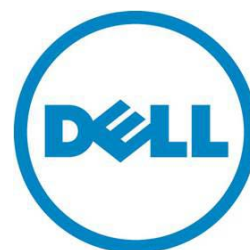

OME1.0/1.0.1 - Scalability and Performance

This whitepaper provides the recommendations to achieve maximum performance for Dell OpenManage Essentials 1.0/1.0.1 along with the detailed performance data collected during testing.

Author(s)

Adithi Anginthaya

Ashish Suyal



Executive summary

This document provides an overview of the scalability and performance testing of Dell OpenManage Essentials (OME) 1.0/1.0.1. It contains detailed reports of test results to assess the product quality and stability for various product features.

This document also provides recommendations to achieve maximum performance for OME.



Contents

Introduction	4
Test environment and methodology:	4
Generic recommendations.....	6
Discovery and Inventory	6
Health Monitoring	10
Events	12
Tasks management	14
System Update (Patch) management	16
Longevity Tests	17
Generic Recommendation.....	20
Learn More	21



Introduction

Open Manage Essentials (OME) is a web- based hardware management application that provides a comprehensive view of Dell systems, supported devices, and components in the enterprise's network.

This white paper summarizes the OME 1.0/1.0.1 system testing environment, methodology, resultant data and recommendations to achieve similar performance as depicted in the results.

Test environment and methodology:

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

- **Small business customer's environment:** This environment consisted of 100 managed systems. For example, a customer having 80 Dell PowerEdge Servers, 10 Dell EqualLogic storage devices and 10 Dell PowerConnect switches.
- **Medium business customer's environment:** Medium business environment consisted of 500 managed systems.
- **Enterprise business customer's environment:** This environment consisted of 2000 managed systems.

The hardware and software configuration of OME was different for these environments. Please refer to Table 1 for more details.



Table 1. Test Environments for OME 1.0/1.0.1

Test Configuration	Test Environment		
	Small Business	Medium Business	Enterprise Business
NO. of Managed Systems	100	500	2000
RAM used on OME system	4 GB	6 GB	8 GB
Processor cores	2 cores	4 cores	8 cores
Operating System on which OME was installed	Windows Server 2008 x86 Standard Edition SP2	Windows Server 2008 x64 Standard Edition R2	Windows Server 2008 x64 Enterprise Edition SP2
Database version and Location	SQL 2008 Express (Local)	SQL 2008 Standard R2 (Local)	SQL 2008 Standard R2 (Remote)

Note: “Local” in the “Database version and Location” implies that the database is to be installed on the same machine as OME. “Remote” implies that the database is to be setup on a different machine than OME. Please refer to the whitepaper “Dell OpenManage Essentials Install” for more information about installing Dell OME using a remote database.

Note: The scalability and performance tests were performed by installing OME in both physical machines and virtual machines. Results are comparable.

The primary focus of OME 1.0/1.0.1 scalability and performance tests is to collect and analyze the various performance parameters; for example CPU utilization and memory consumption etc. The data has been collected for the following OME features:

- Discovery and Inventory.
- Health Monitoring.
- System updates (Patch) management.
- Task management.
- Event console



The tests were performed at various load and network usage conditions and the performance data was collected.

Also, the longevity and reliability tests were performed, where the high priority features of OME were executed at regular intervals over a period of 3-4 weeks. The performance data was collected for these tests as well.

Generic recommendations

Based on the analysis of the performance data collected for the various features tested, the following are the recommendations:

1. The minimum hardware and software mentioned in Table 1 must be used in order for better performance of OME. Higher hardware specifications i.e., increase in processor cores or RAM will yield better performance than that detailed out in the rest of the document.
2. Recommendation is to configure the “max server memory” of SQL server based on the available system resources. Please refer to the [MSDN link](#) for more information.
3. OME should be installed using a remote database when the number of managed system is >500 and if the hardware specification is that provided in Table 1.
4. 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 feature are mentioned in Table 2 & 3 below.

