

PowerEdge Metrics in CloudIQ using OpenManage Enterprise (OME): An Overview

Abstract

This technical white paper provides information on the iDRAC telemetry that is gathered by OpenManage Enterprise (OME) and forwarded to CloudIQ. This feature is enabled by installing the CloudIQ plugin in OME and allows the CloudIQ customers to view and report on the various metrics associated with the system (such as Power, Thermal, Utilization, and so on) and on the various components such as Networking, Storage, and GPU within the server.

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Revisions

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Acknowledgments

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Executive summary

OpenManage Enterprise (OME) as a management console supports discovery and management of a wide variety of devices in a data center including but not limited to servers, storage, and network devices. In addition, it can also be leveraged to retrieve the telemetry data from the supported devices to provide a consolidated view of their performance, efficiency, and utilization. This document provides an overview of the CloudIQ plugin and OME's underlying infrastructure that facilitates PowerEdge server metric collection and the periodic forwarding of the gathered telemetry data to CloudIQ. Troubleshooting of data transfer failures and various scenarios for metric collection failure are also included.

Audience

This white paper is intended for the Dell EMC OpenManage Enterprise and Dell EMC CloudIQ customers.

1 Overview

The Dell EMC PowerEdge server iDRAC provides a variety of metrics through the Redfish and WS-MAN out-of-band management interfaces. OpenManage Enterprise (OME) leverages the iDRAC APIs to gather these metrics from the PowerEdge servers it manages in a data center and forwards the collected data to CloudIQ using the Dell Connectivity Service.

The below diagram illustrates the flow of metrics from the PowerEdge servers to CloudIQ using the OME CloudIQ plugin.



Figure 1 Metrics collected from iDRAC and forwarded to CloudIQ via OME

The different components in OME that facilitate metric streaming are:

- **CloudIQ Plugin**

This plugin enables the OME users to:

- Define the groups of PowerEdge servers to be monitored in CloudIQ.
- Configure a secure connection with CloudIQ using the Dell Connectivity Service.

- **Metrics Collection**

This service manages the periodic tasks that are responsible for:

- Configuring iDRAC on the selected servers to generate and report metrics.
- Collecting metrics from the selected servers using WSMAN or Redfish.

- **Data Forwarding Service**

This service manages the periodic tasks that are responsible for:

- Forwarding of the collected metrics to CloudIQ.
- Forwarding of the inventory, health, and alert information to CloudIQ.

2 Prerequisites

One of the following iDRAC licenses is required for OME metrics collection:

- Enterprise License
- OME Advanced License
- Datacenter License

For a detailed list of the metrics that can be accessed with each license, see [Appendix A.1](#) and [Appendix A.2](#).

3 Configure CloudIQ Plugin in OME

For the administrators to register the PowerEdge servers for monitoring and to establish OME's connectivity with CloudIQ, ensure that the CloudIQ plugin is installed and in an active state as shown below.

Note: Before registering, ensure that the CloudIQ plugin is active and not in a 'Disabled' state.

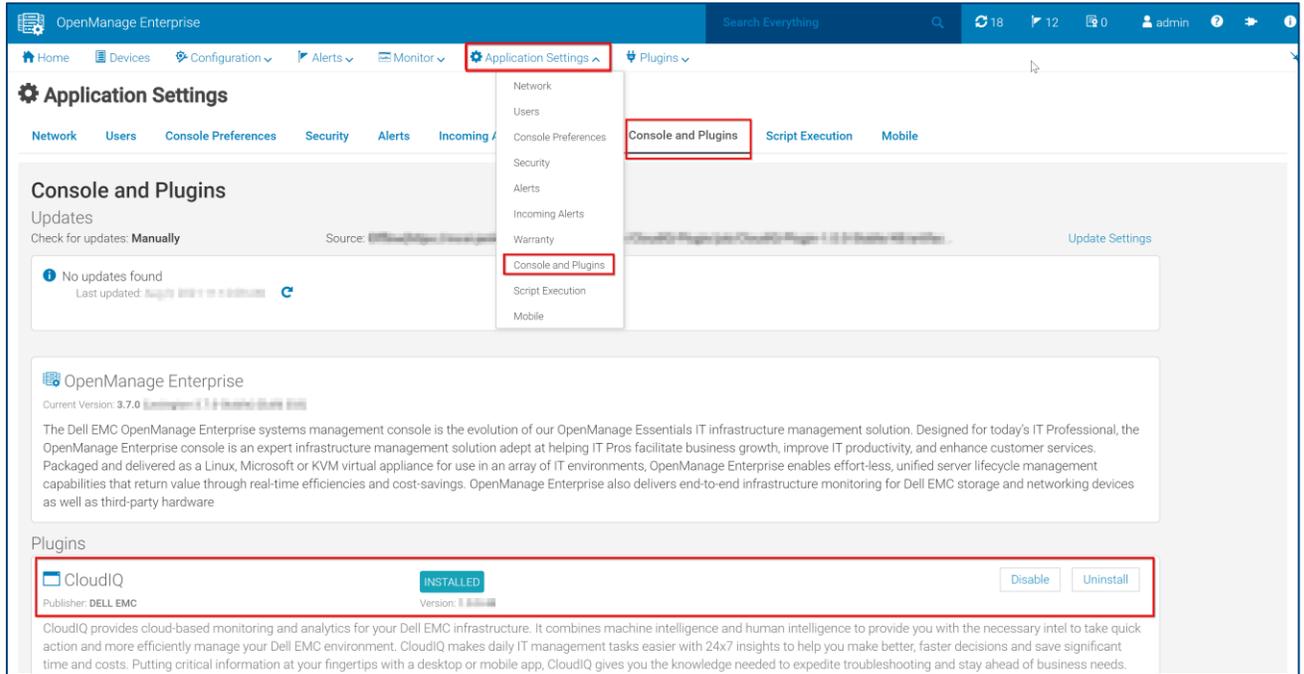


Figure 2 CloudIQ plugin installed and in active state

After installing the CloudIQ plugin, a secure connection must be established with CloudIQ using the Dell Connectivity Service and the status of the connection must remain in a 'healthy' state to maintain continuity of the metric flow to CloudIQ.

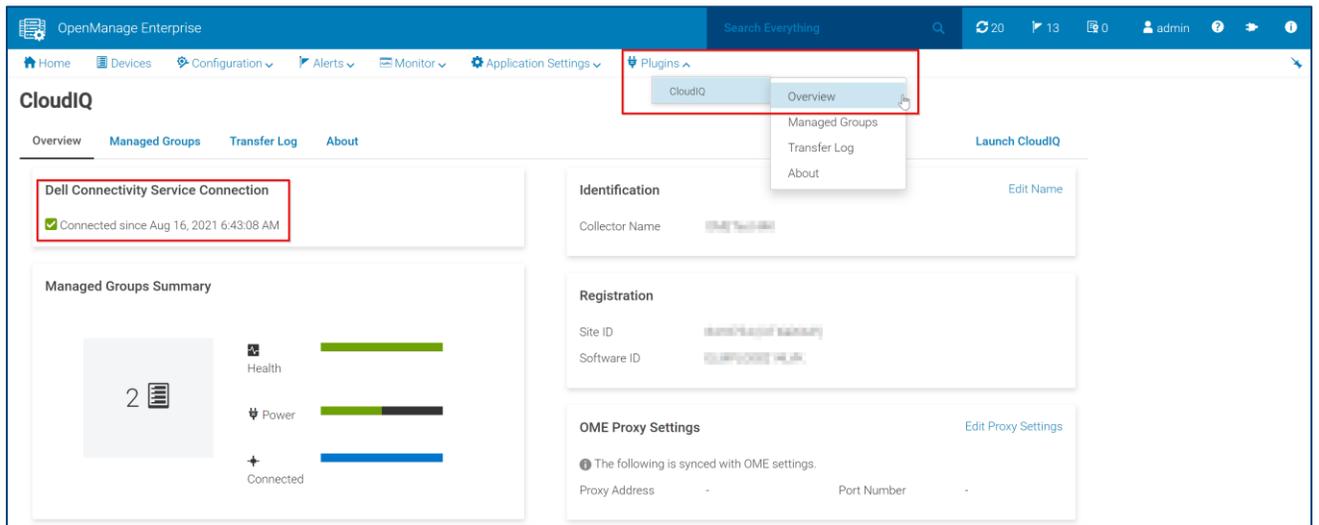


Figure 3 Status of OME's connection with CloudIQ

Once a secure connection is established between OME and CloudIQ, the administrators can add one or more server groups to the CloudIQ Managed Groups as shown below. This allows the Metrics Collection Service in OME to begin metric collection from the servers belonging to these managed groups. For the servers that support advanced Redfish Telemetry, the Metrics Collection Service makes additional configurations on the iDRACs to generate metric reports at specific intervals.

