

Intel® 500 Mailbox Exchange Server 2007 Storage Solution

**Intel® Server Chassis SC5400 and Server
Board S5000PSL**

Tested with: ESRP – Storage Version 2.1, Windows Server 2003 R2

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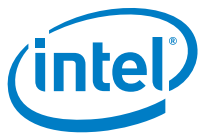
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Hardware Components

Quantity	Item	Manufacturer	Model
One	Intel® Server Board	Intel	S5000PSL. Additional information is available at: http://www.intel.com/products/server/motherboards/s5000psl/s5000psl-overview.htm .
One	Intel® Server Chassis	Intel	SC5400. Additional information is available at: http://www.intel.com/products/server/chassis/sc5400/sc5400-overview.htm .
One (Select one)	Intel® RAID Controller	Intel	SRCSASJV. Additional information is available at: http://www.intel.com/products/server/raid-controllers/srcsasjv/srcsasjv-overview.htm .
	Intel® RAID Controller	Intel	SRCSASRB. Additional information is available at: http://www.intel.com/products/server/raid-controllers/srcsarb/srcsarb-overview.htm .
Two	Intel® Xeon® Processors	Intel	Please refer to the Supported Processor List at http://www.intel.com/support/motherboards/server/sb/CS-022346.htm . Processors must support Intel® EM64T.
4 GB minimum	Memory	Any supported	Please refer to the Tested Memory List at http://www.intel.com/support/motherboards/server/s5000psl/sb/CS-022924.htm .
One (60 GB minimum)	SAS or SATA 3.5-inch hard drives	Any supported	Please refer to the Server Hard Drive Validation Test Report at http://www.intel.com/support/motherboards/server/sb/CS-025416.htm .

Table 1 - Intel® Server Board S5000PSL Hardware Configuration

Software Components

Item	Version	Manufacturer	Comment
1	Windows Server 2003 R2	Microsoft	Any 64-bit edition
1	Exchange Server 2007	Microsoft	Available in 64-bit only

Table 2 - Installation Software BOM



Introduction

This document provides information on Intel's storage solution for Microsoft Exchange Server 2007, based on the Microsoft Exchange Solution Reviewed Program (ESRP) – Storage program*.

*The ESRP – Storage program was developed by Microsoft Corporation to provide a common storage testing framework for vendors to provide information on its storage solutions for Microsoft Exchange Server 2007 software. For more details on the Microsoft ESRP – Storage program, please view:

<http://www.microsoft.com/technet/prodtechnol/exchange/2007/esrp.mspix>.

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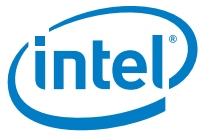
Features

This document describes an Exchange storage solution for 500 users on the Intel® Server Chassis SC5400 storage system. The tested user profile was 0.50 IOPS per user with a mailbox limit of 250 MB.

Solution Description

The tested solution consists of one Intel® server chassis and server board with an Intel® SRCSASRB RAID controller and 4 146GB SAS-interface enterprise-class disk drives installed into the 4-drive and 6-drive cages in the Intel® SC5400 system chassis. This configuration includes 5TB of raw capacity. The Intel® SRCSASRB controller supports SAS and SATA interfaces to disk drives, and can support a mixture of SAS and SATA interface disk drives.

The ESRP-Storage program focuses on storage solution testing to address performance and reliability issues with storage design. However, storage is not the only factor to take into consideration when designing a scale up Exchange solution. Other factors which affect the server scalability are: server processor utilization, server physical and virtual memory limitations, resource requirements for other applications, directory and network service latencies, network infrastructure limitations, replication and recovery requirements, and client usage profiles. All these factors are beyond the scope for ESRP-Storage. Therefore, the number of mailboxes hosted per server as part of the tested configuration may not necessarily be viable for some customer deployment.



For more information on identifying and addressing performance bottlenecks in an Exchange system, please refer to Microsoft's Troubleshooting Microsoft Exchange Server Performance, available at <http://go.microsoft.com/fwlink/?LinkId=23454>.