Table 2. SNMP and WMI Discovery Data

Discovery Data	Test Environment		
	Small Business	Medium Business	Enterprise Business
No. of Managed Systems	100	500	2000
Time taken to discover (min)	6	16	28
Average CPU utilization	90%	85%	90%



Average memory utilization	1.6GB	2.4GB	1.6GB
Average GUI response time (sec)	2 - 3	2-3	3-5

Table 3. SNMP and WMI Inventory Data

Inventory Data	Test Environment		
	Small Business	Medium Business	Enterprise Business
No. of Managed Systems	100	500	2000
Time taken to inventory (min)	5	12	37
Average CPU utilization	90-95%	90%	90-95%
Average memory utilization	1.7 GB	2.5GB	1.7GB
Average GUI response time (sec)	2 - 3	2-3	3-5

The tests included running discovery and inventory tasks for all the test environments listed in Table1 and recording the performance data. For example, a discovery and inventory task was executed to discover and inventory 2000 managed systems (Enterprise business environment) and the corresponding performance data was recorded. This performance data is obtained with a setting of 100% throttle (speed) value.

After analyzing the results, following are the recommendations for using discovery and inventory feature:

1. Lower throttle (speed) is recommended if the other applications are being run on the OME system.
2. ICMP and SNMP retry and timeout values must be increased if the network usage is high.
3. Recommendation is to select only the protocols necessary for a particular discovery task as selecting all the protocols will cause the discovery and inventory task to slow down.



Throttle (Speed) Value

On installation of OME, the default value of throttle (speed) is set to 50%, which implies that OME uses approximately half the available system resources like CPU and memory to perform its operations.

The throttle value can be changed by the customer according to the system's configuration. For example, if a system is running SQL Server which requires significant processing power, a user may not want to use 100% throttle setting. This setting can be lowered to any of the speeds available.

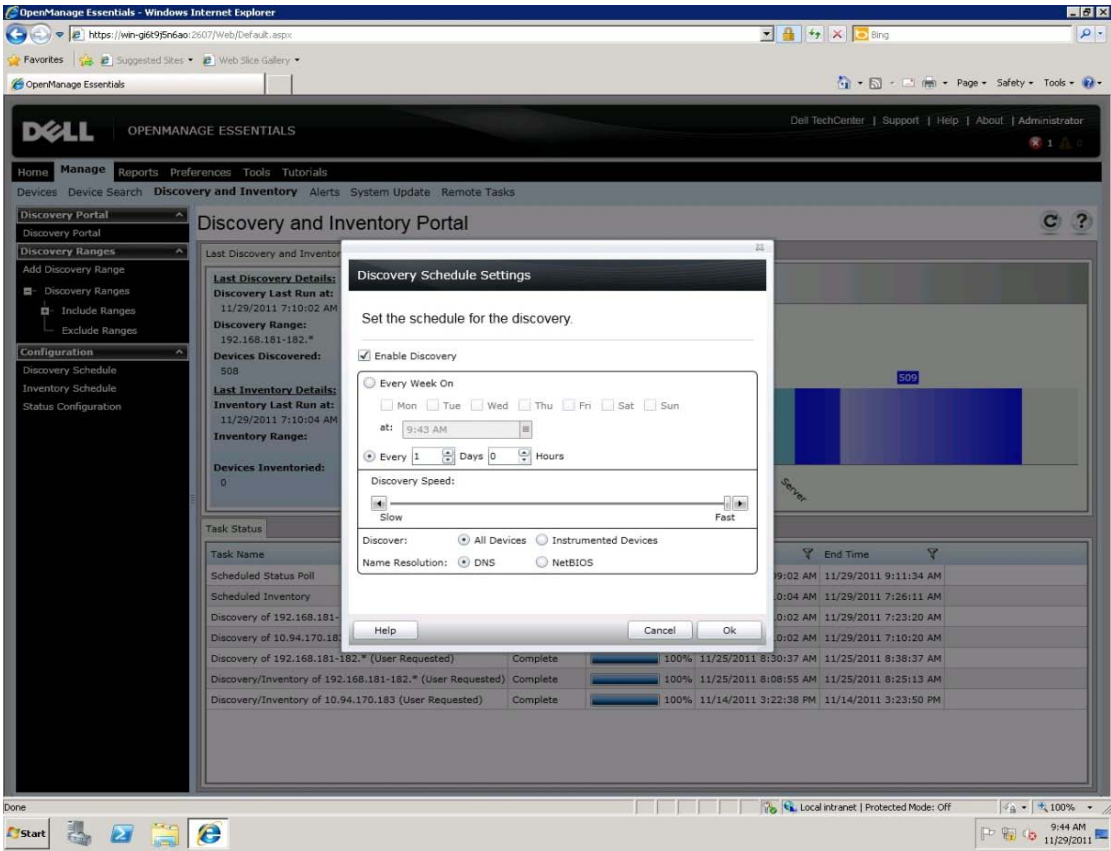
A comparison of performance data by using different throttle values is also provided in tables 5 and 6. These tables can be used to decide the right throttle value for your system. For a higher throttle value, OME performance improves at the cost of increased system resource usage.

