

Scalability and Performance of Dell EMC OpenManage Essentials Version 2.4

Dell EMC Engineering
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Executive summary

This technical white paper provides an overview of scalability and performance testing of OME 2.4, and contains reports of test results used to assess the product quality and stability of various product features. This technical white paper also offers recommendations to achieve maximum performance by using OME.

Introduction

OME is a web-based hardware management application that provides a comprehensive view of Dell EMC systems, supported devices, and components in the enterprise network environment.

This technical white paper summarizes the OME 2.4 system testing environment, methodology, resultant data, and recommendations to achieve performance similar to that demonstrated by the test results.

Test environment and methodology

The scalability and performance tests for OME were performed on the following environments:

- Small business environment: Consisted of 100 managed systems
- Medium business environment: Consisted of 500 managed systems
- Enterprise business environment: Consisted of 2000, 5500, and 8000 managed systems

The hardware and software configuration of OME was different for these environments. For more information, see Table 1.

Table 1: Test environments for OME v2.4

Test Configuration	Test Environment				
	Small Business	Medium Business	Enterprise Business		
Number of Managed Systems	100	500	2000	5500	8000
RAM Used [GB]	4	6	8	8	16
Processor Cores [cores]	2	4	8	8	16
Operating System	Windows Server 2008 R2 Standard Edition	Windows Server 2008 R2 Standard Edition	Windows Server 2008 R2 Enterprise Edition	Windows Server 2012 R2 Datacenter	Windows Server 2012 R2 Datacenter
Database Version and Location	SQL Server 2008 Express [Local]	SQL Server 2008 Standard R2 [Local]	SQL Server 2008 R2 Enterprise [Remote]	SQL 2012 SP1 Enterprise Edition [Remote]	SQL 2012 SP1 Enterprise Edition [Remote]
SQL DB Size [GB]	1	2	6	10	14

Note: **Local** database location refers to database installed on the same system as OME. **Remote** refers to database set up on a different system than that on which OME is installed. For more information about installing Dell EMC OME by using a remote database, see the *Dell OpenManage Essentials Install* technical white paper available on [Dell TechCenter](#).

The primary focus of OME 2.4 scalability and performance tests is to collect and analyze the various performance parameters for the following OME features:

- Discovery and inventory
- Health monitoring
- System update (patch) management
- Server Configuration management
- Events

Also, longevity and reliability tests were performed where certain features of OME were used at regular intervals over a period of 3–4 weeks.

Generic recommendations

Based on the analysis of the performance data collected for the various features tested, Dell EMC recommends the following for optimal OME performance:

- The minimum hardware and software mentioned in Table 1 must be used to ensure best performance of OME. Higher hardware specifications such as increase in processor cores or RAM, will yield better performance than that described in this technical white paper.
- Configure the max server memory of SQL Server based on the available system resources. Refer to this MSDN article for more information.
- OME must be installed by using a remote database when the number of managed system is greater than 500, and when the hardware specification is similar to what is provided in Table 1.
- Domain Name System (DNS) must be configured such that OME is able to resolve the hostname of all the managed systems.

Discovery and inventory

The test results for discovery and inventory features are listed in Table 2 and Table 3.

Table 2: Discovery and inventory data in OME 2.4 with ICMP enabled

Protocol used for discovery and inventory	WS-Man		WMI		SNMP	
	50% Throttle	100% Throttle	50% Throttle	100% Throttle	50% Throttle	100% Throttle
Number of devices discovered	8000	8000	8000	8000	8000	8000
Time taken for first time discovery and inventory (hour)	9	6	6	6	5	3
Time taken for scheduled rediscovery and inventory (hour)	7	4.5	3	1.5	1.5	1
Average OME memory consumption during first time discovery and inventory (MB)	265	35	165	180	135	165
Total CPU usage (percent)	0–19	0–22	0–28	0–30	0–26	0–30
DB size after discovery and inventory (MB) (Initial DB size – 113 MB)	868	895	134	202	328	330
Uploaded bandwidth for discovery and inventory (GB)	6	5	4	4	1	2
Downloaded bandwidth for discovery and inventory (GB)	7	6	16	14	0.657	1

