

# Telemetry Streaming with iDRAC9 Server - Telemetry Performance Reports

Dell EMC PowerEdge Servers with iDRAC9 4.x Datacenter stream data to help IT administrators better understand the inner workings of their server environment. This white paper details the Performance Reports, and how to use them for monitoring and analyzing PowerEdge server utilization.

November 2020

## Revisions

Date	Description
June 2020	Initial release
November 2020	Change in name from CUPS Metric to System Usage Metric

## Acknowledgments

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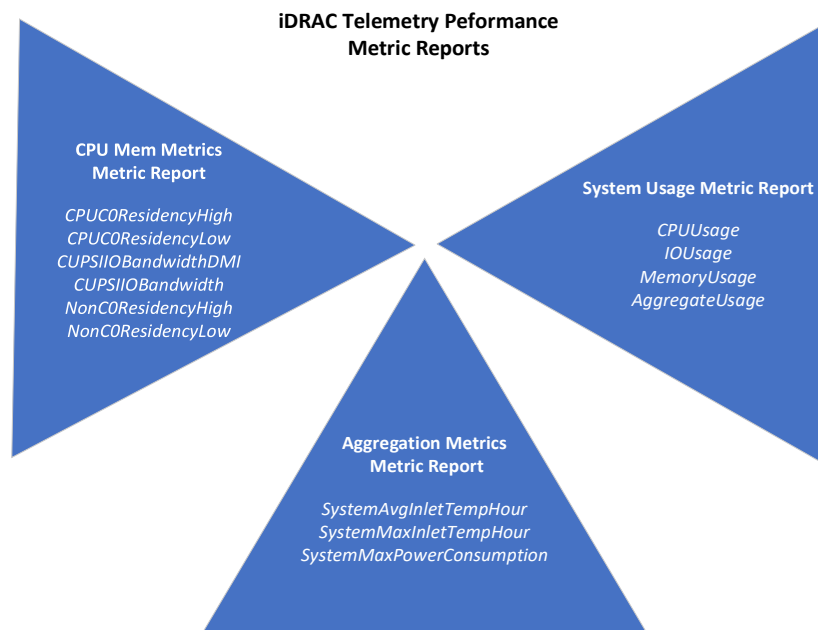
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## Executive summary

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.

Telemetry performance reports include sensor data which indicates compute usage, power consumption, and aggregate temperature readings. The metric definitions in each of the performance metric reports is categorized and shown in the infographics below.



# 1 Introduction

This white paper introduces iDRAC9 telemetry performance reports, and respective metrics in those reports. The iDRAC9 telemetry reports can be pulled on demand through Redfish APIs. Or the reports can be configured to be streamed through HTTP subscription, remote syslog, or Server-Sent Events (SSE) based methods. For best practices, troubleshooting tips and details on setting up the telemetry report streams, see the Telemetry Streaming “Getting Started” white paper.

## 1.1 Terms and Definition

For this technical white paper, following terms and definitions apply:

**System Usage Report:** Metric report with percentage Compute Utilization Per Second (CUPS). This report can be pulled on demand through the Redfish API or can be configured to be streamed through HTTP subscription, remote syslog, or SSE-based methods. (Note: iDRAC versions prior to 4.40.00 refer to this as “CUPS Usage Report.”)

**Aggregation Metrics Report:** Aggregation Metrics report is derived from a set of base metric values for Power, Temperature, and CPU indicating an aggregate value for a set time. It is a “pull only” report and can be generated on demand through the Redfish API.

**CPU Memory Metrics Report:** CPU memory metrics and register values. This report can be pulled on demand through the Redfish API or can be configured to be streamed through HTTP subscription, remote syslog, or SSE-based-methods.

## 1.2 Prerequisites

The Telemetry feature is available on iDRAC9 firmware version 4.00.00.00 or above and requires a Datacenter license.

## 2 Server Performance metrics and workflows

This section describes the telemetry performance reports, metrics, and workflows to derive useful insights.

