

ESRP Storage Program
EMC CLARiiON CX3-20c (600 User) iSCSI
Storage Solution for Microsoft Exchange Server 2007

Tested with: ESRP – Storage Version 2.0
Tested Date: 12/04/07

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EMC CLARiON CX3-20c (600 User) iSCSI Storage Solution for Microsoft Exchange Server 2007

Part Number: H4469

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Overview

This document provides information on EMC's CLARiiON® CX3-20c (600 user) iSCSI Storage Solution for Microsoft Exchange Server 2007, which is based on the *Microsoft Exchange Solution Reviewed Program (ESRP) – Storage program**. For any questions or comments regarding the contents of this document, see the Contact information section.

*The *ESRP – Storage* program was developed by Microsoft Corporation to provide a common storage testing framework for EMC and to provide information on its storage solutions for the Microsoft Exchange Server software. For more details on the *Microsoft ESRP – Storage* program, please visit: <http://www.microsoft.com/technet/prodtechnol/exchange/2007/esrp.msp>

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Features

This document describes an approach that can be used to configure Exchange solutions around EMC's CLARiiON CX3-20c storage systems. Built on the innovative EMC® CLARiiON CX3 UltraScale™ architecture, the EMC CX3-20c offers exceptional performance, ease of use, and unmatched reliability. It meets the storage needs of a wide range of applications including:

- Mail / Messaging
- Databases
- File, print, and Web services
- Distributed applications
- Remote replication

In addition, the CX3-20c supports a wide range of server operating environments such as: Microsoft Windows, Linux, Solaris, AIX, HP-UX, and VMware ESX Server.

EMC's CLARiiON CX3-20c Fibre Channel (FC) / iSCSI array offers 4 GB/s FC and 1 GB/s iSCSI ports that are fully integrated in the same array, enabling customers to leverage their networked storage investments over a broader range of servers and applications with complete flexibility without additional hardware. A total of eight iSCSI ports (four per SP) and four FC ports (two per SP) are available on each CX3-20c array.

The CLARiiON CX3-20c FC / iSCSI array provides customers with an advantage, irrespective of whether they have iSCSI or FC deployed. For customers who are implementing networked storage for the first time and are considering iSCSI, the CLARiiON CX3-20c FC / iSCSI array provides scalable iSCSI storage as well as the flexibility and investment protection of integrated FC support.

For customers with existing FC deployments, the CX3-20c FC / iSCSI array offers the opportunity to expand the reach of their networked storage environment economically with iSCSI, while maintaining complete flexibility with how the incremental capacity is shared across server platforms and interconnects.

With the CX3-20c FC / iSCSI array, customers can choose drive options that meet their specific needs, thereby providing multiple levels of performance in one system. The CX3-20c supports both high-performance and high-capacity disk drives in the same system; it can scale from 365 GB to 59 TB, and can support 128 high-availability hosts.

It supports 4 GB/s (15k rpm) FC drives for demanding applications that require maximum performance. Customers can also choose from 2 GB/s FC (10k rpm) for applications that require balanced performance and costs. Alternatively, customers have the option to choose low-cost 2 GB/s FC drives (7.2k rpm) for Tier 2 applications that require high-capacity and low cost, such as disk-based backup.

The CX3-20c delivers tiered storage that allows customers to provide the right level of performance to the right applications. The system also delivers an exceptional 4 GB/s of performance throughout the entire system without compromises or bottlenecks. Performance-boosting features include four front-end and two back-end 4 GB/s ports, plus state-of-the art low latency, high bandwidth I/O interconnect technologies.

The performance results and best practices discussed in this document provide tested guidelines for configuring the CX3-20c for a high-performance Exchange environment. For this solution, an EMC CLARiiON CX3-20c storage solution for Microsoft Exchange Server was used and configured for 600 Exchange 2007 users.

The server was connected to the CX3-20c through dedicated NICs (used for iSCSI) with the Microsoft iSCSI Software Initiator 2.0.5, and an iSCSI VLAN. Each of the 600 users had a profile of .42 IOPS with a 600 MB mailbox requirement.

Solution description

The solution described uses a single CX3-20c array with a single disk-array enclosure (DAE) that uses four drives for storage group database files, four drives for storage group log files, and five drives for streaming backup with one hot spare drive.

Database drives are then placed on drives 0_10-0_13. The log files are placed on the first four drives 0_0-0_3 each in a RAID 10 configuration. Streaming backup drives are placed on the 0_5-0_9 in a RAID 5 configuration and drive 0_14 is configured as a dedicated hot spare.

Sizing and configuring storage for use with Microsoft Exchange Server is a complicated process, driven by many variables and factors, which vary from one organization to another.

The sizing method described in this ESRP submission is known as the “building block,” which is used to simplify sizing and configuration when using a low number of disks to ensure the highest performance while remaining fault tolerant.

This unit of measure (or building block) is designed to be scalable - based on customer I/O and latency requirements. The building blocks are designed around the Exchange database drives in four-drive increments using RAID 1_0. The Exchange log files are placed onto a four-drive RAID 1_0 configuration that is capable of holding multiple building blocks of storage group log files.