Table 3 Discovery and inventory data in OME 2.4 with ICMP disabled

Protocol used for discovery and inventory	WS-Man		WMI		SNMP	
	50% Throttle	100% Throttle	50% Throttle	100% Throttle	50% Throttle	100% Throttle
Number of devices discovered	8000	8000	8000	8000	8000	8000
Time taken for first time discovery and inventory (hour)	10	6	7	6	6	4
Time taken for scheduled rediscovery and inventory (hour)	7	4.30	4.30	1.45	1.30	1.5
Average OME memory consumption during first time discovery and inventory (MB)	269	312	171	171	137	168
Total CPU usage (percent)	0–17	0–26	0–21	0–28	0–26	0–34
DB size after discovery and inventory (in MB) (Initial DB size – 113 MB)	985	858	134	203	397	327
Uploaded bandwidth for discovery and inventory (GB)	7	5	5	4	1	1
Downloaded bandwidth for discovery and inventory (GB)	7	6	19	14	0.660	0.670

Recommendations for using discovery and inventory features of OME

- Usage of recommended hardware and software components according to the number of devices managed.
- The ICMP and SNMP retry and timeout values must be increased if the network usage is high.
- Select only the protocols necessary for a particular discovery and inventory task because selecting all the protocols causes the discovery and inventory task to run slower.
- For ICMP related settings in OME, see the [OpenManage Essentials 2.4 User's Guide](#).

Throttle (speed) value

After installing OME, the default value of throttle (speed) is set to 50%. This setting can be changed to any of the speeds available.

A comparison of performance data by using different throttle values is also provided in Table 2 and Table 3. These tables can be used to determine the correct throttle value for your system. For a higher throttle value, OME performance improves at the cost of increased system resource.

Figure 1 displays the OME page on which you can change the throttle (speed) setting. The following paths may be followed to access the throttle configuration page:

- Discovery — Start the OME Console and click **Manage → Discovery and Inventory → Discovery Schedule**. Configure the throttle by using the **Discovery Speed** slider.
- Inventory — Start the OME Console and click **Manage → Discovery and Inventory → Inventory Schedule**. Configure the throttle by using the **Inventory Polling Speed** slider.
- Health Monitoring — Start the OME Console and click **Manage → Discovery and Inventory → Status**. Configure the throttle by using the **Status Polling Speed** slider.
- Configuration Inventory — Start the OME Console and click **Manage → Configuration → Configuration Inventory Schedule**. Configure the throttle by using the **Inventory Polling Speed** slider in the **Schedule** section.

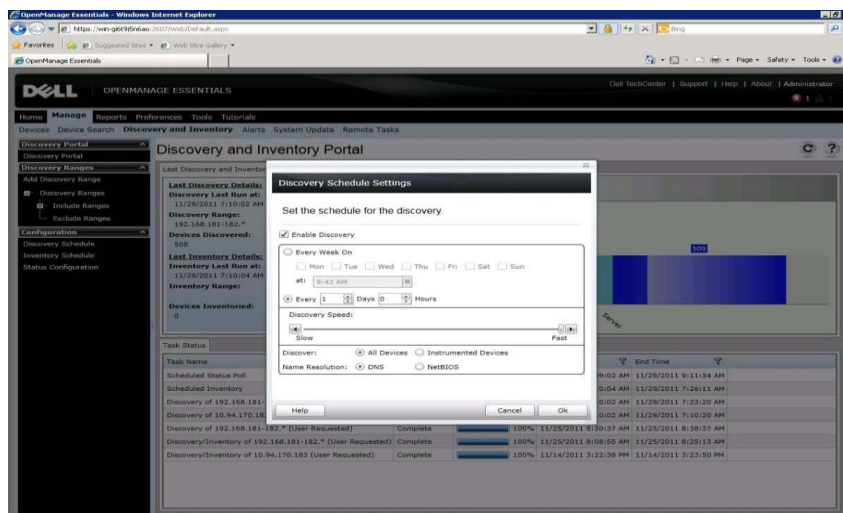


Figure 1 Discovery throttle settings

Network bandwidth utilization

Discovery and inventory bandwidth utilization by using the Guided Discovery wizard

The test results of network bandwidth utilized by different protocols for discovery or inventory, and health status poll by using the Guided Discovery wizard in OME is listed in Table 4.

