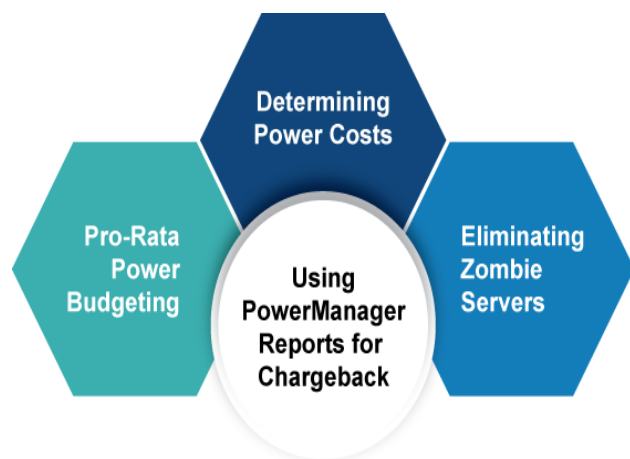


Using OpenManage Enterprise Power Manager for Chargeback



Abstract

This technical white paper provides information about the best practices that you can follow using Dell EMC OpenManage Enterprise Power Manager Plugin 1.2 to optimize the usage of Dell EMC servers and chassis for power cost reduction and efficient budget.

September 2020

Revisions

Date	Description
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Acronyms

Acronym	Expansion
CMC	Chassis Management Controller
CPU	Central Processing Unit
EPR	Emergency Power Reduction
GUI	Graphical User Interface
iDRAC	Integrated Dell Remote Access Controller
I/O	Input Output
OME	OpenManage Enterprise
OME-M	OpenManage Enterprise-Modular
RAM	Random Access Memory
REST	Representational State Transfer
SSB	Small Scale Business
VM	Virtual Machine
PMP	OME Power Manager Plugin
CUPs	Compute Usage per second

Executive Summary

This technical whitepaper provides an overview about how to use Power Manager effectively to control and limit power costs for an organization.

It discusses in detail about how to effectively make use of the Power Manager features to:

- Reduce cost spent on power consumption,
- Reduce carbon footprint,
- Optimize budgeting for power and
- Auditing the power bills against the actual consumption obtained from monitoring devices in a data center.

1 Introduction

Power Manager is a plugin to Dell EMC OpenManage Enterprise console and uses fine-grained instrumentation to provide increased visibility over power consumption, anomalies, and utilization. Also, Power Manager alerts and reports on power and thermal events with servers, chassis, and groups consisting of servers and chassis. This enables increased control, faster response times, greater accuracy, and broader decision-making intelligence than would otherwise be possible.

This technical white paper summarizes the Power Manager 1.2 usage for determining the power consumption and power costs for a datacenter by using the built-in reports or the custom reports available in Power Manager. Also, this paper explains how to use this data to infer cost cutting and move towards a green datacenter along with Power Budgeting Optimization.

2 Using Power Manager Reports to Determine Power Costs

The primary focus of this paper is to determine the actual power consumed by servers and chassis inside a datacenter and infer this data to identify the overall power costs for a data center.

After installing Power Manager on OpenManage Enterprise, a list of pre-canned or built-in reports are available. There are two built-in reports to determine the power consumption of devices and groups monitored through Power Manager— Power Manager: Power and Thermal Report of Devices and Power Manager: Power and Thermal Report of Groups

For example, you can determine the power consumption of all devices being monitored by Power Manager for the last month. Using the **Power Manager: Power and Thermal Report of Devices** report:

- Determine the power consumption for individual devices
- Consolidate power consumption of all devices
- And, aggregate the report data to find the total power consumption

Also, you can add the devices into a group and derive the same data using the **Power Manager: Power and Thermal Report of Groups**. You can find more details about the second report in section [Pro-Rata Power Budgeting](#) [Rata Power Budgeting](#) section.