The building block is also designed to expand into larger building block deployments. These deployments are detailed in EMC ESRP submission documents (for over 4,000 users) on EMC.com.

Figure 1 illustrates the building block layout for this ESRP submission.

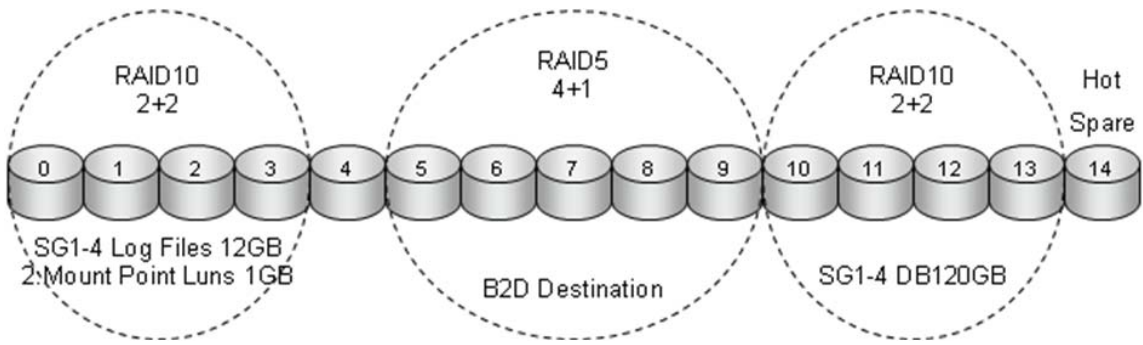


Figure 1 Building block layout

Figure 2 illustrates the physical architecture for the ESRP submission.

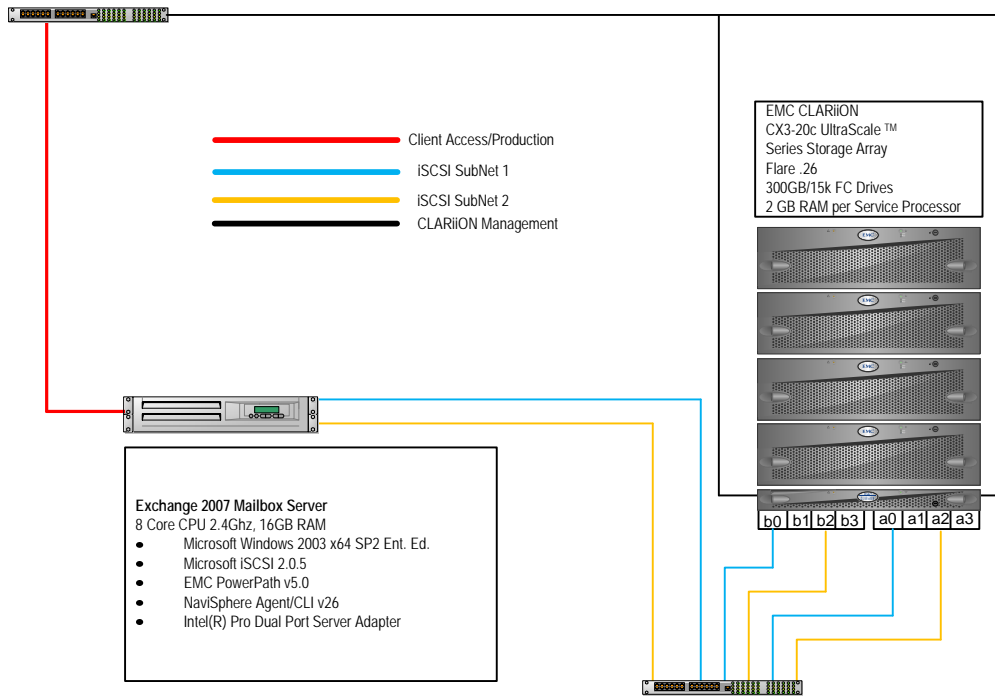


Figure 2 Physical architecture

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 scaling for an Exchange solution. Other factors that affect 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
- Client usage profiles

All these factors are beyond the scope of ESRP-Storage. Therefore, the number of mailboxes hosted per server as part of the tested configuration may not necessarily be viable for some customer deployments.

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>

Targeted customer profile

This solution is intended for small- and medium-sized businesses hosting 600 Exchange mailboxes. The configuration used for testing is as below:

- Number of mailbox servers presented to the storage array = 1
- User I/O profile for testing = 0.42
- User mailbox size for testing = 600 MB
- Backup strategy for testing = streaming backup to disk
- Time for restore = less than 3 hours per SG, and 100 GB database per SG tested

Tested deployment

The following tables summarize the testing environment.

