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

Tested Date: February 25, 2009

Publish Date: September 4, 2009

DISCLAIMER

Contents

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-overview.htm.
	Intel® RAID Controller	Intel	SRCSASRB. Additional information is available at: http://www.intel.com/products/server/raid-controllers/srcsasrb-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
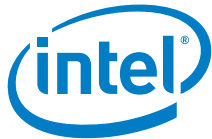
Introduction

This document provides information on Intel's storage solution for Microsoft Exchange Server 2007*, based 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.mspx.

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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® SRCSASJV 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® SRCSASJV 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® SRCSASJV
Internal Boot Disk	Qty. 1 - Seagate 320GB
Disk Array Disks	Qty. 10 - 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
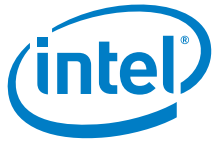
Tested Deployment

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	512 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® SRCSASJV
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
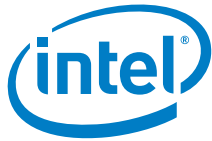
Primary Storage Software

Component	Description
HBA driver	Intel SRCSASJV
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 (ST3146855SS)
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 (ST3146855SS)
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 two 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 two 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.
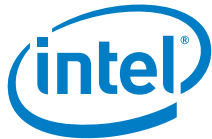
I/O Component	Metric
Database I/O	
Average Database Disk Transfers/sec	134.157
Average Database Disk Reads/sec	68.770
Average Database Disk Writes/sec	199.543
Average Database Disk Read Latency (ms)	0.010
Average Database Disk Write Latency (ms)	0.002
Transaction Log I/O	
Average Log Disk Writes/sec	34.599
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 are based on the tests introduced in the ESRP test framework. Customers 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 SRCSASJV 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	2/23/2009 8:55:03 PM
Test End Time	2/25/2009 10:06:27 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_23_20_58_43.blg C:\Data\Jetstress\Stress_2009_2_23_21_6_15.blg C:\Data\Jetstress\DBChecksum_2009_2_25_22_6_27.blg

Database Sizing and Throughput

Achieved I/O per Second	268.313
Target I/O per Second	250
Initial database size	134139101184
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
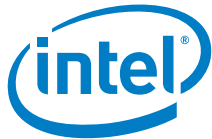
Insert operations	25%
Delete operations	10%
Replace operations	50%
Read operations	15%
Lazy commits	80%

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	0.034	68.770	199.543	(n/a)
Log (L:)	0.000	0.002	0.000	34.599	6990.854

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.299	0.038	2.369
Available MBytes	3097.507	2987.000	3130.000
Free System Page Table Entries	4170416.000	4170416.000	4170416.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	34025264.356	33927168.000	34156544.000
Pool Paged Bytes	46298612.622	45522944.000	47525888.000
Database Page Fault Stalls/sec	0.000	0.000	0.067

Test Log 2/23/2009 8:55:03 PM -- Jetstress testing begins …

2/23/2009 8:55:03 PM -- Prepare testing begins …

2/23/2009 8:55:04 PM -- Attaching databases …

2/23/2009 8:55:04 PM -- Prepare testing ends.

2/23/2009 8:55:04 PM -- Dispatching transactions begins …

2/23/2009 8:55:04 PM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)

2/23/2009 8:55:04 PM -- Database flush thresholds: (start: 2.6 MB, stop: 5.1 MB)

2/23/2009 8:55:06 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.1 seconds/read).

2/23/2009 8:55:06 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.1 seconds/write).

2/23/2009 8:55:06 PM -- Attaining prerequisites:

2/23/2009 8:58:43 PM -- \Database (JetstressWin)\Database Cache Size, Last: 241745900.0 (lower bound: 241591900.0, upper bound: none)
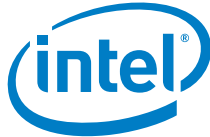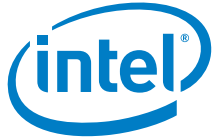
2/23/2009 8:58:44 PM -- Performance logging begins (interval: 5000 ms).

2/23/2009 8:58:44 PM -- Automatic tuning begins …

2/23/2009 8:59:14 PM -- Volume M: has 0.00023 for read latency slope.