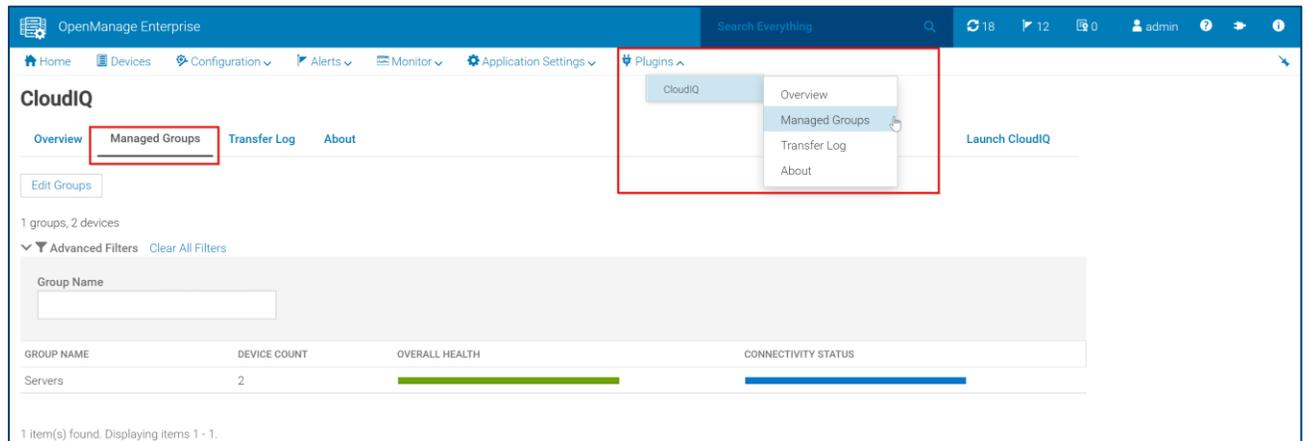


Figure 4 CloudIQ plugin – Server group added to CloudIQ Managed Groups

OME's Metrics Collection Service runs a periodic task every 15 minutes to collect metrics from the registered PowerEdge servers. For more information about the complete list of metrics and associated collection intervals, refer Appendix B. The collected Metrics are persisted in a time-series database.

The Data Forwarding Service runs a task to continuously read the metric records from the time-series database and transfers them in a compressed format to CloudIQ. Once the data is transferred successfully, it's purged from OME's database.

Note: Users with direct access to iDRAC can disable the telemetry feature or delete the metric report definitions provisioned by OME on individual servers. This can cause temporary loss of data; however, the Metrics Collection Service will detect this and reconfigure iDRAC to resume generating metrics. For more details, refer the [Troubleshooting](#) section.

4 Monitor Metric Collection Status in OME

The OME users can monitor the overall status of metrics collection on the **Monitor > Jobs** page. To view only the Metrics tasks, filter by Job Type = 'Metrics task' and Source = 'System generated'.

Click on **View Details** to see the individual status of the last few metrics collection cycles. This provides information about the time taken for each cycle and if the cycle was completed successfully for all the servers or not.

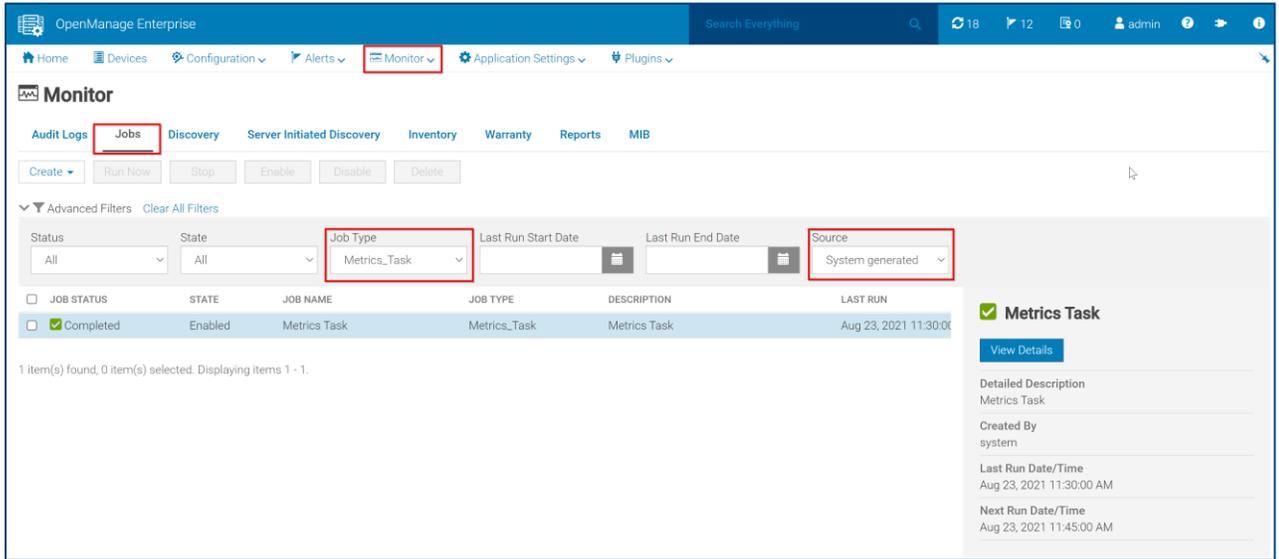


Figure 5 Metrics Collection overall status

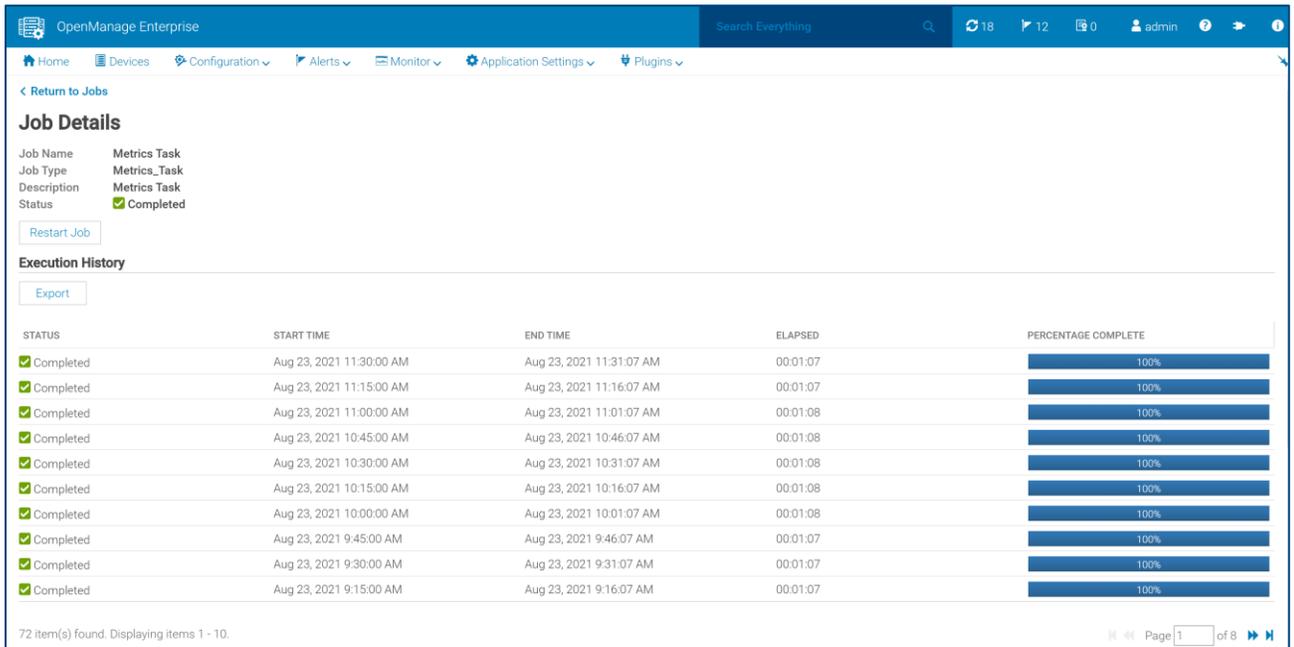


Figure 6 Status of individual Metrics collection cycles

To see the status of metric collection for an individual server within a cycle, you can click on one of the rows from the above screen. This provides information on the time taken for collecting all the supported metrics for that server and a summary of the number of metrics collected.