### 2.1 System Usage report metrics

The Compute Usage Per Second (CUPS) report is available on Intel-based server platforms. CUPS report enables real-time performance monitoring data for CPU, memory, I/O, and system utilization. It is independent of the operating system that is installed at the servers and does not consume CPU resources. Sensors in the server store the CPU, memory, and I/O resource utilization values as CUPS. The iDRAC monitors this CUPS index for overall system utilization and monitors instantaneous utilization index values of CPU, memory, and I/O. For AMD systems, the System Usage report will only contain CPU Usage metrics.

The metrics for System Usage reports are listed below:

- **CPU Usage** - The combined CPU utilization of all the CPU cores in the system. Utilization is based on time that is spent in active state compared to time spent in inactive state.
- **I/O Usage** – Each root port in the PCIe root complex has a counter that measures the traffic from or directed to the root port. These counters are combined to measure traffic for all PCIe segments derived from the package. This aggregate number is measure of I/O bandwidth utilization for the system.
- **Memory Usage** - There are individual counters to measure memory traffic occurring at each memory channel or memory controller instance. These counters are combined to measure the cumulative memory traffic across all the memory channels on the system. This number is a measure of memory bandwidth consumption and not the capacity of the system memory.
- **Aggregate Usage** - This value is calculated by combining CPU, memory, and I/O indexes considering the load factor of each resource. The load factor depends on the nature of workload on the system.

#### Note regarding a change in the name of this report metric:

Dell EMC iDRAC firmware version 4.40.00.00 modifies the naming schema within Telemetry Reporting. Compute Usage Per Second (CUPS) terminology is Intel-specific terminology. With the addition of AMD processor support within this report, CUPS report metrics will now be identified as System Usage report metrics.

Previous Report Schema (iDRAC9 4.00.00.00 - 4.32.10.00):

```
CUPS {
  CPUUsage,
  MemoryUsage,
  IOUsage,
  SystemUsage
}
```

New Report Schema (iDRAC9 4.40.00.00 - Later):

```
SystemUsage {
  CPUUsage,
  MemoryUsage,
  IOUsage,
  AggregateUsage
}
```

In the example, the output compares the telemetry report queried from an Intel-based Dell EMC PowerEdge server before and after the naming schema modification has been implemented. AMD-based Dell EMC PowerEdge servers will differ when compared with Intel-based servers. While the System Usage report for Intel-based servers will contain metrics for CPU Usage, Memory Usage, IO Usage, and Aggregate Usage, the System Usage report for AMD-based servers will only contain CPU Usage metrics.

In addition, any Telemetry Streaming scripts that were leveraging the old "CUPS" report name will require modifications to support the new "System Usage" report name after iDRAC9 4.40.00.00 releases.

## 2.2 Aggregation Metrics report metrics

Aggregation Metrics report provides selected aggregate values which are useful to derive downstream insights. The metrics that are in this report are listed below:

- SystemAvgInletTempHour - Average Inlet temperature for the last hour
- SystemMaxInletTempHour - Peak Inlet temperature for the last hour
- SystemMaxPowerConsumption - Peak system power consumption

## 2.3 CPU Memory Metrics report metrics

CPU Memory Metrics, or CPUMemMetrics, report provides selected CPU memory metrics and utilization figures. The metrics that are in the report are listed below:

- CPUC0ResidencyHigh - CPU C0 Residency high value. 32 MSBs of the 64-bit counter containing the aggregate C0 residency count from all the cores.
- CPUC0ResidencyLow - CPU C0 Residency Low value. 32 LSBs of the 64-bit counter containing the aggregate C0 residency count from all the cores.
- CUPSIIOBandwidthDMI - CUPS IIO Bandwidth DMI Metric value which indicates utilization counter of the DMI Port.
- CUPSIIOBandwidthPort<port number> - CUPS IIO Bandwidth Port specific Metric. Utilization counter of the integrated I/O Port on a per x16 port granularity

## 2.4 Triggers for Server Performance reports

Telemetry reports can be configured to emit automatically on the event of selected life cycle triggers at the server. The reports are sent across all active HTTPs subscription or SSE streams. Following table outlines this behavior for performance reports.