Table 4: Network bandwidth utilization for discovery and inventory by using Guided Discovery

Device Type	Protocol Used for Discovery	OME Workflow	Bandwidth	
			Incoming (approx.)	Outgoing (approx.)
iDRAC (Server Out-of-band)	WS-Man	Discovery/Inventory	569 KB to 756 KB	69 KB to 168 KB
		Status Poll	12 KB	6 KB
Server with OMSA	SNMP	Discovery/Inventory	50 KB to 133 KB	40 KB to 103 KB
		Status Poll	4 KB	3 KB
Windows Server without OMSA	WMI	Discovery/Inventory	2 MB	123 KB
		Status Poll	242 KB	12 KB
Linux Server without OMSA	SSH	Discovery/Inventory	24 KB	10 KB
		Status Poll	3 KB	2 KB
ESXi Host + Guests	WS-Man + SNMP	Discovery/Inventory	756 KB	168 KB
		Status Poll	330 KB	115 KB
Hyper-V Host + Guests	WMI + SNMP	Discovery/Inventory	2 MB	166 KB
		Status Poll	184 KB	13 KB
Comprehensive Chassis Discovery	WS-Man (SNMP protocol is used for discovering IOAs)	Discovery/Inventory	3 MB	365 KB
		Status Poll	62 KB	26 KB
Client	WMI	Discovery/Inventory	2 MB	88 KB
		Status Poll	390 KB	20 KB
Dell EMC PowerVault MD Array	MD Array	Discovery/Inventory	163 KB	2 KB
		Status Poll	162 KB	772 B

Discovery and inventory bandwidth utilization by using the Standard Discovery wizard

The test results of network bandwidth utilized by different protocols for discovery or inventory, and health status poll by using the Standard Discovery wizard in OME is listed in Table 5.

Table 5: Network bandwidth utilization for discovery and inventory by using Standard Discovery

Device Type	Protocol	OME Workflow	Bandwidth Used	
			Incoming (approx)	Outgoing (approx)
iDRAC	WS-Man	Discovery/Inventory	569 KB to 756 KB	69 KB to 168 KB
		Status Poll	11.6 KB	6 KB
iDRAC	IPMI	Discovery/Inventory	7 KB	6 KB
		Status Poll	2 KB	2 KB
iDRAC	SNMP	Discovery/Inventory	11 KB	9 KB
		Status Poll	1 KB	868 B
Dell EMC Server (Inband)	SNMP (OMSA)	Discovery/Inventory	50 KB to 133 KB	40 KB to 102 KB
		Status Poll	4 KB	3 KB
Dell EMC Server (Inband)	WMI (OMSA)	Discovery/Inventory	3 MB	632 KB
		Status Poll	184.7 KB	19 KB
Dell EMC Server (Inband)	WS-Man(OMSA/ESX)	Discovery/Inventory	756 KB	168 KB
		Status Poll	330 KB	115 KB
Dell EMC Server (Inband)	SSH (Linux Server without OMSA)	Discovery/Inventory	24 KB	10 KB
		Status Poll	3 KB	2 KB
CMC	WS-Man	Discovery/Inventory	294 KB	80 KB
		Status Poll	12 KB	5 KB
CMC	SNMP	Discovery/Inventory	13 KB	10 KB
		Status Poll	8.6 KB	7.7 KB
Printer	SNMP	Discovery/Inventory	6 KB to 8 KB	4 KB to 5 KB
		Status Poll	4 KB	3 KB
FC Switch	SNMP	Discovery/Inventory	14 KB to 20 KB	12 KB to 17 KB
		Status Poll	698 B	565 B
	SNMP	Discovery/Inventory	14 KB	11 KB

Storage/Compellent		Status Poll	736 B	442 B
Storage/EqualLogic	SNMP	Discovery/Inventory	9 KB to 65 KB	7 KB to 53 KB
		Status Poll	4 KB to 7 KB	3 KB to 6 KB
Storage/EMC NAS	SNMP	Discovery/Inventory	6 KB	5 KB
		Status Poll	230 B	246 B
Storage/PowerVault MD	SNMP	Discovery/Inventory	163 KB	2 KB
		Status Poll	162 KB	772 B
Storage/Tape	Symbol	Discovery/Inventory	4 KB	3 KB
		Status Poll	774 B	540 B
IOA	SNMP	Discovery/Inventory	18 KB to 23 KB	7 KB to 10 KB
		Status Poll	4 KB	2 KB
Client	WMI	Discovery/Inventory	2 MB	88 KB
		Status Poll	390 KB	19 KB
Client	SNMP	Discovery/Inventory	11 KB	9 KB
		Status Poll	626 B	546 B
UPS	SNMP	Discovery/Inventory	5 KB	4 KB
		Status Poll	398 B	462 B
PDU	SNMP	Discovery/Inventory	5 KB to 6 KB	4 KB to 5 KB
		Status Poll	327 B to 349 B	288 B
KVM	SNMP	Discovery/Inventory	4 KB	3 KB
		Status Poll	646 B	449 B

Network bandwidth utilization in OME configuration tasks

The test results of network bandwidth utilization by OME during the different configuration tasks are listed in Table 6.