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

1. Discovery: Launch OME Console and navigate to "Manage -> Discovery and Inventory -> Discovery Schedule". Configure the throttle by using the "Discovery Speed" slider.
2. Inventory: Launch OME Console and navigate to "Manage -> Discovery and Inventory -> Inventory Schedule". Configure the throttle by using the "Inventory Polling Speed" slider.
3. Health Monitoring: Launch OME Console and navigate to "Manage -> Discovery and Inventory -> Status Configuration". Configure the throttle by using the "Status Polling Speed" slider.



Figure 1. Discovery Schedule



Health Monitoring

The test results for Health monitoring feature are mentioned in Table 4 below.

Table 4. Health Monitoring Data

Health Monitoring Data	Test Environment		
	Small Business	Medium Business	Enterprise Business
No. of Managed Systems	100	500	2000
Time taken to change status (min)	1	3.5	9
Average CPU utilization	80%	85%	90%
Average memory utilization	1.2 GB	2.1GB	1.75GB

The tests for health monitoring included simulating health changes for managed systems in different customer environments (as mentioned in Table 1) which trigger the health monitoring poll tasks. The performance counters were recorded when these status poll tasks were running.

These results are obtained with a setting of 100% throttle value for Health Monitoring (Status). After analyzing the results, following are the recommendations for using health monitoring feature:

1. Lower throttle (speed) is recommended if the other applications are being run on the OME system.
2. Default status polling interval is 1 hour. Recommendation is to configure the polling interval to 5 hours or above if the number of managed systems is more than 1000 devices.

Performance data for different throttle values

The performance data for discovery and inventory was also recorded for different [throttle](#) values. The comparison of OME performance with different



throttle values is depicted in table 5 for discovery and table 6 for inventory. This data can be used to decide the right throttle value for a given environment.

Table 5. Discovery Throttle Comparison

Discovery Data	Small Business (100 systems)			Medium Business (500 systems)			Enterprise Business (2000 systems)		
	10%	50%	100%	10%	50%	100%	10%	50%	100%
Time taken to discover (min)	17	7	6	32	22	16	60	50	28
Average CPU utilization	26%	35%	90%	13%	45%	85%	45%	65%	90%

Table 6. Inventory Throttle Comparison

Inventory Data	Small Business (100 systems)			Medium Business (500 systems)			Enterprise Business (2000 systems)		
	10%	50%	100%	10%	50%	100%	10%	50%	100%
Time taken to inventory (min)	10	7	5	17	14	12	72	55	37
Average CPU utilization	35%	62%	90%	20%	45%	90%	50%	70%	90-95%

