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# Telemetry Streaming with iDRAC9 - Power and Thermal Metrics

## Abstract

Dell EMC PowerEdge Servers with iDRAC9 4.x Datacenter streams data to help IT administrators better understand the inner workings of their server environment. This white paper explains how to use the Telemetry Power and Thermal reports for monitoring and creating graphs for PowerEdge server power and thermal subsystems.

August 2020

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# Revisions

| Date | Description |
|---|---|
| August 2020 | Initial release |

# Acknowledgments

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# Executive summary

Beginning with iDRAC9 v4.00.00.00 firmware and a Datacenter license, IT managers can integrate advanced server hardware operation telemetry into their existing analytics solutions. Telemetry is provided as granular, timeseries data that is streamed, or pushed, compared to inefficient, legacy polling, or pulled, methods. The advanced agent-free architecture in iDRAC9 provides over 180 data metrics that are related to server and peripherals operations. Metrics are precisely timestamped and internally buffered to allow highly efficient data stream collection and processing with minimal network loading. This comprehensive telemetry can be fed into analytics tools to predict failure events, optimize server operation, and enhance cyber resiliency.

The iDRAC9 Telemetry Streaming collects and streams live system data from one or more PowerEdge servers to a centralized collector. The focus of this paper is the Power and Thermal Telemetry reports, which include metrics, statistics, and sensor data. It also describes how the reports can be triggered with associated triggers.
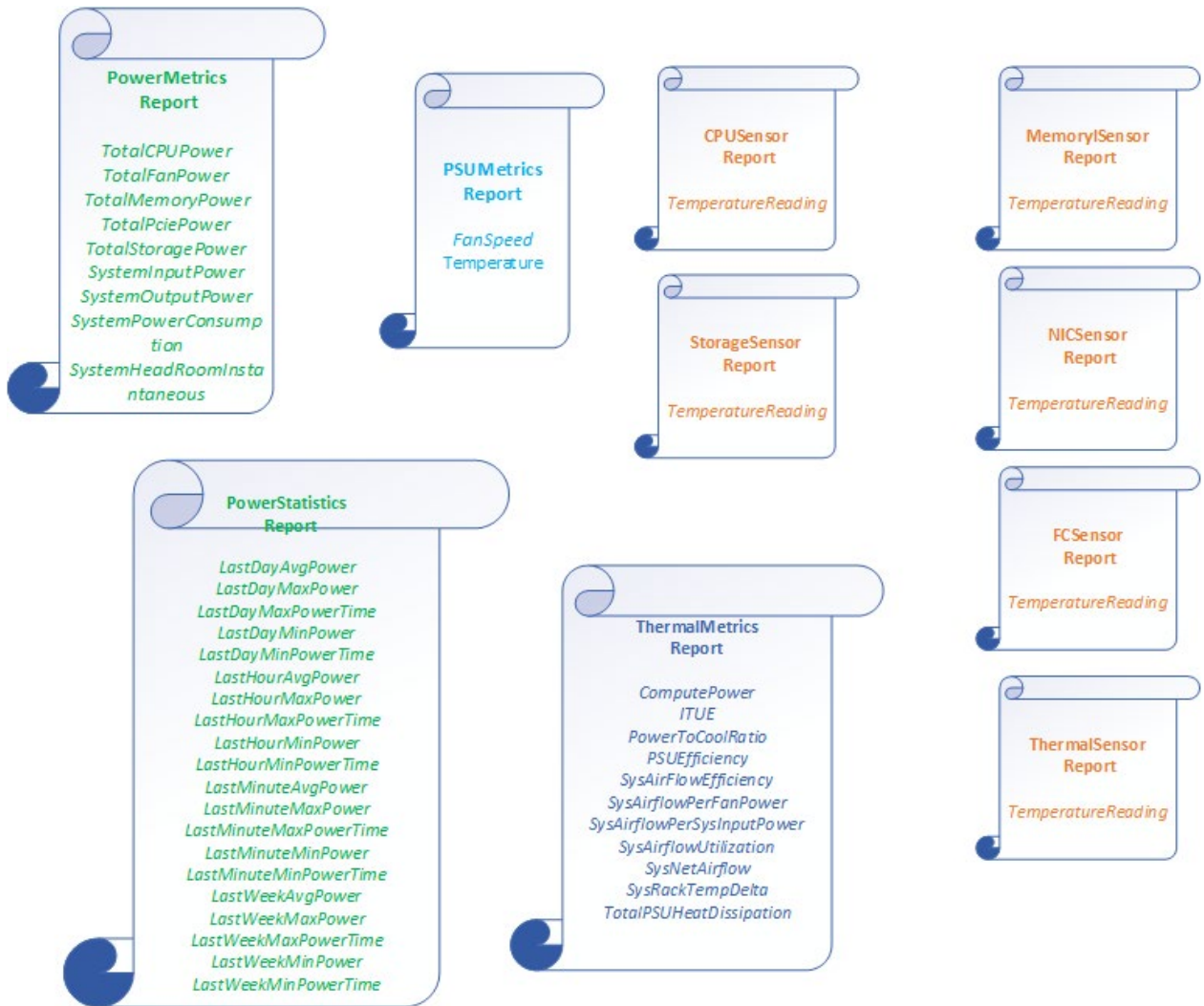


Figure 1    Telemetry Power and Thermal Reports

For details about how to configure and get started with Telemetry, see the white paper - "*Telemetry Getting Started*."