Performance report	Qualifying server life-cycle trigger
SystemUsage	TMPCpuCriticalTrigger, TMPCpuWarnTrigger, TMPMemCriticalTrigger, TMPMemWarnTrigger
AggregationMetrics	PULL only
CPUMemMetrics	None

For help with setting up triggers, see the "Telemetry – Getting Started" available at [dell.com/support/idrac](http://dell.com/support/idrac).

## 2.5 Workflows and Examples

iDRAC9 telemetry feature for downstream analytics and visualization by plotting streamed metric values for gaining useful insights. The image below shows a plot of System Usage metric values.

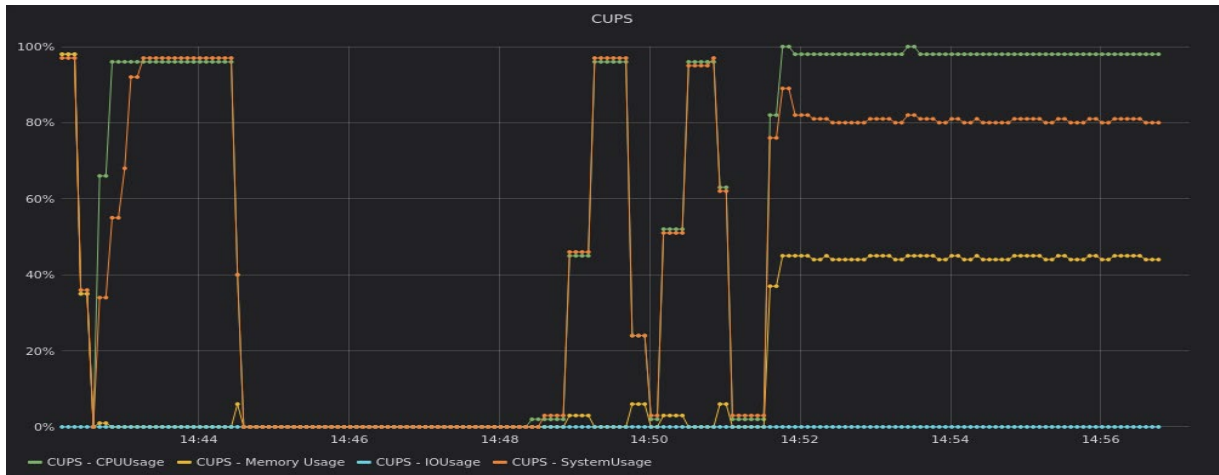


Figure 1 – A time lapse Grafana plot of iDRAC telemetry System Usage metric values

This graph illustrates a plot of the system usage metric.