2/23/2009 9:01:14 PM -- 183 batch transactions/sec and 16 sessions have 397 IOPS.

2/23/2009 9:01:14 PM -- 16 sessions have actual 397 IOPS (target IOPS: 250)

2/23/2009 9:01:14 PM -- Volume M: has 0.0312 for Avg. Disk sec/Read.

2/23/2009 9:01:14 PM -- Process has average database read latencies higher than 0.020.

2/23/2009 9:01:14 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.

2/23/2009 9:01:14 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 9:01:14 PM -- Operation mix: Sessions 8, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/23/2009 9:01:44 PM -- Volume M: has 0.00031 for read latency slope.

2/23/2009 9:03:44 PM -- 174 batch transactions/sec and 8 sessions have 349 IOPS.

2/23/2009 9:03:44 PM -- 8 sessions have actual 349 IOPS (target IOPS: 250)

2/23/2009 9:03:44 PM -- Volume M: has 0.0252 for Avg. Disk sec/Read.

2/23/2009 9:03:44 PM -- Process has average database read latencies higher than 0.020.

2/23/2009 9:03:44 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.

2/23/2009 9:03:44 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 9:03:44 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/23/2009 9:04:14 PM -- Volume M: has 0.00005 for read latency slope.

2/23/2009 9:06:14 PM -- 126 batch transactions/sec and 4 sessions have 272 IOPS.

2/23/2009 9:06:14 PM -- 4 sessions have actual 272 IOPS (target IOPS: 250)

2/23/2009 9:06:14 PM -- Volume M: has 0.0162 for Avg. Disk sec/Read.

2/23/2009 9:06:14 PM -- Volume L: has 0.0025 for Avg. Disk sec/Write.

2/23/2009 9:06:14 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 9:06:15 PM -- Performance logging ends.

2/23/2009 9:06:15 PM -- Automatic tuning succeeded.

2/23/2009 9:06:16 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/23/2009 9:06:16 PM -- Performance logging begins (interval: 15000 ms).

2/23/2009 9:06:16 PM -- Attaining prerequisites:

2/23/2009 9:06:16 PM -- \Database(JetstressWin)\Database Cache Size, Last: 268435500.0 (lower bound: 241591900.0, upper bound: none)

2/24/2009 9:06:18 PM -- Performance logging ends.

2/24/2009 9:06:18 PM -- JetInterop batch transaction stats: 328050.

2/24/2009 9:06:37 PM -- Dispatching transactions ends.

2/24/2009 9:06:37 PM -- Shutting down databases …

2/25/2009 10:06:27 PM -- Instance2536.1 (complete)

2/25/2009 10:06:28 PM -- Performance logging begins (interval: 15000 ms).

2/25/2009 10:06:28 PM -- Verifying database checksums …

2/25/2009 10:27:40 PM -- M: (100% processed)

2/25/2009 10:27:41 PM -- Performance logging ends.

2/25/2009 10:27:41 PM -- C:\Data\Jetstress\DBChecksum_2009_2_25_22_6_27.blg has 84 samples.

2/25/2009 10:27:44 PM -- C:\Data\Jetstress\DBChecksum_2009_2_25_22_6_27.html is saved.

2/25/2009 10:27:44 PM -- Verifying log checksums …

2/25/2009 10:27:45 PM -- L:\01 (20 logs passed)

2/25/2009 10:27:45 PM -- C:\Data\Jetstress\Stress_2009_2_23_21_6_15.blg has 5760 samples.

2/25/2009 10:27:45 PM -- Creating test report …

2/25/2009 10:28:38 PM -- Volume M: has 0.0100 for Avg. Disk sec/Read.

2/25/2009 10:28:38 PM -- Volume L: has 0.0022 for Avg. Disk sec/Write.

2/25/2009 10:28:38 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/25/2009 10:28:38 PM -- Test has 0.0666741093688262 Maximum Database Page Fault Stalls/sec.

2/25/2009 10:28:38 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.