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# 1　Telemetry Overview

## 1.1　Terms and Definitions

**Telemetry**:  Telemetry is an automated communications process by which measurements and other data are collected at remote or inaccessible points and transmitted to receiving equipment for monitoring.

**Telemetry Report:**  Telemetry (Metric) Report is a DMTF Telemetry specification-compliant JSON document that consists of Metric names, Metric values, and Timestamps.

**SSE:** Server-Sent Events allow for a client to open a connection with a web service. The web service can continuously push data to the client as needed.

**Remote Syslog (Rsyslog**):  Remote Syslog uses the basic syslog protocol along with rich content-based filtering and flexible configuration options.

## 1.2　Prerequisites

The Telemetry feature is available on iDRAC9 firmware version 4.00.00.00 or above with Datacenter license installed.

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# 2 Power Subsystem Telemetry

This section describes metrics in the power subsystem telemetry reports and workflows to use the reports to generate useful insights.

## 2.1 PowerMetrics

Following metrics are in the PowerMetric report.

| Metric | Description |
| --- | --- |
| TotalCPUPower | Overall CPU power consumption |
| TotalMemoryPower | Overall memory power consumption |
| TotalStoragePower | Overall Storage power consumption |
| TotalFanPower | Overall Fan power consumption |
| TotalPciePower | Overall PCIe power consumption |
| SystemInputPower | Current System Input Power |
| SystemOutputPower | Current System Output Power |
| SystemPowerConsumption | Present system power consumption |
| SystemHeadRoomInstantaneous | The difference between the power budget maximum power consumption limit and the system current power consumption |

## 2.2 PowerStatistics

Following metrics are in the PowerStatistics report.

| Metric | Description |
| --- | --- |
| LastDayAvgPower | Last Day Average Power |
| LastDayMaxPower | Last Day Max Power |
| LastDayMaxPowerTime | Last Day Max Power Time |
| LastDayMinPower | Last Day Min Power |
| LastDayMinPowerTime | Last Day Min Power Time |
| LastHourAvgPower | Last Hour Average Power |
| LastHourMaxPower | Last Hour Max Power |
| LastHourMaxPowerTime | Last Hour Max Power Time |
| LastHourMinPower | Last Hour Min Power |
| LastHourMinPowerTime | Last Hour Min Power Tim |
| LastMinuteAvgPower | Last Minute Average Power |
| LastMinuteMaxPower | Last Minute Max Power |
| LastMinuteMaxPowerTime | Last Minute Max Power Time |
| LastMinuteMinPower | Last Minute Min Power |
| LastMinuteMinPowerTime | Last Minute Min Power Time |
| LastWeekAvgPower | Last Week Average Power |
| LastWeekMaxPower | Last Week Max Power |
| LastWeekMaxPowerTime | Last Week Max Power Time |
| LastWeekMinPower | Last Week Min Power |
| LastWeekMinPowerTime | Last Week Min Power Time |

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## 2.3     PSUMetrics

Following metrics are in the PSUMetrics report.

| Metric | Description |
|---|---|
| FanSpeed | PSU fan speed in RPM |
| Temperature | PSU Temperature |

## 2.4     Triggers

Telemetry reports can be configured to stream automatically on the event of selected triggers at the server. ReportsReports are sent across all active Subscription, SSE, Rsyslog connections.

| Report | Trigger |
|---|---|
| PSUMetrics | *VLTCriticalTrigger*  - active when any of the voltage threshold crossing LCL events are generated. |
| PowerMetrics | None |
| PowerStatistics | None |

## 2.5     Workflow Example Power Monitoring

iDRAC telemetry feature for downstream analytics and visualization by plotting streamed metric values for gaining useful insights
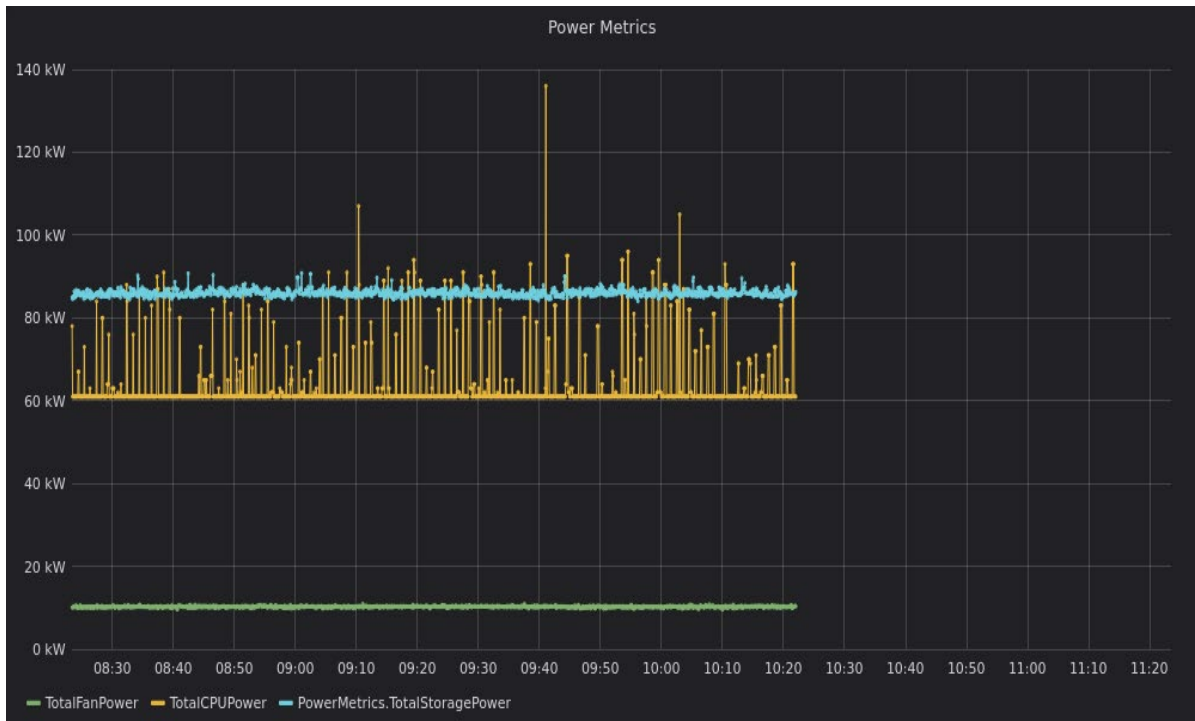


