

Virtual machine power mapping and utilization in OpenManage Enterprise Power Manager

Abstract

This whitepaper provides guidance to visualize the virtual machines hosted on the servers and monitor their respective power and energy utilizations.

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Revisions

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Acronyms

Acronym	Expansion
OME	Open Manage Enterprise
PMP	Power Manager Plugin
OMEPM	Open Manage Enterprise Power Manager
iDRAC	Integrated Dell Remote Access Controller
CMC	Chassis Management Controller
MSM	Modular System Management
MCM	Multi Chassis Management
MM	Management Module
REST	Representational State Transfer
GUI	Graphical User Interface
EPR	Emergency Power Reduction
NGDC	Next Generation Data Centers

Executive summary

In Next Generation Data Centers (NGDC) paradigm, virtualization and automation are the key foundations and capabilities that are considered by the cloud providers. With virtualization, the hardware users can be separated from the application users that allows system configuration, monitoring, and management to be homogenized and automated across all data centers.

Followings are the key benefits for NGDC paradigm from monitoring, managing and measuring the power usage of virtualized systems:

- The use of virtual machines allows you to have safe isolation of multiple workloads on a single device or share resources among multiple devices to work as one entity and give a seamless user experience. This results in an improved resource utilization with existing devices. However, the lack of visibility into virtual machine power usage takes away the advantages of server power metering that is available without virtualization.
- Sometimes, a virtual machine may be shut down or migrated to a different server having more capacity if the virtual machine is exhausting the resources of the current server. This way you can use the server's resources effectively. In addition to this, datacenter administrators can measure how much energy the software consumes when executed on a physical server but cannot measure the resource consumption when running on a virtual machine.
- The limitation of using virtual machines is that we have no visibility to the virtual machine's resource consumptions. This limitation cripples the developer's ability to optimize the software for lower power consumption.
- To evaluate which workloads can be consolidated to which servers, capacity planning and workload analysis becomes the key parameters for datacenter users.

The virtual machine feature makes Power Manager plugin eligible in computing power utilization metrics for virtual machines and can be considered as the first step into virtualization and NGDC space. However, virtual machine power utilization will be an approximate or estimated value and is computed with the consideration of virtual machine CPU utilization and total power consumed by the server at a particular point of time.

1 Supported hypervisors for virtual machines

OpenManage Enterprise version 3.6.1 and Power Manager version 2.0 support virtual machine feature on the following hypervisors:

Table 1 Operating systems and the supported versions

Operating Systems	Supported Versions
Microsoft Windows Hypervisors	<ul style="list-style-type: none">• Microsoft Windows 2022• Microsoft Windows 2019• Microsoft Windows 2016
VMware ESXi	<ul style="list-style-type: none">• ESXi 7.0• ESXi 7.0 U1• ESXi 6.7 U3

2 View virtual machines

This section describes how the virtual machines are added to Power Manager virtual machine monitoring list.

2.1 Adding virtual machines to Power Manager

When a host server is added to Power Manager, and after the first metric collection of that server, the virtual machines hosted on that server are automatically added to Power Manager's Virtual Machines list. And, the virtual machine data is updated or refreshed after each metric collection cycle.

Note: You cannot add the virtual machines manually to Power Manager's Virtual Machines list.

Note: Ensure that the server (iDRAC) with valid license and the hypervisor (host operating system) of the supported versions are discovered in OpenManage Enterprise.

Note: Ensure that the credentials provided to discover the hypervisor have Administrator privileges.

3 Removing virtual machines

This section describes how to remove or delete virtual machines from Power Manager's **Virtual Machines** list.

3.1 Removing virtual machines

When a host server is removed from Power Manager, the virtual machines hosted on that server are automatically removed from Power Manager's Virtual Machine list.

Note: You cannot remove or delete the virtual machines manually from Power Manager's **Virtual Machine** list.

Note: When a virtual machine is migrated from one host to another, where both the hosts are monitored by Power Manager, the subsequent metric collection cycle automatically detects the movement of the virtual machine provided that the UUID of the virtual machine is not changed, and Power Manager maps the same virtual machine add previously collected metrics to the new host.

4 Monitoring virtual machines

This section describes how to monitor virtual machines in Power Manager. The virtual machine monitoring feature enables you to view all the virtual machines monitored by Power Manager, and their details such as power and energy consumption.

4.1 Viewing monitored virtual machines

1. Navigate to **Plugins > Power Management > Power Manager Device Page**.
2. On the left navigation menu click **VIRTUAL MACHINES > All Virtual Machines**. A list of virtual machines is displayed with the following columns:
 - Name—name of the virtual machine.
 - Device Name—name of the server where the virtual machine is hosted.
 - Identifier—server identifier where the virtual machine is hosted. A link is provided on the Identifier column. Click the link to navigate to Device overview page.