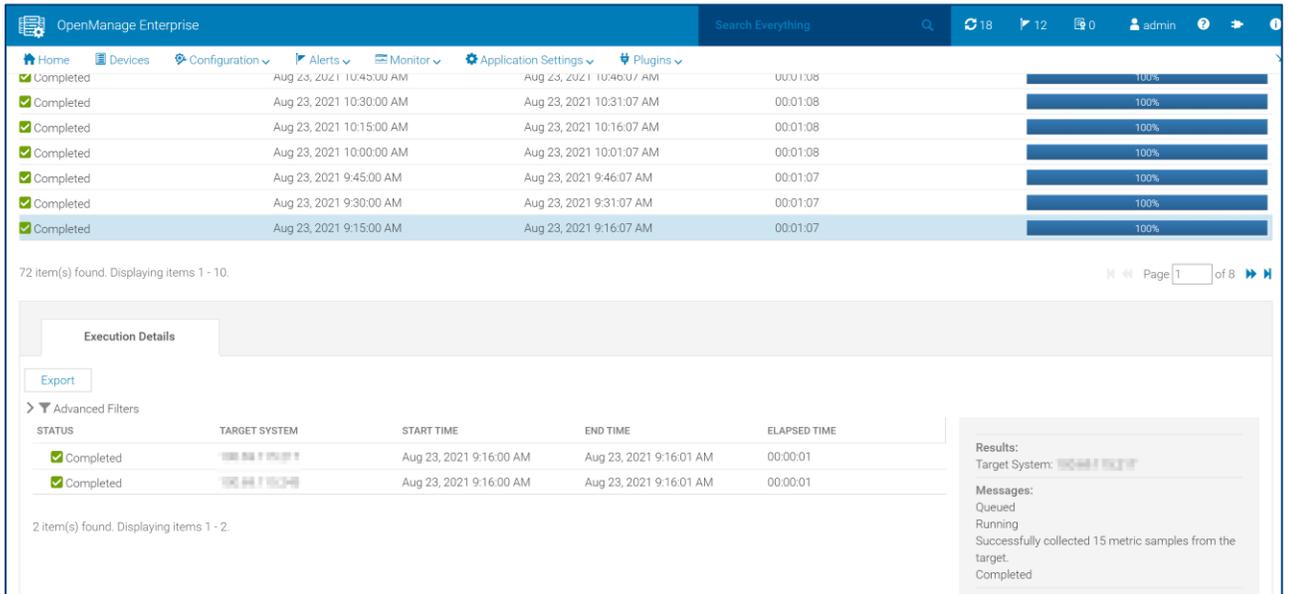


Figure 7 Metrics Collection status for individual servers

The number of metric samples collected for each server may vary as it depends on the licenses installed on the device and its hardware inventory.

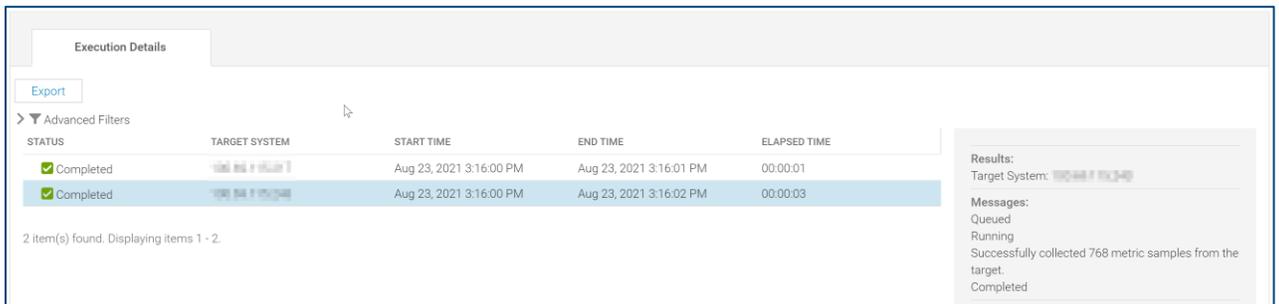


Figure 8 Metrics Collection summary for a server with Data center license

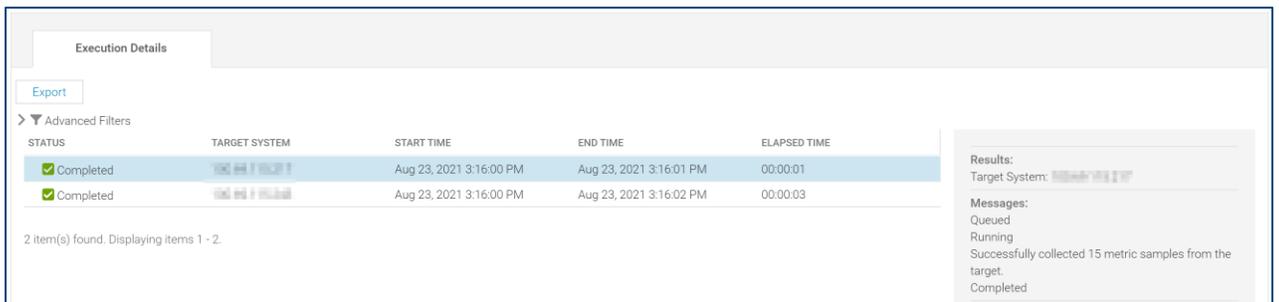
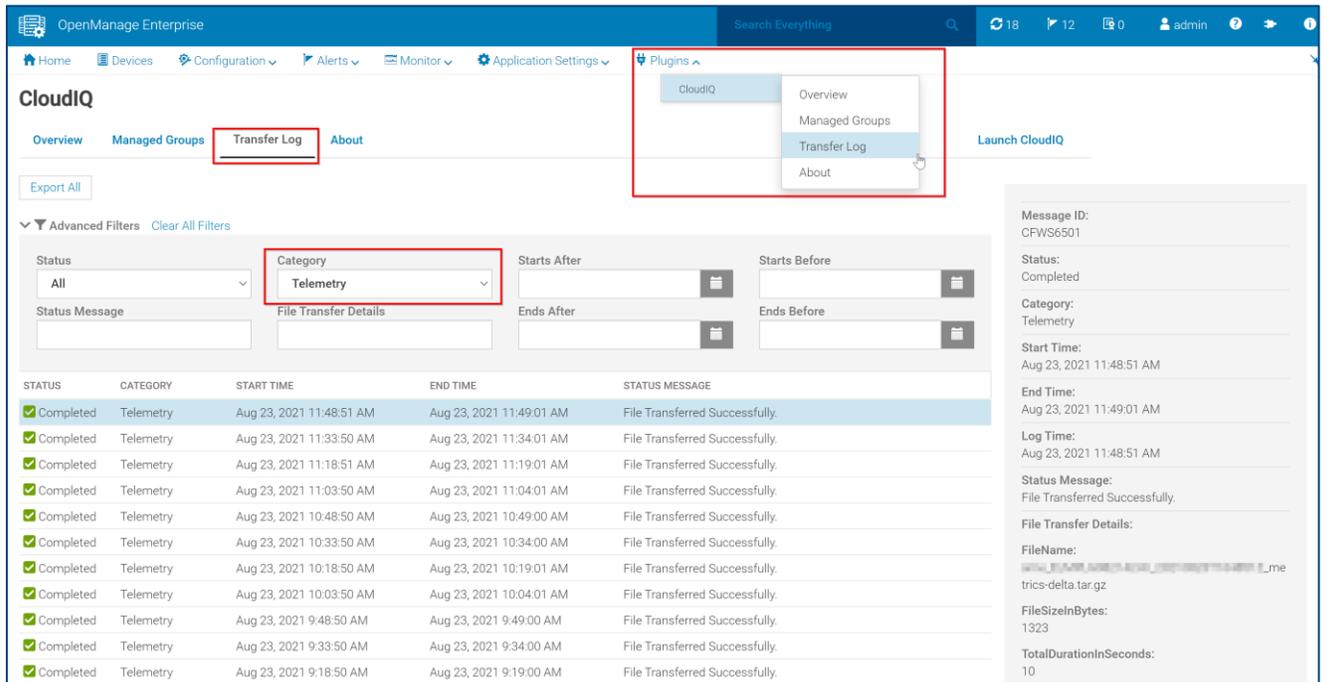


Figure 9 Metrics Collection summary from a server with Enterprise license

5 Monitor Metric Data Transfer to CloudIQ in OME

You can monitor the status of metric data transfer to CloudIQ on OME's CloudIQ Transfer Log page (**Plugins > CloudIQ > Transfer Log**). To view only the Telemetry data, filter by Category = 'Telemetry'.



The screenshot shows the OpenManage Enterprise interface. The 'Plugins' menu is open, highlighting 'CloudIQ'. The 'Transfer Log' page is active, showing a table of telemetry data. The 'Category' filter is set to 'Telemetry'. The table lists 10 successful transfers of telemetry files.