Figure 2     A time lapse Grafana plot of  fan, cpu, and storage power consumption from PowerMetric report
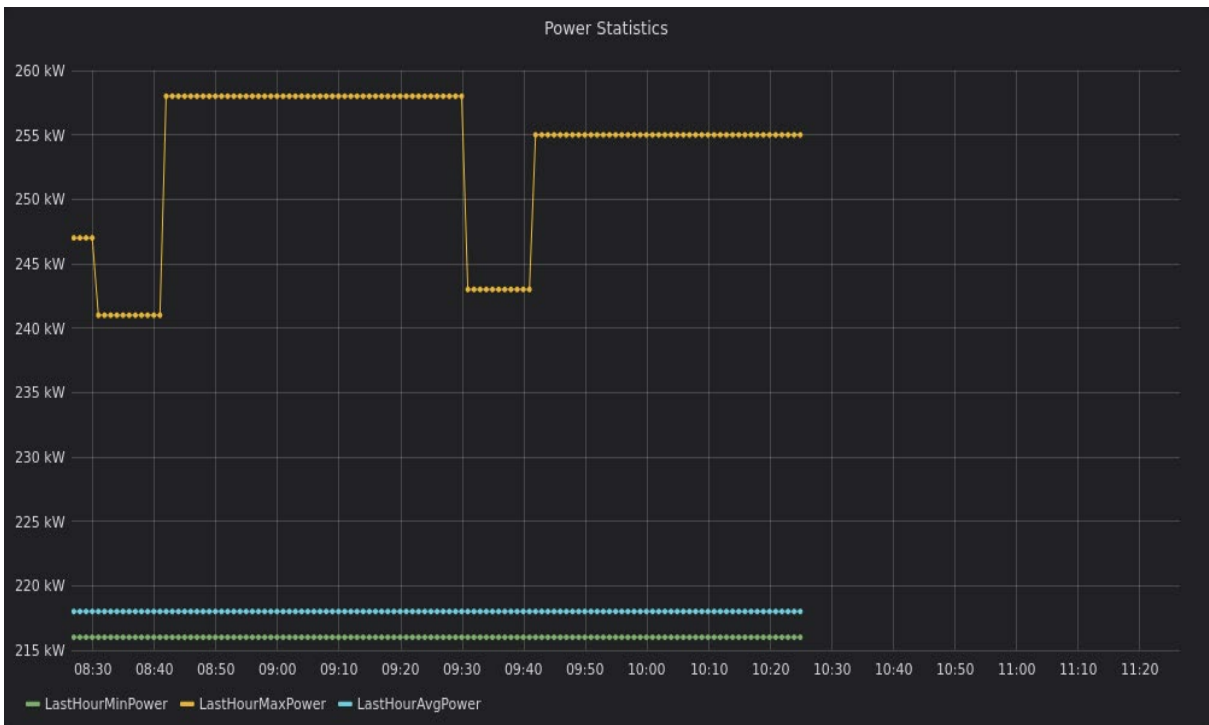
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Figure 3    A time lapse Grafana plot of last hour, min, max, and average power consumption from the PowerStatistics report
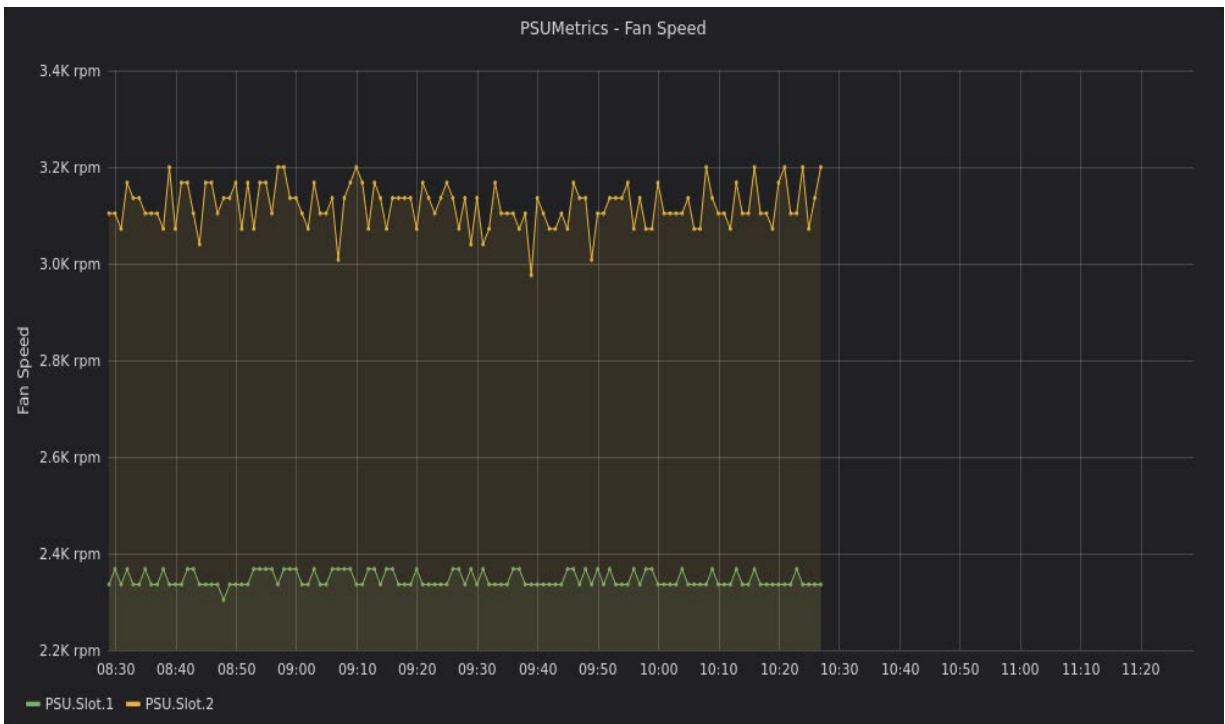


