The science behind the report:

Rein in power consumption faster and more easily

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report Rein in power consumption faster and more easily.

We concluded our hands-on testing on October 6, 2022. During testing, we determined the appropriate hardware and software configurations and applied updates as they became available. The results in this report reflect configurations that we finalized on September 28, 2022 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

To learn more about how we have calculated the wins in this report, go to http://facts.pt/calculating-and-highlighting-wins. Unless we state otherwise, we have followed the rules and principles we outline in that document.

Table 1: Results of our testing.

	Dell OpenManage Enterprise Power Manager 3.0	Manual with iDRAC
Collecting power data		
Single node		
Time (seconds)	27	91
Steps	8	12
Two servers		
Time (seconds)	27	182
Steps	8	24
Three servers		
Time (seconds)	27	273
Steps	8	36

	Dell OpenManage Enterprise Power Manager 3.0	Manual with iDRAC
Four servers		
Time (seconds)	27	364
Steps	8	48
Eight servers		
Time (seconds)	27	728
Steps	8	96
Applying power cap		
On an eight-node cluster		
Time (seconds)	49	288
Steps	14	48

System configuration information

Table 2: Detailed information on the systems we tested.

System configuration information	Dell™ PowerEdge™ R630	Dell PowerEdge R630	Dell PowerEdge R740	Dell PowerEdge R740
BIOS name and version	2.15.0	2.15.0	2.15.1	2.15.1
Operating system name and version/ build number	VMware® ESXi™ 7.0U3e-20036589-standard	VMware ESXi 7.0U3e-20036589-standard	VMware ESXi 7.0U3e-20036589-standard	VMware ESXi 7.0U3e-20036589-standard
Date of last OS updates/patches applied	09/15/2022	09/15/2022	09/15/2022	09/15/2022
Power management policy	Performance	Performance	Performance	Performance
Dell iDRAC				
Version	iDRAC8	iDRAC8	iDRAC9	iDRAC9
Firmware version	2.83.83.83	2.83.83.83	5.10.50.00	5.10.50.00
Processor				
Number of processors	2	2	2	2
Vendor and model	Intel® Xeon® E5-2698 v4	Intel Xeon E5-2698 v4	Intel Xeon Platinum 8168	Intel Xeon Platinum 8168
Core count (per processor)	20	20	24	24
Core frequency (GHz)	2.20	2.20	2.70	2.70
Memory module(s)				
Total memory in system (GB)	256	256	256	256
Number of memory modules	16	16	16	16
Vendor and model	Samsung M393A2G40DB0-CPB / Hynix Semiconductor HMA42GR7AFR4N-TF	Samsung M393A2G40DB0-CPB / Hynix Semiconductor HMA42GR7AFR4N-TF	Hynix Semiconductor HMA42GR7MFR4N-TF	Micron Technology 18ASF2G72PDZ-3G2E1
Size (GB)	16	16	16	16
Type	DDR4	DDR4	DDR4	DDR4
Speed (MHz)	2,133	2,133	2,133	3,200
Speed running in the server (MHz)	2,133	2,133	2,133	2,666
Local storage (OS)				
Number of drives	1	1	1	1
Drive vendor and model	Intel SSDSC2BB24	Intel SSDSC2BB24	Intel SSDSC2BB24	Intel SSDSC2BB24
Drive size (GB)	256	256	256	256
Drive information (speed, interface, type)	6Gb, SATA, SSD	6Gb, SATA, SSD	6Gb, SATA, SSD	6Gb, SATA, SSD

System configuration information	Dell™ PowerEdge™ R630	Dell PowerEdge R630	Dell PowerEdge R740	Dell PowerEdge R740
Network adapter (a)				
Vendor and model	Broadcom® 57800S 2 x GbE + 2 x 10GbE SFP+	Broadcom 57800S 2 x GbE + 2 x 10GbE SFP+	Broadcom Gigabit Ethernet BCM5720	Broadcom Gigabit Ethernet BCM5720
Number and type of ports	4x 10GbE	4x 10GbE	4x 1GbE	4x 1GbE
Driver version	15.35.06	15.35.06	22.00.6	22.00.6
Network adapter (b)				
Vendor and model	N/A	N/A	Intel Ethernet Converged Network Adapter X710-T	N/A
Number and type of ports	N/A	N/A	4x 10Gbe	N/A
Driver version	N/A	N/A	20.5.16	N/A
Power supplies				
Vendor and model	Dell PowerEdge 0HTRH4A01 / Dell 0G6W6KX02	Dell PowerEdge 0HTRH4A01 / Dell 0G6W6KX02	Dell 0Y26KXA02	Dell 0Y26KXA02
Number of power supplies	2	2	2	2
Wattage of each (W)	750	750	1,100	1,100

Table 3: Detailed configuration information for the servers we used in testing.