Test Server Configuration

Component	Description
Server Chassis	Intel® SC5400
Server Board	Intel® S500PSL
CPU	Two Intel® Xeon® E5320, quad-core, 1.86 GHz (8 total cores)
Memory	4 GB DDR2 ECC
NIC	Dual Intel® Gigabit Ethernet (Intel® 82563EB)
RAID Controller	Intel® SRCSASRB
Internal Boot Disk	Qty. 1 - Seagate 320GB
Disk Array Disks	Qty. 4 - Seagate Cheetah 15K.5, ST3146855SS, 146GB, 15K RPM

Targeted Customer Profile

This solution is intended for small and medium-sized organization hosting up to 500 mailboxes. The configuration used for testing is:

- Number of mailboxes: 500
- Number of hosts: 1
- User I/O profile: 0.50 I/O per second (IOPS)
- 1 Storage Groups, 1 Databases
- Mailbox size: 250 MB



Tested Deployment

The following tables summarize the testing environment:

Description	Data
Number of Exchange mailboxes simulated	500
Number of hosts	1
Number of storage groups / host	1
Number of mailbox stores / storage group	1
Number of mailboxes / mailbox store	500
Number of mailbox store LUNs / storage group	1
Simulated profile: I/O's per second per mailbox	0.50 IOPS
Database LUN size	136 GB
Log LUN size	136 GB
Backup LUN size / storage group	N/A
Total database size for performance testing	122.1 GB
% storage capacity used by Exchange database	89%

Primary Storage Hardware

Component	Description
Storage Connectivity (Fibre Channel, SAS, SATA, iSCSI)	SAS/SATA
Storage model and OS firmware	
Storage cache	256 MB
Number of storage controllers	1
Number of storage ports	2
Maximum bandwidth of storage	6 Gb/sec (2 x 3 Gb SAS ports)
Adapter model and firmware	Intel® SRCSASRB
Number of adapters / host	1
Host server type	Intel® S5000PSL, 2 Intel® Xeon® E5320 quad-core (1.86 GHz), 8 total cores
Total number of disks tested in solution	4
Maximum number of spindles can be hosted in the storage	10



Primary Storage Software

Component	Description
HBA driver	Intel SRCASRB
HBA Queue Target Setting	N/A
HBA Queue Depth Setting	N/A
Multi-Pathing	N/A
Host OS	MS Windows Server 2003 R2 Enterprise x64 Edition w/ Service Pack 1
ESE.dll file version	08.00.0685.024
Replication solution name / version	N/A

Primary Storage Disk Configuration (Mailbox Store Disks)

Component	Description
Disk type, speed and firmware revision	Seagate SAS, 15K RPM, 0002 (ST3146855S)
Raw capacity per disk (GB)	136.7
Number of physical disks in test	2
Total raw storage capacity (GB)	273.4
Number of slices per LUN or number of disks per LUN	2
RAID level	RAID 1
Total formatted capacity	136

Primary Storage Disk Configuration (Transactional Log Disks)

Component	Description
Disk type, speed and firmware revision	Seagate SAS, 15K RPM, 0002 (ST3146855S)
Raw capacity per disk (GB)	136.7
Number of physical disks in test	2
Total raw storage capacity (GB)	273.4
Number of slices per LUN or number of disks per LUN	2
RAID level	RAID 1
Total formatted capacity	136.0



Best Practices

Exchange Server is a disk-intensive application. Based on the testing runs using the ESRP framework, we recommend the following Microsoft best practices for storage system design for Exchange Server 2007, available at: <http://technet.microsoft.com/en-us/library/bb124518.aspx>.

Contact for Additional Information

Consult the *Certified Intel RAID Configurations for Microsoft Exchange Servers* document available at: <http://www.intelraid.com/tech.php>.

Test Result Summary

This section provides a high level summary of the test data from ESRP and the link to the detailed HTML reports which are generated by ESRP testing framework. Please click on the underlined headings below to view the html report for each test.

Reliability

A number of tests in the framework are to check Reliability tests runs for 24 hours. The goal is to verify the storage can handle high I/O load for a long period of time. Both log and database files will be analyzed for integrity after the stress test to ensure no database/log corruption.

The following list provides an overview: (click on the underlined word will show the HTML report after the reliability tests run)

- No errors reported in the saved eventlog file.
- No errors reported in during the database and log checksum process.