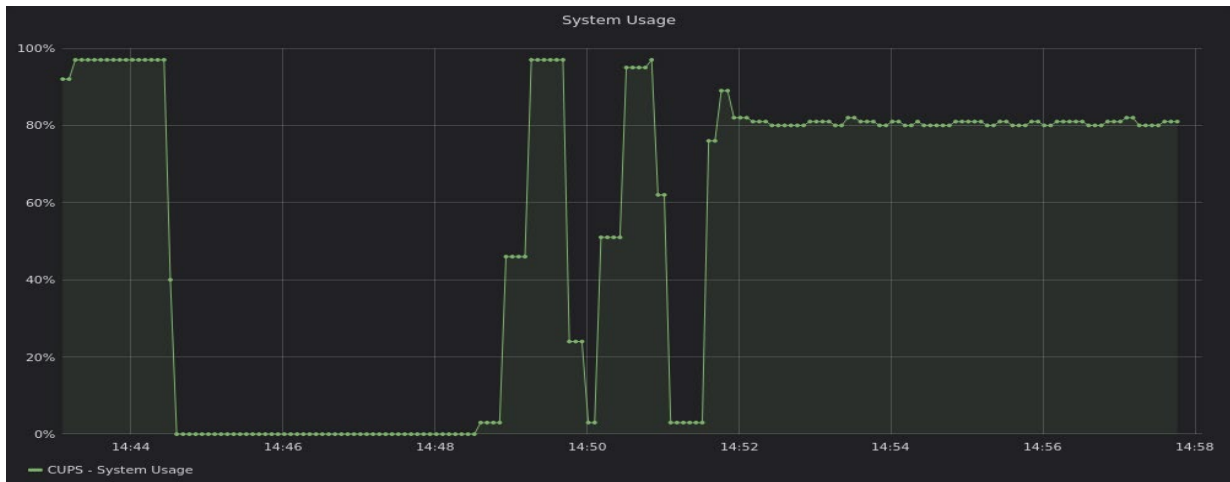


Figure 2 – A time lapse Grafana plot of System Usage metric values

The next image shows a time lapse Grafana plot of CPU MemMetrics report metrics.



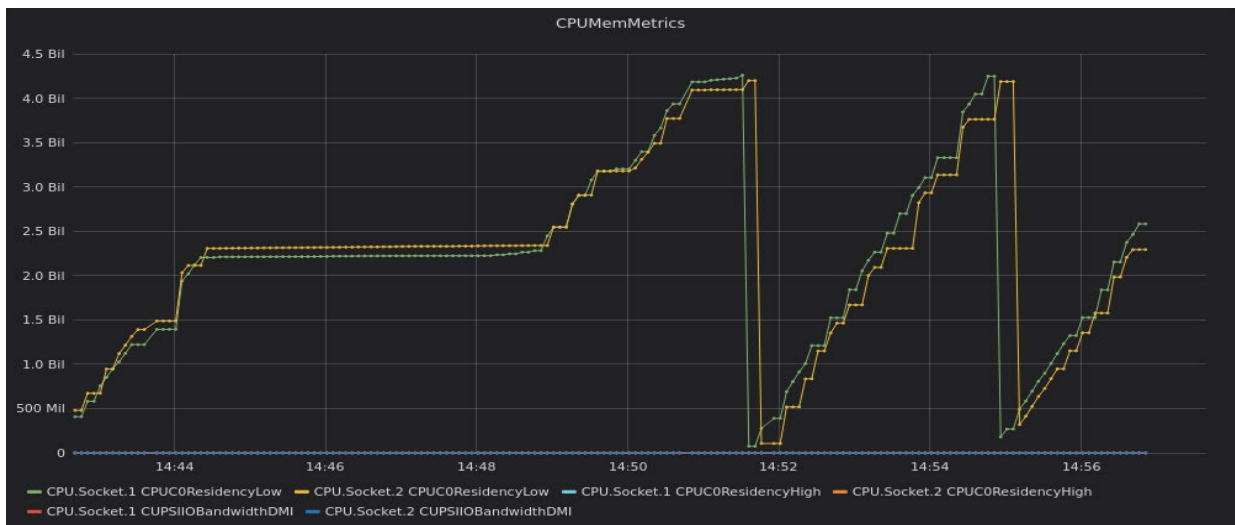


Figure 3 – A time lapse Grafana plot of iDRAC telemetry CPUMemMetrics metric values

A step-by-step outline of workflow involved to set up such a plot is summarized below:

- 1) All prerequisites like iDRAC9 Datacenter licensing requirements are met.
- 2) Enable Telemetry Steaming in iDRAC9 GUI, RACADM, or Redfish APIs.
- 3) Enable the required reports to use iDRAC or Redfish APIs.
- 4) Set up telemetry HTTP subscription remote syslog or SSE-based streams.
- 5) Gather data available through the streams to store at big databases like InfluxDB to perform necessary server-side analytics and plotting.

## 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](http://www.dell.com/support/idrac)

iDRAC User Guides and other manuals

[www.dell.com/idracmanuals](http://www.dell.com/idracmanuals)

Dell Technical Support

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