System configuration information	Dell PowerEdge R730	Dell PowerEdge R730	Dell PowerEdge R730	Dell PowerEdge R730
BIOS name and version	2.15.0	2.15.0	2.15.0	2.15.0
Operating system name and version/ build number	VMware ESXi 7.0U3e-20036589-standard	VMware ESXi 7.0U3e-20036589-standard	VMware ESXi 7.0U3e-20036589-standard	VMware ESXi 7.0U3e-20036589-standard
Date of last OS updates/patches applied	09/15/2022	09/15/2022	09/15/2022	09/15/2022
Power management policy	Performance	Performance	Performance	Performance
Dell iDRAC				
Version	iDRAC8	iDRAC8	iDRAC8	iDRAC8
Firmware version	2.83.83.83	2.83.83.83	2.83.83.83	2.83.83.83
Processor				
Number of processors	2	2	2	2
Vendor and model	Intel Xeon E5-2690 v3	Intel Xeon E5-2690 v3	Intel Xeon E5-2640 v4	Intel Xeon E5-2699 v4
Core count (per processor)	12	12	10	22
Core frequency (GHz)	2.60	2.60	2.40	2.20

System configuration information	Dell PowerEdge R730	Dell PowerEdge R730	Dell PowerEdge R730	Dell PowerEdge R730
Memory module(s)				
Total memory in system (GB)	256	256	256	256
Number of memory modules	8	16	16	16
Vendor and model	Samsung M386A4G40DM0-CPB	Samsung M393A2G40DB0-CPB	Hynix Semiconductor HMA42GR7MFR4N-TF	Hynix Semiconductor HMA82GR7AFR8N-VK
Size (GB)	32	16	16	16
Type	DDR4	DDR4	DDR4	DDR4
Speed (MHz)	2,133	2,133	2,133	2,133
Speed running in the server (MHz)	2,133	2,133	2,133	2,133
Local storage (OS)				
Number of drives	1	1	1	1
Drive vendor and model	Intel SSDSC2BB24	Intel SSDSC2BB24	Intel SSDSC2BB24	Intel SSDSC2BB24
Drive size (GB)	256	256	256	256
Drive information (speed, interface, type)	6Gb, SATA, SSD	6Gb, SATA, SSD	6Gb, SATA, SSD	6Gb, SATA, SSD
Network adapter (a)				
Vendor and model	Broadcom Gigabit Ethernet BCM5720	Broadcom Gigabit Ethernet BCM5720	Broadcom Gigabit Ethernet BCM5720	Broadcom Gigabit Ethernet BCM5720
Number and type of ports	4x 1GbE	4x 1GbE	4x 1GbE	4x 1GbE
Driver version	22.00.6	22.00.6	22.00.6	22.00.6
Power supplies				
Vendor and model	Dell 0TPJ2XA00/ Dell 0G6W6KX02	Dell 0TPJ2XA00/ Dell 0G6W6KX02	Dell 0TPJ2XA00/ Dell 0G6W6KX02	Dell 0TPJ2XA00/ Dell 0G6W6KX02
Number of power supplies	2	2	2	2
Wattage of each (W)	750	750	750	750

Table 4: We tested these scenarios with a realistic mix of processor and RAM configurations to mimic a real-world situation. Both the iDRAC-only scenario and the OME scenarios used the same configurations.

Software versions	
OpenManage Enterprise (OME)	Version 3.9.0 (Build 55)
OMEVV plugin (for VMware vCenter)	Version: 1.0.1.887
Power Manager Plugin (PMP)	Version: 3.0.0.190

How we tested

Collecting power data

Automated approach through OME Power Manager

1. Log into OME.
2. From the home page, hover over Monitor, and select Reports.
3. To move to the second page of reports , scroll down, and click the double arrows.
4. Click Power Manage, select the Power checkbox, and select the Thermal Report of Groups checkbox.
5. Click Run.
6. Click Download.
7. Select the XLS format.
8. Click Finish.

Manual approach through iDRAC

1. Log onto the server iDRAC.
2. Select Power/Thermal.
3. From the Jump To: menu, select Present Reading.
4. Record the Present Reading data for the day.
5. Scroll down to Cumulative Reading, and enter Total Usage into the appropriate column on the spreadsheet.
6. Scroll to Historical Trends, and record Average Usage, Max Peak, and Min Peak
7. From the top of the page, select Temperatures.
8. Under Temperature Probes, record the relevant Reading into the spreadsheet.
9. Under System Board Inlet Ambient Historical Temperature Data, select CSV, and click Export.
10. Open the downloaded spreadsheet.
11. Scroll to the current date, and copy the Peak Temperature to the main spreadsheet.
12. Copy the Average temperature to the main spreadsheet.