Primary Storage Performance Results

The Primary Storage performance testing is designed to exercise the storage with maximum sustainable Exchange type of I/O for 2 hours. The test is to show how long it takes for the storage to respond to an I/O under load. The data below is the sum of all of the logical disk I/O's and average of all the logical disks I/O latency in the 2 hours test duration. Each server is listed separately and the aggregate numbers across all servers is listed as well.

Individual Server Metrics:

The sum of I/O's across Storage Groups and the average latency across all Storage Groups on a per server basis.

I/O Component	Metric
---------------	--------



Database I/O	
Average Database Disk Transfers/sec	132.593
Average Database Disk Reads/sec	71.512
Average Database Disk Writes/sec	193.674
Average Database Disk Read Latency (ms)	0.010
Average Database Disk Write Latency (ms)	0.036
Transaction Log I/O	
Average Log Disk Writes/sec	35.534
Average Log Disk Write Latency (ms)	0.002

Conclusion

This document is developed by storage solution providers, and reviewed by the Microsoft Exchange Product team. The test results/data presented in this document is based on the tests introduced in the ESRP test framework. Customer should not quote the data directly for his/her pre-deployment verification. It is still necessary to go through the exercises to validate the storage design for a specific customer environment.

ESRP program is not designed to be a benchmarking program; tests are not designed to getting the maximum throughput for a giving solution. Rather, it is focused on producing recommendations from vendors for Exchange application. So the data presented in this document should not be used for direct comparisons among the solutions.



Appendix A - Test Results

Microsoft Exchange Server Jetstress 24 Hour Reliability

Microsoft Exchange Server **Jetstress**

Stress Test Result Report

Test Summary

Overall Test Result **Pass**

Machine Name DMRTK-SRVR-I2

Test Description Intel® SRCASRB 4-SAS drives, mailboxes=500, size=250, IOPS=0.5, threads=Auto, DB=RAID1(1+1), Log=RAID1(1+1), SG=1

Test Start Time 2/26/2009 8:46:24 PM

Test End Time 2/28/2009 8:04:23 PM

Jetstress Version 08.02.0060.000

Ese Version 08.00.0685.024

Operating System Microsoft Windows Server 2003 R2 Service Pack 2 (5.2.3790.131072)

Performance Log C:\Data\Jetstress\Tuning_2009_2_26_20_50_3.blg
C:\Data\Jetstress\Stress_2009_2_26_20_58_5.blg
C:\Data\Jetstress\DBChecksum_2009_2_28_20_4_23.blg

Database Sizing and Throughput

Achieved I/O per Second 265.185

Target I/O per Second 250

Initial database size 133868568576

Final database size 145919770624

Database files (count) 1

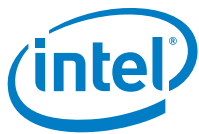
Jetstress System Parameters

Thread count 4 (per-storage group)

Log buffers 9000

Minimum database cache 32.0 MB

Maximum database cache 256.0 MB



Insert operations	25%
Delete operations	10%
Replace operations	50%
Read operations	15%
Lazy commits	80%

Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (M:)	0.010	0.036	71.512	193.674	(n/a)
Log (L:)	0.000	0.002	0.000	35.534	7164.761

Host System Performance

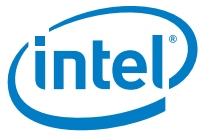
Counter	Average	Minimum	Maximum
% Processor Time	0.301	0.052	2.396
Available MBytes	3101.723	3001.000	3131.000
Free System Page Table Entries	4170256.000	4170256.000	4170256.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	34134059.378	34091008.000	34205696.000
Pool Paged Bytes	47681508.267	46813184.000	49020928.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

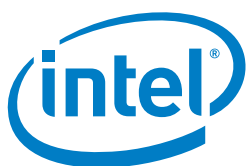
2/26/2009 8:46:24 PM -- Jetstress testing begins ...
 2/26/2009 8:46:24 PM -- Prepare testing begins ...
 2/26/2009 8:46:26 PM -- Attaching databases ...
 2/26/2009 8:46:26 PM -- Prepare testing ends.
 2/26/2009 8:46:26 PM -- Dispatching transactions begins ...
 2/26/2009 8:46:26 PM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)
 2/26/2009 8:46:26 PM -- Database flush thresholds: (start: 2.6 MB, stop: 5.1 MB)
 2/26/2009 8:46:27 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.1 seconds/read).
 2/26/2009 8:46:27 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.1 seconds/write).
 2/26/2009 8:46:27 PM -- Attaining prerequisites:
 2/26/2009 8:50:03 PM -- \Database(JetstressWin)\Database Cache Size, Last: 242606100.0 (lower bound: 241591900.0, upper bound: none)
 2/26/2009 8:50:04 PM -- Performance logging begins (interval: 5000 ms).