STATUS	CATEGORY	START TIME	END TIME	STATUS MESSAGE
Completed	Telemetry	Aug 23, 2021 11:48:51 AM	Aug 23, 2021 11:49:01 AM	File Transferred Successfully.
Completed	Telemetry	Aug 23, 2021 11:33:50 AM	Aug 23, 2021 11:34:01 AM	File Transferred Successfully.
Completed	Telemetry	Aug 23, 2021 11:18:51 AM	Aug 23, 2021 11:19:01 AM	File Transferred Successfully.
Completed	Telemetry	Aug 23, 2021 11:03:50 AM	Aug 23, 2021 11:04:01 AM	File Transferred Successfully.
Completed	Telemetry	Aug 23, 2021 10:48:50 AM	Aug 23, 2021 10:49:00 AM	File Transferred Successfully.
Completed	Telemetry	Aug 23, 2021 10:33:50 AM	Aug 23, 2021 10:34:00 AM	File Transferred Successfully.
Completed	Telemetry	Aug 23, 2021 10:18:50 AM	Aug 23, 2021 10:19:01 AM	File Transferred Successfully.
Completed	Telemetry	Aug 23, 2021 10:03:50 AM	Aug 23, 2021 10:04:01 AM	File Transferred Successfully.
Completed	Telemetry	Aug 23, 2021 9:48:50 AM	Aug 23, 2021 9:49:00 AM	File Transferred Successfully.
Completed	Telemetry	Aug 23, 2021 9:33:50 AM	Aug 23, 2021 9:34:00 AM	File Transferred Successfully.
Completed	Telemetry	Aug 23, 2021 9:18:50 AM	Aug 23, 2021 9:19:00 AM	File Transferred Successfully.

Message ID: CFWS6501
Status: Completed
Category: Telemetry
Start Time: Aug 23, 2021 11:48:51 AM
End Time: Aug 23, 2021 11:49:01 AM
Log Time: Aug 23, 2021 11:48:51 AM
Status Message: File Transferred Successfully.
File Transfer Details:
FileName: trics-delta.tar.gz
FileSizeInBytes: 1323
TotalDurationInSeconds: 10

Figure 10 Status of telemetry files forwarded to CloudIQ platform

You can click on the individual rows to know the status of each transfer attempt. This provides information about the name of the compressed file, its size, and the time taken to successfully transfer the file.

6 View Metrics on the CloudIQ Portal

The CloudIQ Overview page provides a consolidated view of the systems including the PowerEdge servers monitored in OME.

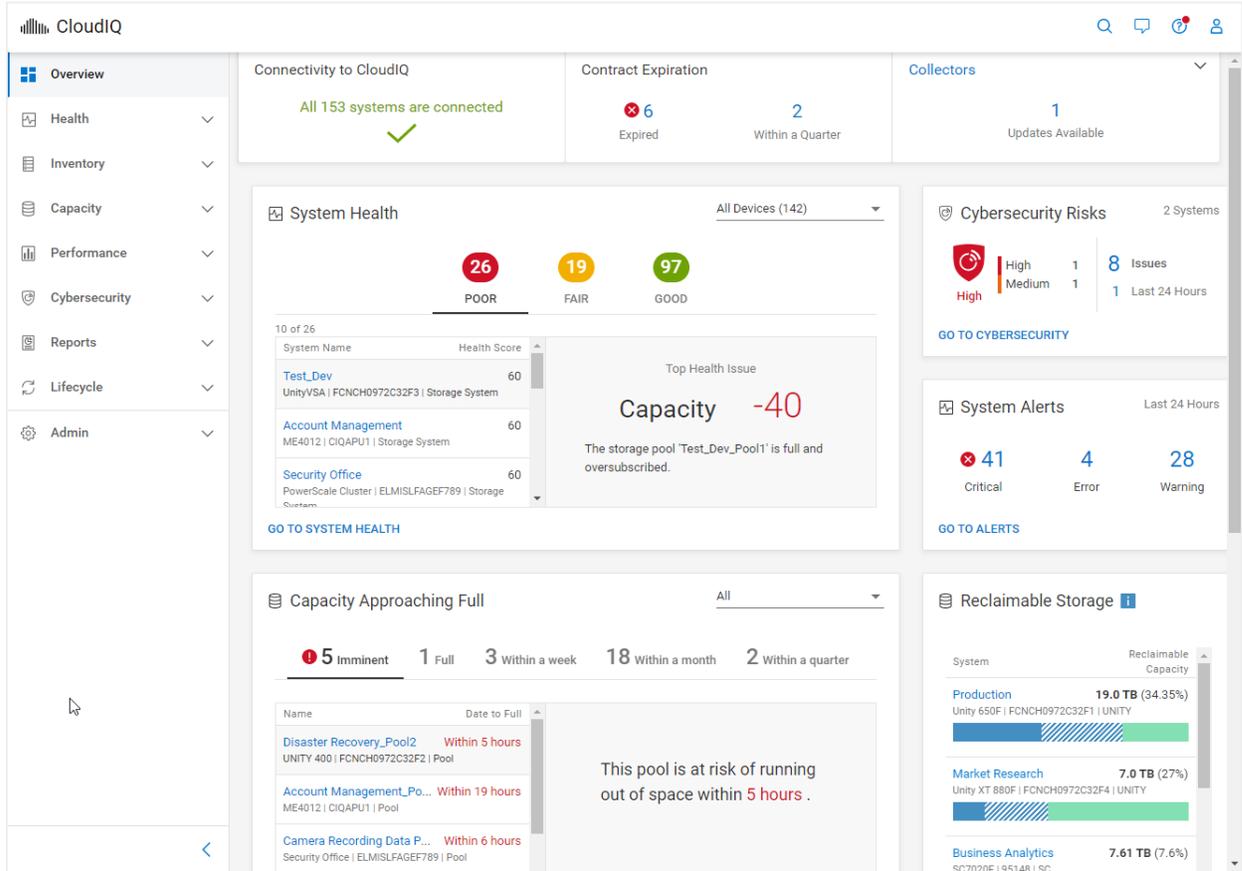


Figure 11 CloudIQ portal Overview page

You can go to **Overview Performance > System Performance** (click on 'SERVER' tab) to see the Thermal and System utilization metric summary of individual servers.

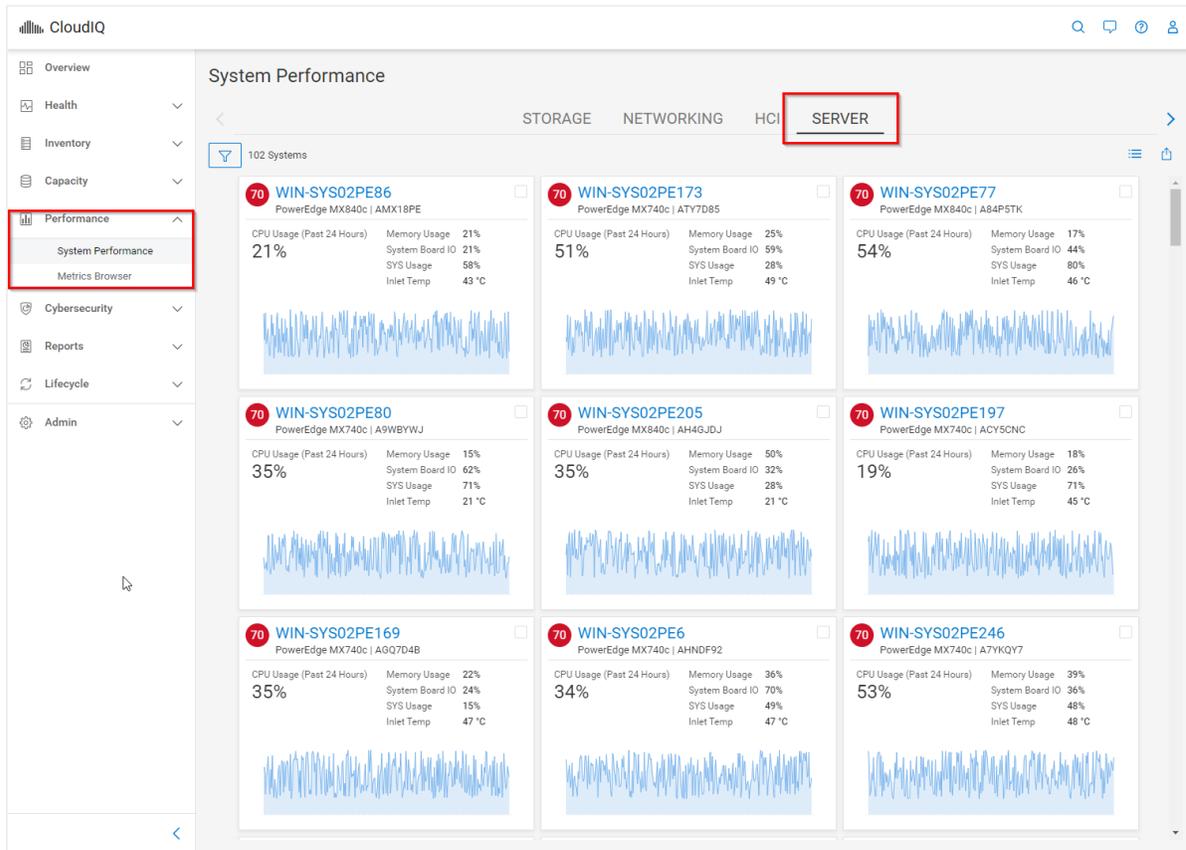


Figure 12 CloudIQ portal – System Performance Metrics view

For a detailed view of the individual performance metrics, click on one of the servers. This provides graphs for each of the metrics with a summary of Average, Minimum and Maximum values for the last 24 hours. It also provides links to navigate to the related hardware inventory such as Processors, Memory.