Simulated Exchange configuration

| Item | Description |
|---|--------------------|
| Number of Exchange mailboxes simulated | 600 |
| Number of hosts | 1 |
| Number of mailboxes/host | 600 |
| Number of storage groups/host | 4 |
| Number of mailbox stores/storage group | 1 |
| Number of mailboxes/mailbox store | 150 |
| Number of mailbox store LUNs/storage group | 1 |
| Simulated profile: I/Os per second per mailbox (IOPS, include 20% headroom) | 0.5 |
| Database LUN size | 120 GB |
| Log LUN size | 12 GB |
| Backup LUN size/storage group | Not applicable |
| Total database size for performance testing | 100 GB |
| % Storage capacity used by Exchange database** | 80% |

**Storage performance characteristics change based on the percentage utilization of the individual disks. Tests that use a small percentage of the storage (~25%) may exhibit reduced throughput if the storage capacity utilization is significantly increased beyond what is tested in this paper.

Primary storage hardware

| Item | Description |
|--|--|
| Storage connectivity (Fibre Channel, SAS, SATA, iSCSI) | iSCSI |
| Storage model and OS/firmware revision | CX3-20c FLARE® 26 |
| Storage cache | 2 GB/SP |
| Number of storage controllers | 2 |
| Number of storage ports | 4 tested – 8 possible |
| Maximum bandwidth of storage connectivity to host | 4*1 Gb per SP |
| Switch type/model/firmware revision | Dell 5324 Version 2.0.0.39 |
| HBA model and firmware | Intel PRO/1000 PT Dual Port Server Adapter |
| Number of HBAs/host | 2 |
| Host server type | Dell PowerEdge 2950 4: Dual Core [01]: EM64T Family 6 Model 15 Stepping 7 GenuineIntel ~2328 Mhz [02]: EM64T Family 6 Model 15 Stepping 7 GenuineIntel ~2328 Mhz [03]: EM64T Family 6 Model 15 Stepping 7 GenuineIntel ~2328 Mhz [04]: EM64T Family 6 Model 15 Stepping 7 GenuineIntel ~2328 Mhz [05]: EM64T Family 6 Model 15 Stepping 7 GenuineIntel ~2328 Mhz [06]: EM64T Family 6 Model 15 Stepping 7 GenuineIntel ~2328 Mhz [07]: EM64T Family 6 Model 15 Stepping 7 GenuineIntel ~2328 Mhz [08]: EM64T Family 6 Model 15 Stepping 7 GenuineIntel ~2328 Mhz |
| Total number of disks tested in solution | 14 with hotspare |
| Maximum number of spindles that can be hosted in the storage | 15 |

Primary storage software

| Item | Description |
|-----------------------------------|---|
| HBA driver | c:\windows\system32\drivers\le5132.sys 9.9.13.0 built by : winDDK 6/19/2007 10:47am 348,568 |
| HBA QueueTarget Setting | Not applicable |
| HBA QueueDepth Setting | Not applicable |
| Multi-Pathing | Microsoft iSCSI Initiator 2.0 Build 3392 EMC powermt for PowerPath® 5.0.0 (build 94) |
| Host OS | Microsoft Windows Server 2003 Enterprise x64 Edition OS Version: 5.2.3790 Service Pack 2 |
| ESE.dll file version | 08.00.0685.024 |
| Replication solution name/version | Not applicable |

Primary storage disk configuration (mailbox store disks)

| Item | Description |
|---|-----------------------------------|
| Disk type, speed and firmware revision | FC SCSI: 4 GB/s, 15,000 rpm, 630A |
| Raw capacity per disk (GB) | 268.403 GB |
| Number of physical disks in test | 4 |
| Total raw storage capacity (GB) | 1073.612 GB |
| Disk slice size (GB) | Not applicable |
| Number of slices per LUN or number of disks per LUN | Not applicable |
| Number of LUNs per RAID group | 4 |
| LUN size in GB | 120 |
| RAID level | RAID 1_0 |
| Total formatted capacity | 480 GB |
| Storage capacity utilization | 44% |
| Database capacity utilization | 80% |

Primary storage disk configuration (transactional log disks)

| Item | Description |
|---|-----------------------------------|
| Disk type, speed and firmware revision | FC SCSI: 4 GB/s, 15,000 rpm, 630A |
| Raw capacity per disk (GB) | 268.403 GB |
| Number of spindles in test | 4 |
| Total raw storage capacity (GB) | 1073.612 GB |
| Disk slice size (GB) | Not applicable |
| Number of slices per LUN or number of disks per LUN | Not applicable |
| Number of LUNs per RAID group | 4 |
| LUN size in GB | 12 |
| RAID level | RAID 1_0 |
| Total formatted capacity | 48 GB |

Streaming backup

Disk configuration (streaming backup to disk)

| Item | Description |
|---|-----------------------------------|
| Disk type, speed and firmware revision | FC SCSI: 4 GB/s, 15,000 rpm, 630A |
| Raw capacity per disk (GB) | 268.403 GB |
| Number of spindles in test | 5 |
| Total raw storage capacity (GB) | 1342.015 GB |
| Disk slice size (GB) | Not applicable |
| Number of slices per LUN or number of disks per LUN | Not applicable |
| Number of LUNs per RAID group | 1 |
| RAID level | RAID 5 |
| Total formatted capacity | 1073.612 GB |

Best practices

Microsoft Exchange Server is a disk-intensive application. Based on the testing that is run using the ESRP framework, EMC would recommend the Exchange 2007 best practices to improve the storage performance.