2/26/2009 8:50:04 PM -- Automatic tuning begins ...
2/26/2009 8:50:34 PM -- Volume M: has 0.00062 for read latency slope.
2/26/2009 8:51:04 PM -- Volume M: has 0.00048 for read latency slope.
2/26/2009 8:53:04 PM -- 186 batch transactions/sec and 16 sessions have 383 IOPS.
2/26/2009 8:53:04 PM -- 16 sessions have actual 383 IOPS (target IOPS: 250)
2/26/2009 8:53:04 PM -- Volume M: has 0.0291 for Avg. Disk sec/Read.
2/26/2009 8:53:04 PM -- Process has average database read latencies higher than 0.020.
2/26/2009 8:53:04 PM -- Volume L: has 0.0025 for Avg. Disk sec/Write.
2/26/2009 8:53:04 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/26/2009 8:53:04 PM -- Operation mix: Sessions 8, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
2/26/2009 8:53:34 PM -- Volume M: has 0.00007 for read latency slope.
2/26/2009 8:55:34 PM -- 158 batch transactions/sec and 8 sessions have 344 IOPS.
2/26/2009 8:55:34 PM -- 8 sessions have actual 344 IOPS (target IOPS: 250)
2/26/2009 8:55:34 PM -- Volume M: has 0.0248 for Avg. Disk sec/Read.
2/26/2009 8:55:34 PM -- Process has average database read latencies higher than 0.020.
2/26/2009 8:55:34 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.
2/26/2009 8:55:34 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/26/2009 8:55:34 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
2/26/2009 8:56:04 PM -- Volume M: has 0.00016 for read latency slope.
2/26/2009 8:58:04 PM -- 127 batch transactions/sec and 4 sessions have 267 IOPS.
2/26/2009 8:58:04 PM -- 4 sessions have actual 267 IOPS (target IOPS: 250)
2/26/2009 8:58:04 PM -- Volume M: has 0.0153 for Avg. Disk sec/Read.
2/26/2009 8:58:04 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.
2/26/2009 8:58:04 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/26/2009 8:58:05 PM -- Performance logging ends.
2/26/2009 8:58:05 PM -- Automatic tuning succeeded.
2/26/2009 8:58:06 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
2/26/2009 8:58:06 PM -- Performance logging begins (interval: 15000 ms).
2/26/2009 8:58:06 PM -- Attaining prerequisites:
2/26/2009 8:58:06 PM -- \Database(JetstressWin)\Database Cache Size, Last: 268435500.0 (lower bound: 241591900.0, upper bound: none)
2/27/2009 8:58:08 PM -- Performance logging ends.
2/27/2009 8:58:08 PM -- JetInterop batch transaction stats: 336466.



2/27/2009 8:58:39 PM -- Dispatching transactions ends.
2/27/2009 8:58:39 PM -- Shutting down databases ...
2/28/2009 8:04:23 PM -- Instance2108.1 (complete)
2/28/2009 8:04:23 PM -- Performance logging begins (interval: 15000 ms).
2/28/2009 8:04:23 PM -- Verifying database checksums ...
2/28/2009 8:25:30 PM -- M: (100% processed)
2/28/2009 8:25:31 PM -- Performance logging ends.
2/28/2009 8:25:31 PM -- C:\Data\Jetstress\DBChecksum_2009_2_28_20_4_23.blg has 84 samples.
2/28/2009 8:25:34 PM -- C:\Data\Jetstress\DBChecksum_2009_2_28_20_4_23.html is saved.
2/28/2009 8:25:34 PM -- Verifying log checksums ...
2/28/2009 8:25:35 PM -- L:\01 (16 logs passed)
2/28/2009 8:25:35 PM -- C:\Data\Jetstress\Stress_2009_2_26_20_58_5.blg has 5760 samples.
2/28/2009 8:25:35 PM -- Creating test report ...
2/28/2009 8:26:27 PM -- Volume M: has 0.0101 for Avg. Disk sec/Read.
2/28/2009 8:26:27 PM -- Volume L: has 0.0022 for Avg. Disk sec/Write.
2/28/2009 8:26:27 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/28/2009 8:26:27 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
2/28/2009 8:26:27 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.
2/28/2009 8:26:27 PM -- C:\Data\Jetstress\Stress_2009_2_26_20_58_5.xml has 5759 samples queried.