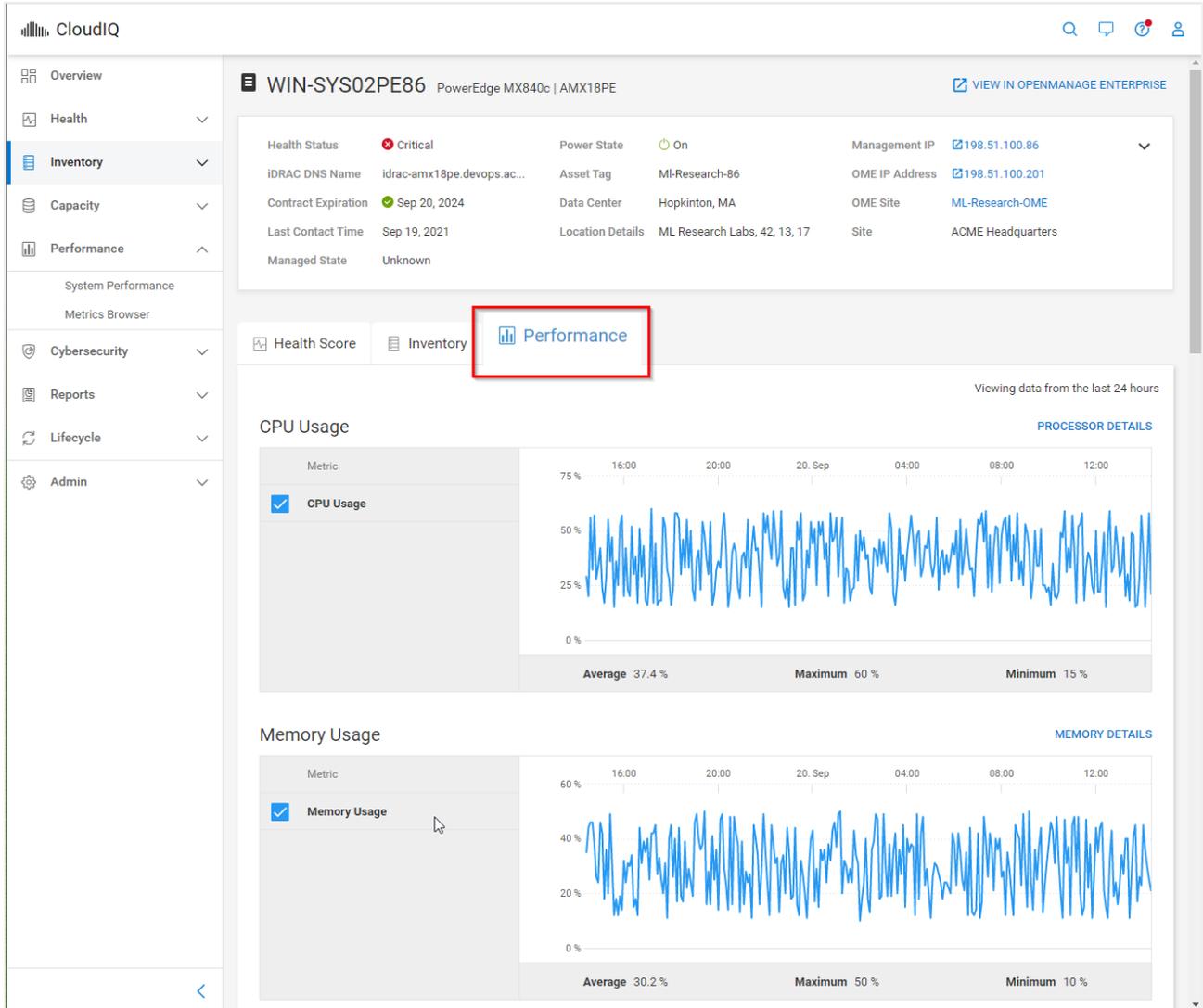


Figure 13 CloudIQ portal – Individual server performance detailed view

CloudIQ has an option to create custom reports for all other metrics on the **Overview > Reports > Report Browser** page.

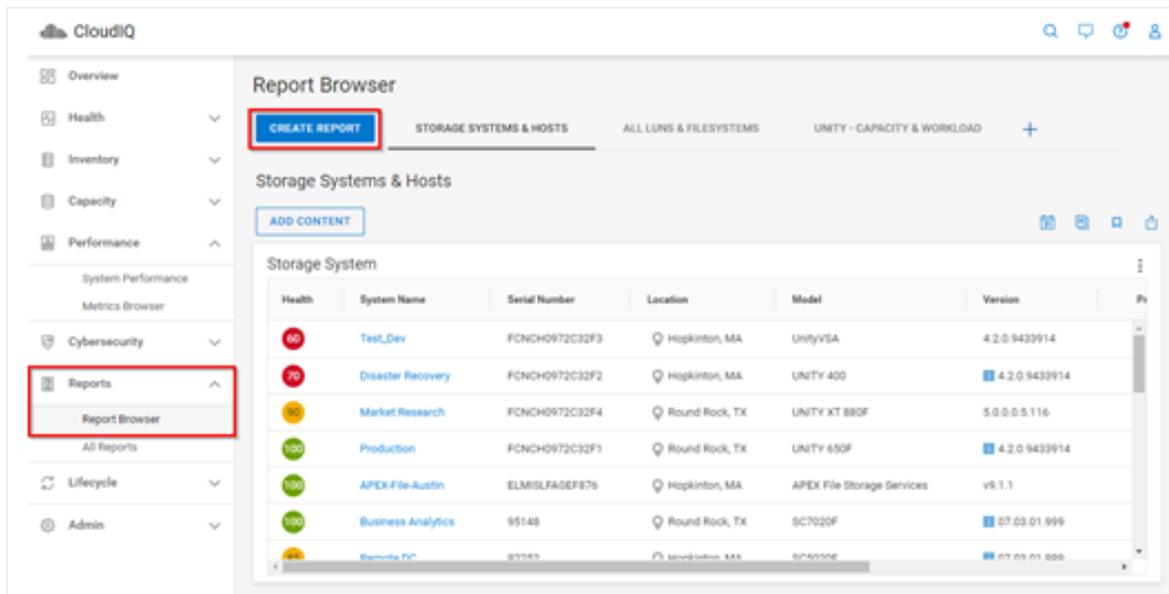


Figure 14 CloudIQ portal – Create Custom Report

Click on 'Add Content' in the above screen to see the list of metrics to be included in the custom report. For example, on selecting 'PowerEdge' from the “Product” list, you will see the list of metric categories as shown below. You can select either the “Line Chart” or “Table” format for graphical representation of the custom report.