For Exchange 2007 best practices on storage design, please visit:
<http://technet.microsoft.com/en-us/library/bb124518.aspx>

Core storage/replication

1. Use diskpart (in Microsoft Windows 2003 SP2 x64) to align all disks used with Microsoft Exchange, using a value of 64 for CLARiiON. This aligns all of the Exchange-related NTFS partitions on a 64 KB boundary.
2. Isolate the Microsoft Exchange database workload from other I/O intensive applications or workloads. This ensures the highest levels of performance for Microsoft Exchange and makes troubleshooting efforts easier in the event of a disk-related Microsoft Exchange performance issue.
3. TcpAckFrequency = 1 for each iSCSI connection. Refer to:
<http://support.microsoft.com/kb/328890>.
4. Size and configure the environment for spindle performance as a primary consideration, with storage capacity as secondary.
5. iSCSI configuration with PowerPath 5.0 uses a balanced path approach. Log in with NIC0 to A0(SPa) and B0(SPb), NIC1 to A2(SPa) and B2(SPb).
6. Tuning the CX3-20c storage system parameters is important for obtaining best performance. The following list details the optimal parameters for Exchange:
 - Cache page size of 8 KB
 - Balance read and write caching
 - Read and write cache enabled for all LUNs
 - Read cache minimum of 50 - 100 MB for prefetch

See the following Microsoft documentation for storage-based replication best practices and support criteria:

Deployment Guidelines for Data Replication:

<http://www.microsoft.com/technet/prodtechnol/exchange/guides/E2k3DataRepl/bedf62a9-dff7-49a8-bd27-b2f1c46d5651.mspx>

Multi-site data replication support for Exchange:

<http://support.microsoft.com/?kbid=895847>

Backup strategy

This solution used RAID 5 for the backup-to-disk LUNs (to maximize space), and then used EMC NetWorker[®] or NTBackup for backup to CDL or tape for long-term storage of databases.

Test result summary

This section provides a high-level summary of the test data from ESRP. [Microsoft Exchange Server Jetstress 2-hour performance test results](#), [Microsoft Exchange Server Jetstress 24-hour performance test results](#), [Microsoft Exchange Server Jetstress soft recovery test results](#), and the [Microsoft Exchange Server Jetstress streaming backup test results](#) contain detailed HTML reports that are generated by the ESRP testing framework.

Reliability

A number of tests in the framework are to check the 24-hour reliability tests. The goal is to verify that the storage can handle high I/O load for a long period of time. Both the log and database files are analyzed for integrity after the stress test to ensure there was no database or log corruption.

- No errors reported in the saved eventlog file
- No errors reported during the database and log
- Event ID: 215 as expected at the end of the Jetstress run for streaming backup
- No errors during database checksum on the remote storage database

Primary storage performance results

The primary storage performance testing is designed to exercise the storage with the 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 logical disk I/Os, and the average of all the logical disk I/O latency in the 2-hour test duration. Each server is listed separately and the aggregate numbers across all servers is also listed.

Individual server metrics

The following table details the sum of I/O across storage groups and the average latency across all storage groups on a per server basis.

| Database I/O | |
|--|---------|
| Average database disk transfers/sec | 322.828 |
| Average database disk reads/sec | 160.699 |
| Average database disk writes/sec | 162.129 |
| Average database disk read latency (ms) | 0.0085 |
| Average database disk write latency (ms) | 0.003 |
| Transaction log I/O | |
| Average log disk writes/sec | 114.901 |
| Average log disk write latency (ms) | 0.001 |

Streaming backup performance

For the 1.0 release, only streaming backup is supported for framework testing. There are two tests in this section: the first test is to measure the read I/O performance metrics by running checksum on all the databases and log files, the second test is to measure the end-to-end performance when the databases are backed up to disks.

Database read-only performance

This test is to measure the maximum rate for the databases (streaming backup). The following table shows the average rate for a single database file.

| Item | Description |
|-------------------------------|--------------------|
| MB read/sec per storage group | 10.245 |
| MB read/sec total | 40.98 |
| File size/sec taken | 387947.08/37889 |

Log read-only performance

This test is to measure the maximum rate that the log files can be played against the databases. The following table shows the average rate for 500 log files played in a single storage group. Each log file is 1 MB in size.

| Item | Description |
|---|--------------------|
| Average time to play one log file (sec) | 0.551669121 |

Backup-to-disk performance

This test runs a backup on all the database files, and stores them on disks. The following table lists the average rate that each storage group can be backed up.

| Item | Description |
|--|--------------------|
| Total database size per storage group (GB) | 378.8545703 |
| Time taken to back up each storage group | 2:37:52 |
| Average MB backed up/sec per storage group | 10.24574459 |

Conclusion

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

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

Contact information

EMC recommends that you consult with EMC Professional Services to assist with the design and deployment of a similar solution. For information regarding this or any other EMC Solution, please use the following numbers:

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Canada: (800) 543-4782 (543-4SVC)
Worldwide: (508) 497-7901

For additional information on EMC products and services available to customers and partners, please refer to:

<http://EMC.com> or <http://powerlink.EMC.com>

Microsoft Exchange Server Jetstress 2-hour performance test results

Performance test result report

Test summary

Overall Test **Pass**

Result

Machine Name 6TTRGD1

Test Description

Test Start Time 10/11/2007 4:23:26 AM

Test End Time 10/11/2007 6:41:36 AM

Jetstress Version 08.01.0177.000

Ese Version 08.00.0685.024

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

Performance Log C:\Q4\Jetstress\4SG\1t\perf4-with evt cleared\Performance_2007_10_11_4_23_35.blg
C:\Q4\Jetstress\4SG\1t\perf4-with evt cleared\DBChecksum_2007_10_11_6_41_36.blg

Database sizing and throughput

Achieved I/O per Second 322.826

Capacity Percentage 100%

Throughput Percentage 100%

Initial database size 412311683072

Final database size 415792955392

Database files (count) 4

Jetstress system parameters

Thread count 1 (per-storage group)

Log buffers 9000

Minimum database cache 128.0 MB

Maximum database cache 1024.0 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 (t:\sg1db) | 0.009 | 0.003 | 39.605 | 40.455 | (n/a) |
| Database (t:\sg2db) | 0.008 | 0.003 | 40.561 | 40.303 | (n/a) |
| Database (s:\sg3db) | 0.009 | 0.003 | 39.784 | 41.171 | (n/a) |
| Database (s:\sg4db) | 0.008 | 0.003 | 40.749 | 40.200 | (n/a) |
| Log (s:\sg1lg) | 0.000 | 0.001 | 0.000 | 28.779 | 9807.859 |
| Log (s:\sg2lg) | 0.000 | 0.001 | 0.000 | 28.359 | 9857.304 |
| Log (t:\sg3lg) | 0.000 | 0.001 | 0.000 | 28.836 | 10077.139 |
| Log (t:\sg4lg) | 0.000 | 0.001 | 0.000 | 28.927 | 9833.654 |

Host system performance

| Counter | Average | Minimum | Maximum |
|---------------------------------|--------------|--------------|--------------|
| % Processor Time | 0.741 | 0.000 | 1.263 |
| Available MBytes | 14711.892 | 14708.000 | 14812.000 |
| Free System Page Table Entries | 16758305.167 | 16758291.000 | 16758311.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 57287722.667 | 57053184.000 | 57499648.000 |
| Pool Paged Bytes | 42541465.600 | 42508288.000 | 42573824.000 |
| Database Page Fault Stalls/sec | 0.000 | 0.000 | 0.000 |

Test Log

10/11/2007 4:23:25 AM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c "C:\Q4\Jetstress\4SG\1t\perf4-with evt cleared\Perf.xml"

10/11/2007 4:23:25 AM -- Jetstress testing begins ...

10/11/2007 4:23:26 AM -- Prepare testing begins ...

10/11/2007 4:23:30 AM -- Attaching databases ...

10/11/2007 4:23:30 AM -- Prepare testing ends.

10/11/2007 4:23:30 AM -- Dispatching transactions begins ...

10/11/2007 4:23:30 AM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)

10/11/2007 4:23:30 AM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)

10/11/2007 4:23:35 AM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).

10/11/2007 4:23:35 AM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).

10/11/2007 4:23:36 AM -- Operation mix: Sessions 1, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

10/11/2007 4:23:36 AM -- Performance logging begins (interval: 15000 ms).

10/11/2007 4:23:36 AM -- Attaining prerequisites:

10/11/2007 4:41:31 AM -- \Database(JetstressCmd)\Database Cache Size, Last: 966516700.0