Microsoft Exchange Server Jetstress

Test Result Report

Checksum Statistics - All

Database	Seen pages	Bad pages	Correctable pages	Wrong page no pages	File length / seconds taken
M:\01\Jetstress1.edb	17812472	0	0	0	139159 MBytes / 1266 seconds
(Sum)	17812472	0	0	0	139159 MBytes / 1266 seconds

Disk Subsystem Performance (of checksum)

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec
M:	0.050	0.000	1755.018	0.006

Memory System Performance (of checksum)

Counter	Average	Minimum	Maximum
% Processor Time	1.830	1.133	3.294
Available MBytes	3346.321	3340.000	3349.000
Free System Page Table Entries	4170256.000	4170256.000	4170256.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	34534058.667	34512896.000	34549760.000
Pool Paged Bytes	48695686.095	48300032.000	49373184.000

Test Log

2/26/2009 8:46:24 PM -- Jetstress testing begins ...
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 2/26/2009 8:46:26 PM -- Attaching databases ...
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 2/26/2009 8:46:27 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.1 seconds/write).
 2/26/2009 8:46:27 PM -- Attaining prerequisites:
 2/26/2009 8:50:03 PM -- \Database(JetstressWin)\Database Cache Size, Last: 242606100.0 (lower bound: 241591900.0, upper bound: none)
 2/26/2009 8:50:04 PM -- Performance logging begins (interval: 5000 ms).
 2/26/2009 8:50:04 PM -- Automatic tuning begins ...
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2/26/2009 8:53:04 PM -- 16 sessions have actual 383 IOPS (target IOPS: 250)
2/26/2009 8:53:04 PM -- Volume M: has 0.0291 for Avg. Disk sec/Read.
2/26/2009 8:53:04 PM -- Process has average database read latencies higher than 0.020.
2/26/2009 8:53:04 PM -- Volume L: has 0.0025 for Avg. Disk sec/Write.
2/26/2009 8:53:04 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
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2/26/2009 8:58:06 PM -- \Database(JetstressWin)\Database Cache Size, Last: 268435500.0 (lower bound: 241591900.0, upper bound: none)
2/27/2009 8:58:08 PM -- Performance logging ends.
2/27/2009 8:58:08 PM -- JetInterop batch transaction stats: 336466.
2/27/2009 8:58:39 PM -- Dispatching transactions ends.
2/27/2009 8:58:39 PM -- Shutting down databases ...
2/28/2009 8:04:23 PM -- Instance2108.1 (complete)
2/28/2009 8:04:23 PM -- Performance logging begins (interval: 15000 ms).
2/28/2009 8:04:23 PM -- Verifying database checksums ...
2/28/2009 8:25:30 PM -- M: (100% processed)
2/28/2009 8:25:31 PM -- Performance logging ends.
2/28/2009 8:25:31 PM -- C:\Data\Jetstress\DBChecksum_2009_2_28_20_4_23.blg has 84 samples.



Microsoft Exchange Server **Jetstress 2 Hour Performance**

Microsoft Exchange Server **Jetstress**

Performance Test Result Report

Test Summary

Overall Test Result **Pass**

Machine Name DMRTK-SRVR-I2

Test Description Intel SRCSASRB 4-SAS drives, mailboxes=500, size=250, IOPS=0.5, threads=Auto, DB=RAID1(1+1), Log=RAID1(1+1), SG=1

Test Start Time 2/26/2009 3:36:36 PM

Test End Time 2/26/2009 7:52:35 PM

Jetstress Version 08.02.0060.000

Ese Version 08.00.0685.024

Operating System Microsoft Windows Server 2003 R2 Service Pack 2 (5.2.3790.131072)

Performance Log C:\Data\Jetstress\Tuning_2009_2_26_17_44_11.blg
C:\Data\Jetstress\Performance_2009_2_26_17_52_14.blg
C:\Data\Jetstress\DBChecksum_2009_2_26_19_52_35.blg