Some points to note here before determining the power consumption are:

- If there are Modular chassis such as MX7000, M1000e, VRTX, FX2, FX2s present in your datacenter, then adding up the power consumption on modular servers inside these chassis is redundant as the chassis sensor accounts for all the components inside the chassis such as I/O modules, storage sleds and so on. Therefore, exempt modular servers from this computation if the parent chassis is included in Power Manager.
- For PowerEdge C series servers such as C6320, C6420 or C6525 their parent chassis C6400 is not supported for monitoring and management with Power Manager, therefore include these servers in Power Manager for computation of power consumption.
- This whitepaper accounts for device level power and cooling power consumption. The cost to cool down a device is typically \$0.5 per \$1 spent on device power consumption.
- For CMCs such as M1000e, FX2, FX2s, and VRTX the total power consumption is calculated as average power consumed by servers present in a chassis.

Change the **Report Duration** setting in Power Manager, to say 1 Month. For information about changing the settings in Power Manager, see the Power Manager User's Guide.

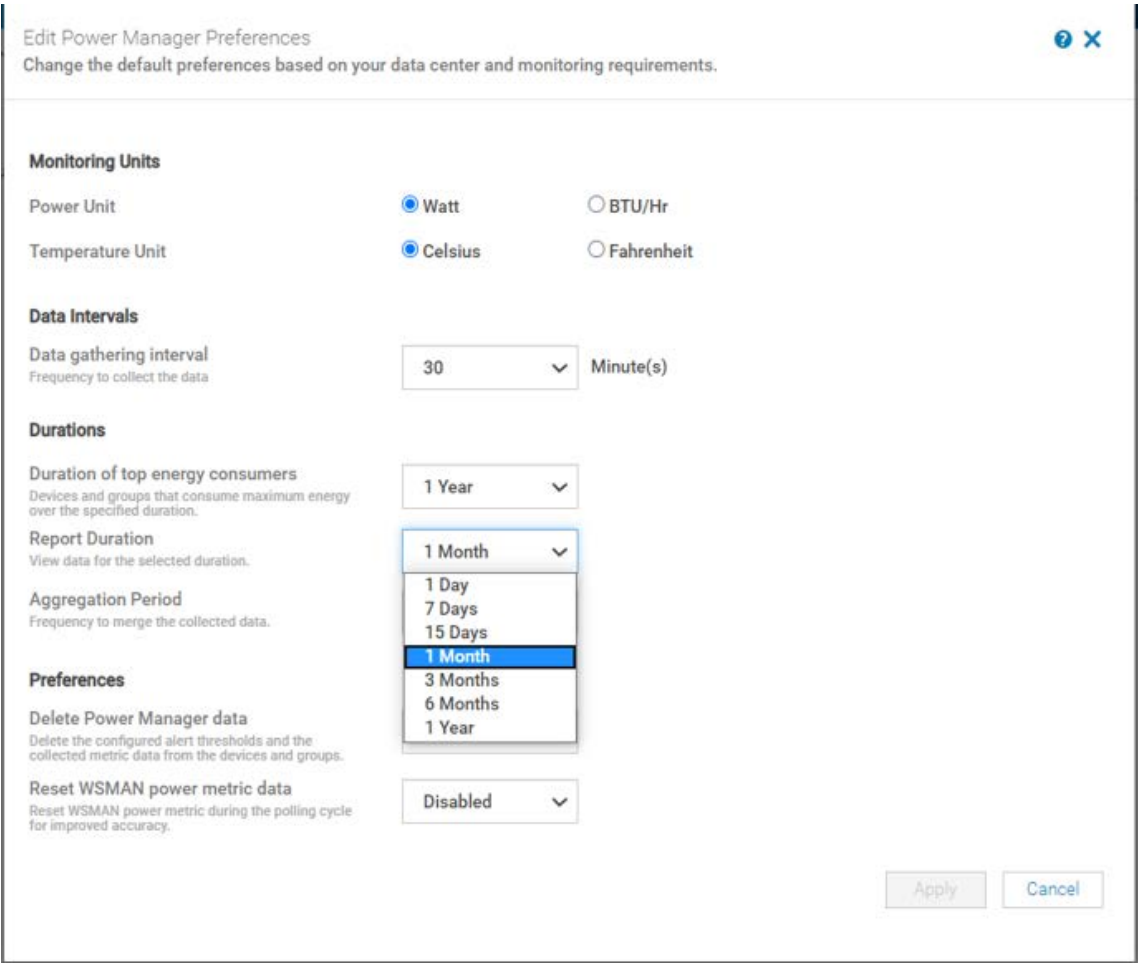


Figure 1 Setting report duration in Power Manager

After the report duration is set, run the reports after a month.

