

e-Messaging Performance Benchmarks

e-Messaging 1.4M8

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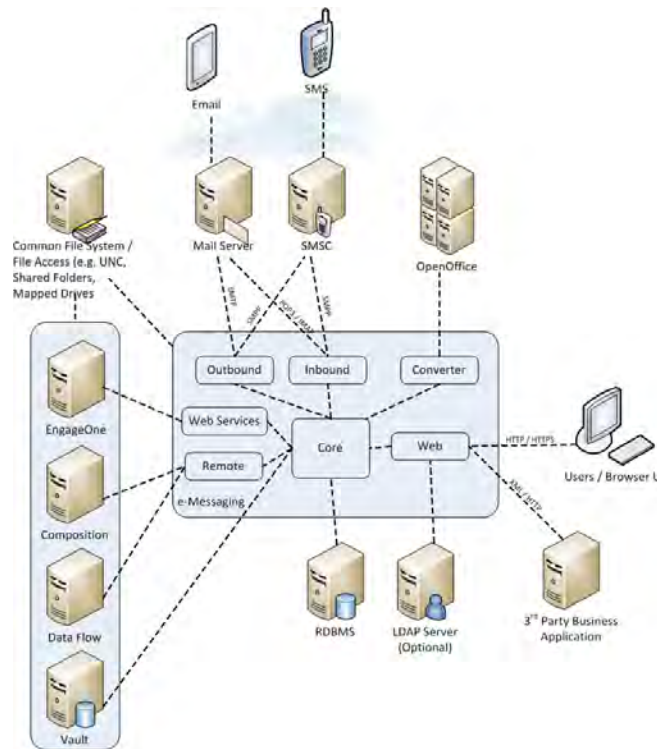
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Purpose & Scope

The purpose of this document is to provide performance results achieved after testing the e-Messaging application in different technical environments and test data. These results can be used by the customers to estimate their hardware and software requirements based on their organizational data to be processed. This version of the document will cover only one environment stack i.e. e-Messaging running on Windows with Apache Tomcat server. Future versions of the document will cover performance results of the application running on additional combinations of the technical environments.

e-Messaging Architecture

The following diagram shows the e-Messaging physical architecture.



e-Messaging Environment

The following sections of the document describe performance benchmarks for e-Messaging 1.4M8 running on Windows with Tomcat server. The testing environment consisted of two dedicated servers configured as Mail Server and Database Server (SQL Server) respectively. For more detailed information on environment combinations, please refer the *e-Messaging Release Notes* and *e-Messaging Installation Guide*.

Hardware Specifications

This section describes the hardware specifications of the performance machine(s) used for testing.

e-Messaging, Tomcat & Mail Server

CPU:	Quantity – 2: AMD Opteron(tm) Processor 252, 2600 MHz, 1 Core(s)
Memory:	16 GB
Hard Drives:	C: 136 GB capacity: RAID 1 E: 273 GB capacity: RAID 0 F: 273 GB capacity: RAID 0

SQL Server Database

CPU:	Quantity – 2: AMD Opteron(tm) Processor 252, 2600 MHz, 1 Core(s)
Memory:	16 GB
Hard Drives:	C: 136 GB capacity: RAID 1 E: 273 GB capacity: RAID 0 F: 273 GB capacity: RAID 0

Software Specifications

This section describes the software specifications of the performance machine(s) used for testing.

Operating System

- The SQL Server is configured with 64-bit Windows Server 2008 Enterprise R2 with 6.1.7601 Service Pack 1 Build.
- The Mail server is configured with 64-bit Windows Server 2008 Enterprise R2 with 6.1.7601 Service Pack 1 Build.

e-Messaging Version

- 1.4M8

Apache Tomcat Version

- 6.0.35

Database Version

- Microsoft SQL Server 2008

Storage Device Configuration

To test for optimum performance capabilities of the system, high performance iSCSI drives were installed along with RAID 0 and 1 drive(s) on the machine.

Testing Scenarios

The following test scenarios were performed and tracked:

- Baseline functionality to provide baseline performance numbers
- Benchmark tests to determine how the use of different options changes the performance
- Customer(s) specific scenarios derived from the field
- Load Tests to check the threshold limit

E-mail Performance Testing

This section shows performance testing results for e-mail processing.

E-mail Test Scenarios

The following scenarios were executed to test the performance of e-mail processing:

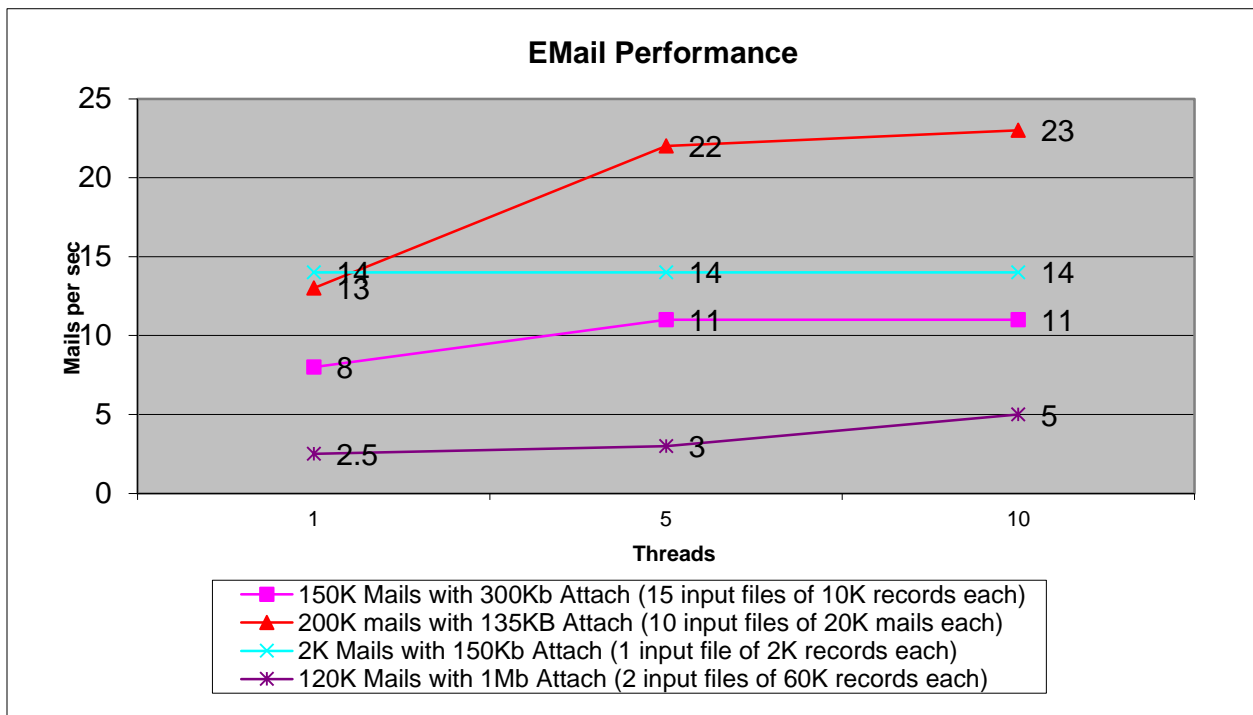
Table 1: E-mail Test Data

S.No.	Number of Input Files	Number of Records/ Input File	Attachment Size / Type	Feature Enabled	Number of Messages Delivered /Sec with 1 Thread	Number of Messages Delivered/ Sec with 5 Threads	Number of Messages Delivered/ Sec with 10 Threads
1	5	2000	No Attachment	NA	21.16	28.02	NA
2	5	2000	150KB /(Personalized)	NA	12	21.83	NA
3	5	2000	150KB /(Personalized)	Message Beacon	12	22.46	NA
4	5	2000	150KB /(Personalized)	Digital Signature	6.33	13.71	NA
5	5	2000	150KB /(Personalized)	Content Verification	10.15	21.36	NA
6	5	2000	150KB /(Personalized)	Archive	9.16	15.11	NA
7	5	2000	135KB /(Personalized)	Five (5) images in HTML body	12.73	22.47	NA
8	5	10	150KB /(Personalized)	NA	3.8	7.13	NA
9	5	2000	2MB / (Personalized)	NA	1.7	3.17	NA
10	1	2000	150KB /(Personalized)	NA	13.83	14.13	14.07
11	2	60000	1MB / (Personalized)	NA	2.64	2.92	5.15
12	10	20000	135KB / (Personalized)	NA	13	22	23
13	15	10000	300KB / (Personalized)	NA	7.9	10.93	11.08

E-mail Performance for Different Batch Sizes

This section shows performance results for a number of test cases that represent actual customer usage. Following is the graphical representation of performance numbers for test cases numbered 10 to 13 of **Table 1 – E-mail Test Data**.

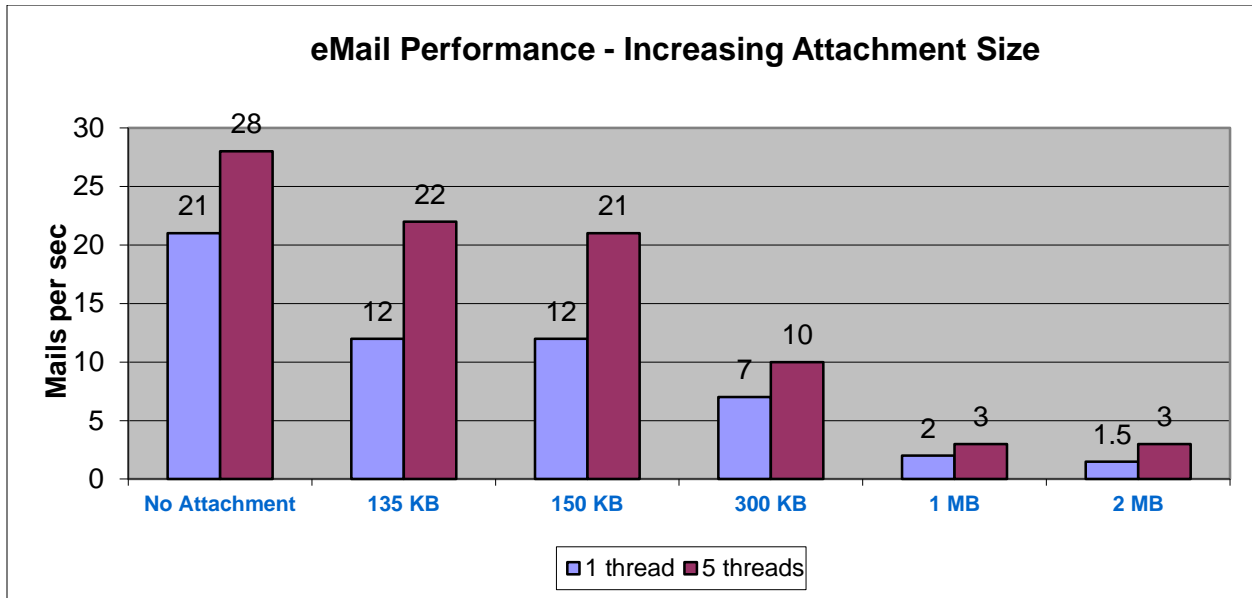
Graph 1: E-mail Performance for Different Batch Sizes



E-mail Performance for Different Attachment Sizes

The following graph shows the impact of increasing attachments size on performance.