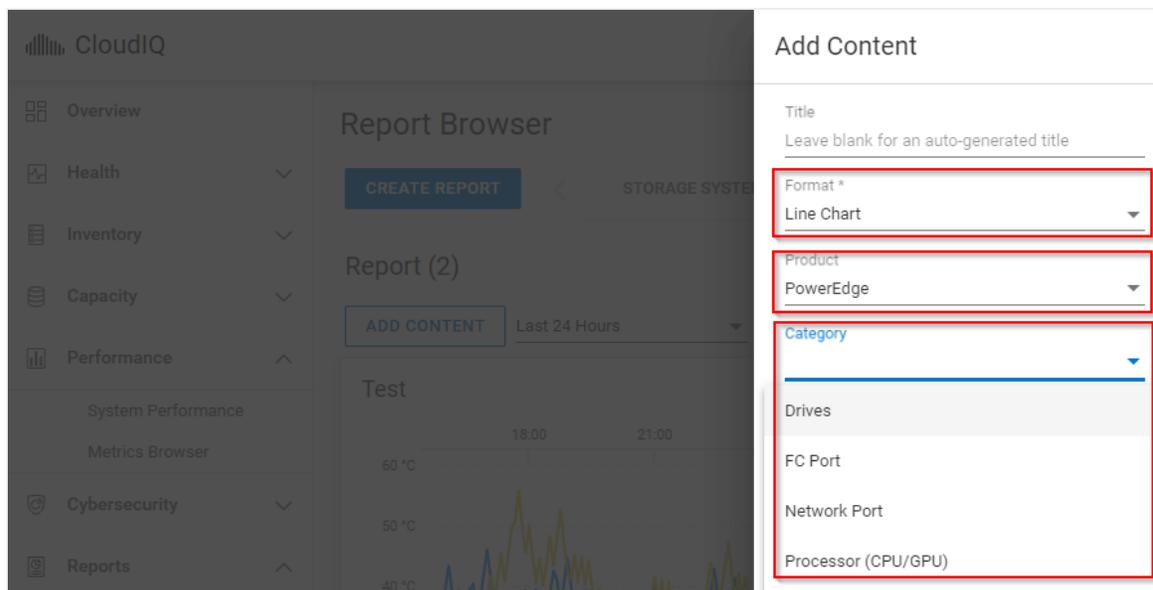


Figure 15 CloudIQ portal – Custom report options

Note: Not all metrics support both 'Line Chart' and 'Table' view formats. Refer the CloudIQ Online Help on Dell EMC CloudIQ portal for more details.

After selecting one of the categories listed in the previous screen (for example, “FC Port”) and a System, a list of related metrics which can be selected along with the applicable component(s) to generate a custom report is displayed.

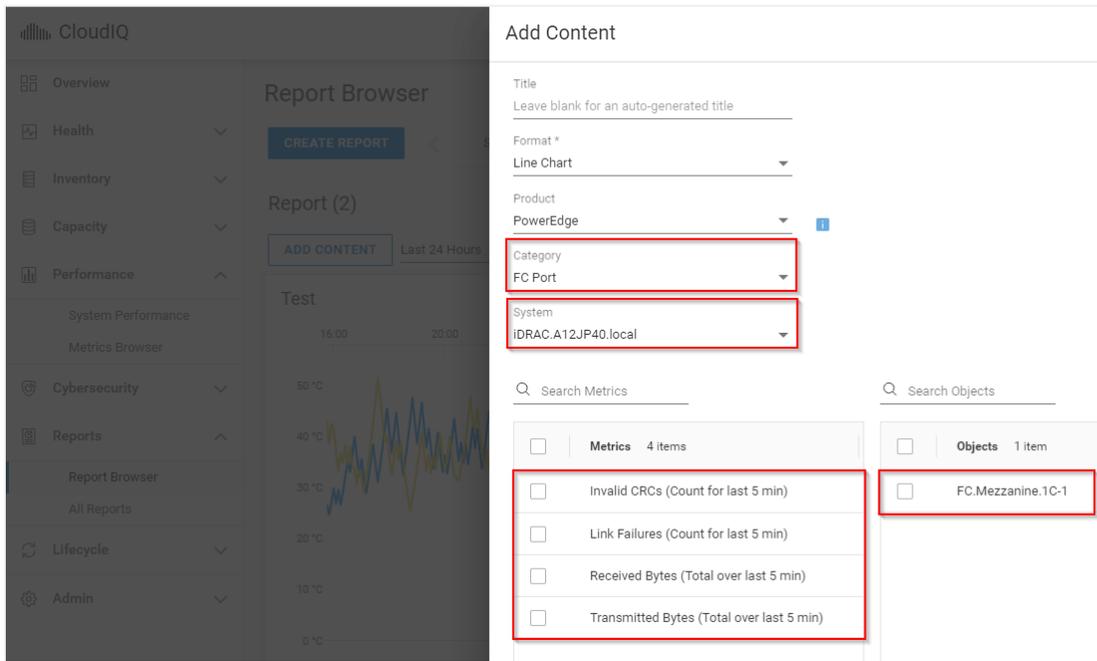


Figure 16 CloudIQ portal – Custom report configuration

Depending on the number of metrics and components selected, one or more graphs will appear under Reports.

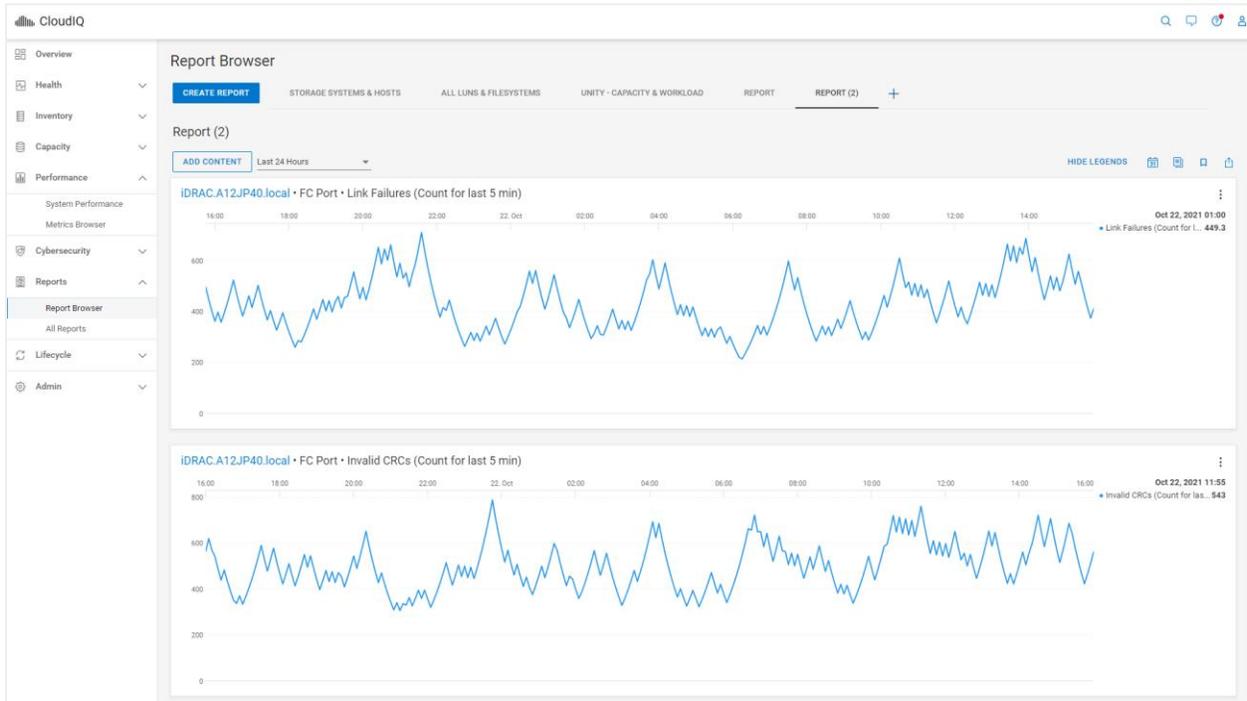


Figure 17 CloudIQ portal – Custom reports

7 Troubleshooting

7.1 Data transfer failures

If the system performance details and/or other metrics are missing on the Dell EMC CloudIQ portal for any of the PowerEdge Servers monitored in OME:

1. Verify that the criteria as described in [Configure the CloudIQ Plugin in OME](#) is met. Check OME's connection status with CloudIQ, and if the status is shown as 'Disconnected' and is in 'Amber' or 'Red' for an extended period, contact the Support team.

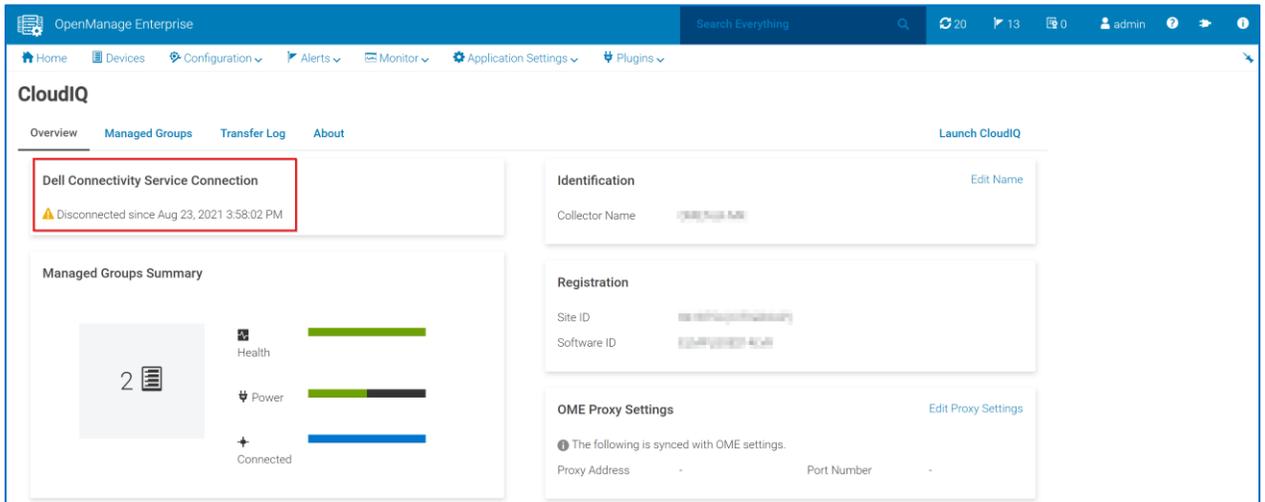


Figure 18 Troubleshooting – connection status between OME and CloudIQ

2. Check the Transfer logs as described in [Monitor Metric Data Transfer to CloudIQ in OME](#). If the errors are due to connection failure or intermittent service failures, subsequent transfer will attempt to transmit the accumulated backlog of data once the issue is resolved.