Figure 2. Discovery Time vs. Throttle



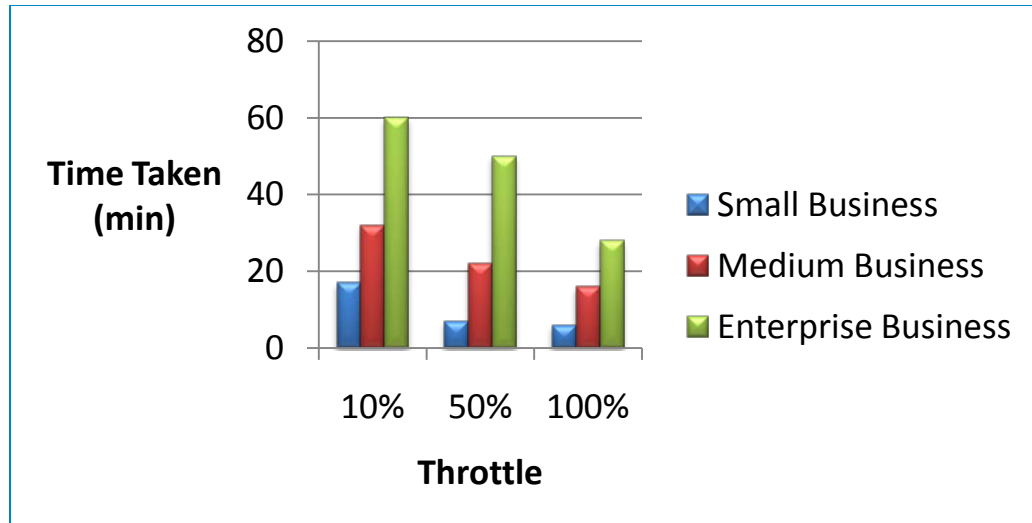
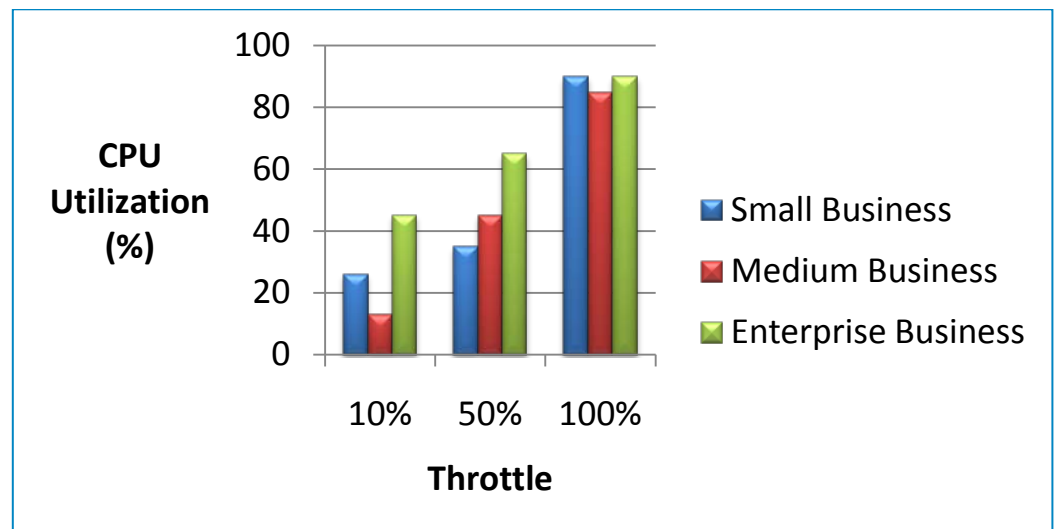


Figure 3. Discovery CPU Utilization vs. Throttle



Events

The tests for events included the following high level scenarios:



- Send alerts to OME event console with different alert frequencies using a simulator. For example, send 1 alert per second to the console.
- Send alerts to OME event console with different alert frequencies when various alert actions are configured. For example, when E-mail/Application Launch/Forwarding actions have been configured.

Table 7 details the test results when 20,000 alerts have been generated as part of an event storm (i.e., 20,000 alerts generated at the same time). No alert action has been configured.

Table 8 details the test results when alerts are sent at various alert frequencies with all the alert actions configured i.e., ignore, forward, e-mail and application launch. All the alert actions are mutually exclusive and the alert action conditions do no overlap.

Note: The memory utilization will be higher if the devices are discovered. The data mentioned below is recorded without discovering the devices.

Table 7. Event Console Data

Event Data	Test Environment		
	Small Business	Medium Business	Enterprise Business
No. of Managed Systems	100	500	2000
Time taken to receive 20,000 alerts (min)	9	6	4 to 5
Average CPU Utilization (%)	45%	35%	30%
Average memory utilization (GB)	2.1	2.4	1.8

Table 8. Event Console Data For Different Frequencies

Event Data	Small Business		
	50 alerts/min	150 alerts/min	450 alerts/min
Test Scenario	50 alerts/min	150 alerts/min	450 alerts/min
Time taken to receive all alerts	~1 min	~1 min	2 min
Average CPU Utilization (%)	30%	36%	54%



Average memory utilization (GB)	1.4	1.45	1.55
---------------------------------	-----	------	------

Based on the analysis following are the recommendations for using events feature:

1. Domain Name System (DNS) must be configured such that OME is able to resolve the hostname all the received alerts. If the name resolution in OME is not successful, the alerts/events are received and processed at a slower rate.
2. From the test data collected, OME can process alerts at the rate 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.
3. 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, "Critical" option must be selected under "Severity Association" and the "Network" option must be selected under "Category and Sources Association".

Tasks management

OME remote tasks can be executed on either one or multiple target managed systems. The tests for tasks feature included the following high level scenarios

- Running the OME remote tasks on multiple target systems. The number of target systems depends on the customer environment.
- Running multiple remote tasks simultaneously by scheduling all of them to run at the same time.