Capping power

Automated approach through OME Power Manager

1. Log into OME.
2. From Plugins, hover over Power Management, and select Policies.
3. Select Create.
4. Leave type as Static.
5. Enter a Name and a short description.
6. Leave Enable checked, and click Next.
7. Click Select Group.
8. Click the previously created Power Management group, and click Add Selected.
9. Click Next.
10. Under Policy Settings, set monitoring time period to 3 months.
11. Set the Power Cap to 434 Watt or 50 percent.
12. Click Next.
13. On Policy Schedule page, leave the defaults, and click Next.
14. On the Summary page, review inputs, and click Finish.

Manual approach through iDRAC

1. Log into the server iDRAC.
2. Select Power/Thermal.
3. Select Active Power Cap Policy.
4. Click Enable.
5. Set the Power Cap to 438.
6. Click Apply.

Installing VMware® ESXi™ 7.0

1. Boot the VMware ESXi installation media using ISO.
2. To continue, press Enter.
3. To Accept and Continue, press F11 key.
4. Under Storage Device, select the installation drive, and press Enter.
5. Select US Default for keyboard layout, and press Enter.
6. Enter the root password twice, and press Enter.
7. At the Confirm Install window, to install, press F11.
8. At the Installation Complete window, to reboot, press Enter.
9. After reboot, press F2 to Configure System.
10. Log in with root user/password, and press Enter.
11. Scroll to Configure Management Network, and press Enter.
12. Scroll to IPv4 Configuration, and press Enter.
13. Scroll to Static IPv4, and use spacebar to select it.
14. Set the IPv4, and use spacebar to select it.
15. To continue, press Enter.
16. Scroll to IPv6 Configuration, and press Enter.
17. Scroll to Disable IPv6, and use spacebar to select it.
18. To continue, press Enter.
19. Scroll to DNS Configuration, and press Enter.
20. Scroll to manually configure DNS, and use the spacebar to select it.
21. Add Primary DNS Server and Alternate DNS Server, and provide the hostname for the system.
22. Scroll to Custom DNS Suffixes, and press Enter.
23. Add the suffix that is required for testing, and press Enter.
24. To accept the changes, press ESC.

Installing iDRAC VIB in ESXi

1. Download Dell EMC iDRAC Service Module (VIB) for ESXi 7.0 U3, v4.3.0.0 from https://www.dell.com/support/home/en-us/drivers/driversdetails?driverid=x497n&oscode=xi70&productcode=poweredge-r730
2. Navigate to the ESXi page
3. Select actions, and select Enter Maintenance mode.
4. From the left pane, select Manage, and select Services.
5. Scroll down to TSM-SHH, right-click, and select Start.
6. Transfer the VIB zipfile to the ESXi host datastore.
7. Open an SSH terminal to install with the following command:

```
esxcli software vib install -d "/vmfs/volumes/datastore1/ ISM-Dell-Web-4.3.0.0-2781.VIB-ESX7i-Live_A00.zip"
```

Licensing SUTs with OME Advanced

1. Navigate to the iDRAC of the server receiving the license.
2. Make note of the Service ID on the Overview screen.
3. Navigate to Licenses.
4. Select Import.
5. Select Browse.
6. Navigate to the folder with the licenses.
7. Select the License that matches the Service ID.
8. Select OK.
9. Select Import.

Installing OME

1. To download the Appliance, navigate to dell.com/support.
2. Enter the Service Tag of the SUT, and click Search.
3. Scroll down to Dell EMC OpenManage Enterprise.
4. Download the .OVF for VMware.
5. Once the file is done downloading, extract the file.
6. Navigate to vCenter.
7. Right-click the infrastructure cluster where OME will reside, and select Deploy OVF Template.
8. Select Deploy Local File.
9. Navigate to .OVF Location.
10. Choose all the files in the extraction Directory.
11. If needed, change the name, version number, company name, etc.
12. Select the correct data center.
13. Select Compute Resource.
14. Select Thin Provision
15. Select the correct datastore.
16. Select a network.
17. Power on the appliance.
18. At the EULA page, press the Tab key two times.
19. Select the relevant Language.
20. Create a Password.
21. Navigate to Set Networking Parameters.
22. Enter the Admin password.
23. Ensure IPv4 is enabled
24. Tab over to Static IPv4 Address, remove, and set an IP.
25. Enter a Static Gateway.
26. Leave Subnet Mask.
27. Set Static Preferred DNS Server.
28. Click Apply.