2.1 Finding Power Consumption and Power Cost for Devices

Run the report **Power Manager: Power and Thermal Report of Devices**. This report contains all metric collection instances (based on metric collection interval set by you in the Power Manager Settings tab). Use this report data to find the Total Energy Consumption by viewing the first 30 days of metric collected.

Download the report in any one of the supported format—CSV/Excel/PDF/HTML as per your requirement. To check the aggregation of 30 days of Total Energy Consumption, see the below figure as an example. The following is a screenshot of a report downloaded as a csv file.

Device Name	Device Type	Device Model	Device Service Tag	Maximum Power (watt)	Minimum Power (watt)	Average Power (watt)	Maximum Temperature	Average Temperature	Instant Temperature	Total Energy Consumed (kwh)	Collected At
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	93	65	69.114	19	18.514		3.531	8/6/2020 23:45
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	93	65	69.063	19	18.125		3.528	8/5/2020 23:45
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	92	65	69.063	19	18		3.525	8/4/2020 23:45
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	89	65	69.063	20	18.438		3.522	8/3/2020 23:46
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	98	65	69.063	19	18.354		3.509	8/2/2020 23:46
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	92	65	69.029	21	18.114		3.504	8/1/2020 23:46
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	88	55	62.468	17	16.872		3.502	7/19/2020 23:46
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	87	56	62.66	20	17.128		3.457	7/18/2020 23:46
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	93	56	62.489	18	17		3.455	7/17/2020 23:46
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	99	56	63.489	21	18.021		3.452	7/16/2020 23:45
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	116	6	71.388	20	17.66		3.446	7/15/2020 23:45
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	101	82	84.521	19	17.813		3.401	7/14/2020 23:45
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	101	82	84.792	20	18.313		3.32	7/13/2020 23:45
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	98	81	84.042	17	17		3.273	7/12/2020 23:46
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	95	82	84.146	18	17		3.249	7/11/2020 23:45
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	101	82	84.841	20	17.545		3.237	7/10/2020 23:45
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	112	82	84.646	18	17.688		3.216	7/9/2020 23:46
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	116	42	84.896	20	18		2.292	7/8/2020 23:46
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	124	19	84.958	18	18		2.788	7/7/2020 23:45
localhost.bdcsv.lab	SERVER	PowerEdge C6525	ABCDEFG	118	19	81.152	20	17.913		2.785	7/6/2020 23:46

Figure 2 Metric report downloaded for 1-month report duration

To calculate total consumption for this device [ABCDEFG], add all the energy consumed metric available in the **Total Energy Consumed** column as shown in the above screenshot from the beginning of the metric duration, that is a month's data.

To find energy consumption for all devices in this duration (1 month), directly perform an aggregate of column K (**Total Energy Consumed**).

The above example considers the billing cycle from 6th July to 6th Aug of 2020 (1 month). Similarly, depending on when metric collection started and for the time range for which you want to calculate the consumption, change the time value in column Collected At.

To calculate the power bill for power consumption of all monitored devices, multiply per unit power cost to number of units of power consumed.

The second method to compute is by checking individual devices for the value of **Energy Consumption** (highlighted in below Figure 3) for the device in the **Metrics and Monitoring History** section.



Figure 3 Metric report downloaded as csv for 1 month report duration

To view the power consumption on a monthly basis, set the **Report Duration** to 1 Month, and for each billing cycle aggregate the value of energy consumed for all devices using the report.

3 Finding Zombie Servers inside a datacenter

There may be devices that keep consuming power irrespective of the amount of workload or payload that it processes for computing. Such servers are referred to as zombies that heavily affect the power costs incurred in a datacenter. To detect such servers, compare CPU, I/O, memory utilization (CUPs) against power utilization. If even for minimal CUPs utilization, power consumption does not drop, it signifies that the server has some component or an issue that keeps drawing excess power. After debugging the issue, replace the server or server parts for efficiency.