Figure 4    A time lapse Grafana plot of PSU Fan Speed from PSUMetrics report
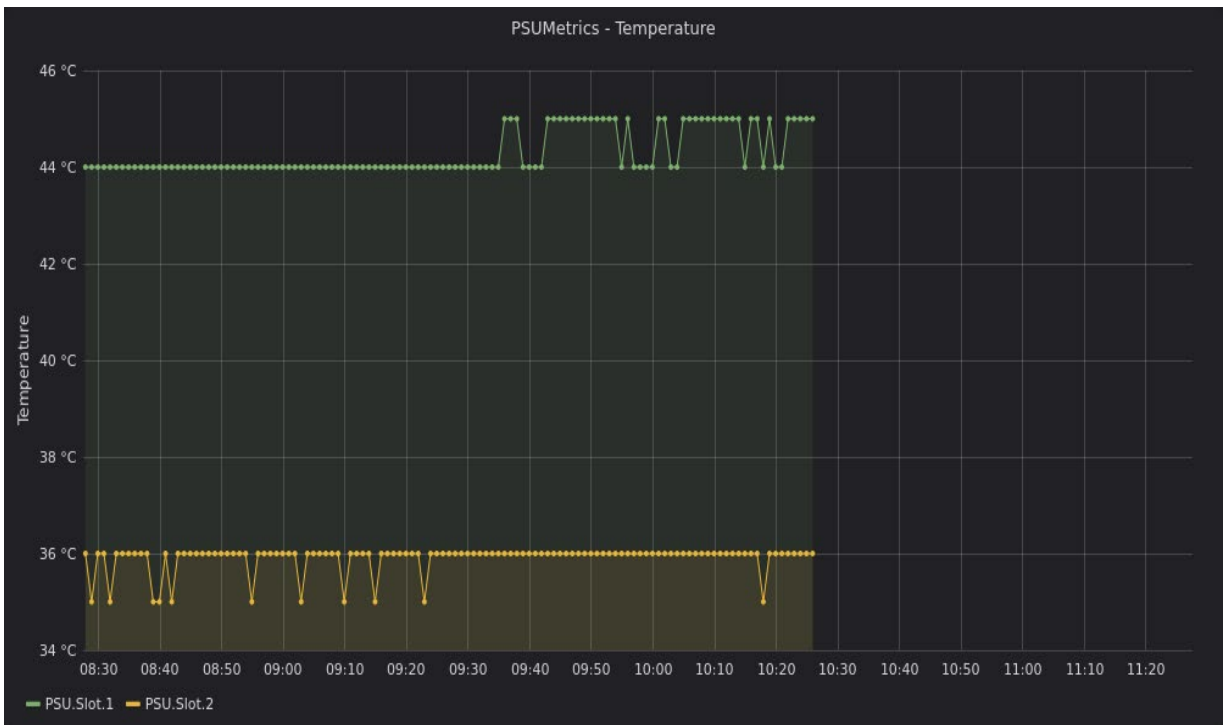
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Figure 5     A time lapse Grafana plot of PSU temperature from PSUMetrics report

# 3 Thermal Subsystem Telemetry

This section describes metrics in the thermal subsystem telemetry reports and workflows to use the reports to generate useful insights.