The screenshot displays the OpenManage Enterprise Power Manager interface. The top navigation bar includes 'Home', 'Devices', 'Configuration', 'Alerts', 'Monitor', 'Application Settings', and 'Plugins'. The 'Power Manager' section is active, with a dropdown menu showing 'Overview', 'Power Manager Devices', 'Policies', 'Emergency Power Reduction', 'Rack View', 'Settings', and 'About'. The left sidebar shows 'MONITORED' and 'UNMONITORED' sections, with 'VIRTUAL MACHINES' selected under 'UNMONITORED'. The main area shows a table of virtual machines with columns for Name, Device Name, and Identifier. The table lists several entries, including 'Lubuntu 18.04 01' and 'pmp4'. A right-hand panel provides details for the selected 'Lubuntu 18.04 01' virtual machine, including its UUID, vCPU Count (1), vCPU Usage (3 MHz), Device CPU Utilization (2%), and Device Power Consumption (144 Watt).

Figure 1 Virtual machines list

A set of filters are provided on the virtual machine list. You can use these filters to filter out the virtual machine records of your interest.

Following filters are provided on the virtual machine list:

- Name—virtual machine name filter, use this filter to filter out the records based on the virtual machine names.
- Device Name—host server name filter, use this filter to filter out the virtual machines hosted on a particular server by providing the host server name.
- Identifier—host server identifier filter, use this filter to filter out the virtual machines hosted on a particular server by providing the host server identifier.