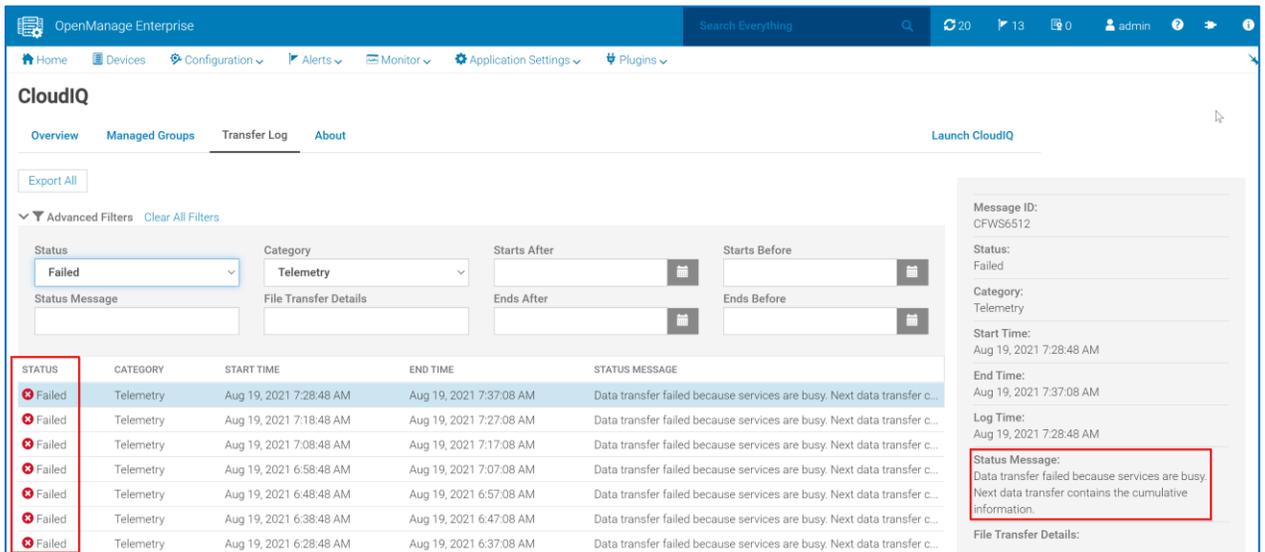


Figure 19 Troubleshooting – data transfer failures

7.2 Metrics collection failures

If the status of the connection between OME and CloudIQ is fine and there are no failures in data transfer, there could potentially be failures in metric collection. The scenarios and recommended actions are mentioned below.

Scenario 1: Connection failure

Recommended Action: Ensure that the device is powered ON and reachable.

STATUS	TARGET SYSTEM	START TIME	END TIME	ELAPSED TIME
Failed	10.100.04.40	Aug 23, 2021 11:31:30 AM	Aug 23, 2021 11:31:30 AM	00:00:00
Failed	10.100.04.40	Aug 23, 2021 11:31:27 AM	Aug 23, 2021 11:34:32 AM	00:03:05
Failed	10.100.04.40	Aug 23, 2021 11:31:23 AM	Aug 23, 2021 11:31:23 AM	00:00:00
Failed	10.100.04.40	Aug 23, 2021 11:31:16 AM	Aug 23, 2021 11:31:25 AM	00:00:09
Failed	10.100.04.40	Aug 23, 2021 11:31:15 AM	Aug 23, 2021 11:35:25 AM	00:04:09
Failed	10.100.04.40	Aug 23, 2021 11:31:13 AM	Aug 23, 2021 11:31:13 AM	00:00:00
Failed	10.100.04.40	Aug 23, 2021 11:31:08 AM	Aug 23, 2021 11:31:18 AM	00:00:09
Failed	10.100.04.40	Aug 23, 2021 11:31:00 AM	Aug 23, 2021 11:31:00 AM	00:00:00

Results:
Target System: 10.100.04.40

Messages:
Queued
Running
Connection failed with : 10.100.04.40
Metrics collection failed for the target.
Task Failed. Completed With Errors.

Figure 20 Troubleshooting – connection failed with iDRAC of the Server

Scenario 2: Authentication failure

Recommended Action: Rerun Server discovery in OME using latest iDRAC credentials.

STATUS	TARGET SYSTEM	START TIME	END TIME	ELAPSED TIME
Failed	10.100.04.40	Aug 22, 2021 7:31:09 PM	Aug 22, 2021 7:31:11 PM	00:00:02
Failed	10.100.04.40	Aug 22, 2021 7:31:09 PM	Aug 22, 2021 7:31:10 PM	00:00:01
Failed	10.100.04.40	Aug 22, 2021 7:31:09 PM	Aug 22, 2021 7:31:13 PM	00:00:04
Failed	10.100.04.40	Aug 22, 2021 7:31:09 PM	Aug 22, 2021 7:31:11 PM	00:00:02
Failed	10.100.04.40	Aug 22, 2021 7:31:09 PM	Aug 22, 2021 7:31:10 PM	00:00:01
Failed	10.100.04.40	Aug 22, 2021 7:31:09 PM	Aug 22, 2021 7:31:10 PM	00:00:01
Failed	10.100.04.40	Aug 22, 2021 7:31:09 PM	Aug 22, 2021 7:31:11 PM	00:00:02
Failed	10.100.04.40	Aug 22, 2021 7:31:09 PM	Aug 22, 2021 7:31:15 PM	00:00:06
Failed	10.100.04.40	Aug 22, 2021 7:31:09 PM	Aug 22, 2021 7:31:12 PM	00:00:03
Failed	10.100.04.40	Aug 22, 2021 7:31:09 PM	Aug 22, 2021 7:31:11 PM	00:00:03

Results:
Target System: 10.100.04.40

Messages:
Queued
Running
Authentication failed with : 10.100.04.40
Metrics collection failed for the target.
Task Failed. Completed With Errors.

Figure 21 Troubleshooting – authentication failed with iDRAC

Scenario 3: Missing/Invalid/Expired license

Recommended Action: Reload valid license (Refer [Appendix A](#))

STATUS	TARGET SYSTEM	START TIME	END TIME	ELAPSED TIME
Failed	10.100.04.40	Aug 23, 2021 2:26:42 PM	Aug 23, 2021 2:26:43 PM	00:00:00
Completed	10.100.04.40	Aug 23, 2021 2:26:42 PM	Aug 23, 2021 2:26:44 PM	00:00:01

2 item(s) found. Displaying items 1 - 2.

Results:
Target System: 10.100.04.40

Messages:
Queued
Running
Target doesn't have required capabilities to retrieve metrics via REDFISH
Target doesn't have required capabilities to retrieve metrics via WSMAN
Metrics collection failed for the target.
Task Failed. Completed With Errors.

Figure 22 Troubleshooting – missing required license on the Server

Scenario 4: Incomplete metric retrieval

Recommended Action: If a server that supports Redfish Telemetry is newly registered for metric collection in OME and if the metric collection is attempted before Metrics collection Service configures Metric report definitions on iDRAC or if the user that has direct access to iDRAC deletes the Metric report definitions, an OME user may see the error below. In such cases, basic metrics available via WS-MAN are retrieved during that cycle. OME will attempt to automatically re-provision the metric report definitions. If successful, the next metrics collection cycle should retrieve the full set of metrics.