2/25/2009 10:28:38 PM -- C:\Data\Jetstress\Stress_2009_2_23_21_6_15.xml has 5759 samples queried.
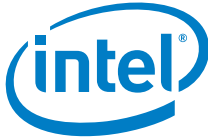
Microsoft Exchange Server Jetstress

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 / 1271 seconds
(Sum)	17812472	0	0	0	139159 MBytes / 1272 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	1746.636	0.006

Memory System Performance (of checksum)

Counter	Average	Minimum	Maximum
% Processor Time	1.799	1.029	2.291
Available MBytes	3312.869	3306.000	3315.000
Free System Page Table Entries	4169936.000	4169936.000	4169936.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	34372315.429	34361344.000	34394112.000
Pool Paged Bytes	47755556.571	47427584.000	48500736.000

Test Log 2/23/2009 8:55:03 PM -- Jetstress testing begins …

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2/23/2009 9:01:14 PM -- Volume M: has 0.0312 for Avg. Disk sec/Read.

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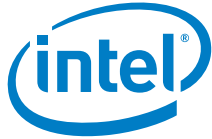2/23/2009 9:06:14 PM -- Volume L: has 0.0025 for Avg. Disk sec/Write.

2/23/2009 9:06:14 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 9:06:15 PM -- Performance logging ends.

2/23/2009 9:06:15 PM -- Automatic tuning succeeded.

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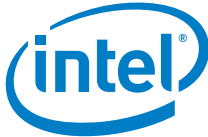
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2/25/2009 10:27:41 PM -- Performance logging ends.

2/25/2009 10:27:41 PM -- C:\Data\Jetstress\DBChecksum_2009_2_25_22_6_27.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 SRCSASJV 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	2/23/2009 3:42:53 PM
Test End Time	2/23/2009 8:17:14 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_23_17_48_51.blg C:\Data\Jetstress\Performance_2009_2_23_18_16_53.blg C:\Data\Jetstress\DBChecksum_2009_2_23_20_17_14.blg

Database Sizing and Throughput

Achieved I/O per Second	275.961
Target I/O per Second	250
Initial database size	131075031040
Final database size	134139101184
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%

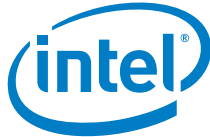| Read operations	15%
Lazy commits	80%

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	141.294	134.667	(n/a)
Log (L:)	0.000	0.002	0.000	75.086	12326.324

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.365	0.000	0.781
Available MBytes	3127.342	3119.000	3128.000
Free System Page Table Entries	4170486.000	4170486.000	4170486.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	33573555.200	33562624.000	33603584.000
Pool Paged Bytes	46210363.733	46112768.000	47136768.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log2/23/2009 3:42:53 PM -- Jetstress testing begins …

2/23/2009 3:42:53 PM -- Prepare testing begins …

2/23/2009 3:42:53 PM -- Creating M:\01\Jetstress1.edb.

2/23/2009 3:42:53 PM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)

2/23/2009 3:42:53 PM -- Database flush thresholds: (start: 2.6 MB, stop: 5.1 MB)

2/23/2009 4:45:32 PM -- 60.0% of 122.1 GB complete (4463139 records inserted).

2/23/2009 5:45:04 PM -- 100.0% of 122.1 GB complete (7131247 records inserted).

2/23/2009 5:45:12 PM -- Attaching databases …

2/23/2009 5:45:12 PM -- Prepare testing ends.

2/23/2009 5:45:12 PM -- Dispatching transactions begins …

2/23/2009 5:45:12 PM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)

2/23/2009 5:45:12 PM -- Database flush thresholds: (start: 2.6 MB, stop: 5.1 MB)

2/23/2009 5:45:13 PM -- Database read latency thresholds: (average: 0.02 seconds/read,

maximum: 0.05 seconds/read).

2/23/2009 5:45:13 PM -- Log write latency thresholds: (average: 0.01 seconds/write,

maximum: 0.05 seconds/write).

2/23/2009 5:45:14 PM -- Attaining prerequisites:

2/23/2009 5:48:51 PM -- \Database(JetstressWin)\Database Cache Size, Last: 241705000.0

(lower bound: 241591900.0, upper bound: none)

2/23/2009 5:48:52 PM -- Performance logging begins (interval: 5000 ms).