Database Sizing and Throughput

Achieved I/O per Second 274.15

Target I/O per Second 250

Initial database size 131075031040

Final database size 133868568576

Database files (count) 1

Jetstress System Parameters

Thread count 4 (per-storage group)

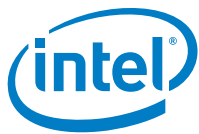
Log buffers 9000

Minimum database cache 32.0 MB

Maximum database cache 256.0 MB

Insert operations 25%

Delete operations 10%



Replace operations 50%
Read operations 15%
Lazy commits 80%

Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (M:)	0.012	0.071	139.504	134.646	(n/a)
Log (L:)	0.000	0.002	0.000	75.691	12308.349

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.363	0.062	0.776
Available MBytes	3132.035	3125.000	3134.000
Free System Page Table Entries	4170256.000	4170256.000	4170256.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	33673531.733	33660928.000	33697792.000
Pool Paged Bytes	46746436.267	46374912.000	47509504.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

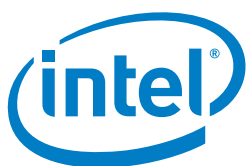
2/26/2009 3:36:36 PM -- Jetstress testing begins ...
 2/26/2009 3:36:36 PM -- Prepare testing begins ...
 2/26/2009 3:36:36 PM -- Creating M:\01\Jetstress1.edb.
 2/26/2009 3:36:36 PM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)
 2/26/2009 3:36:36 PM -- Database flush thresholds: (start: 2.6 MB, stop: 5.1 MB)
 2/26/2009 4:40:10 PM -- 60.0% of 122.1 GB complete (4463139 records inserted).
 2/26/2009 5:40:20 PM -- 100.0% of 122.1 GB complete (7133045 records inserted).
 2/26/2009 5:40:28 PM -- Attaching databases ...
 2/26/2009 5:40:28 PM -- Prepare testing ends.
 2/26/2009 5:40:28 PM -- Dispatching transactions begins ...
 2/26/2009 5:40:28 PM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)
 2/26/2009 5:40:28 PM -- Database flush thresholds: (start: 2.6 MB, stop: 5.1 MB)
 2/26/2009 5:40:29 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).
 2/26/2009 5:40:29 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).



2/26/2009 5:40:29 PM -- Attaining prerequisites:
2/26/2009 5:44:11 PM -- \Database(JetstressWin)\Database Cache Size, Last: 242327600.0
(lower bound: 241591900.0, upper bound: none)
2/26/2009 5:44:12 PM -- Performance logging begins (interval: 5000 ms).
2/26/2009 5:44:12 PM -- Automatic tuning begins ...
2/26/2009 5:44:42 PM -- Volume M: has 0.00012 for read latency slope.
2/26/2009 5:46:42 PM -- 194 batch transactions/sec and 16 sessions have 372 IOPS.
2/26/2009 5:46:42 PM -- 16 sessions have actual 372 IOPS (target IOPS: 250)
2/26/2009 5:46:42 PM -- Volume M: has 0.0319 for Avg. Disk sec/Read.
2/26/2009 5:46:42 PM -- Process has average database read latencies higher than 0.020.
2/26/2009 5:46:42 PM -- Volume L: has 0.0025 for Avg. Disk sec/Write.
2/26/2009 5:46:42 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/26/2009 5:46:42 PM -- Operation mix: Sessions 8, Inserts 25%, Deletes 10%, Replaces 50%,
Reads 15%, Lazy Commits 80%.
2/26/2009 5:47:12 PM -- Volume M: has 0.00076 for read latency slope.
2/26/2009 5:47:42 PM -- Volume M: has 0.00024 for read latency slope.
2/26/2009 5:49:42 PM -- 175 batch transactions/sec and 8 sessions have 341 IOPS.
2/26/2009 5:49:42 PM -- 8 sessions have actual 341 IOPS (target IOPS: 250)
2/26/2009 5:49:42 PM -- Volume M: has 0.0259 for Avg. Disk sec/Read.
2/26/2009 5:49:42 PM -- Process has average database read latencies higher than 0.020.
2/26/2009 5:49:42 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.
2/26/2009 5:49:42 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/26/2009 5:49:42 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%,
Reads 15%, Lazy Commits 80%.
2/26/2009 5:50:12 PM -- Volume M: has 0.00034 for read latency slope.
2/26/2009 5:52:12 PM -- 134 batch transactions/sec and 4 sessions have 266 IOPS.
2/26/2009 5:52:12 PM -- 4 sessions have actual 266 IOPS (target IOPS: 250)
2/26/2009 5:52:12 PM -- Volume M: has 0.0163 for Avg. Disk sec/Read.
2/26/2009 5:52:12 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.
2/26/2009 5:52:12 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/26/2009 5:52:13 PM -- Performance logging ends.
2/26/2009 5:52:14 PM -- Automatic tuning succeeded.
2/26/2009 5:52:14 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%,
Reads 15%, Lazy Commits 80%.
2/26/2009 5:52:14 PM -- Performance logging begins (interval: 15000 ms).
2/26/2009 5:52:14 PM -- Attaining prerequisites:



2/26/2009 5:52:14 PM -- \Database(JetstressWin)\Database Cache Size, Last: 267935700.0
(lower bound: 241591900.0, upper bound: none)
2/26/2009 7:52:16 PM -- Performance logging ends.
2/26/2009 7:52:16 PM -- JetInterop batch transaction stats: 66424.
2/26/2009 7:52:17 PM -- Dispatching transactions ends.
2/26/2009 7:52:17 PM -- Shutting down databases ...
2/26/2009 7:52:35 PM -- Instance2728.1 (complete)
2/26/2009 7:52:35 PM -- Performance logging begins (interval: 7500 ms).
2/26/2009 7:52:35 PM -- Verifying database checksums ...
2/26/2009 8:12:05 PM -- M: (100% processed)
2/26/2009 8:12:06 PM -- Performance logging ends.
2/26/2009 8:12:07 PM -- C:\Data\Jetstress\DBChecksum_2009_2_26_19_52_35.blg has 156 samples.
2/26/2009 8:12:11 PM -- C:\Data\Jetstress\DBChecksum_2009_2_26_19_52_35.html is saved.
2/26/2009 8:12:11 PM -- Verifying log checksums ...
2/26/2009 8:12:11 PM -- L:\01 (21 logs passed)
2/26/2009 8:12:11 PM -- C:\Data\Jetstress\Performance_2009_2_26_17_52_14.blg has 480 samples.
2/26/2009 8:12:11 PM -- Creating test report ...
2/26/2009 8:12:15 PM -- Volume M: has 0.0121 for Avg. Disk sec/Read.
2/26/2009 8:12:15 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.
2/26/2009 8:12:15 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/26/2009 8:12:15 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
2/26/2009 8:12:15 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.
2/26/2009 8:12:15 PM -- C:\Data\Jetstress\Performance_2009_2_26_17_52_14.xml has 479 samples queried.



Microsoft Exchange Server Jetstress

Test Result Report

Checksum Statistics - All

Database	Seen pages	Bad pages	Correctable pages	Wrong page no pages	File length / seconds taken
M:\01\Jetstress1.edb	16341378	0	0	0	127667 MBytes / 1169 seconds
(Sum)	16341378	0	0	0	127667 MBytes / 1169 seconds

Disk Subsystem Performance (of checksum)

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec
M:	0.050	0.000	1744.757	0.010

Memory System Performance (of checksum)

Counter	Average	Minimum	Maximum
% Processor Time	1.860	1.169	2.784
Available MBytes	3386.622	3379.000	3409.000
Free System Page Table Entries	4170256.000	4170256.000	4170256.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	34413384.205	34365440.000	34430976.000
Pool Paged Bytes	47433150.359	47083520.000	48152576.000

Test Log2/26/2009 3:36:36 PM -- Jetstress testing begins ...

2/26/2009 3:36:36 PM -- Prepare testing begins ...

2/26/2009 3:36:36 PM -- Creating M:\01\Jetstress1.edb.

2/26/2009 3:36:36 PM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)

2/26/2009 3:36:36 PM -- Database flush thresholds: (start: 2.6 MB, stop: 5.1 MB)

2/26/2009 4:40:10 PM -- 60.0% of 122.1 GB complete (4463139 records inserted).

2/26/2009 5:40:20 PM -- 100.0% of 122.1 GB complete (7133045 records inserted).