To debug the issue, observe the metric values for a large duration. For example, consider 12 months of data, the trend of power consumption to CUPs utilization is directly proportional, because as the payload to a server increases, the CPU has to increase its clock speed resulting in higher rotation per unit time, which in turn heats up the CPU and it needs more cooling thereby increasing power consumption drawn by CPU fans. The same applies to the Memory and I/O devices too, when the heat increases, excess power is consumed to increase cooling to keep the component and server safe.

After exporting data for a large duration (12 months of data), when you compare the trend in an excel file then for minimal CUP utilization, the power consumption values must reduce for a regular server, otherwise the server is mostly a zombie server. And, if such behavior appears consistently, probabilities are high that this is a zombie server.

To check this at a device level, view the metrics graphs present in the **Power Management and Monitoring** section for the device.

For example, the below graph depicts the trend for a zombie server. In this example, the power consumption keeps increasing even when there was no load on the CPU. Although for an instance this could be pretty normal and there might be multiple factors contributing to such a behavior. But for a long duration such as 9 months or 1 year, if the trend continues, it means that the power consumption is regularly high without any context switches on the CPU, and similarly no utilization on RAM either.

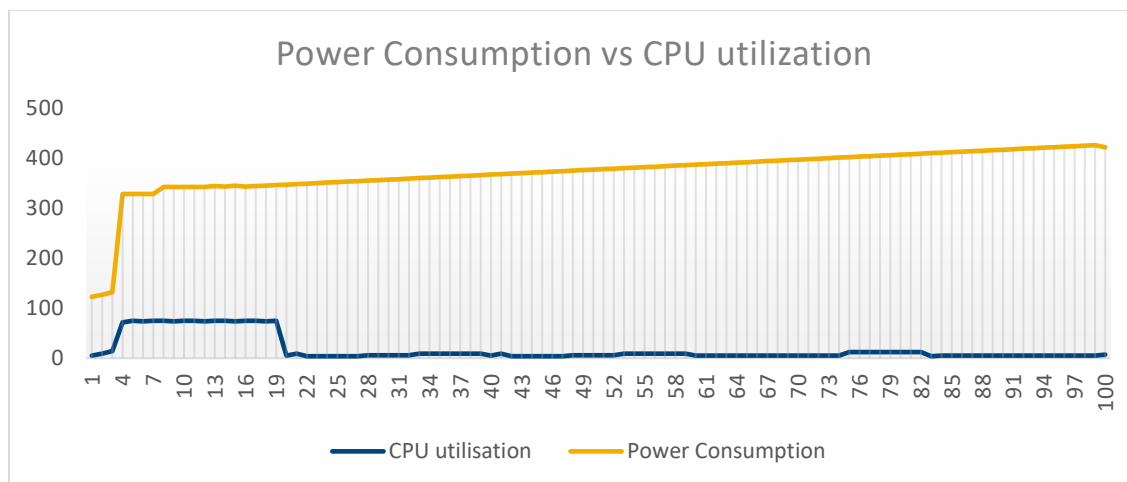


Figure 4 Power consumption versus CPU utilization trend for a zombie server

After detecting a zombie server, you can debug and find out the reason for excess power consumption. This could be due to faulty components such as PSU, or server fans that keep cooling down the server even when cooling is not needed. This scan helps you find out such defective parts or devices and after fixing or replacing them, reduce the power consumption.

4 Pro-Rata Power Budgeting

An organization consists of multiple sub-organizations, and power costs are generally divided equally as part of the operating income. For example, there is a sub-organization SO-A, and SO-B. If SO-A consumes 90% of the power and SO-B consumes only 10%, you cannot bill them equally when they have consumed different amount of power. Hence, both the sub-organizations must be billed based on the amount of power consumed by them respectively.

This results in an imbalance in the budgeting. For example, a certain organization such as the IT might always consume more power compared to the Finance organization, but since the power bill is equally divided, the actual operating income per sub-organization level is never truly known. Power Manager helps you create an effective and transparent power budgeting system.

