy	percent_busy	True
Reads	reads	True
Writes	writes	True

## 7.15 Masking View Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
Capacity	capacity	False
HostIOs	host_ios	True
HostMBs	host_mbs	True
ReadResponseTime	read_response_time	False
ResponseTime	response_time	True
WriteResponseTime	write_response_time	False

## 7.16 IP Interface Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
IoRate	io_rate	True
MBs	mbs	True
PacketCount	packet_count	True
Reads	reads	True
ResponseTime	response_time	False
TotalReadTime	total_read_time	False
TotalWriteTime	total_write_time	False
Writes	writes	True

## 7.17 iSCSI Target Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
IoRate	io_rate	True
MBS	mbs	True
PacketCount	packet_count	True
Reads	reads	True
ResponseTime	response_time	False
TotalReadTime	total_read_time	False
TotalWriteTime	total_write_time	False
Writes	writes	True

## 7.18 RDF/A Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
ActiveCycleSize	active_cycle_size	False
AvgCycleSize	avg_cycle_size	True
AvgCycleTime	avg_cycle_time	True
AvgIOServiceTime	avg_io_service_time	True
CompressedMBReceived	compressed_mb_received	False
CompressedMBSent	compressed_mb_sent	False
CompressedMBSentAndReceived	compressed_mb_sent_and_received	False
CycleNumber	cycle_number	False
DSEThreshold	dse_threshold	False
DSEUsedTracks	dse_used_tracks	False
InactiveCycleSize	inactive_cycle_size	False
LastCycleDuration	last_cycle_duration	False
LocalWPCount	local_wp_count	True
MBReads	mb_reads	False
MBWritten	mb_written	False
NumDevsInSession	num_devs_in_session	False
NumberOfCompressedLinks	number_of_compressed_links	False
NumberOfLinks	number_of_links	False
NumberOfRDFInvalidTracks	number_of_rdf_invalid_tracks	False
PercentCompressedMBReceived	percent_compressed_mb_received	False
PercentCompressedMBSent	percent_compressed_mb_sent	False
PercentCompressedMBSentAndReceived	percent_compressed_mb_sent_and_received	False
R1_R2_Lag_Time	r1_r2_lag_time	False
R2_LastRestoreTime	r2_last_restore_time	False
RDFA_ActiveIndicator	rdfa_active_indicator	False
RDFA_SessionIndicator	rdfa_session_indicator	False
RDFA_WPCount	rdfa_wp_count	True
RDFRewrites	rdf_rewrites	False
RDF_R1_R2_IOS	rdf_r1_r2_ios	True
RDF_R1_R2_MBS	rdf_r1_r2_mbs	True
RDF_R2_R1_IOS	rdf_r2_r1_ios	False
RDF_R2_R1_MBS	rdf_r2_r1_mbs	False
RdfMBRead	rdf_mb_read	False

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Table 5 – continued from previous page

RdfMBWritten	rdf_mb_written	False
RdfReads	rdf_reads	False
RdfResponseTime	rdf_response_time	True
RdfWrites	rdf_writes	False
ReadHits	read_hits	False
SessionNumber	session_number	False
SpillOverPackedSlots	spill_over_packed_slots	False
SystemWPCount	system_wp_count	False
SystemWPLimit	system_wp_limit	False
TimeSinceLastSwitch	time_since_last_switch	False
TotalHARepatWrites	total_ha_repeat_writes	False
TotalHAWrites	total_ha_writes	False
TotalReads	total_reads	False
TotalTracksSpilledBack	total_tracks_spilled_back	False
TotalTracksSpilledOver	total_tracks_spilled_over	False
TotalTracksSpilledOverUsed	total_tracks_spilled_over_used	False
TotalWrites	total_writes	False
UncommittedTracks	uncommitted_tracks	False

## 7.19 RDF/S Metrics

Unisphere Metric	Splunk Formatted Metric	Is KPI
AvgIOSize	avg_io_size	False
AvgReadSize	avg_read_size	False
AvgWritePacedDelay	avg_write_paced_delay	True
AvgWriteSize	avg_write_size	False
BEDiskReadResponseTime	be_disk_read_response_time	False
BEMBReads	be_mb_reads	False
BEMBTransferred	be_mb_transferred	False
BEMBWritten	be_mb_written	False
BEPercentReads	be_percent_reads	False
BEPercentWrites	be_percent_writes	False
BEPrefetchedMBs	be_prefetched_mbs	False
BEPrefetchedTrackUsed	be_prefetched_track_used	False
BEPrefetchedTrackss	be_prefetched_tracks	False
BEReadReqs	be_read_reqs	True
BEReadRequestTime	be_read_request_time	False
BEReadTaskTime	be_read_task_time	False
BEReqs	be_reqs	True
BEWriteReqs	be_write_reqs	True
BlockSize	block_size	False
HostHits	host_hits	True
HostIOs	host_ios	True
HostMBReads	host_mb_reads	True
HostMBWritten	host_mb_written	True
HostMBs	host_mbs	True
HostMisses	host_misses	True
HostReadHits	host_read_hits	False