(lower bound: 966367600.0, upper bound: none)
10/11/2007 6:41:33 AM -- Performance logging ends.
10/11/2007 6:41:33 AM -- JetInterop batch transaction stats: 20771, 20766, 20746, and 21000.
10/11/2007 6:41:33 AM -- Dispatching transactions ends.
10/11/2007 6:41:33 AM -- Shutting down databases ...
10/11/2007 6:41:36 AM -- Instance636.1 (complete), Instance636.2 (complete), Instance636.3 (complete), and Instance636.4 (complete)
10/11/2007 6:41:36 AM -- Performance logging begins (interval: 15000 ms).
10/11/2007 6:41:36 AM -- Verifying database checksums ...
10/11/2007 7:36:32 AM -- t:\sg1db (100% processed), t:\sg2db (100% processed), s:\sg3db (100% processed), and s:\sg4db (100% processed)
10/11/2007 7:36:33 AM -- Performance logging ends.
10/11/2007 7:36:33 AM -- [C:\Q4\Jetstress\4SG\1t\perf4-with evt cleared\DBChecksum 2007 10 11 6 41 36.blg](#) has 219 samples.
10/11/2007 7:36:37 AM -- [C:\Q4\Jetstress\4SG\1t\perf4-with evt cleared\DBChecksum 2007 10 11 6 41 36.html](#) is saved.
10/11/2007 7:36:37 AM -- Verifying log checksums ...
10/11/2007 7:36:42 AM -- s:\sg1lg (22 logs passed), s:\sg2lg (21 logs passed), t:\sg3lg (22 logs passed), and t:\sg4lg (22 logs passed)
10/11/2007 7:36:42 AM -- [C:\Q4\Jetstress\4SG\1t\perf4-with evt cleared\Performance 2007 10 11 4 23 35.blg](#) has 551 samples.
10/11/2007 7:36:42 AM -- Creating test report ...
10/11/2007 7:36:46 AM -- Volume t:\sg1db has 0.0086 for Avg. Disk sec/Read.
10/11/2007 7:36:46 AM -- Volume t:\sg2db has 0.0078 for Avg. Disk sec/Read.
10/11/2007 7:36:46 AM -- Volume s:\sg3db has 0.0089 for Avg. Disk sec/Read.
10/11/2007 7:36:46 AM -- Volume s:\sg4db has 0.0080 for Avg. Disk sec/Read.
10/11/2007 7:36:46 AM -- Volume s:\sg1lg has 0.0009 for Avg. Disk sec/Write.
10/11/2007 7:36:46 AM -- Volume s:\sg1lg has 0.0000 for Avg. Disk sec/Read.
10/11/2007 7:36:46 AM -- Volume s:\sg2lg has 0.0009 for Avg. Disk sec/Write.
10/11/2007 7:36:46 AM -- Volume s:\sg2lg has 0.0000 for Avg. Disk sec/Read.
10/11/2007 7:36:46 AM -- Volume t:\sg3lg has 0.0009 for Avg. Disk sec/Write.
10/11/2007 7:36:46 AM -- Volume t:\sg3lg has 0.0000 for Avg. Disk sec/Read.
10/11/2007 7:36:46 AM -- Volume t:\sg4lg has 0.0009 for Avg. Disk sec/Write.
10/11/2007 7:36:46 AM -- Volume t:\sg4lg has 0.0000 for Avg. Disk sec/Read.
10/11/2007 7:36:46 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
10/11/2007 7:36:46 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.
10/11/2007 7:36:46 AM -- [C:\Q4\Jetstress\4SG\1t\perf4-with evt cleared\Performance 2007 10 11 4 23 35.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 |
|-------------------------|------------|-----------|-------------------|---------------------|------------------------------|
| t:\sg1db\Jetstress1.edb | 12689506 | 0 | 0 | 0 | 99136 MBytes / 3099 seconds |
| t:\sg2db\Jetstress1.edb | 12688482 | 0 | 0 | 0 | 99128 MBytes / 3295 seconds |
| s:\sg3db\Jetstress1.edb | 12693346 | 0 | 0 | 0 | 99166 MBytes / 3276 seconds |
| s:\sg4db\Jetstress1.edb | 12684642 | 0 | 0 | 0 | 99098 MBytes / 2707 seconds |
| (Sum) | 50755976 | 0 | 0 | 0 | 396531 MBytes / 3295 seconds |

Disk subsystem performance (of checksum)

| LogicalDisk | Avg. Disk sec/Read | Avg. Disk sec/Write | Disk Reads/sec | Disk Writes/sec |
|-------------|--------------------|---------------------|----------------|-----------------|
| t:\sg1db | 0.141 | 0.002 | 512.579 | 0.003 |
| t:\sg2db | 0.154 | 0.002 | 477.726 | 0.001 |
| s:\sg3db | 0.148 | 0.001 | 483.807 | 0.001 |
| s:\sg4db | 0.142 | 0.003 | 588.321 | 0.004 |

Memory system performance (of checksum)

| Counter | Average | Minimum | Maximum |
|---------------------------------|--------------|--------------|--------------|
| % Processor Time | 9.221 | 5.528 | 10.768 |
| Available MBytes | 15546.694 | 15524.000 | 15727.000 |
| Free System Page Table Entries | 16758061.320 | 16758061.000 | 16758131.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 79216864.438 | 74141696.000 | 80797696.000 |
| Pool Paged Bytes | 42636947.288 | 42610688.000 | 43163648.000 |

Test Log

10/11/2007 4:23:25 AM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c "C:\Q4\Jetstress\4SG\1t\perf4-with evt cleared\Perf.xml"

10/11/2007 4:23:25 AM -- Jetstress testing begins ...

10/11/2007 4:23:26 AM -- Prepare testing begins ...

10/11/2007 4:23:30 AM -- Attaching databases ...

10/11/2007 4:23:30 AM -- Prepare testing ends.

10/11/2007 4:23:30 AM -- Dispatching transactions begins ...

10/11/2007 4:23:30 AM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)

10/11/2007 4:23:30 AM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)