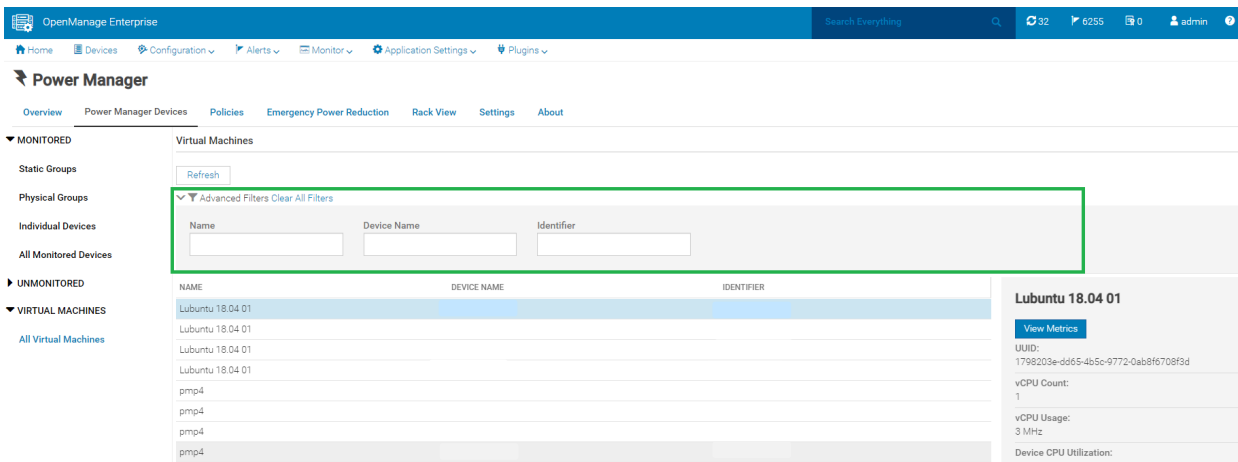


Figure 2 Virtual machine list

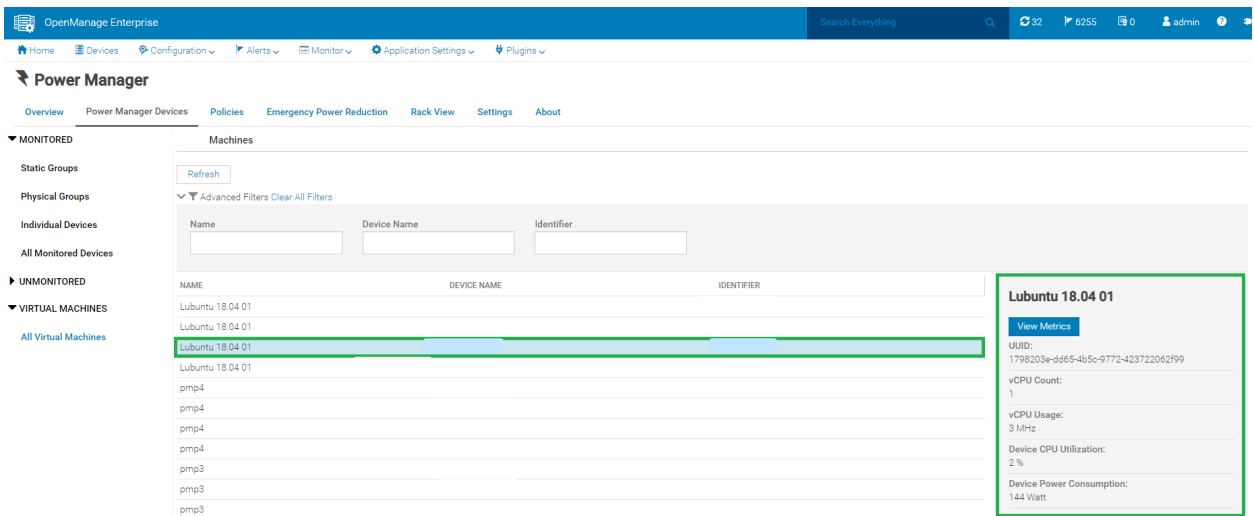


Figure 3 Virtual machine list filters

The API to view virtual machines is <https://<IP>/api/PowerService/VirtualEntities/VirtualMachines>.

For more information about the Power Manager APIs, see the OpenManage Enterprise Power Manager API document available on the support site.

Note: If you are logging in as a Device Manager, only the device groups and devices that are in your scope are available for viewing and management. For example, if you are logging in as a Device Manager DM1 user, and a group G1 is assigned to the Device Manager DM1 user, you can view only the virtual machines that are hosted by the devices in the G1 group.

4.2 View virtual machine details

To view a virtual machine details, click on a virtual machine row in the list. The virtual machine details are displayed on the right-hand side pane of the page as illustrated in the below image.

The virtual machine detail section has the following information about the virtual machine:

- Virtual Machine Name—the virtual machine details section has the virtual machine name as the section heading.

- **UUID**—each virtual machine is uniquely identified by their respective UUID and is assumed to be unique.
- **vCPU Count**—this is a virtual machine specific metric. It displays the latest CPU count of the virtual machine.
- **vCPU Usage**—this is a virtual machine specific metric. It displays the latest CPU usage of a virtual machine.
- **Device CPU Utilization**—this is the host server specific metric where the virtual machine is hosted. This metric displays the latest CPU utilization of the host server.
- **Device Power Consumption**—this is the host server specific metric where the virtual machine is hosted. It displays the latest power consumption of the host server.

The API to view specific virtual machine details are

[https://<IP>/api/PowerService/VirtualEntities/VirtualMachines\(<ID>\)/Details](https://<IP>/api/PowerService/VirtualEntities/VirtualMachines(<ID>)/Details)

For more information about the Power Manager APIs, see the OpenManage Enterprise Power Manager API document available on the support site.

5 Visualizing virtual machine metrics

This section is about visualizing the virtual machine metrics through graphs and reports.

5.1 Virtual machine metric graphs

To view the virtual machine metrics, in the virtual machine section, click View Metrics. The power history of the virtual machine is displayed graphically. This is the calculated power consumption of the virtual machine against the host server power consumption.

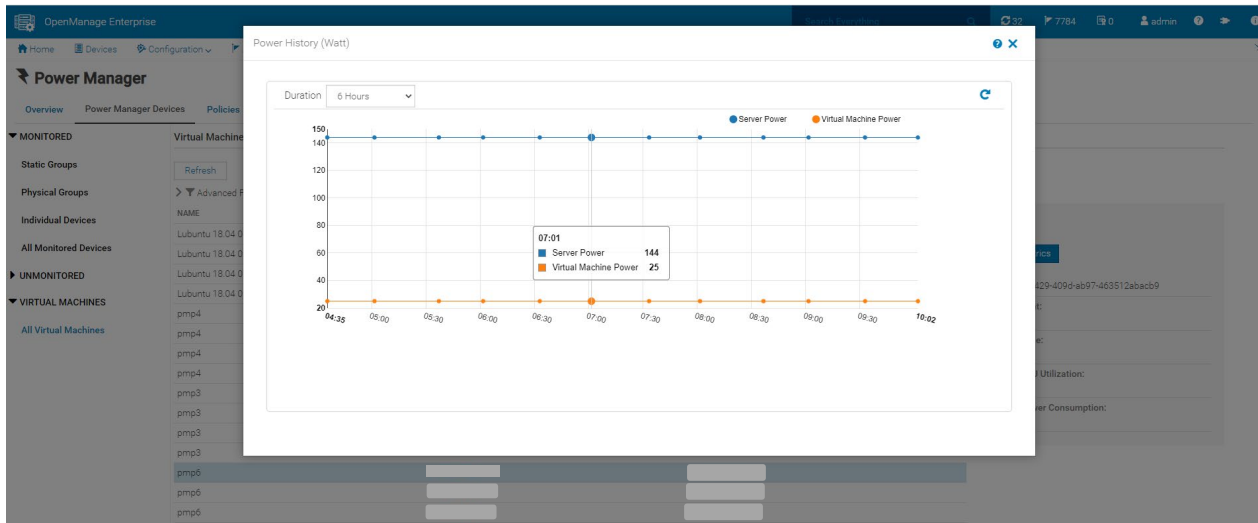


Figure 4 Virtual Machine Metrics

5.2 Virtual machine reports

This section focuses on the built-in virtual machine report.