The performance data was recorded while the preceding scenarios were executed.

Table 9 and table 10 display the resultant test data that has been captured.

Table 9. Remote Task Data

Task Data	Medium Business	Medium Business
Test Scenario	1 task against 20 targets	20 tasks with each task having a single target
Average time taken to complete the task	3.5 min	30 to 60 seconds / task



Average CPU Utilization	20%	15%
Average memory utilization	1.6 GB	2.5 GB

Note: Table 9 displays the test scenario data for Medium Business environment.

Table 10. Remote Task Data

Task Data	Enterprise Business	Enterprise Business	Enterprise Business
Test Scenario	10 tasks with 10 targets each	30 tasks with 30 targets each	40 tasks with 40 targets each
Average time taken to complete the task	~2 min/task	~5 min/task	~7 min/task
Average CPU Utilization	12%	22%	60%
Average memory utilization	1.7 GB	2.1GB	2.4 GB

Note: Table 10 displays the test scenario data for Enterprise Business environment.

Based on the analysis following are the recommendations for using tasks feature:

1. The recommended number of managed targets for a single remote task is 40.
2. It is not recommended to schedule more than 20 remote tasks to run simultaneously.
3. Server Administrator deployment task must be run with a maximum of 20 managed system targets. For Linux target systems, operating system specific Dell OpenManage Server Administrator packages are recommended.
4. Separate remote tasks must be created for Windows and Linux managed systems.



System Update (Patch) management

The test results for System Update feature are mentioned in Table 11 below. This feature includes the update of firmware, drivers, BIOS etc. on managed systems.

The tests for system update feature include updating the system components like BIOS and firmware on multiple target systems simultaneously. The performance data was recorded while the target managed systems were being updated.

Table 11. System Update Data

System Update Data	Enterprise Business
Test Scenario	System Update of 30 targets where each target had 3 to 6 updatable components
Catalog Source	Dell OpenManage Server Update Utility DVD (SUU)
Time taken to complete	1 hour 35 minutes
Average CPU Utilization	55%
Average memory utilization	3.8 GB

Note: Table 11 above provides the data for an Enterprise Business environment. The average memory utilization is higher due to 2000 devices being discovered and inventoried on the OME system.

These are the recommendations for using the patch feature, based on the analysis of the test results:

1. Recommendation is to update not more than 30 managed systems at any given time.
2. In order to download packages at faster rate, recommendation is to use SUU, mounted on DVD drive locally on the system where OME is installed,
3. Separate system update tasks must be created for Windows and Linux targets.



Longevity Tests

The primary goal for running these tests is to validate the reliability of OME when it is used continuously for a defined period of time. These tests were run for three weeks, and included the execution of all the high priority features like discovery, inventory, events, health monitoring and tasks at regular intervals.

Figures 4 and 5 below depict the results obtained from these tests.

Note: Figure 4 depicts the average CPU utilization in a Medium Business environment for 15 days.