2/23/2009 5:48:52 PM -- Automatic tuning begins …

2/23/2009 5:49:22 PM -- Volume M: has 0.00062 for read latency slope.

2/23/2009 5:49:52 PM -- Volume M: has 0.00020 for read latency slope.

2/23/2009 5:51:52 PM -- 212 batch transactions/sec and 16 sessions have 384 IOPS.

2/23/2009 5:51:52 PM -- 16 sessions have actual 384 IOPS (target IOPS: 250)

2/23/2009 5:51:52 PM -- Volume M: has 0.0308 for Avg. Disk sec/Read.

2/23/2009 5:51:52 PM -- Process has average database read latencies higher than 0.020.

2/23/2009 5:51:52 PM -- Volume L: has 0.0020 for Avg. Disk sec/Write.

2/23/2009 5:51:52 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 5:51:52 PM -- Operation mix: Sessions 8, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/23/2009 5:52:22 PM -- Volume M: has 0.00003 for read latency slope.

2/23/2009 5:54:22 PM -- 184 batch transactions/sec and 8 sessions have 334 IOPS.

2/23/2009 5:54:22 PM -- 8 sessions have actual 334 IOPS (target IOPS: 250)

2/23/2009 5:54:22 PM -- Volume M: has 0.0219 for Avg. Disk sec/Read.

2/23/2009 5:54:22 PM -- Process has average database read latencies higher than 0.020.

2/23/2009 5:54:22 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.

2/23/2009 5:54:22 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 5:54:22 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/23/2009 5:54:52 PM -- Volume M: has 0.00003 for read latency slope.

2/23/2009 5:56:52 PM -- 141 batch transactions/sec and 4 sessions have 274 IOPS.

2/23/2009 5:56:52 PM -- 4 sessions have actual 274 IOPS (target IOPS: 250)

2/23/2009 5:56:52 PM -- Volume M: has 0.0217 for Avg. Disk sec/Read.

2/23/2009 5:56:52 PM -- Process has average database read latencies higher than 0.020.

2/23/2009 5:56:52 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.

2/23/2009 5:56:52 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 5:56:52 PM -- Operation mix: Sessions 2, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/23/2009 5:57:22 PM -- Volume M: has 0.00003 for read latency slope.

2/23/2009 5:59:22 PM -- 104 batch transactions/sec and 2 sessions have 205 IOPS.

2/23/2009 5:59:22 PM -- 2 sessions have actual 205 IOPS (target IOPS: 250)

2/23/2009 5:59:22 PM -- Volume M: has 0.0110 for Avg. Disk sec/Read.

2/23/2009 5:59:22 PM -- Volume L: has 0.0028 for Avg. Disk sec/Write.

2/23/2009 5:59:22 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 5:59:22 PM -- Operation mix: Sessions 3, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/23/2009 5:59:52 PM -- Volume M: has 0.00011 for read latency slope.

2/23/2009 6:01:52 PM -- 117 batch transactions/sec and 3 sessions have 245 IOPS.

2/23/2009 6:01:52 PM -- 3 sessions have actual 245 IOPS (target IOPS: 250)

2/23/2009 6:01:52 PM -- Volume M: has 0.0165 for Avg. Disk sec/Read.

2/23/2009 6:01:52 PM -- M: has 7 maximum database read latency errors.

2/23/2009 6:01:52 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.

2/23/2009 6:01:52 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 6:01:52 PM -- Operation mix: Sessions 1, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/23/2009 6:02:22 PM -- Volume M: has 0.00014 for read latency slope.

2/23/2009 6:04:22 PM -- 69 batch transactions/sec and 1 sessions have 141 IOPS.

2/23/2009 6:04:22 PM -- 1 sessions have actual 141 IOPS (target IOPS: 250)

2/23/2009 6:04:22 PM -- Volume M: has 0.0095 for Avg. Disk sec/Read.

2/23/2009 6:04:22 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.

2/23/2009 6:04:22 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 6:04:22 PM -- Operation mix: Sessions 3, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/23/2009 6:04:52 PM -- Volume M: has 0.00016 for read latency slope.