## 3.1 ThermalMetrics

Following are the metrics in the ThermalMetrics report.

| Metric | Description |
|---|---|
| ComputePower | Compute power that is not wasted |
| ITUE | The power utilization efficiency is expressed as the ratio of total system power to compute power. |
| PowerToCoolRatio | Fan Power over system power ratio (PCTR) |
| PSUEfficiency | PSU efficiency in percentage |
| SysAirFlowEfficiency | System airflow efficiency metric (SAFE) |
| SysAirflowPerFanPower | System airflow per unit of system fan power consumption |
| SysAirflowPerSysInputPower | System airflow per unit of system input [DC] power consumption |
| SysAirflowUtilization | Specifies the system airflow utilization (CFM/Max CFM). CFM (cubic feet per min) |
| SysNetAirflow | System net airflow |
| SysRackTempDelta | Temperature difference between exhaust air and inlet air temperature of the server |
| TotalPSUHeatDissipation | Heat that is dissipated from the PSU as a result of its inefficiency. |

## 3.2 Temperature Sensors

The following sensor reports include temperature reading.

### 3.2.1 CPUSensor

The following metric is in the CPUSensor report.

| Metric | Description |
|---|---|
| TemperatureReading | CPU temperature |

### 3.2.2 MemorySensor

The following metric is in the MemorySensor report.

| Metric | Description |
|---|---|
| TemperatureReading | DIMM temperature |

### 3.2.3 FCSensor

The following metric is in the FCSensor report.

| Metric | Description |
|---|---|
| TemperatureReading | FibreChannel ASIC temperature |

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### 3.2.4 NICSensor

The following metric is in the NICSensor report.

| Metric | Description |
|---|---|
| TemperatureReading | NIC ASIC temperature |

### 3.2.5 StorageSensor

The following metric is in the StorageSensor report.

| Metric | Description |
|---|---|
| TemperatureReading | Temperature information for the storage internal drives (PCIeSSD/NVMe devices (drives and HHHL cards) SAS/SATA HDD/SSD drives behind PERC, BOSS M.2 drives, and SATA HDD/SSD behind a SWRAID controller). |

### 3.2.6 ThermalSensor

Following are the metrics in the ThermalSensor report.

| Metric | Description |
|---|---|
| TemperatureReading | System board ambient temperature |

## 3.3 Triggers

Telemetry reports can be configured to stream automatically on the event of selected triggers at the server. Reports are sent across all active Subscription, SSE, Rsyslog connections.

| Report | Trigger |
|---|---|
| ThermalMetrics | *TMPDiskCriticalTrigger, TMPDiskWarnTrigger, TMPCriticalTrigger, TMPWarnTrigger* - active when any of the temperature thresholds crossing critical or warning LCL events are generated. |
| ThermalSensor | *TMPCriticalTrigger, TMPWarnTrigger* - active when any of the temperature thresholds crossing critical or warning LCL events are generated. |
| CPUSensor | *CPUCriticalTrigger, CPUWarnTrigger, TMPCpuCriticalTrigger, TMPCpuWarnTrigger* - active when any of the CPU thresholds crossing critical or warning LCL events are generated. |
| MemorySensor | *MEMCriticalTrigger, MEMWarnTrigger* - active when any of the memory thresholds crossing critical or warning LCL events are generated. |

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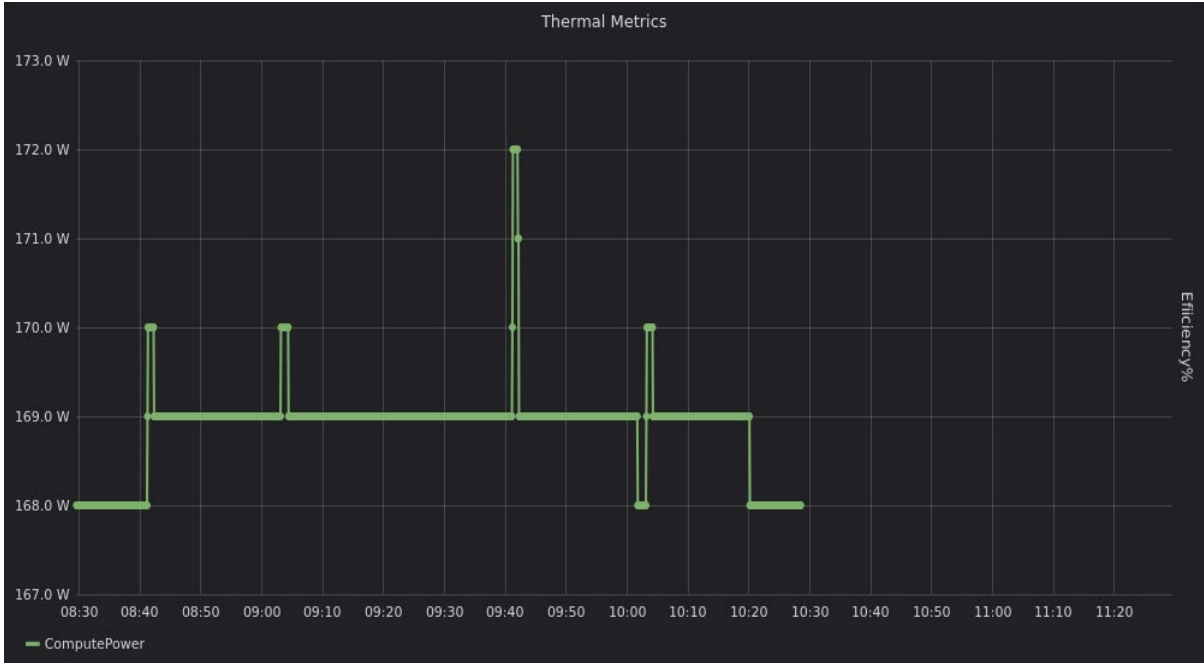## 3.4    Workflow Example Thermal Monitoring