Graph 2: E-mail Performance for Increasing Attachment Size

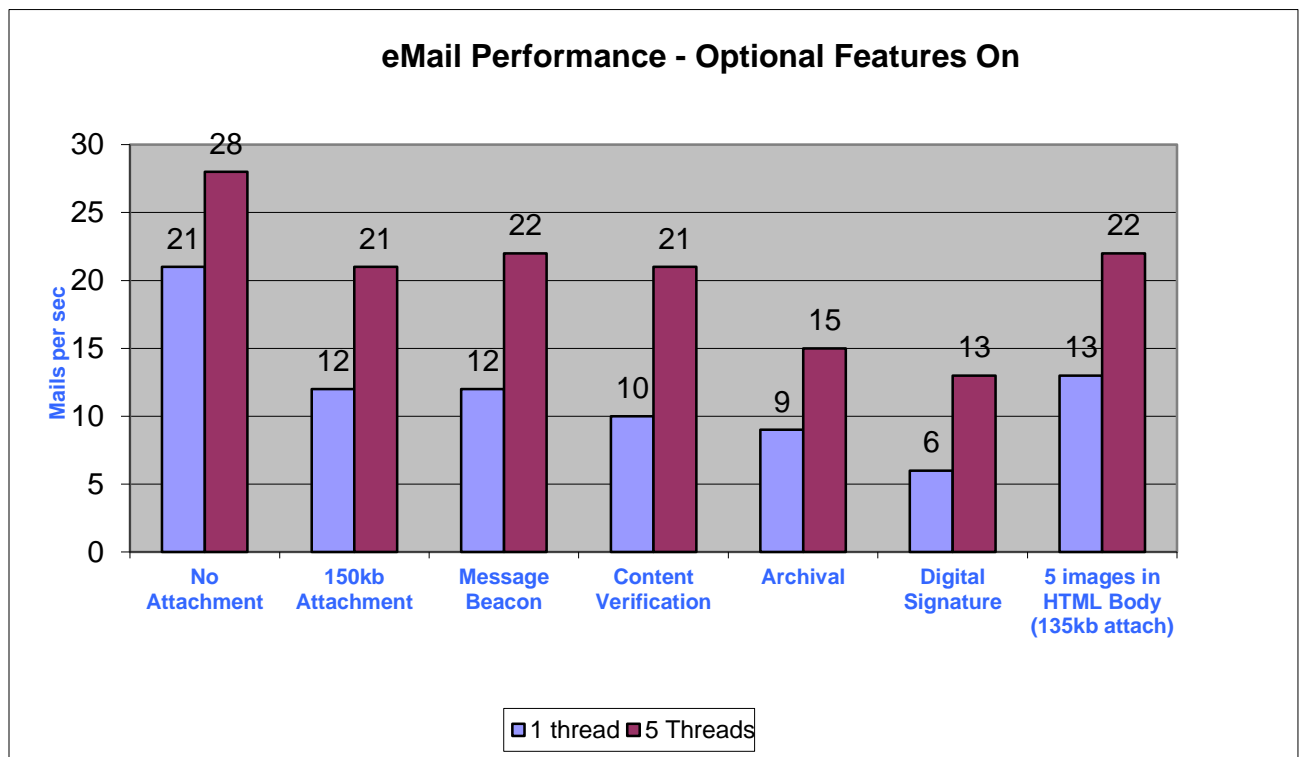


E-mail Performance for Optional Features Turned ON

e-Messaging provides a number of optional features, which can be turned ON or OFF. This section explains how performance improves when you turn the features ON one-by-one.

Following is the graphical representation of the performance numbers achieved after executing tests numbered 1 to 7 of **Table – 1: E-mail Test Data** for 1 and 5 number of threads.

Graph 3: E-mail Performance with Optional Features ON



SMS Performance Testing

This section shows performance testing results for SMS processing.

SMS Test Scenarios

The following scenarios were executed to test the performance of SMS processing:

Table 2: SMS Test Data

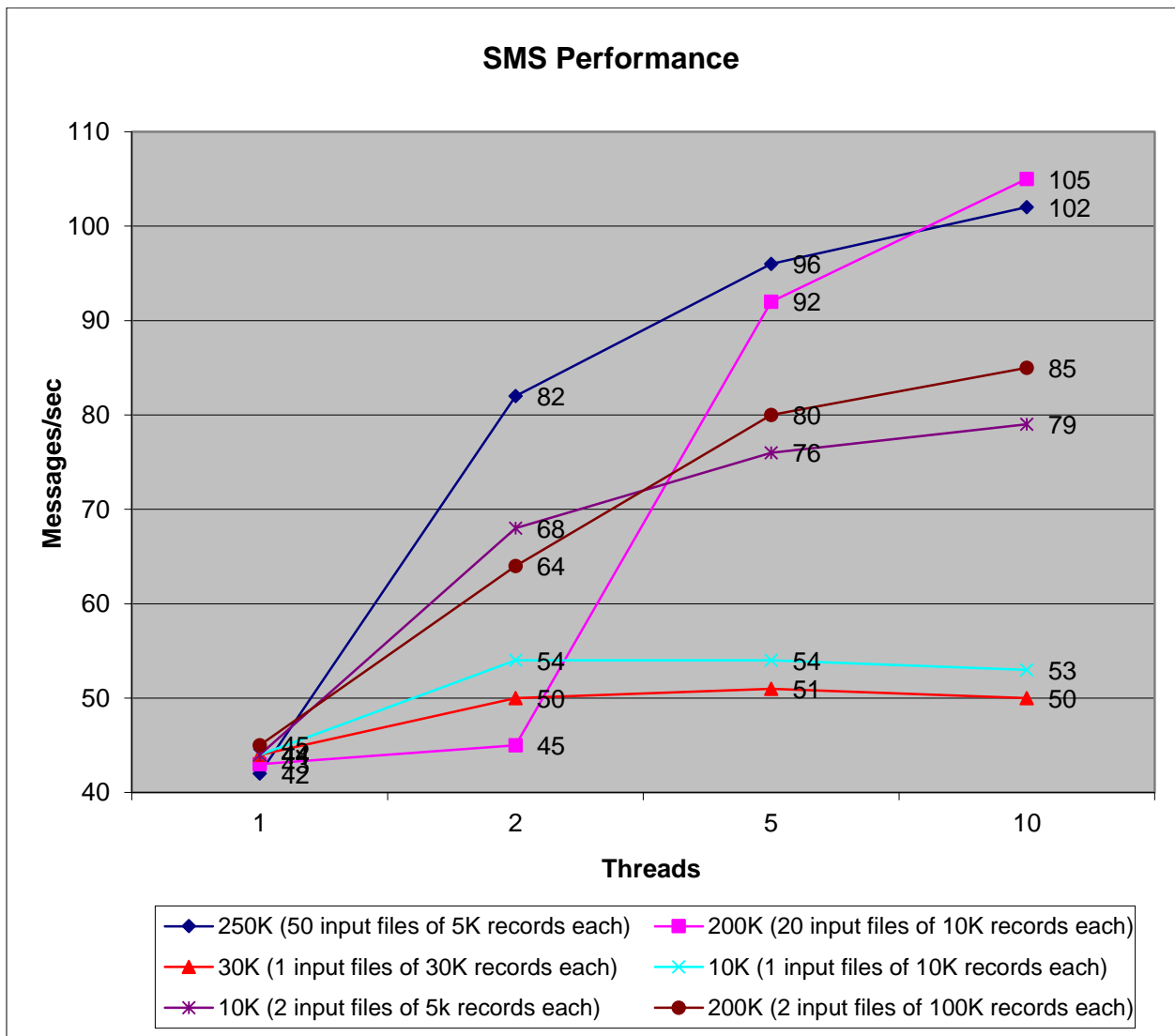
S. No.	Number of Input Files	Number of Records/Input File	Feature Enabled	Number of Messages Delivered/Sec with 1 Thread	Number of Messages Delivered/Sec with 2 Threads	Number of Messages Delivered/Sec with 5 Threads	Number of Messages Delivered/Sec with 10 Threads
1	1	30000	NA	44	50	51	50
2	1	10000	NA	44	54	54	53
3	2	100000	NA	45	64	80	85
4	50	5000	NA	42	82	96	102
5	20	10000	NA	43	45	92	105
6	2	5000	NA	44	68	76	79
7	2	5000	Archive	37	53	54	54