2/23/2009 6:06:52 PM -- 120 batch transactions/sec and 3 sessions have 240 IOPS.

2/23/2009 6:06:52 PM -- 3 sessions have actual 240 IOPS (target IOPS: 250)

2/23/2009 6:06:52 PM -- Volume M: has 0.0146 for Avg. Disk sec/Read.

2/23/2009 6:06:52 PM -- Volume L: has 0.0025 for Avg. Disk sec/Write.

2/23/2009 6:06:52 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 6:06:52 PM -- Operation mix: Sessions 2, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/23/2009 6:07:22 PM -- Volume M: has 0.00004 for read latency slope.

2/23/2009 6:09:22 PM -- 95 batch transactions/sec and 2 sessions have 205 IOPS.

2/23/2009 6:09:22 PM -- 2 sessions have actual 205 IOPS (target IOPS: 250)

2/23/2009 6:09:22 PM -- Volume M: has 0.0125 for Avg. Disk sec/Read.

2/23/2009 6:09:22 PM -- Volume L: has 0.0026 for Avg. Disk sec/Write.

2/23/2009 6:09:22 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 6:09:22 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/23/2009 6:09:52 PM -- Volume M: has 0.00014 for read latency slope.

2/23/2009 6:11:52 PM -- 133 batch transactions/sec and 4 sessions have 284 IOPS.

2/23/2009 6:11:52 PM -- 4 sessions have actual 284 IOPS (target IOPS: 250)

2/23/2009 6:11:52 PM -- Volume M: has 0.0225 for Avg. Disk sec/Read.

2/23/2009 6:11:52 PM -- Process has average database read latencies higher than 0.020.

2/23/2009 6:11:52 PM -- Volume L: has 0.0025 for Avg. Disk sec/Write.

2/23/2009 6:11:52 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 6:11:52 PM -- Operation mix: Sessions 2, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/23/2009 6:12:22 PM -- Volume M: has 0.00023 for read latency slope.

2/23/2009 6:14:22 PM -- 98 batch transactions/sec and 2 sessions have 206 IOPS.

2/23/2009 6:14:22 PM -- 2 sessions have actual 206 IOPS (target IOPS: 250)
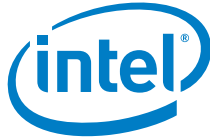
2/23/2009 6:14:22 PM -- Volume M: has 0.0130 for Avg. Disk sec/Read.

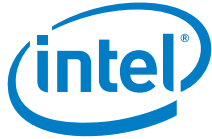2/23/2009 6:14:22 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.

2/23/2009 6:14:22 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 6:14:22 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/23/2009 6:14:52 PM -- Volume M: has 0.00012 for read latency slope.

2/23/2009 6:16:52 PM -- 139 batch transactions/sec and 4 sessions have 280 IOPS.

2/23/2009 6:16:52 PM -- 4 sessions have actual 280 IOPS (target IOPS: 250)

2/23/2009 6:16:52 PM -- Volume M: has 0.0155 for Avg. Disk sec/Read.

2/23/2009 6:16:52 PM -- Volume L: has 0.0025 for Avg. Disk sec/Write.

2/23/2009 6:16:52 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 6:16:53 PM -- Performance logging ends.

2/23/2009 6:16:53 PM -- Automatic tuning succeeded.

2/23/2009 6:16:54 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2/23/2009 6:16:54 PM -- Performance logging begins (interval: 15000 ms).

2/23/2009 6:16:54 PM -- Attaining prerequisites:

2/23/2009 6:16:54 PM -- \Database(JetstressWin)\Database Cache Size, Last: 268238800.0 (lower bound: 241591900.0, upper bound: none)

2/23/2009 8:16:56 PM -- Performance logging ends.

2/23/2009 8:16:56 PM -- JetInterop batch transaction stats: 74727.

2/23/2009 8:16:57 PM -- Dispatching transactions ends.

2/23/2009 8:16:57 PM -- Shutting down databases …

2/23/2009 8:17:14 PM -- Instance796.1 (complete)

2/23/2009 8:17:14 PM -- Performance logging begins (interval: 7500 ms).