4.1 Implementation

You can consider each of the sub-organization at a cost-center level as a group in OpenManage Enterprise. Each of these groups have a certain set of devices for which they are billed pro-rata wise. To differentiate between devices of different sub-organizations, create separate groups for each sub-organization and keep the devices in their respective groups. Using Power Manager run the **Power and thermal report** to evaluate the power and energy consumption during a phase (each billing cycle—one month).

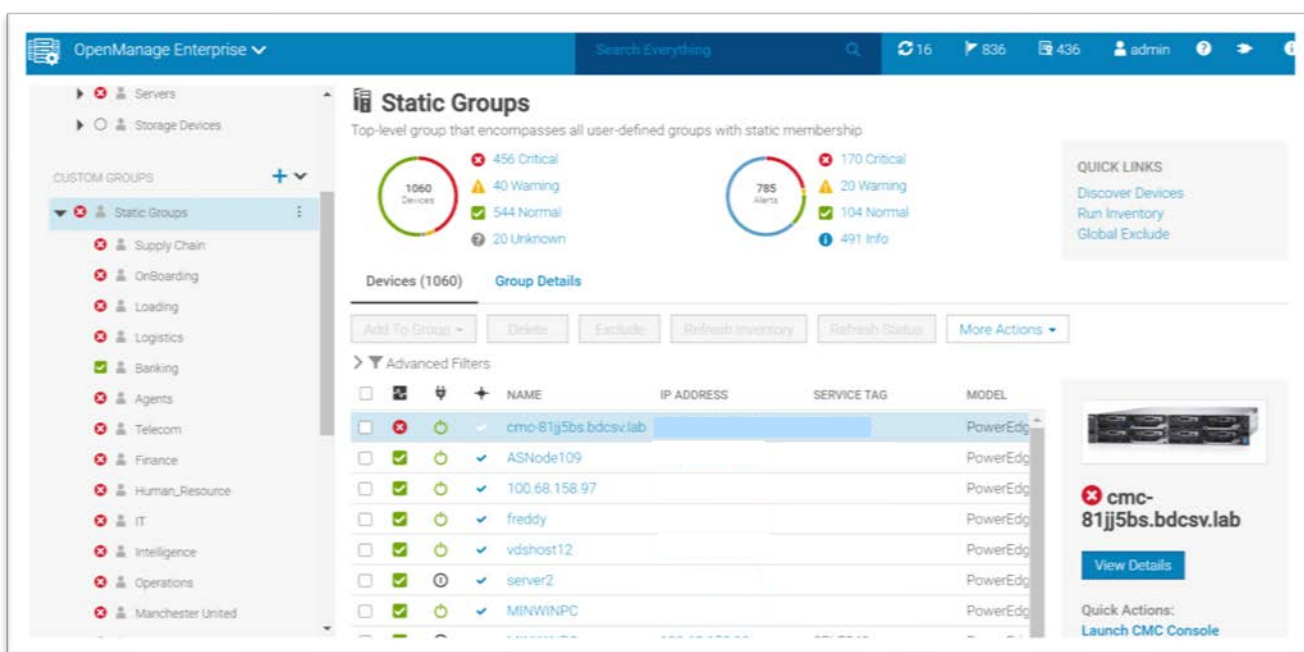


Figure 5 Example of different sub-organizations in a company

Report Definition

?

X

Name and Description

Report Builder

Name

Custom_report_for_Energy_Consumption_For_group

Description

Description

(Maximum characters: 1024)
You have 1024 characters left.

Step 1 of 2

Next

Cancel

Figure 6 Creating a custom power and thermal report 1

Report Definition

?

X

Name and Description

Report Builder

Category

Power Manager Devices

Alerts

Devices

Groups

Jobs

Power Manager Devices

Power Manager Groups

Servers

Select Columns

Search...

Alert

Chassis Device

Device FRU

Device General Info

Device License Info

Device Location

Device Management

Device Metric Threshold

Sort by

Select field...