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Table 6 – continued from previous page

HostReadMisses	host_read_misses	False
HostReads	host_reads	True
HostWriteHits	host_write_hits	False
HostWriteMisses	host_write_misses	False
HostWrites	host_writes	True
IODensity	io_density	False
MaxWPThreshold	max_wp_threshold	False
PercentHit	percent_hit	True
PercentMisses	percent_misses	True
PercentRandomIO	percent_random_io	False
PercentRandomReadHit	percent_random_read_hit	False
PercentRandomReadMiss	percent_random_read_miss	False
PercentRandomReads	percent_random_reads	False
PercentRandomWriteHit	percent_random_write_hit	False
PercentRandomWriteMiss	percent_random_write_miss	False
PercentRandomWrites	percent_random_writes	False
PercentRead	percent_read	True
PercentReadHit	percent_read_hit	False
PercentReadMiss	percent_read_miss	False
PercentSeqIO	percent_seq_io	False
PercentSeqRead	percent_seq_read	False
PercentSeqReadHit	percent_seq_read_hit	False
PercentSeqReadMiss	percent_seq_read_miss	False
PercentSeqWriteHit	percent_seq_write_hit	False
PercentSeqWriteMiss	percent_seq_write_miss	False
PercentSeqWrites	percent_seq_writes	False
PercentWrite	percent_write	True
PercentWriteHit	percent_write_hit	False
PercentWriteMiss	percent_write_miss	False
RDFS_WriteResponseTime	rdfs_write_response_time	True
RandomIOs	random_ios	False
RandomReadHits	random_read_hits	False
RandomReadMisses	random_read_misses	False
RandomReads	random_reads	False
RandomWriteHits	random_write_hits	False
RandomWriteMisses	random_write_misses	False
RandomWrites	random_writes	False
RdfMBsReadPerSec	rdf_mbs_read_per_sec	False
RdfMBsWrittenPerSec	rdf_mbs_written_per_sec	False
RdfReadHitsPerSec	rdf_read_hits_per_sec	False
RdfReadsPerSec	rdf_reads_per_sec	False
RdfRewritesPerSec	rdf_rewrites_per_sec	False
RdfWritesPerSec	rdf_writes_per_sec	False
ReadMissResponseTime	read_miss_response_time	False
ReadResponseTime	read_response_time	True
ResponseTime	response_time	True
SeqIOs	seq_ios	False
SeqReadHits	seq_read_hits	False
SeqReadMisses	seq_read_misses	False
SeqReads	seq_reads	False

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Table 6 – continued from previous page

SeqWriteHits	seq_write_hits	False
SeqWriteMisses	seq_write_misses	False
SeqWrites	seq_writes	False
SpilloverPackedSlots	spill_over_packed_slots	False
TotalCapacityGB	total_capacity_gb	False
WPCount	wp_count	True
WriteMissResponseTime	write_miss_response_time	False
WritePacedDelay	write_paced_delay	True
WriteResponseTime	write_response_time	True





## 8.1 Where to find logs

If you are having issues with the TA or want to check on the performance of metric collection runs you will need to look at the TA specific log file. The default location for this log file is:

- `{splunk_install_dir}/var/log/splunk/ta_dellemc_vmax_inputs.log`

The second important log is the `splunkd` log file. If there is issues initialising the TA and nothing is appearing in the TA log, the `splunkd` logs may provide some answers. When Splunk is starting up there should be warning or error messages for the TA indicating why there is initialisation issues. The default location for this log file is:

- `{splunk_install_dir}/var/log/splunk/splunkd.log`

## 8.2 GitHub Issues

From the PowerMax for Splunk 3.x release code will be hosted on the public [Dell GitHub](#) repo. The code and documentation are released with no warranties or SLAs and are intended to be supported through a community driven process.

We aim to track and document everything related to this repo via the issues page. The following links will direct you to the issues sections of the respective PowerMax for Splunk offerings:

- [PowerMax Add-on for Splunk Issues](#)
- [PowerMax App for Splunk Issues](#)

When opening an issue please include the following information to help us debug:

- Detailed information about the problem you are having
- PowerMax for Splunk version
- Unisphere version
- Splunk Enterprise version
- Splunk Operating system version
- PowerMax for Splunk TA logs and `splunkd` logs if required (if these contain sensitive data they can be sent directly to our support contact alias listed in [Support Contact](#)).

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**Note:** We will support N-2 releases from the current master release which includes bug and security fixes. If an issue appears in a code base older than N-2 we will try to assist as best possible but ultimately upgrading to a newer version

of PowerMax for Splunk will be the ideal outcome. As new releases of PowerMax for Splunk are made available, anything older than N-2 will be marked as End of Life (EOL).