Figure 6      A time lapse Grafana plot of Compute Power from ThermalMetrics report
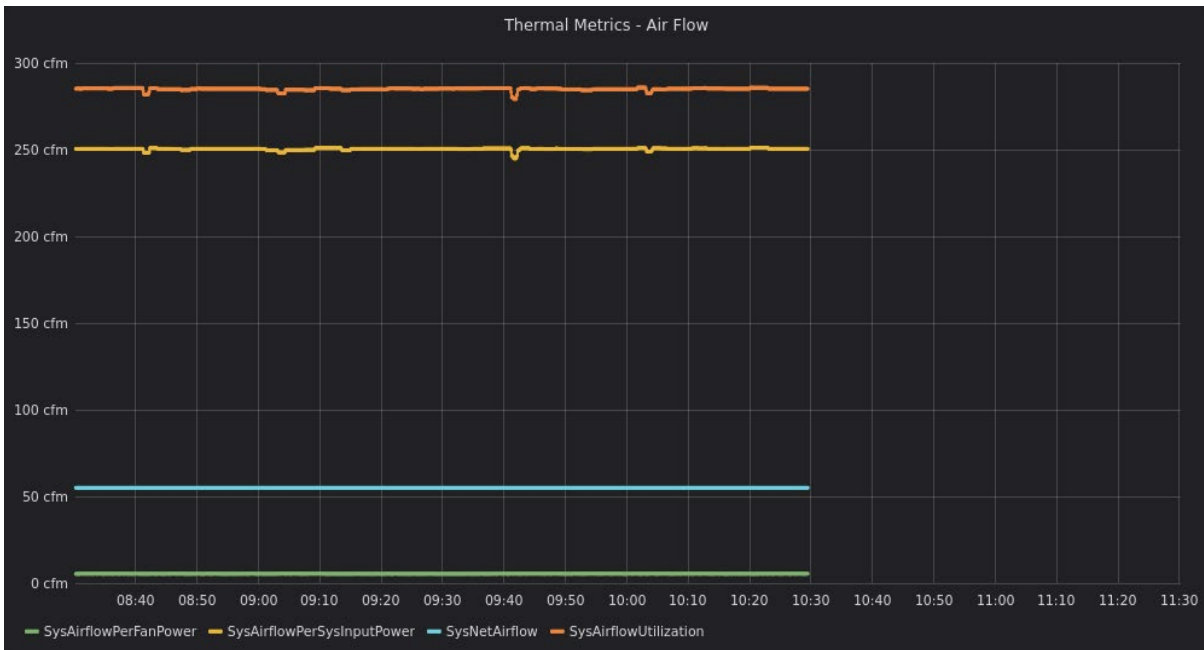


Figure 7      A time lapse Grafana plot of Airflows from ThermalMetrics report
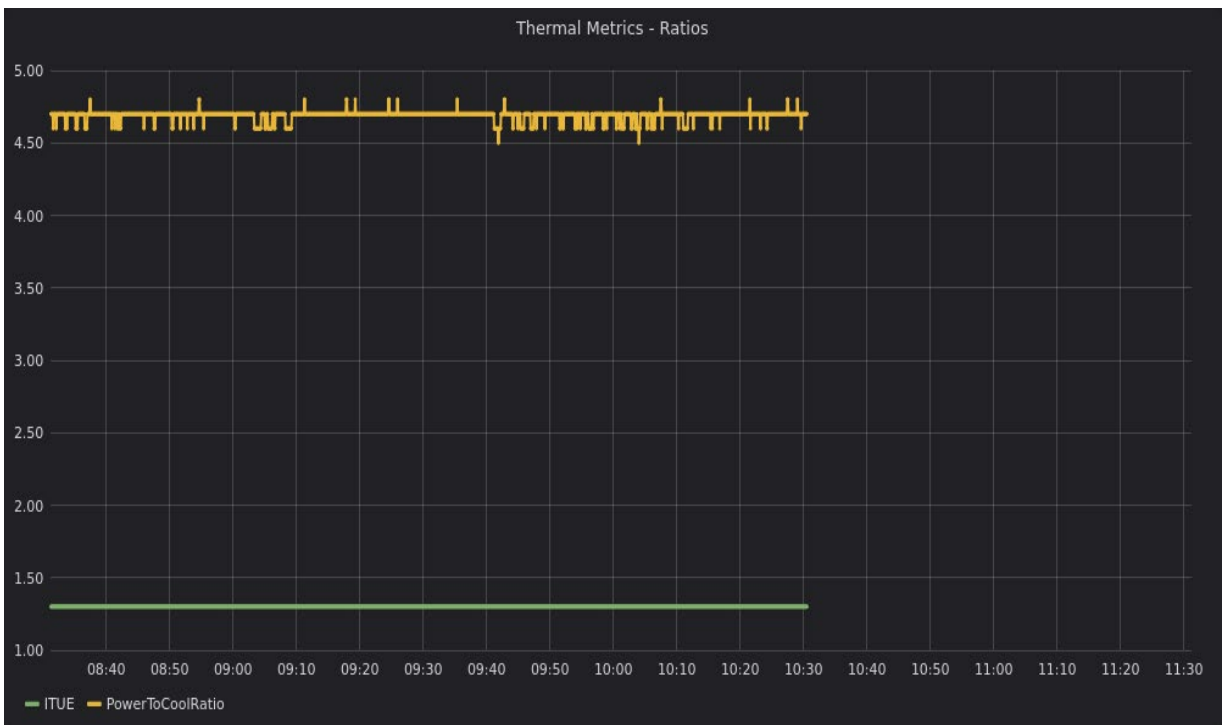
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Figure 8      A time lapse Grafana plot of PowerToCool from ThermalMetrics report