2/26/2009 5:40:28 PM -- Attaching databases ...

2/26/2009 5:40:28 PM -- Prepare testing ends.

2/26/2009 5:40:28 PM -- Dispatching transactions begins ...

2/26/2009 5:40:28 PM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)

2/26/2009 5:40:28 PM -- Database flush thresholds: (start: 2.6 MB, stop: 5.1 MB)

2/26/2009 5:40:29 PM -- Database read latency thresholds: (average: 0.02 seconds/read,



maximum: 0.05 seconds/read).

2/26/2009 5:40:29 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).

2/26/2009 5:40:29 PM -- Attaining prerequisites:

2/26/2009 5:44:11 PM -- \Database(JetstressWin)\Database Cache Size, Last: 242327600.0 (lower bound: 241591900.0, upper bound: none)

2/26/2009 5:44:12 PM -- Performance logging begins (interval: 5000 ms).

2/26/2009 5:44:12 PM -- Automatic tuning begins ...

2/26/2009 5:44:42 PM -- Volume M: has 0.00012 for read latency slope.

2/26/2009 5:46:42 PM -- 194 batch transactions/sec and 16 sessions have 372 IOPS.

2/26/2009 5:46:42 PM -- 16 sessions have actual 372 IOPS (target IOPS: 250)

2/26/2009 5:46:42 PM -- Volume M: has 0.0319 for Avg. Disk sec/Read.

2/26/2009 5:46:42 PM -- Process has average database read latencies higher than 0.020.

2/26/2009 5:46:42 PM -- Volume L: has 0.0025 for Avg. Disk sec/Write.

2/26/2009 5:46:42 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/26/2009 5:46:42 PM -- Operation mix: Sessions 8, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/26/2009 5:47:12 PM -- Volume M: has 0.00076 for read latency slope.

2/26/2009 5:47:42 PM -- Volume M: has 0.00024 for read latency slope.

2/26/2009 5:49:42 PM -- 175 batch transactions/sec and 8 sessions have 341 IOPS.

2/26/2009 5:49:42 PM -- 8 sessions have actual 341 IOPS (target IOPS: 250)

2/26/2009 5:49:42 PM -- Volume M: has 0.0259 for Avg. Disk sec/Read.

2/26/2009 5:49:42 PM -- Process has average database read latencies higher than 0.020.

2/26/2009 5:49:42 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.

2/26/2009 5:49:42 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/26/2009 5:49:42 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/26/2009 5:50:12 PM -- Volume M: has 0.00034 for read latency slope.

2/26/2009 5:52:12 PM -- 134 batch transactions/sec and 4 sessions have 266 IOPS.

2/26/2009 5:52:12 PM -- 4 sessions have actual 266 IOPS (target IOPS: 250)

2/26/2009 5:52:12 PM -- Volume M: has 0.0163 for Avg. Disk sec/Read.

2/26/2009 5:52:12 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.

2/26/2009 5:52:12 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/26/2009 5:52:13 PM -- Performance logging ends.

2/26/2009 5:52:14 PM -- Automatic tuning succeeded.

2/26/2009 5:52:14 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%,



Reads 15%, Lazy Commits 80%.

2/26/2009 5:52:14 PM -- Performance logging begins (interval: 15000 ms).

2/26/2009 5:52:14 PM -- Attaining prerequisites:

2/26/2009 5:52:14 PM -- \Database(JetstressWin)\Database Cache Size, Last: 267935700.0
(lower bound: 241591900.0, upper bound: none)

2/26/2009 7:52:16 PM -- Performance logging ends.

2/26/2009 7:52:16 PM -- JetInterop batch transaction stats: 66424.

2/26/2009 7:52:17 PM -- Dispatching transactions ends.

2/26/2009 7:52:17 PM -- Shutting down databases ...

2/26/2009 7:52:35 PM -- Instance2728.1 (complete)

2/26/2009 7:52:35 PM -- Performance logging begins (interval: 7500 ms).

2/26/2009 7:52:35 PM -- Verifying database checksums ...

2/26/2009 8:12:05 PM -- M: (100% processed)

2/26/2009 8:12:06 PM -- Performance logging ends.

2/26/2009 8:12:07 PM -- C:\Data\Jetstress\DBChecksum_2009_2_26_19_52_35.blg has 156 samples.