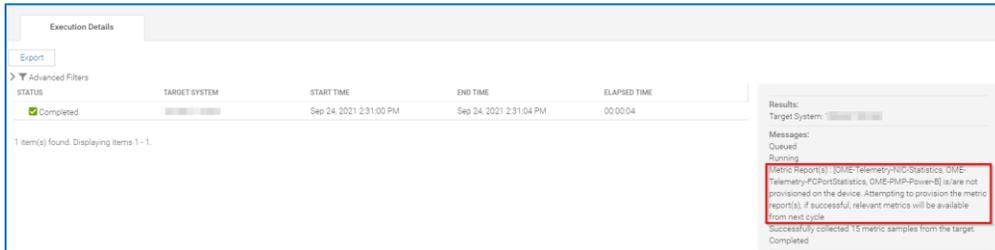


Figure 23 Troubleshooting – Metric report definition not provisioned on device

Scenario 5: Telemetry disabled

Recommended Action: If the Telemetry feature is disabled in iDRAC due to a factory reset or if it is manually disabled by the user that has direct access to iDRAC, OME user may see the following error. In such cases, OME will automatically enable Telemetry. If successful, the next metrics collection cycle should run without errors.

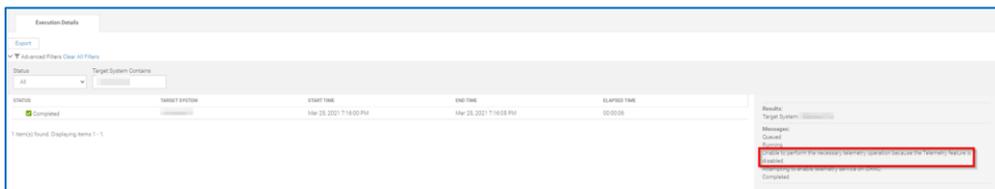


Figure 24 Troubleshooting – Telemetry service disabled on device

8 Technical Support and Resources

- iDRAC white papers on Redfish Telemetry
<https://downloads.dell.com/manuals/common/dell-emc-idrac9-telemetry-streaming-basics.pdf>
<https://downloads.dell.com/manuals/common/dell-emc-idrac9-telemetry-streaming-performance-report.pdf>
- iDRAC User Guides and other manuals
<http://www.dell.com/idracmanuals>
- OpenManage Enterprise User Guide
<https://www.dell.com/support/home/en-us/product-support/product/dell-openmanage-enterprise/docs>
- OpenManage Enterprise CloudIQ Plugin 1.0 User Guide
https://dl.dell.com/content/docu105523_openmanage-enterprise-cloudiq-plugin-1-0-users-guide.pdf?language=en_us
- CloudIQ white paper
<https://www.delltechnologies.com/asset/en-us/products/storage/industry-market/h15691-emc-cloudiq-overview.pdf>
- Dell Technical Support
<http://www.dell.com/support>

A Appendix

A.1 PowerEdge in CloudIQ Support Matrix

iDRAC License Type	iDRAC firmware	OME License Type	Basic Metrics*	Advanced Metrics**
Enterprise	YX2X PowerEdge servers with iDRAC7 2.70 or higher YX3X PowerEdge servers with iDRAC8 2.75 or higher YX4X PowerEdge servers with iDRAC9 3.34 to 4.40.00 YX4X/YX5X PowerEdge servers with iDRAC9 4.40.10 or higher	No license required	Yes	No
Basic, Express, or Enterprise	YX2X PowerEdge servers with iDRAC7 2.70 or higher YX3X PowerEdge servers with iDRAC8 2.75 or higher YX4X PowerEdge servers with iDRAC9 3.34 to 4.40.00 YX4X/YX5X PowerEdge servers with iDRAC9 4.40.10 or higher***	OME Advanced	Yes	No
Data Center	YX4X/YX5X PowerEdge servers with iDRAC9 4.40.10 or higher	No license required	Yes	Yes

* **Basic Metrics** include Power, Thermal, and CPU. YX5X servers have different Basic Metrics based on whether it's AMD or Intel:

- Intel model Basic Metrics include Power, Thermal, CPU, IO, and Memory utilization.
- AMD model Basic Metrics include Power, Thermal, and CPU.

** **Advanced Metrics** include NIC, Fiber Channel, GPU, and Storage.

*** **Basic metrics via Redfish.**

Supported devices:

- YX1X, YX2X, YX3X, YX4X, and YX5X generations of Dell EMC PowerEdge servers
- Dell EMC PowerEdge C-Series servers
- Dell EMC XE Series
- Dell EMC XR Series

A.2 List of metrics supported for CIQP 1.0

A.2.1 Overview of the table headers for the below listed Metric Groups

Header Name	Description
Metrics	Supported list of metrics
Collection Function	Selected collection function is applied across a time interval and computes one single value. Possible values are "Average", "Minimum", "Maximum" and "Summation".
Collection Duration (Mins)	Specifies the duration (<i>in Minutes</i>) over which the function is computed
Minimum Platform Supported	Minimum Supported platform generation in which the listed metrics can be generated
Minimum iDRAC FW version	Minimum Supported iDRAC firmware version to generate the metrics listed
License required	Supported license requirement to generate the metrics listed

A.2.2 CPUSensor

Metrics	Collection Function	Collection Duration (Mins)	Minimum Platform Supported	Minimum iDRAC FW version	License required
TemperatureReading	Avg, Min & Max	15	14G	4.40.10.00	OME-Advanced/ Data Center

A.2.3 SystemUsage

Metrics	Collection Function	Collection Duration (Mins)	Minimum Platform Supported	Minimum iDRAC FW version	License required
CPUUsage, IOUsage, MemoryUsage	Avg, Min & Max	15	12G	2.70	Enterprise
		5	14G	4.40.10.00	OME-Advanced/ Data Center
SystemUsage	Avg, Min & Max	5	14G	4.40.10.00	OME-Advanced/ Data Center

A.2.4 FCPortStatistics

Metrics	Collection Function	Collection Duration (Mins)	Minimum Platform Supported	Minimum iDRAC FW version	License required
FCInvalidCRCs, FCLinkFailures, FCRxKBCount, FCTxKBCount	Max	5	14G	4.40.10.00	Data Center

A.2.5 GPUMetrics

Metrics	Collection Function	Collection Duration (Mins)	Minimum Platform Supported	Minimum iDRAC FW version	License required
BoardTemperature, PowerConsumption, PrimaryTemperature, SecondaryTemperature	Avg, Min & Max	15	14G	4.40.10.00	Data Center

A.2.6 GPUStatistics

Metrics	Collection Function	Collection Duration (Mins)	Minimum Platform Supported	Minimum iDRAC FW version	License required
DBERetiredPages, SBERetiredPages	Max	15	14G	4.40.10.00	Data Center

A.2.7 NICStatistics

Metrics	Collection Function	Collection Duration (Mins)	Minimum Platform Supported	Minimum iDRAC FW version	License required
DiscardedPkts, FCOELinkFailures, FCOEPktRxCount, FCOEPktTxCount, RDMARxTotalPackets, RDMA TxTotalBytes, RDMA TxTotalPackets, RxBytes, RxErrorPktFCSErrors, RxJabberPkt, TxBytes,	Max	5	14G	4.40.10.00	Data Center

TxErrorPktExcessiveCollision, TxErrorPktMultipleCollision					
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A.2.8 NVMeSMARTData

Metrics	Collection Function	Collection Duration (Mins)	Minimum Platform Supported	Minimum iDRAC FW version	License required
AvailableSpareThreshold, CompositeTemperature, CriticalWarning, PercentageUsed	Max	60	14G	4.40.10.00	Data Center

A.2.9 PowerMetrics

Metrics	Collection Function	Collection Duration (Mins)	Minimum Platform Supported	Minimum iDRAC FW version	License required
SystemPowerConsumption	Avg, Min & Max	15	12G	2.70	Enterprise/ OME- Advanced/ Data Center
TotalCPUPower, TotalMemoryPower, CumulativeSystemEnergy	Avg, Min & Max	15	14G	4.40.10.00	OME- Advanced/ Data Center

A.2.10 StorageDiskSMARTData

Metrics	Collection Function	Collection Duration (Mins)	Minimum Platform Supported	Minimum iDRAC FW version	License required
CommandTimeout, CRCErrorCount, DriveTemperature, EraseFailCount, ExceptionModeStatus, MediaWriteCount, PercentDriveLifeRemaining, PowerOnHours, ProgramFailCount, ReadErrorRate, ReallocatedBlockCount, UncorrectableErrorCount,	Max	60	14G	4.40.10.00	Data Center

UncorrectableLBACount, VolatileMemoryBackupSourceFailures					
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A.2.11 ThermalMetrics

Metrics	Collection Function	Collection Duration (Mins)	Minimum Platform Supported	Minimum iDRAC FW version	License required
SysNetAirflow	Avg, Min & Max	15	14G	4.40.10.00	OME-Advanced/ Data Center
TemperatureReading	Avg, Min & Max	15	12G	2.70	Enterprise/ OME-Advanced/ Data Center