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## 8.3 GitHub Discussion

A new feature in GitHub, ‘Discussions’, allows for community interaction between developers and users. If you have a general query and would rather community input for it than opening an issue or sending an e-mail to the developers, Discussions is the place to do it.

- [PowerMax Add-on for Splunk Discussion](#)
- [PowerMax App for Splunk Discussion](#)

Before opening a new discussion, check if there are no existing discussions that match what you would like to talk about. If you cannot find an existing discussion, open one and describe your topic as clearly as possible, including TA/App versions where applicable.

## 8.4 Support Contact

In addition to contact via GitHub, it is possible to contact directly via the support e-mail `powermax.splunk.support@de11.com`. Please include as much information as possible about the problem including:

- Detailed information about the problem you are having
- PowerMax for Splunk version
- Unisphere version
- Splunk Enterprise version
- Splunk Operating system version
- PowerMax for Splunk TA logs and splunkd logs if required

## **WELCOME TO THE OFFICIAL POWERMAX FOR SPLUNK DOCUMENTATION!**

### **9.1 Overview**

PowerMax for Splunk provides Splunk users with a backend Technology Add-on (TA) and frontend app to simplify interaction with Splunk Enterprise environments.

The Splunk Technology Add-on for PowerMax allows a Splunk Enterprise administrator to collect inventory, performance information, alert, and audit log information from VMAX/PowerMax storage arrays. The TA is a wrapper around the opensource library [PyU4V](#), providing programmatic access to the Unisphere for PowerMax REST API. You can directly analyse data use it as a contextual data feed to correlate with other operational or security data in Splunk Enterprise.

The Splunk App for Dell EMC PowerMax allows a Splunk Enterprise administrator to data from PowerMax arrays through the TA and present them in pre-built dashboards, tables, and time charts for in-depth analysis.

The TA and App can be downloaded from the links below:

- [Dell EMC PowerMax Add-on for Splunk Enterprise](#)
- [Dell EMC PowerMax App for Splunk Enterprise](#)

From the PowerMax for Splunk 3.x release code for both the TA and app will be actively managed and maintained from the public Dell GitHub repo. The source for both code can be viewed and downloaded from the links below:

- [Dell EMC PowerMax Add-on for Splunk Enterprise source](#)
- [Dell EMC PowerMax App for Splunk Enterprise source](#)

### **9.2 Version Info**

<b>PowerMax for Splunk</b>	3.0
<b>Technology Add-On</b>	3.0.0.0
<b>App</b>	3.0.0.0
<b>Minimum Unisphere Version</b>	9.2.0.0
<b>Array Model</b>	VMAX-3, VMAX AFA, PowerMax
<b>Array uCode</b>	HyperMax OS, PowerMax OS
<b>Minimum Splunk Version</b>	Splunk Enterprise 8.1
<b>Platforms</b>	Linux, Windows
<b>Python</b>	Splunk Native 3.7

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**Note:** To get full support of all features in PowerMax for Splunk 3.x you will need to have your array u-code at level 5978.7xx.xxx (Hickory SR) or newer and use both Solutions Enabler 9.2.1 and Unisphere for PowerMax 9.2.1. PowerMax for Splunk uses new efficiency statistics which are only available in the Hickory SR release. If your array is lower than 5978.7xx.xxx then these statistics will not be reported on in PowerMax for Splunk.

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**Note:** PowerMax for Splunk has been tested and verified only against Python 3.x. There is **no** support for Python 2.x, it reached end-of-life in January 2020.

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## 9.3 Getting Started

### *Overview*

About the TA and App, what's new, contact information, and hours of operation.

### *Installation*

Supported versions, enabling performance metrics collection in Unisphere, configuring Unisphere users permissions for Splunk, SSL configuration, and installing the TA and App.

### *Configuration*

Configuring PowerMax for Splunk TA and App for your environment.

### *Unisphere for PowerMax Performance Metrics*

Detailed list of all Splunk supported Unisphere performance category metrics.

### *Support*

How to get open issues or get support for PowerMax for Splunk.

## 9.4 Build your own Docs

PowerMax for Splunk docs have been included with the PowerMax for Splunk TA and App source code, if you would like to build the docs from scratch to view locally use the following commands:

```
$ pip install sphinx
$ pip install sphinx-rtd-theme
$ cd {powermax_for_splunk}/docs
$ make clean && make html
```

All of the necessary make files and Sphinx configuration files are included with PowerMax for Splunk so you can build the docs after the required dependencies have been installed.

Once the above commands have been run you will find newly generated html files within the {powermax\_for\_splunk}/docs/build folder. Open index.html within a browser of your choosing to view the docs offline. Generating the docs is not required, we have bundled the most up-to-date docs with PowerMax for Splunk so you can still navigate to {powermax\_for\_splunk}/docs/build/index.html within your browser to view PowerMax for Splunk docs offline.

## 9.5 Disclaimer

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