10/11/2007 4:23:35 AM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).
10/11/2007 4:23:35 AM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).
10/11/2007 4:23:36 AM -- Operation mix: Sessions 1, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
10/11/2007 4:23:36 AM -- Performance logging begins (interval: 15000 ms).
10/11/2007 4:23:36 AM -- Attaining prerequisites:
10/11/2007 4:41:31 AM -- \Database(JetstressCmd)\Database Cache Size, Last: 966516700.0 (lower bound: 966367600.0, upper bound: none)
10/11/2007 6:41:33 AM -- Performance logging ends.
10/11/2007 6:41:33 AM -- JetInterop batch transaction stats: 20771, 20766, 20746, and 21000.
10/11/2007 6:41:33 AM -- Dispatching transactions ends.
10/11/2007 6:41:33 AM -- Shutting down databases ...
10/11/2007 6:41:36 AM -- Instance636.1 (complete), Instance636.2 (complete), Instance636.3 (complete), and Instance636.4 (complete)
10/11/2007 6:41:36 AM -- Performance logging begins (interval: 15000 ms).
10/11/2007 6:41:36 AM -- Verifying database checksums ...
10/11/2007 7:36:32 AM -- t:\sg1db (100% processed), t:\sg2db (100% processed), s:\sg3db (100% processed), and s:\sg4db (100% processed)
10/11/2007 7:36:33 AM -- Performance logging ends.
10/11/2007 7:36:33 AM -- [C:\Q4\Jetstress\4SG\1t\perf4-with evt cleared\DBChecksum 2007 10 11 6 41 36.blg](#) has 219 samples.

Microsoft Exchange Server Jetstress 24-hour performance test results

Stress test result report

Test summary

Overall Test Result **Pass**

Machine Name 6TTRGD1

Test Description

Test Start Time 10/28/2007 7:17:10 AM

Test End Time 10/29/2007 7:52:28 AM

Jetstress Version 08.01.0177.000

Ese Version 08.00.0685.024

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

Performance Log G:\Itstress\Stress_2007_10_28_7_17_23.blg

G:\Itstress\DBChecksum_2007_10_29_7_52_28.blg

Database sizing and throughput

Achieved I/O per Second 189.287

Capacity Percentage 100%

Throughput Percentage 100%

Initial database size 412311683072

Final database size 431920054272

Database files (count) 4

Jetstress system parameters

Thread count 1 (per-storage group)

Log buffers 9000

Minimum database cache 128.0 MB

Maximum database cache 1024.0 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 (T:\SG1DB) | 0.009 | 0.074 | 24.129 | 23.181 | (n/a) |
| Database (T:\SG2DB) | 0.008 | 0.071 | 23.979 | 23.201 | (n/a) |
| Database (S:\SG3DB) | 0.009 | 0.081 | 24.048 | 23.266 | (n/a) |
| Database (S:\SG4DB) | 0.008 | 0.074 | 24.042 | 23.441 | (n/a) |
| Log (S:\SG1LG) | 0.000 | 0.006 | 0.000 | 15.457 | 9956.415 |
| Log (S:\SG2LG) | 0.000 | 0.006 | 0.000 | 15.389 | 10028.980 |
| Log (T:\SG3LG) | 0.000 | 0.006 | 0.000 | 15.470 | 10027.435 |
| Log (T:\SG4LG) | 0.000 | 0.006 | 0.000 | 15.562 | 10064.258 |

Host system performance

| Counter | Average | Minimum | Maximum |
|---------------------------------|--------------|--------------|--------------|
| % Processor Time | 0.534 | 0.182 | 2.083 |
| Available MBytes | 14709.911 | 14694.000 | 14819.000 |
| Free System Page Table Entries | 16758188.688 | 16758181.000 | 16758191.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 58730065.067 | 58474496.000 | 59023360.000 |
| Pool Paged Bytes | 42400385.422 | 41926656.000 | 43311104.000 |
| Database Page Fault Stalls/sec | 0.000 | 0.000 | 0.000 |

Test Log

10/28/2007 7:17:09 AM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c "G:\1tstress\stress.xml"

10/28/2007 7:17:10 AM -- Jetstress testing begins ...

10/28/2007 7:17:10 AM -- Prepare testing begins ...

10/28/2007 7:17:17 AM -- Attaching databases ...

10/28/2007 7:17:17 AM -- Prepare testing ends.

10/28/2007 7:17:17 AM -- Dispatching transactions begins ...

10/28/2007 7:17:17 AM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)

10/28/2007 7:17:17 AM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)

10/28/2007 7:17:23 AM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.1 seconds/read).

10/28/2007 7:17:23 AM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.1 seconds/write).

10/28/2007 7:17:24 AM -- Operation mix: Sessions 1, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

10/28/2007 7:17:24 AM -- Performance logging begins (interval: 15000 ms).

10/28/2007 7:17:24 AM -- Attaining prerequisites:

10/28/2007 7:51:41 AM -- \Database(JetstressCmd)\Database Cache Size, Last: 966475800.0