Figure 4. Average CPU Utilization

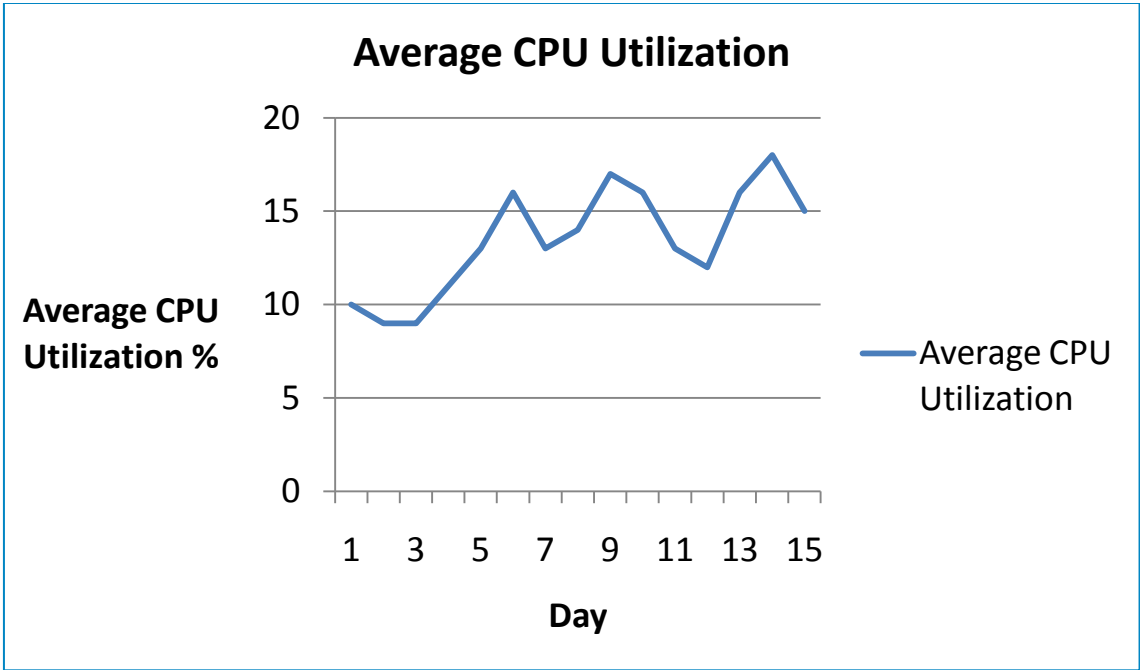
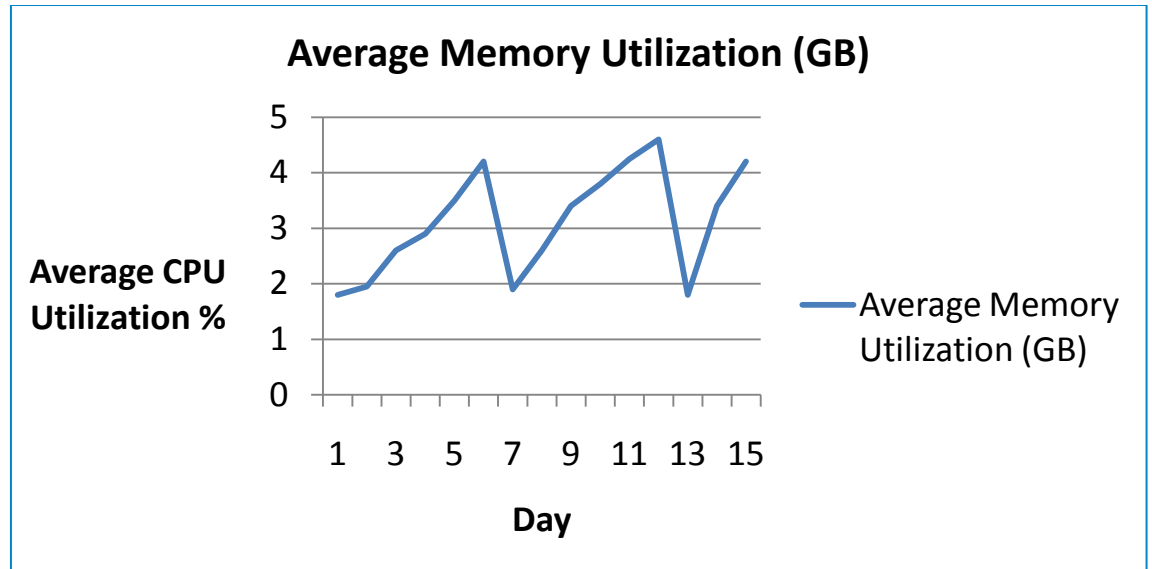


Figure 5. Average Memory Utilization





Note: Figure 5 above, depicts the average memory consumption on a daily basis, in a Medium Business environment. The Essentials Network Monitor service is restarted on a regular basis as the memory consumption increases in a linear manner. On an OME setup where the database is setup on a remote machine, the restart of services is required less frequently.

Once the OME task is completed, OME process will release the resources used and resource consumption of the system will settle back to normal. OME may take 15-20 minutes to release the resources.

For example below is the screenshot shows the resource while discovery task is running and after discovery task is completed.