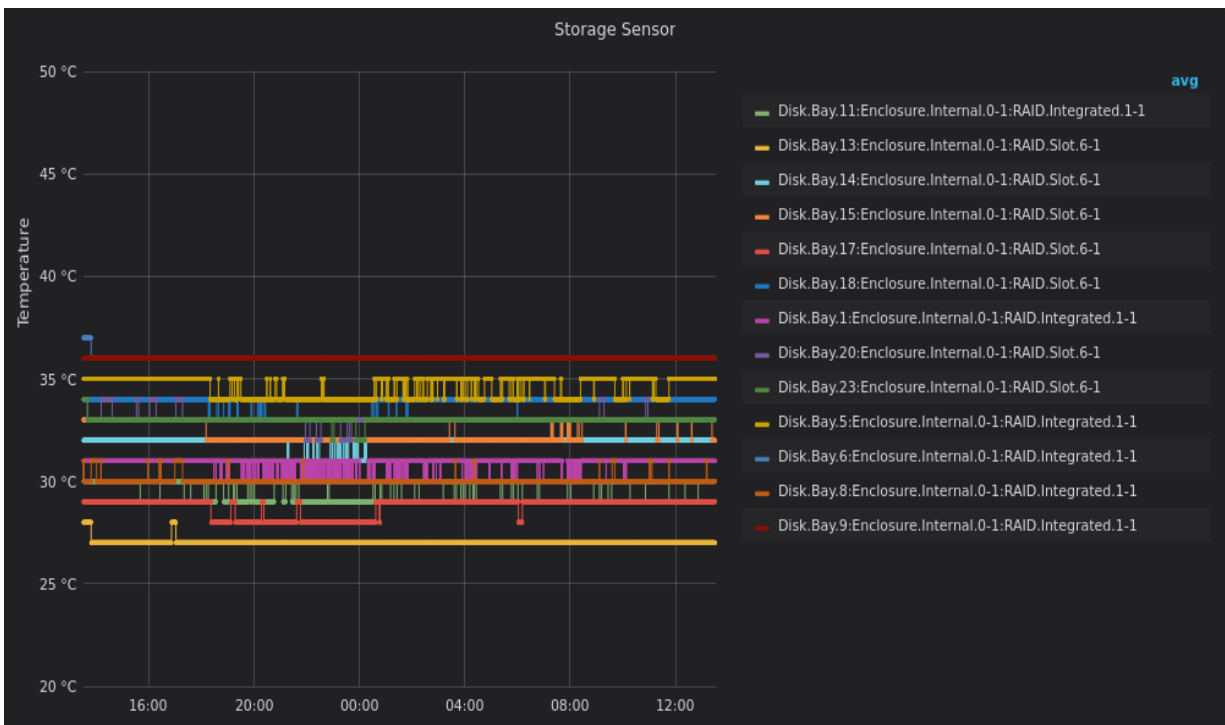Figure 9      A time lapse Grafana plot of Exhaust Temperature from ThermalSensor report

Figure 10    A time lapse Grafana plot of Exhaust Temperature from StorageSensor report