Table 6: Network bandwidth utilization in OME configuration tasks

Tasks	Download	Upload
Create Baseline (iDRAC WS-Man Protocol)	44 KB	24 KB
Create Template ((iDRAC WS-Man Protocol)	62 KB	28 KB
Configuration inventory ((iDRAC WS-Man Protocol)	52 KB	26 KB
System Update(One 102 MB OS Driver Pack Firmware Used)	2 MB	113 MB

The above data can be considered for planning the network usage or requirement for different actions in OME.

System update and server configuration management

Recommendations for using the System Update & Server Configuration feature based on the analysis of the test results:

- For System Update or Server configuration deployment tasks, recommendation is to use 100 managed systems at any given time.
- For better result and performance of server configuration management features such as Device Compliance and Configuration Inventory, recommendations are as follows:
 - Device Compliance
 - Associate baseline with 500 devices at a time.
 - If the managed device count is more than 500, create custom device groups for each set of 500 devices, clone the existing baseline, and separately associate the other set of 500 devices group.
 - Configuration Inventory
 - Disable scheduled device configuration inventory if the number of managed out-of-band devices are more than 500.
 - Scheduled Configuration inventory task might run for a longer time than expected if managed devices are more than 500 devices at a time.
 - If the managed device count is more than 500, based on demand, the configuration inventory can be triggered from device tree by selecting multiple intended devices or set of devices added in a custom device group.
- Dell Repository manager is recommended as the catalog source for system update, because the packages are downloaded at a faster rate. However, Dell Online FTP catalog can also be used.
- Separate system update tasks must be created for Windows and Linux targets in case of in-band system updates.
- OME Enterprise Business configuration was used for the above analysis.

Note: The recommended minimum network bandwidth required for OpenManage Essentials in a WAN environment is 10 Mbps (for Monitoring) and 20 Mbps (for Updates).

Alerts and task management

Recommendations for using the system update feature based on the analysis of the test results:

- Domain Name System (DNS) must be configured such that OME is able to resolve the hostname and all the received alerts. If the name resolution in OME is not successful, the alerts or events are received and processed at a slower rate.
- From the test data collected, OME can process alerts at the rate of 1/second. If the alert frequency increases, the performance of OME will be slower. Alert actions might not always be triggered at a higher alert frequency.
- Alert actions must be created for the required severity and category such that all alerts are not processed by the created alert action. This will enhance the performance of OME. For example, if an alert action is to be created for all critical network alerts, the Critical option must be selected under Severity Association, and the Network option must be selected under Category and Sources Association.
- In case of an events storm, where more than 20000 alerts are generated at the same time, OME drops about 1% alerts after receiving 20000 alerts. This happens while the old alerts are getting purged. OME receives all the alerts generated without dropping any if alerts are received at a rate of 30 alerts/min without any alerts actions configured, and 9 alerts/sec with all the alerts actions configured.

Table 7 lists an overall data about the size consumed by alerts when received in OME. Note, the OME configuration used is as per the enterprise configuration requirement in Table 1.

Table 7: OME DB size after receiving the alerts

Initial DB Size after Installing OME	113 MB
DB Size After Discovering 8000 devices (WS-Man)	847 MB
DB Size After Receiving 2000 Alerts	848 MB
DB Size After Receiving 20000 Alerts	852 MB
DB Size After Receiving 40000 Alerts	857 MB

Task management

- The recommended number of managed targets for a single remote task is 40.
- Schedule no more than 20 remote tasks to run simultaneously.
- The Server Administrator deployment task must be run with a maximum of 20 managed system targets. For Linux target systems, use of operating system-specific Dell EMC OpenManage Server Administrator packages are recommended.
- Separate remote tasks must be created for Windows and Linux managed systems.

Known limitations

- **Discovery and Inventory:** Memory used by OME for subsequent scheduled discovery and inventory gradually increases. We have observed an increase in memory usage reaching 1 GB by OME for discovery and inventory with the default schedule cycle (24 hours) over a period of 5 months (with 8000 managed devices). However, the memory will be released after restarting the OME service, or the OS on which the OME is installed.
- **Device Configuration Inventory:** If the managed device count is more than 500 and scheduled configuration inventory is triggered, the task might run for a longer time than expected. Follow the recommendation mentioned in [System update and server configuration management](#).