2/23/2009 8:17:14 PM -- Verifying database checksums …

2/23/2009 8:36:55 PM -- M: (100% processed)

2/23/2009 8:36:56 PM -- Performance logging ends.

2/23/2009 8:36:56 PM -- C:\Data\Jetstress\DBChecksum_2009_2_23_20_17_14.blg has 157 samples.

2/23/2009 8:37:00 PM -- C:\Data\Jetstress\DBChecksum_2009_2_23_20_17_14.html is saved.

2/23/2009 8:37:00 PM -- Verifying log checksums …

2/23/2009 8:37:01 PM -- L:\01 (22 logs passed)

2/23/2009 8:37:01 PM -- C:\Data\Jetstress\Performance_2009_2_23_18_16_53.blg has 480 samples.

2/23/2009 8:37:01 PM -- Creating test report …

2/23/2009 8:37:05 PM -- Volume M: has 0.0120 for Avg. Disk sec/Read.

2/23/2009 8:37:05 PM -- Volume L: has 0.0025 for Avg. Disk sec/Write.

2/23/2009 8:37:05 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 8:37:05 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.

2/23/2009 8:37:05 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.

2/23/2009 8:37:05 PM -- C:\Data\Jetstress\Performance_2009_2_23_18_16_53.xml has 479 samples queried.
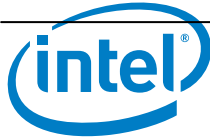
Microsoft Exchange Server Jetstress

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	16374402	0	0	0	127925 MBytes / 1179 seconds
(Sum)	16374402	0	0	0	127925 MBytes / 1180 seconds

Disk Subsystem Performance (of checksum)

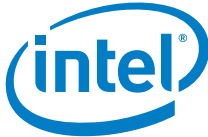| LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec
M:	0.051	0.000	1732.667	0.010

Memory System Performance (of checksum)

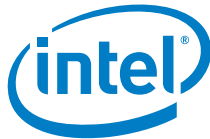| Counter	Average	Minimum	Maximum
% Processor Time	1.779	0.964	2.656
Available MBytes	3384.599	3378.000	3387.000
Free System Page Table Entries	4170416.000	4170416.000	4170416.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	34414931.159	34406400.000	34443264.000
Pool Paged Bytes	46424168.357	46022656.000	47095808.000

Test Log

2/23/2009 3:42:53 PM -- Jetstress testing begins …
2/23/2009 3:42:53 PM -- Prepare testing begins …
2/23/2009 3:42:53 PM -- Creating M:\01\Jetstress1.edb.
2/23/2009 3:42:53 PM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)
2/23/2009 3:42:53 PM -- Database flush thresholds: (start: 2.6 MB, stop: 5.1 MB)
2/23/2009 4:45:32 PM -- 60.0% of 122.1 GB complete (4463139 records inserted).
2/23/2009 5:45:04 PM -- 100.0% of 122.1 GB complete (7131247 records inserted).
2/23/2009 5:45:12 PM -- Attaching databases …
2/23/2009 5:45:12 PM -- Prepare testing ends.
2/23/2009 5:45:12 PM -- Dispatching transactions begins …
2/23/2009 5:45:12 PM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)
2/23/2009 5:45:12 PM -- Database flush thresholds: (start: 2.6 MB, stop: 5.1 MB)
2/23/2009 5:45:13 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).
2/23/2009 5:45:13 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).
2/23/2009 5:45:14 PM -- Attaining prerequisites:
2/23/2009 5:48:51 PM -- \Database(JetstressWin)\Database Cache Size, Last: 241705000.0 (lower bound: 241591900.0, upper bound: none)
2/23/2009 5:48:52 PM -- Performance logging begins (interval: 5000 ms).
2/23/2009 5:48:52 PM -- Automatic tuning begins …
2/23/2009 5:49:22 PM -- Volume M: has 0.00062 for read latency slope.
2/23/2009 5:49:52 PM -- Volume M: has 0.00020 for read latency slope.