SMS Performance for Different Batch Sizes

This section shows performance results for a number of test cases that represent actual customer usage.

Following is the graphical representation of the performance numbers achieved after executing test cases numbered 1 to 6 mentioned in **Table 2: SMS Test Data**.

Graph 4: SMS Performance for Different Batch Sizes

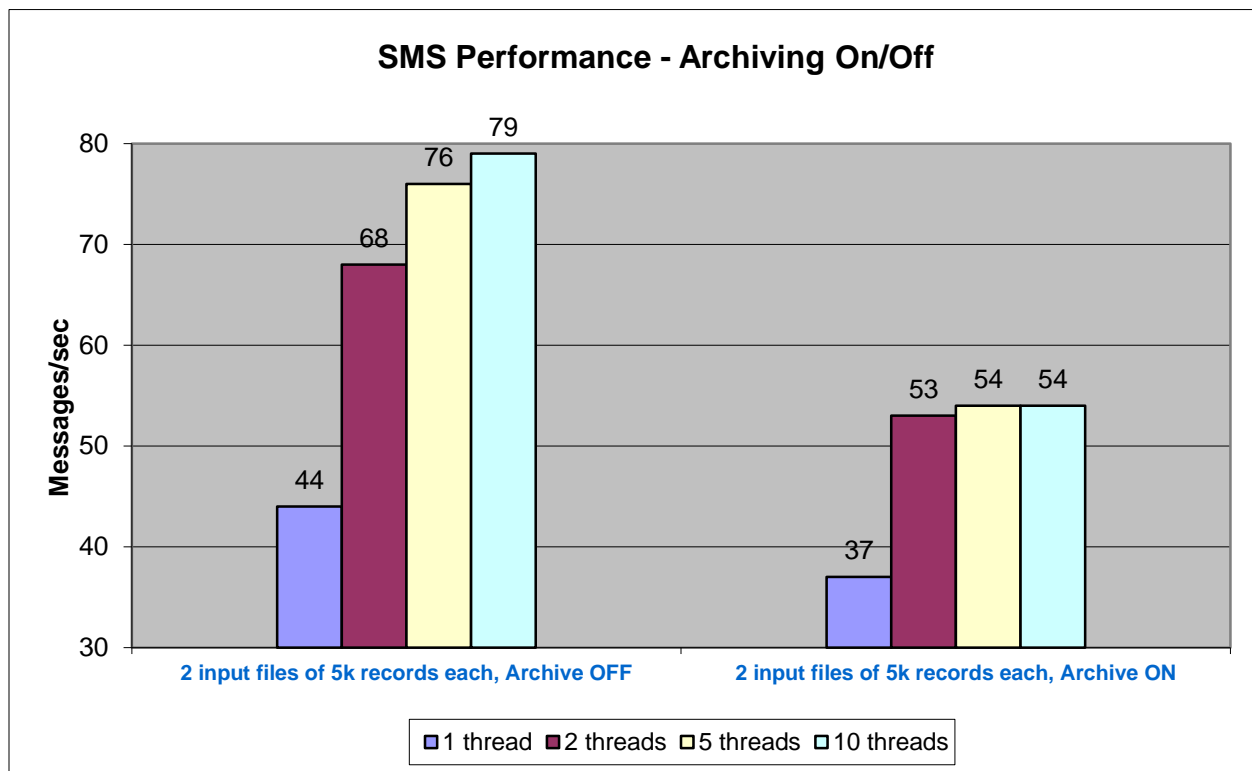


SMS Performance with Archiving ON and OFF

This section shows the performance numbers achieved after testing SMS processing with archive feature ON/OFF.

Following is the graphical representation of the performance numbers achieved after executing tests numbered 6 and 7 in **Table 2: SMS Test Data** for 1, 2, 5 and 10 number of threads.

Graph 5: SMS Performance with Archiving ON/OFF



System Load Results

This section shows the system load in terms of memory and CPU utilization.