Figure 6. Resource Utilization While Discovery Task is -progress

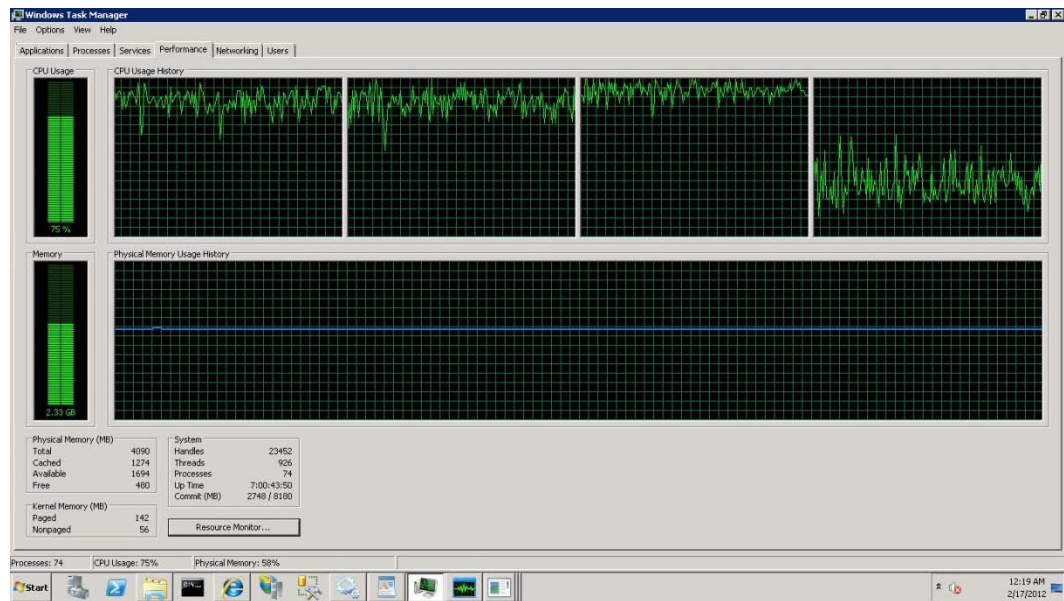
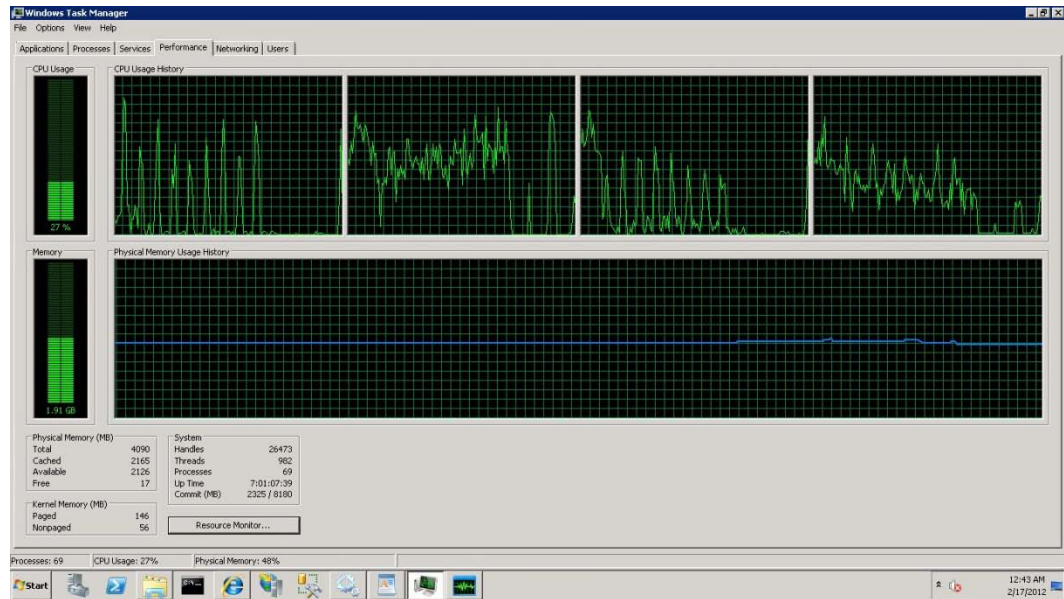


Figure 7. Resource Utilization once Discovery Task is Completed





Generic Recommendation

1. Recommendation is to configure the "max server memory" of SQL server (not required for SQL Express) based on the available system resources. Please refer to the [MSDN link](#) for more information.
2. OME should be installed using a remote database when the number of managed system is >500 and if the hardware specification is that provided in Table 1.
3. Recommended to schedule the System Update task to run later, if the number component is > 10 for upgrade and FTP is used as catalog source.
4. Refer to Table 5, Table 6 and Figure 3 for choosing discovery and inventory throttle as required.



Learn More

Visit <http://en.community.dell.com> for more information on Dell's Management Software.