Additional OME configuration

1. Shut down the OME appliance.
2. Navigate to vCenter.
3. Right-click the OME appliance, and select Edit Settings.
4. Select Add New Network Adapter
5. Select VMXNET3 type.
6. Assign to a second network.
7. Start the OME appliance.
8. Select Network Configuration.
9. Enable IPv4.
10. Set the IP Address.
11. Set 0.0.0.0 as the Gateway.
12. Set correct subnet mask of 255.255.0.0.
13. Disable IPV6.
14. Click Apply.
15. Restart the appliance for changes to take effect

Installing Plugins within OME

1. Navigate to the OME Address.
2. Log in with the set credentials.
3. Navigate to Application Settings.
4. From the drop-down menu, select Console and Plugins.
5. Under No Updates Found, select the refresh arrow.
6. Proceed to installing each plugin.

Installing Power Manager Plugin

1. From the right-hand side near Power Manager update details, select Install.
2. Select the appropriate version in the drop-down menu, We installed the latest version: 3.0.0.190.
3. From the bottom right of the card, select Download Plugin.
4. Wait for the plugin to finish downloading, and then the Download button will change to Install Plugin. Click Install Plugin.
5. At the EULA, click Accept.
6. After the EULA, OME will prompt for confirmation that a Snapshot of OME has been taken before allowing the install to proceed.
7. Navigate back to the vCenter holding the OME appliance.
8. Right-click the OME appliance, hover over Snapshot, and select Take Snapshot.
9. On the Take Snapshot pop up, enter a short description, and click Create.
10. Once the Snapshot is completed, navigate back to the OME window, and select the box confirming a snapshot has been taken, and select Confirm Install.
11. The appliance will reboot once Plugin is finished installing

Configuring Power Manager

Creating a custom group for monitoring

1. From the top menu, navigate to the Device page.
2. From All Devices, select Group Actions, and from the drop-down menu, select Create Custom Group.
3. From the pop-up menu, select Static Group, and click Create.
4. Give the Static Group a name. We used PMP Manager.
5. Enter a description.
6. From the drop-down menu, select the Parent Group Static Groups, and click Next.
7. Select the members that will be a part of this group. We added our SUTs.
8. Click Finish.

Adding Devices to be managed by Power Manager

1. Navigate to Plugins, and from the drop-down menu, select Power Manager.
2. On the Overview screen, select Power Manager Devices.
3. Under Static Groups, select Add Group(s), and check the box next to the PMP Managed Group we created.
4. Click Add Selected.
5. Now, you can view details of power management from the Power Manager Overview, or by viewing the individual units on the OME Device page. General information is available on the OME homepage.

Configuring OMEVV

1. Once the OMEVV plugin has been installed, navigate to OME, select Plugins from the main menu, and from the drop-down menu, select OMEVV.
2. The Administration page will serve as the homepage. Select Register.
3. Enter the FQDN, enter a description, vCenter credentials, and opt to register with the vSphere Lifecyle Manager.
4. Click Finish.

Accessing OMEVV

1. Navigate back to Vcenter, open the hamburger side menu, and select OpenManage Enterprise Plugin.
2. Select Repository Profile, and click Create new profile.
3. On the pop-up, select Get Started.
4. Enter a name and a description. Click Next.
5. On Profile Settings, change the Protocol to HTTPS, and enter https://downloads.dell.com/catalog/Catalog.gz .
6. No Username or Password are required, so skip this step.
7. Under Test Settings,click Begin test.
8. Click Next.
9. Click Finish.

Discovering hosts

1. Navigate to Compliance & Profiles.
2. Navigate to Management Compliance
3. Select Discover Host(s), and click Get Started.
4. Enter a Job name, a description, and from the drop-down menu, select the vCenter (in our case, vcenter.pod2.lab).
5. Enter the iDRAC credentials, and click Next.
6. Select the Cluster where the Hosts reside, and select Finish.
7. Select the hosts being added to OMEVV, and click first run inventory.
8. Select all the hosts again, and click Manage.

Creating a baseline profile

1. From the left menu, select Baseline Profile.
2. Select Create Baseline Profile, and from the pop-up, click Get Started.
3. Enter a Profile Name and Description (we used PMP Baseline), and click Next.
4. Click the checkbox for Firmware Repository Profile, and pick the Dell Default repository created in the previous step. Click Next.
5. If the list of Clusters is empty, click Browse and select the appropriate cluster. Click Next.
6. Select the days and time for drift detection, and click Next.
7. Click Finish.

Read the report at https://facts.pt/3a2yDEn ▶

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