2/23/2009 5:51:52 PM -- 212 batch transactions/sec and 16 sessions have 384 IOPS.
2/23/2009 5:51:52 PM -- 16 sessions have actual 384 IOPS (target IOPS: 250)
2/23/2009 5:51:52 PM -- Volume M: has 0.0308 for Avg. Disk sec/Read.
2/23/2009 5:51:52 PM -- Process has average database read latencies higher than 0.020.
2/23/2009 5:51:52 PM -- Volume L: has 0.0020 for Avg. Disk sec/Write.
2/23/2009 5:51:52 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/23/2009 5:51:52 PM -- Operation mix: Sessions 8, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
2/23/2009 5:52:22 PM -- Volume M: has 0.00003 for read latency slope.
2/23/2009 5:54:22 PM -- 184 batch transactions/sec and 8 sessions have 334 IOPS.
2/23/2009 5:54:22 PM -- 8 sessions have actual 334 IOPS (target IOPS: 250)
2/23/2009 5:54:22 PM -- Volume M: has 0.0219 for Avg. Disk sec/Read.
2/23/2009 5:54:22 PM -- Process has average database read latencies higher than 0.020.
2/23/2009 5:54:22 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.
2/23/2009 5:54:22 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/23/2009 5:54:22 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
2/23/2009 5:54:52 PM -- Volume M: has 0.00003 for read latency slope.
2/23/2009 5:56:52 PM -- 141 batch transactions/sec and 4 sessions have 274 IOPS.
2/23/2009 5:56:52 PM -- 4 sessions have actual 274 IOPS (target IOPS: 250)
2/23/2009 5:56:52 PM -- Volume M: has 0.0217 for Avg. Disk sec/Read.
2/23/2009 5:56:52 PM -- Process has average database read latencies higher than 0.020.
2/23/2009 5:56:52 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.
2/23/2009 5:56:52 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/23/2009 5:56:52 PM -- Operation mix: Sessions 2, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
2/23/2009 5:57:22 PM -- Volume M: has 0.00003 for read latency slope.
2/23/2009 5:59:22 PM -- 104 batch transactions/sec and 2 sessions have 205 IOPS.
2/23/2009 5:59:22 PM -- 2 sessions have actual 205 IOPS (target IOPS: 250)
2/23/2009 5:59:22 PM -- Volume M: has 0.0110 for Avg. Disk sec/Read.
2/23/2009 5:59:22 PM -- Volume L: has 0.0028 for Avg. Disk sec/Write.
2/23/2009 5:59:22 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/23/2009 5:59:22 PM -- Operation mix: Sessions 3, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
2/23/2009 5:59:52 PM -- Volume M: has 0.00011 for read latency slope.
2/23/2009 6:01:52 PM -- 117 batch transactions/sec and 3 sessions have 245 IOPS.
2/23/2009 6:01:52 PM -- 3 sessions have actual 245 IOPS (target IOPS: 250)
2/23/2009 6:01:52 PM -- Volume M: has 0.0165 for Avg. Disk sec/Read.
2/23/2009 6:01:52 PM -- M: has 7 maximum database read latency errors.
2/23/2009 6:01:52 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.
2/23/2009 6:01:52 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/23/2009 6:01:52 PM -- Operation mix: Sessions 1, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
2/23/2009 6:02:22 PM -- Volume M: has 0.00014 for read latency slope.
2/23/2009 6:04:22 PM -- 69 batch transactions/sec and 1 sessions have 141 IOPS.
2/23/2009 6:04:22 PM -- 1 sessions have actual 141 IOPS (target IOPS: 250)
2/23/2009 6:04:22 PM -- Volume M: has 0.0095 for Avg. Disk sec/Read.
2/23/2009 6:04:22 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.
2/23/2009 6:04:22 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/23/2009 6:04:22 PM -- Operation mix: Sessions 3, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
2/23/2009 6:04:52 PM -- Volume M: has 0.00016 for read latency slope.
2/23/2009 6:06:52 PM -- 120 batch transactions/sec and 3 sessions have 240 IOPS.
2/23/2009 6:06:52 PM -- 3 sessions have actual 240 IOPS (target IOPS: 250)
2/23/2009 6:06:52 PM -- Volume M: has 0.0146 for Avg. Disk sec/Read.
2/23/2009 6:06:52 PM -- Volume L: has 0.0025 for Avg. Disk sec/Write.
2/23/2009 6:06:52 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.