Direction

Ascending

Column Order

Drag and drop to specify order from left to right in the report

results

Device Service Tag

Device General Info

Device Name

Figure 7 Select Power Manager Devices while creating the report

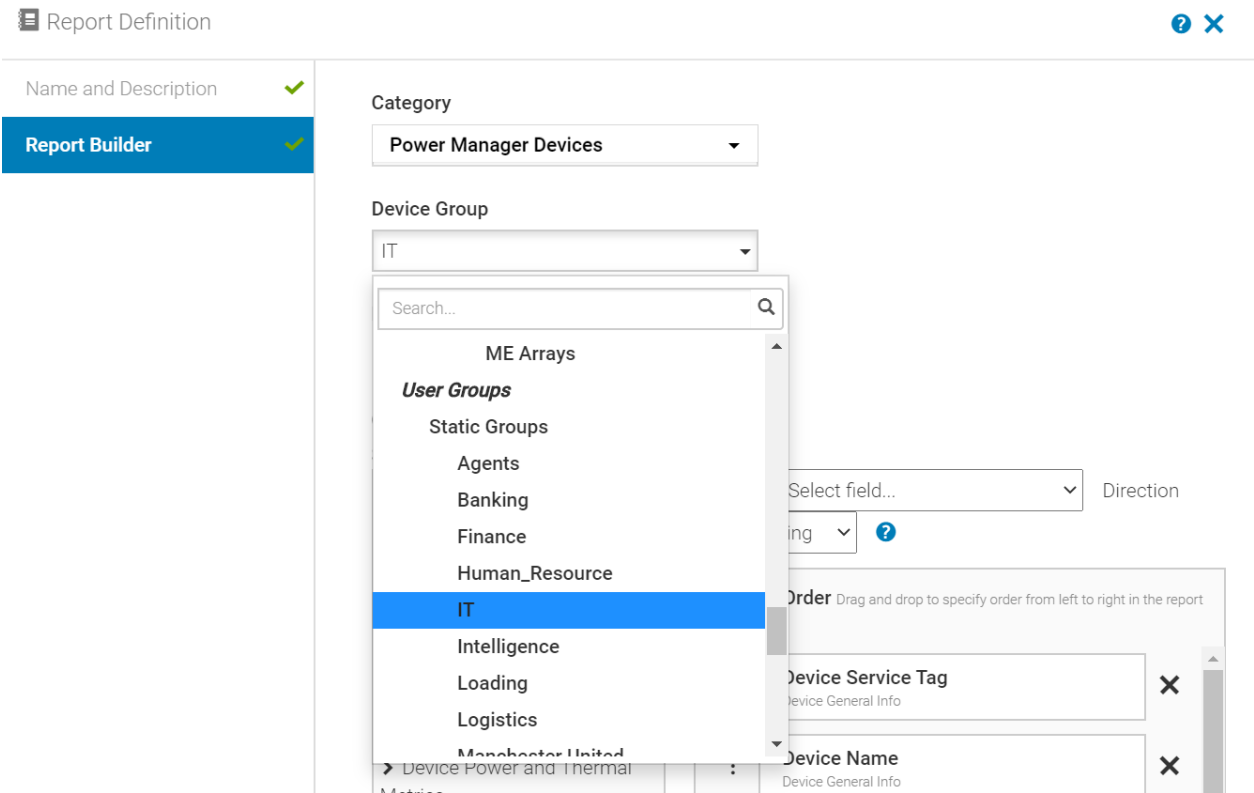


Figure 8 Select a group to create the report

Report Definition

Name and Description

Report Builder

Category

Power Manager Devices

Device Group

IT

Filter (optional)

Edit

Column Selection, Ordering, and Sorting

Select Columns

Search...

> Alert

> Chassis Device

> Device FRU

> Device General Info

> Device License Info

> Device Location

> Device Management

> Device Metric Threshold

> Device Power and Thermal Metrics

> Device Software

> Device Sub-Types

> Server Device

> Warranty

Sort by

Select field...