5.2.1 Power Manager: Virtual Machine Performance Report

Type: Built-In

Description: This report displays the CPU count, CPU usage, power, and energy that is consumed by the virtual machines that are monitored in Power Manager.

Advantages: The benefit of this Report is that you get a consolidated report of CPU count, CPU usage, power, and energy consumption of all the virtual machines that are monitored in Power Manager for a report duration and granularity configured in Power Manager settings.

Using this consolidated report, you can do further statistical analysis of all the virtual machines data using a single report.

Below is a snippet of a sample report run:

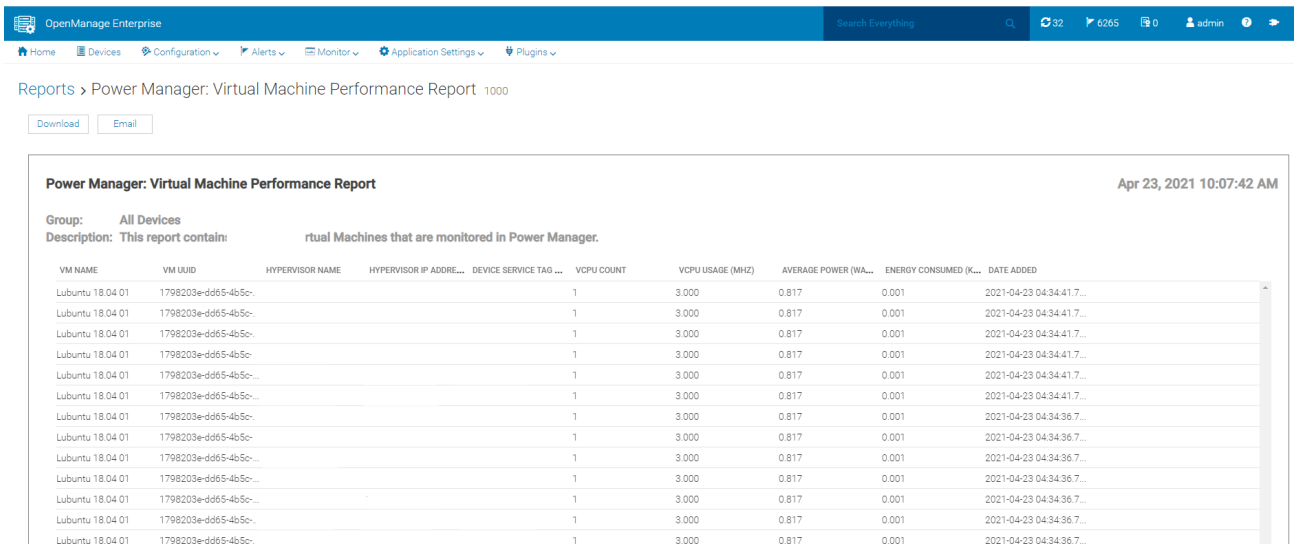


Figure 5 Virtual Machine Report Result

Note: If you are logging in as a Device Manager, only the device groups and devices that are in your scope are available for viewing and management. For example, if you are logging in as a Device Manager DM1 user, and a group G1 is assigned to the Device Manager DM1 user, you can view only the virtual machines that are hosted by the devices in the G1 group.

6 Conclusion

Using this white paper, you can visualize the virtual machines hosted on the servers and monitor each virtual machine's power and energy consumption in Power Manager plugin.

7 Technical support and resources

Dell.com/support is focused on meeting customer needs with proven services and support.

7.1 Related resources

- Knowledge Base for Dell EMC OpenManage Enterprise [Link](#).
- Knowledge Base for Dell EMC OpenManage Enterprise Power Manager [Link](#).
- Dell EMC OpenManage Enterprise Power Manager Version 2.0 User's Guide [Link](#).
- Dell EMC OpenManage Enterprise Power Manager RESTful API Guide version 2.0 [Link](#).
- Dell EMC OpenManage Enterprise Power Manager 2.0 Release Notes [Link](#).