Memory Utilization

The following parameters were observed while processing a number of scenarios:

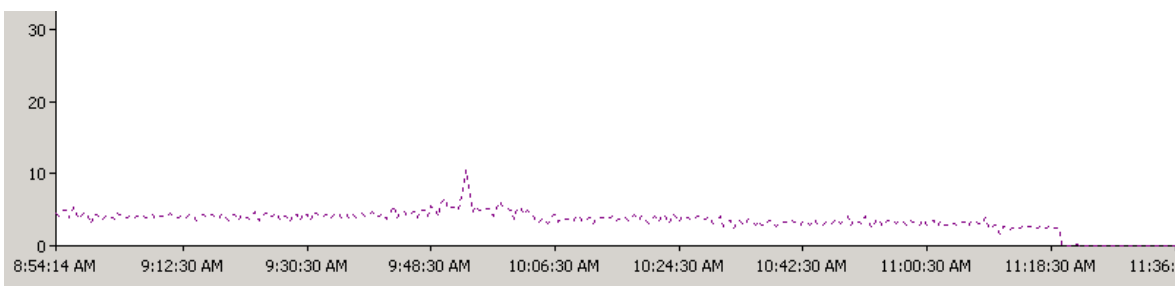
- Disk Reads/sec
- Disk Writes/sec
- % Disk Read Time
- Page Faults/sec
- Page Writes/sec

Scenario 1: Batch size of 200K records with 135 KB attachment and 5 threads

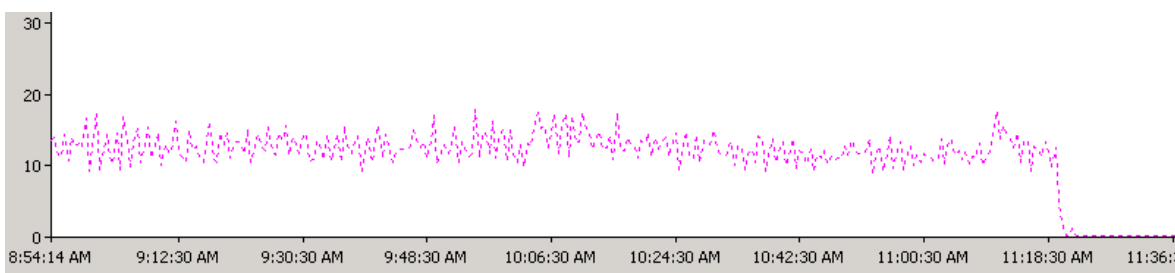
- Test case execution start time: 8:55 AM
- Test case execution end time: 11:20 AM

The following graphs represent the system behavior while executing the above scenario:

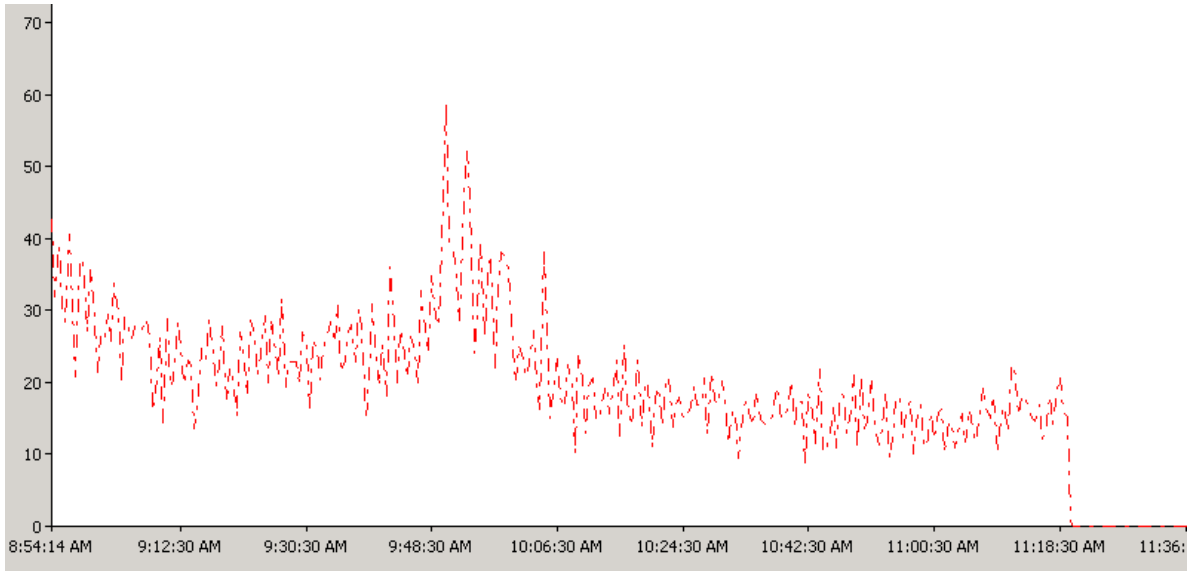
Graph 6: Disk Reads/sec - Scenario 1



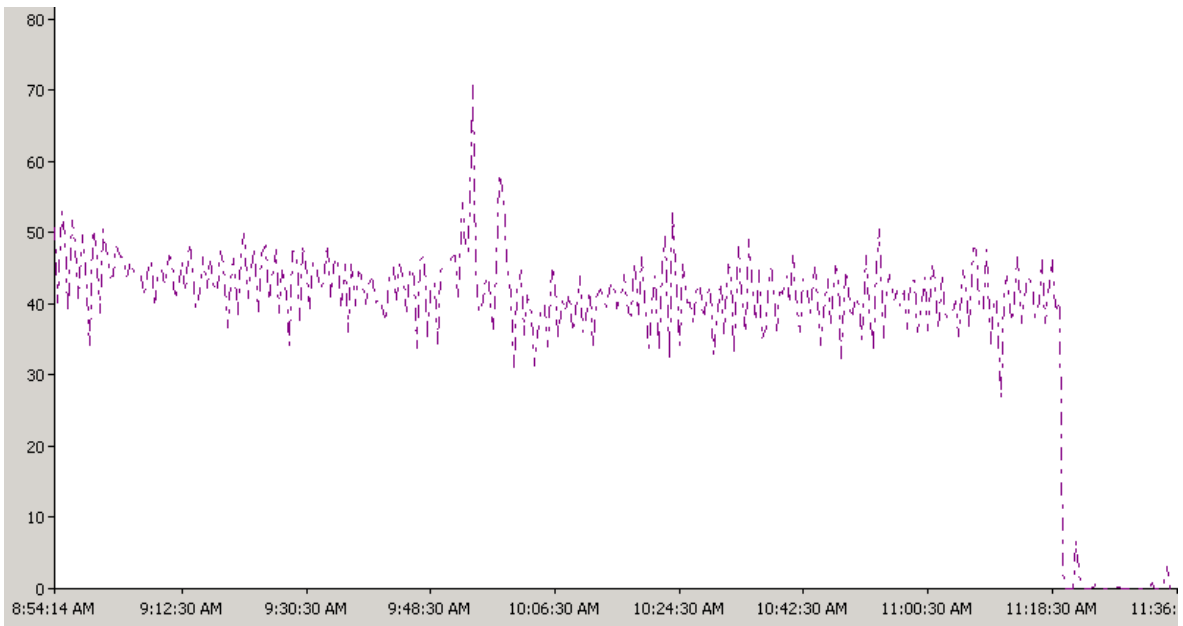
Graph 7: Disk Writes/sec - Scenario 1



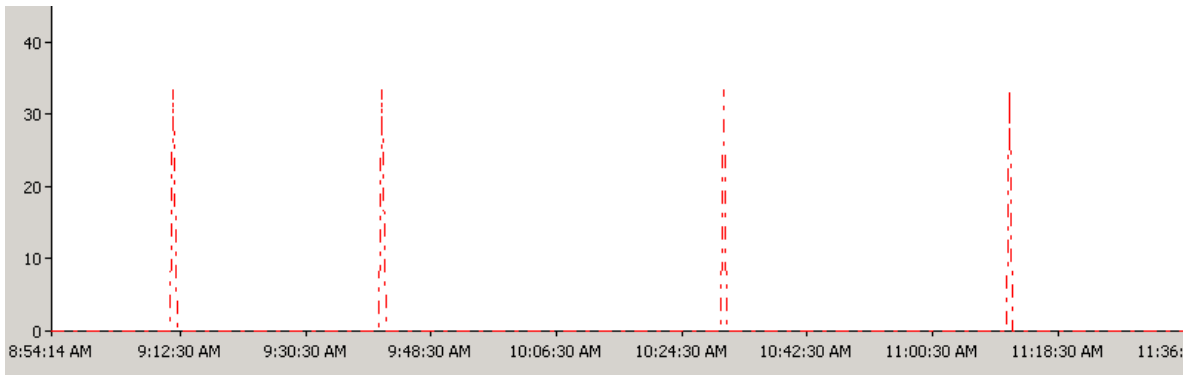
Graph 8: % Disk Read Time - Scenario 1



Graph 9: Page Faults/sec - Scenario 1



Graph 10: Page Writes/sec - Scenario 1

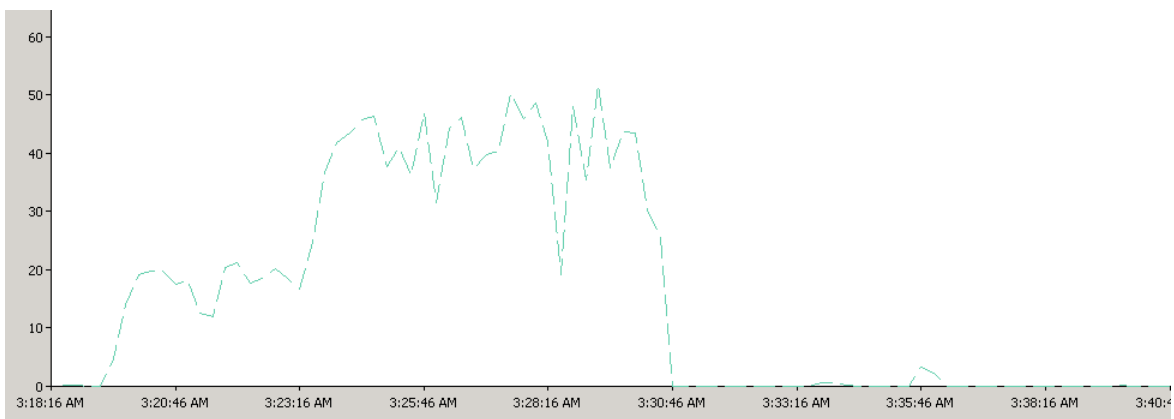


Scenario 2: Batch size of 10K records with 150 KB attachment and 5 threads with archival

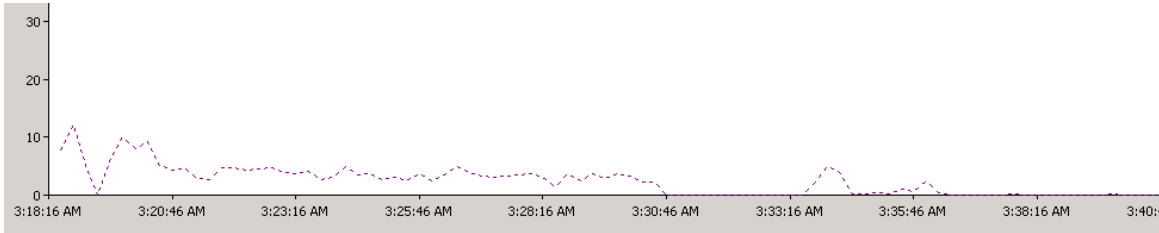
- Test case execution start time: 3:18 AM
- Test case execution end time: 3:37 AM

The following graphs represent the system behavior while executing the above scenario:

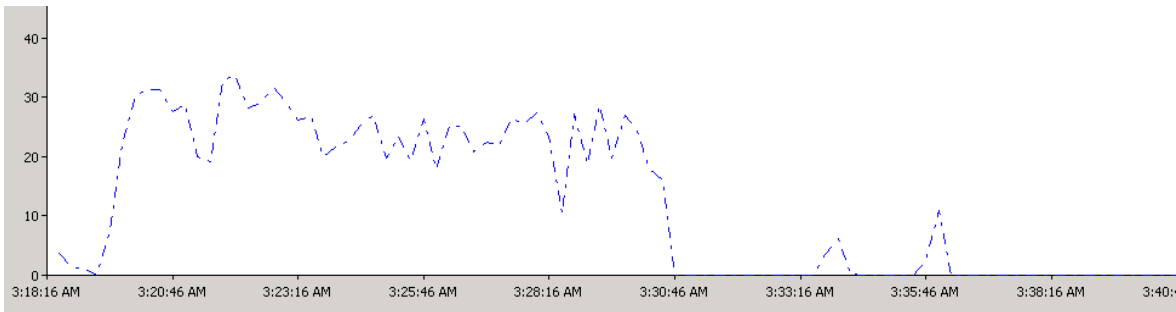
Graph 11: Disk Reads/sec - Scenario 2



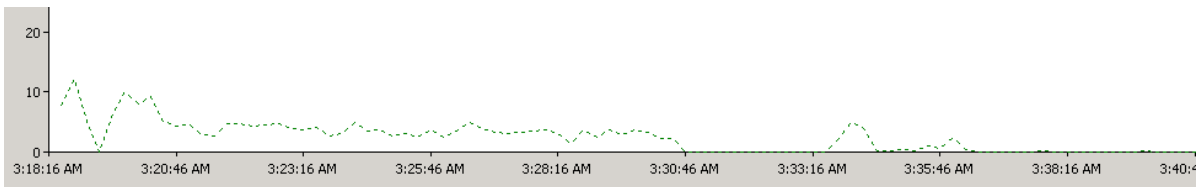
Graph 12: Disk Writes/sec - Scenario 2



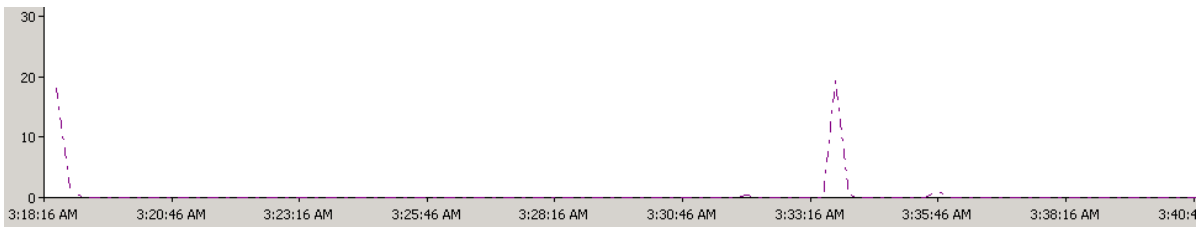
Graph 13: % Disk Read Time - Scenario 2



Graph 14: Page Faults/sec - Scenario 2



Graph 15: Page Writes/sec - Scenario 2



CPU Utilization

The following parameters were observed while processing a number of scenarios:

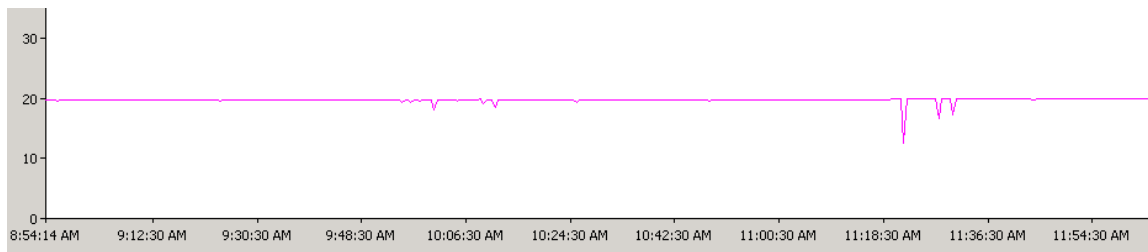
- % Processor Time
- Processor Frequency

Scenario 1: Batch size of 200K records with 135 KB attachment and 5 threads

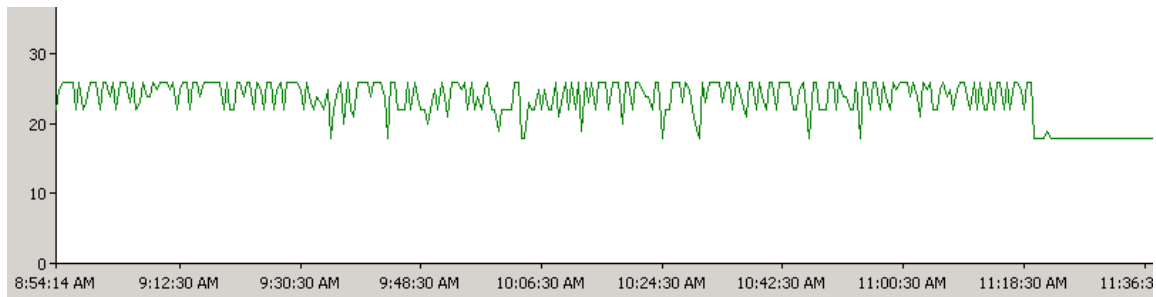
- Test case execution start time: 8:55 AM
- Test case execution end time: 11:20 AM

The following graphs represent the system behavior while executing the above scenario:

Graph 16: % Processor Time - Scenario 1



Graph 17: Processor Frequency - Scenario 1



Scenario 2: Batch size of 10K records with 150 KB attachment and 5 threads with archival

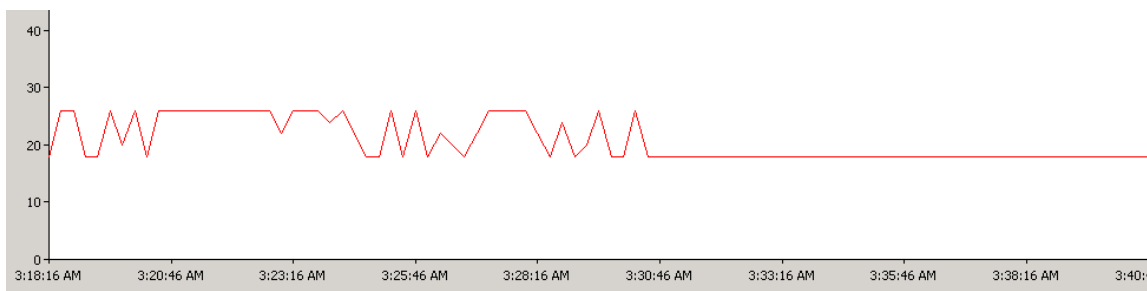
- Test case execution start time: 3:18 AM
- Test case execution end time: 3:37 AM

The following graphs represent the system behavior while executing the above scenario:

Graph 18: % Processor Time - Scenario 2



Graph 19: Processor Frequency - Scenario 2



e-Messaging Performance Recommendations

Note: You can also review the recommendations in the *e-Messaging Installation Guide*.