Direction

Ascending

Column Order

Drag and drop to specify order from left to right in the report

results

Device Service Tag

Device General Info

Device Name

Device General Info

Device Model

Device General Info

Device IP Address

Device Management

Total Energy Consumed (kWh)

Device Power and Thermal Metrics

Collected At

Report Settings

Report Duration

1 Month

Aggregation Period

Daily

Step 2 of 2

Previous

Finish

Cancel

Figure 9 Select Energy Consumption metric, Report Duration as 1 Month and Aggregation Period as Daily

Custom_report_for_Energy_Consumption_For_group**Group:** IT**Description:**

DEVICE NAME	DEVICE MODEL	DEVICE IP ADDRESS	TOTAL ENERGY CONSU...	COLLECTED AT
MINWINPC	PowerEdge R630		3.173	2020-07-13 23:46:21.5...
MINWINPC	PowerEdge R630		3.160	2020-07-14 23:46:18.6...
MINWINPC	PowerEdge R630		3.126	2020-07-15 23:45:49.0...
MINWINPC	PowerEdge R630		3.130	2020-07-16 23:45:55.5...
MINWINPC	PowerEdge R630		3.129	2020-07-17 23:46:15.7...
MINWINPC	PowerEdge R630		3.129	2020-07-18 23:46:22.8...
MINWINPC	PowerEdge R630		3.126	2020-07-19 23:46:15.1...
MINWINPC	PowerEdge R630		3.126	2020-08-01 23:46:26.9...
MINWINPC	PowerEdge R630		0.001	2020-08-02 23:46:26.4...
MINWINPC	PowerEdge R630		0.001	2020-08-03 23:46:23.5...
MINWINPC	PowerEdge R630		0.000	2020-08-04 23:45:39.3...
MINWINPC	PowerEdge R630		0.000	2020-08-05 23:47:28.3...
MINWINPC	PowerEdge R630		2.613	2020-07-06 23:47:49.4...
MINWINPC	PowerEdge R630		2.653	2020-07-07 23:47:35.1...
MINWINPC	PowerEdge R630		2.647	2020-07-08 23:47:01.3...
MINWINPC	PowerEdge R630		2.637	2020-07-09 23:47:16.6...
MINWINPC	PowerEdge R630		2.611	2020-07-10 23:30:13.0...
MINWINPC	PowerEdge R630		2.688	2020-07-11 23:47:12.9...
MINWINPC	PowerEdge R630		2.649	2020-07-12 23:48:27.2...
MINWINPC	PowerEdge R630		2.641	2020-07-13 23:45:26.2...

Figure 10 Run the report for the selected group

After running the report, download the report to a CSV or Excel format file and aggregate the values as depicted in [section 2.1](#) to find out the Energy Consumption by the devices of this group. Similarly, repeat the steps for all the groups to find out energy consumption for each group.

Based on the consumption of each sub-organization groups in OpenManage Enterprise, the power consumed (in kWh) multiplied to the per unit power cost is divided among the groups. Hence, this method provides chargeback to organizations that are billed incorrectly.

5 Conclusion

Data center power costs is one of the major problems faced by all IT industries, because the cost of running a datacenter and cooling it, not only puts substantial load on the budget and also increases the carbon footprint if not managed properly.

In such a scenario it is important for you to buy a product that can help manage, distribute and optimize power costs. Power Manager Reports are helpful in finding out energy consumed for devices in order to manage and distribute evenly across various parts of an organization.

This whitepaper serves as an essential tool in order to solve various data center power problems such as finding zombie servers, pro-rata power budgeting to each sub-organization or vendor using power from one source, and in determining the power costs at a data center as well as at individual sub group levels such as Rack, Aisle ,Room and so on or for OpenManage Enterprise logical groups(Static Groups).

6 Technical Support and Resources

- Dell.com/support is focused on meeting customer needs with proven services and support.
- To watch quick and short videos about handling the PowerEdge server components, visit the [QRL video website](#).

6.1 Related Resources

- Knowledge Base for Dell EMC OpenManage Enterprise [HTML](#)
- Knowledge Base for Dell EMC OpenManage Enterprise Power Manager and Power Center [HTML](#)
- Dell EMC OpenManage Enterprise Power Manager Version 1.2 User's Guide [PDF](#) [HTML](#)
- Dell EMC OpenManage Enterprise Power Manager RESTful API Guide version 1.2 [PDF](#) [HTML](#)
- Dell EMC OpenManage Enterprise Power Manager 1.2 Release Notes [PDF](#) [HTML](#)