Figure 11    A time lapse Grafana plot of Exhaust Temperature from CPUSensor report
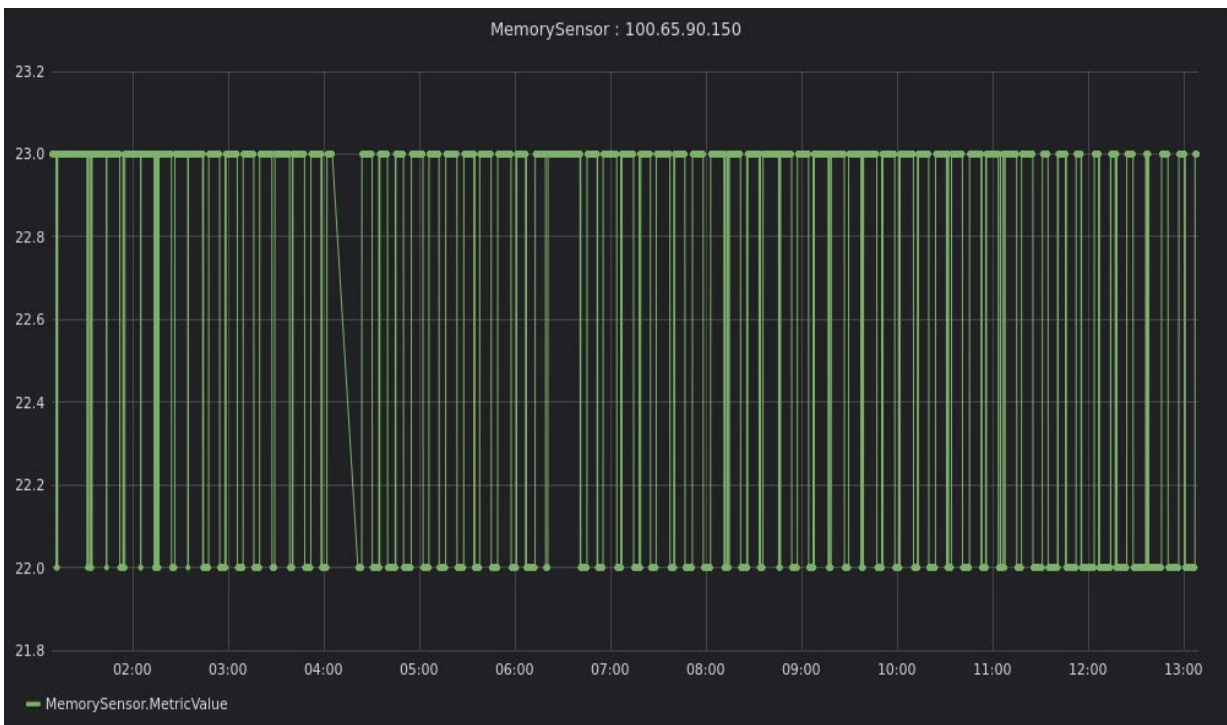
Figure 12    Figure 12. A time lapse Grafana plot of Exhaust Temperature from MemorySensor report
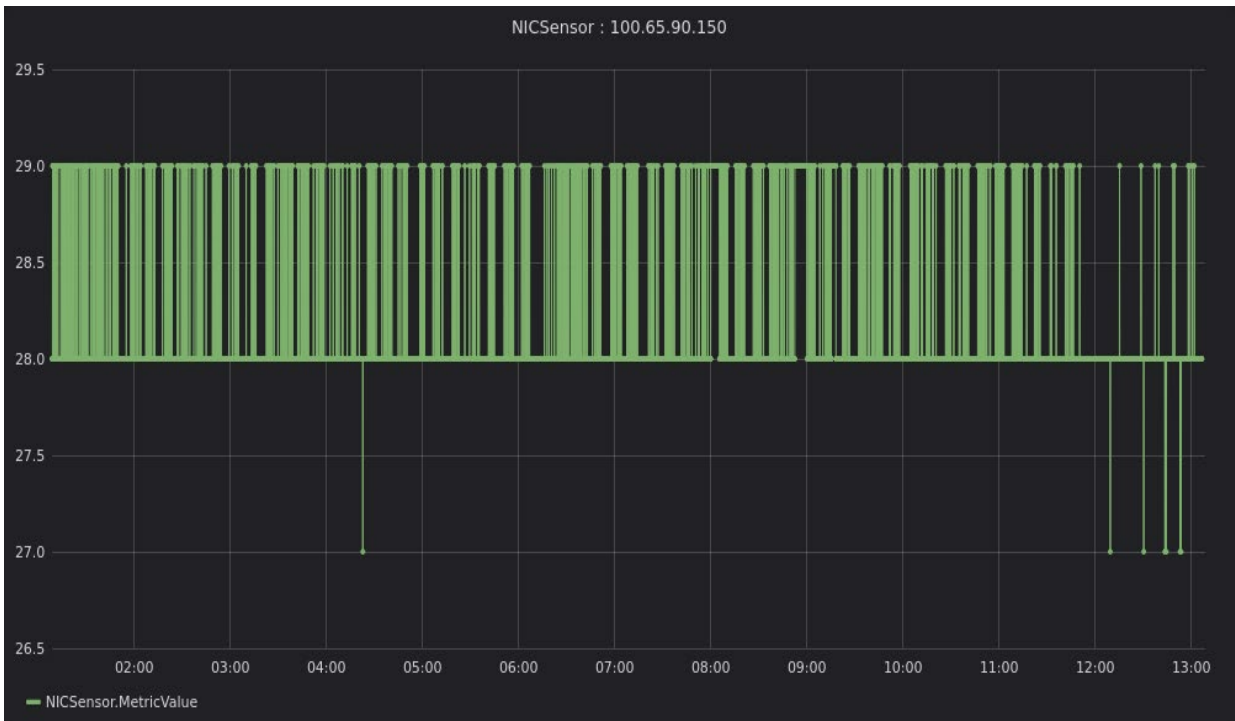


Figure 13    Figure 13. A time lapse Grafana plot of Exhaust Temperature from NICSensor report

# A Technical support and resources

iDRAC Telemetry Workflow examples

https://github.com/dell/iDRAC-Telemetry-Scripting/

Open-source iDRAC REST API with Redfish Python and PowerShell examples.

https://github.com/dell/iDRAC-Redfish-Scripting

The iDRAC support home page provides access to product documents, technical white papers, how-to videos, and more.

www.dell.com/support/idrac

iDRAC User Guide and other manuals

www.dell.com/idracmanuals

Dell Technical Support

www.Dell.com/support

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