The primary factors in achieving maximum e-Messaging performance include the following:

1. **Disk Drive IOPS:** Persistent storage performance is vital in achieving optimum results. High Performance RAID storage with Serial Attached SCSI (SAS) drives, such as 15K RPM Hard Drives or High Performance SLC SSD is highly recommended.
2. **CPU (quantity and speed):** Due to the multi-threaded architecture of e-Messaging application, 8 processors (2 Quad cores) or more are recommended.
3. **RAM (quantity and speed):** To take advantage of file system caching and provide ample memory for JVM to allow internal caching, 32 GB or more of high-speed RAM is recommended.
4. **Multiple disks:** If separate and independent high-performance drives are available, configure each of the following directories on a separate drive but on the same server. If only one high-performance drive is available, keep all directories on that drive.
 - Directories containing the DIJ, HTML, text, images, error, and vendor files
 - Archive Folder (if archiving enabled)
5. Latency to the e-mail and SMS gateways should be kept to a minimum; 10 ms maximum, zero latency when possible.
6. Bandwidth to the e-mail and SMS gateways should be sufficient to handle the expected amount of traffic.
7. You are recommended to use a connection having speed at least double the expected traffic size since any binary data (such as PDF attachments) must be UUEncoded which increases the size of the e-mail. For example, if your e-mail body is 15KB and your attachment is 120KB, your total e-mail size will be 135KB. If you want to send 10 per second you would need at least 2.7MB/sec Internet connectivity ($2 * 10 * 135\text{KB}/\text{sec} = 2.7\text{MB}/\text{sec}$). Note if e-mails and SMS will be sent simultaneously insure your bandwidth requirements include both.
8. Firewalls can reduce performance and should be avoided when possible.
9. Ensure that the e-Messaging database purge scripts are set to run on a regular basis.
10. Regularly perform server Health Check and Database maintenance activities:
 - Update Statistics, Purge SQL Logs and tempDB
 - Application logs - Review logging levels
 - Disk Defragmentation

Configuration considerations for optimal performance

In order to achieve the above stated performance numbers, the following settings have been configured according to our testing environment. These values may not work for all environments. However, whenever a new environment is tuned, these are the settings that will typically be targeted first for potential adjustment.

- The number of threads configured in the `outboundProcessor.properties` file should be equal to the number of DIJs (Journal files) to be executed. For more information related to this property, refer *e-Messaging Reference Guide*.
- While installing e-Messaging, you can set the Root Folder (vendor folder) locally or remotely depending on which provides a desirable latency time of 1 ms or less. For more information, please refer *e-Messaging Installation Guide*.

Implementing Multithreading

This section will provide configuration tips for performance settings. Multithreading feature is available in e-Messaging version 1.4M2 onwards. Therefore, customers have to install/upgrade e-Messaging application version 1.4M2 or higher. You can use the following approach to determine suitable values for the settings as per your business requirements and available technical environment:

1. You need to verify that e-Messaging 1.4M2 or higher version is working fine with e-Messaging 1.4M1 settings. To do so:
 - a. Edit the **outboundProcessor.properties** file. This file can be located at the `<install_path>/core.war/WEB-INF/classes` directory. Set values for the properties as shown below:
 - i. `outbound.profile.email.parallelThreadCount=1`
 - ii. `outbound.profile.sms.parallelThreadCount=1`
 - iii. `outbound.profile.threadPool.maxSize=10`
 - iv. `outbound.reuseEmailConnectionForBatch=false`
 - b. Process the messages (e-mail/SMS) as per your requirement.
 - c. If the messages are not processed successfully, then analyze the e-Messaging and application server logs to find out the issue.
 - d. If the messages are processed successfully, check if you need more performance improvement.
 - i. If no, keep the same property settings.
 - ii. If yes, go to next step.
2. Stop the e-Messaging server.

3. You need to change the thread count and thread pool size to improve the performance. To do so:
 - a. Edit the **outboundProcessor.properties** file. Based on the business requirements and technical environment, set values for the following properties. Please refer **Table 1 – Parallel Thread Settings** for setting appropriate values:
 - i. `outbound.profile.email.parallelThreadCount`
 - ii. `outbound.profile.sms.parallelThreadCount`
 - iii. `outbound.profile.threadPool.maxSize`

Note: The value for the **outbound.reuseEmailConnectionForBatch** property will remain “false”

Table 1: Parallel Thread Settings

No of active e-mail profiles [X]	E-mail parallel threads [A]	Pool requirement for e-mail [X*A]	No. of active SMS profiles [Y]	SMS parallel threads [B]	Pool requirements for SMS [Y*B]	Total pool size [(X*A)+(Y*B)]	No. of parallel connections allowed at e-Messaging e-mail gateway [1.2*(X*A)]
10	1	10	1	1	1	11	12
10	2	20	1	2	2	22	24
10	3	30	2	1	2	32	36
20	1	20	2	2	4	24	24
20	2	40	3	1	3	43	48
20	3	60	3	2	6	66	72
50	1	50	3	3	9	59	60
50	2	100	5	1	5	105	120
50	3	150	5	2	10	160	180
50	3	100	5	3	15	115	120

- b. Restart the e-Messaging server.
- c. Process the messages (e-mail/SMS) as per your requirement.
- d. If the messages are not processed successfully, then analyze the e-Messaging and application server logs to find out the issue. If the issue is because of the existing thread count and thread pool size, then repeat step 2 and 3. While repeating these steps, reduce the thread count and thread pool size.
- e. If the messages are processed successfully, check if you need more performance improvement.
 - i. If no, keep the same property settings.

- ii. If yes, then repeat step 2 and 3 by incrementally changing the thread count and thread pool size.