2/23/2009 6:06:52 PM -- Operation mix: Sessions 2, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
2/23/2009 6:07:22 PM -- Volume M: has 0.00004 for read latency slope.
2/23/2009 6:09:22 PM -- 95 batch transactions/sec and 2 sessions have 205 IOPS.
2/23/2009 6:09:22 PM -- 2 sessions have actual 205 IOPS (target IOPS: 250)
2/23/2009 6:09:22 PM -- Volume M: has 0.0125 for Avg. Disk sec/Read.
2/23/2009 6:09:22 PM -- Volume L: has 0.0026 for Avg. Disk sec/Write.
2/23/2009 6:09:22 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/23/2009 6:09:22 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
2/23/2009 6:09:52 PM -- Volume M: has 0.00014 for read latency slope.
2/23/2009 6:11:52 PM -- 133 batch transactions/sec and 4 sessions have 284 IOPS.
2/23/2009 6:11:52 PM -- 4 sessions have actual 284 IOPS (target IOPS: 250)
2/23/2009 6:11:52 PM -- Volume M: has 0.0225 for Avg. Disk sec/Read.
2/23/2009 6:11:52 PM -- Process has average database read latencies higher than 0.020.
2/23/2009 6:11:52 PM -- Volume L: has 0.0025 for Avg. Disk sec/Write.
2/23/2009 6:11:52 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/23/2009 6:11:52 PM -- Operation mix: Sessions 2, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
2/23/2009 6:12:22 PM -- Volume M: has 0.00023 for read latency slope.
2/23/2009 6:14:22 PM -- 98 batch transactions/sec and 2 sessions have 206 IOPS.
2/23/2009 6:14:22 PM -- 2 sessions have actual 206 IOPS (target IOPS: 250)
2/23/2009 6:14:22 PM -- Volume M: has 0.0130 for Avg. Disk sec/Read.
2/23/2009 6:14:22 PM -- Volume L: has 0.0024 for Avg. Disk sec/Write.
2/23/2009 6:14:22 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/23/2009 6:14:22 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
2/23/2009 6:14:52 PM -- Volume M: has 0.00012 for read latency slope.
2/23/2009 6:16:52 PM -- 139 batch transactions/sec and 4 sessions have 280 IOPS.
2/23/2009 6:16:52 PM -- 4 sessions have actual 280 IOPS (target IOPS: 250)
2/23/2009 6:16:52 PM -- Volume M: has 0.0155 for Avg. Disk sec/Read.
2/23/2009 6:16:52 PM -- Volume L: has 0.0025 for Avg. Disk sec/Write.
2/23/2009 6:16:52 PM -- Volume L: has 0.0000 for Avg. Disk sec/Read.
2/23/2009 6:16:53 PM -- Performance logging ends.
2/23/2009 6:16:53 PM -- Automatic tuning succeeded.
2/23/2009 6:16:54 PM -- Operation mix: Sessions 4, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
2/23/2009 6:16:54 PM -- Performance logging begins (interval: 15000 ms).
2/23/2009 6:16:54 PM -- Attaining prerequisites:
2/23/2009 6:16:54 PM -- \Database(JetstressWin)\Database Cache Size, Last: 268238800.0 (lower bound: 241591900.0, upper bound: none)
2/23/2009 8:16:56 PM -- Performance logging ends.
2/23/2009 8:16:56 PM -- JetInterop batch transaction stats: 74727.
2/23/2009 8:16:57 PM -- Dispatching transactions ends.
2/23/2009 8:16:57 PM -- Shutting down databases …
2/23/2009 8:17:14 PM -- Instance796.1 (complete)
2/23/2009 8:17:14 PM -- Performance logging begins (interval: 7500 ms).
2/23/2009 8:17:14 PM -- Verifying database checksums …
2/23/2009 8:36:55 PM -- M: (100% processed)
2/23/2009 8:36:56 PM -- Performance logging ends.
2/23/2009 8:36:56 PM -- C:\Data\Jetstress\DBChecksum_2009_2_23_20_17_14.blg has 157 samples.