(lower bound: 966367600.0, upper bound: none)
10/29/2007 7:51:43 AM -- Performance logging ends.
10/29/2007 7:51:43 AM -- JetInterop batch transaction stats: 118347, 118336, 118656, and 119198.
10/29/2007 7:51:43 AM -- Dispatching transactions ends.
10/29/2007 7:51:43 AM -- Shutting down databases ...
10/29/2007 7:52:28 AM -- Instance2512.1 (complete), Instance2512.2 (complete), Instance2512.3 (complete), and Instance2512.4 (complete)
10/29/2007 7:52:29 AM -- Performance logging begins (interval: 15000 ms).
10/29/2007 7:52:29 AM -- Verifying database checksums ...
10/29/2007 8:48:19 AM -- T:\SG1DB (100% processed), T:\SG2DB (100% processed), S:\SG3DB (100% processed), and S:\SG4DB (100% processed)
10/29/2007 8:48:20 AM -- Performance logging ends.
10/29/2007 8:48:20 AM -- [G:\Itstress\DBChecksum 2007 10 29 7 52 28.blg](#) has 223 samples.
10/29/2007 8:48:24 AM -- [G:\Itstress\DBChecksum 2007 10 29 7 52 28.html](#) is saved.
10/29/2007 8:48:24 AM -- Verifying log checksums ...
10/29/2007 8:48:30 AM -- S:\SG1LG (22 logs passed), S:\SG2LG (21 logs passed), T:\SG3LG (22 logs passed), and T:\SG4LG (22 logs passed)
10/29/2007 8:48:30 AM -- [G:\Itstress\Stress 2007 10 28 7 17 23.blg](#) has 5897 samples.
10/29/2007 8:48:30 AM -- Creating test report ...
10/29/2007 8:49:23 AM -- Volume T:\SG1DB has 0.0087 for Avg. Disk sec/Read.
10/29/2007 8:49:23 AM -- Volume T:\SG2DB has 0.0082 for Avg. Disk sec/Read.
10/29/2007 8:49:23 AM -- Volume S:\SG3DB has 0.0089 for Avg. Disk sec/Read.
10/29/2007 8:49:23 AM -- Volume S:\SG4DB has 0.0081 for Avg. Disk sec/Read.
10/29/2007 8:49:23 AM -- Volume S:\SG1LG has 0.0058 for Avg. Disk sec/Write.
10/29/2007 8:49:23 AM -- Volume S:\SG1LG has 0.0000 for Avg. Disk sec/Read.
10/29/2007 8:49:23 AM -- Volume S:\SG2LG has 0.0057 for Avg. Disk sec/Write.
10/29/2007 8:49:23 AM -- Volume S:\SG2LG has 0.0000 for Avg. Disk sec/Read.
10/29/2007 8:49:23 AM -- Volume T:\SG3LG has 0.0057 for Avg. Disk sec/Write.
10/29/2007 8:49:23 AM -- Volume T:\SG3LG has 0.0000 for Avg. Disk sec/Read.
10/29/2007 8:49:23 AM -- Volume T:\SG4LG has 0.0058 for Avg. Disk sec/Write.
10/29/2007 8:49:23 AM -- Volume T:\SG4LG has 0.0000 for Avg. Disk sec/Read.
10/29/2007 8:49:23 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
10/29/2007 8:49:23 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.
10/29/2007 8:49:23 AM -- [G:\Itstress\Stress 2007 10 28 7 17 23.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 |
|-------------------------|------------|-----------|-------------------|---------------------|------------------------------|
| T:\SG1DB\Jetstress1.edb | 13169250 | 0 | 0 | 0 | 102884 MBytes / 3189 seconds |
| T:\SG2DB\Jetstress1.edb | 13178466 | 0 | 0 | 0 | 102956 MBytes / 3349 seconds |
| S:\SG3DB\Jetstress1.edb | 13180514 | 0 | 0 | 0 | 102972 MBytes / 3332 seconds |
| S:\SG4DB\Jetstress1.edb | 13196386 | 0 | 0 | 0 | 103096 MBytes / 2772 seconds |
| (Sum) | 52724616 | 0 | 0 | 0 | 411911 MBytes / 3350 seconds |

Disk subsystem performance (of checksum)

| LogicalDisk | Avg. Disk sec/Read | Avg. Disk sec/Write | Disk Reads/sec | Disk Writes/sec |
|-------------|--------------------|---------------------|----------------|-----------------|
| T:\SG1DB | 0.137 | 0.003 | 516.710 | 0.002 |
| T:\SG2DB | 0.153 | 0.001 | 488.266 | 0.002 |
| S:\SG3DB | 0.146 | 0.001 | 495.159 | 0.002 |
| S:\SG4DB | 0.137 | 0.001 | 597.189 | 0.003 |

Memory system performance (of checksum)

| Counter | Average | Minimum | Maximum |
|---------------------------------|--------------|--------------|--------------|
| % Processor Time | 9.758 | 8.203 | 13.125 |
| Available MBytes | 15545.000 | 15525.000 | 15725.000 |
| Free System Page Table Entries | 16758111.314 | 16758111.000 | 16758181.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 80717888.287 | 75685888.000 | 81686528.000 |
| Pool Paged Bytes | 44029759.139 | 43769856.000 | 44322816.000 |

Test Log

10/28/2007 7:17:09 AM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c "G:\1tstress\stress.xml"
 10/28/2007 7:17:10 AM -- Jetstress testing begins ...
 10/28/2007 7:17:10 AM -- Prepare testing begins ...
 10/28/2007 7:17:17 AM -- Attaching databases ...
 10/28/2007 7:17:17 AM -- Prepare testing ends.
 10/28/2007 7:17:17 AM -- Dispatching transactions begins ...
 10/28/2007 7:17:17 AM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)
 10/28/2007 7:17:17 AM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)

10/28/2007 7:17:23 AM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.1 seconds/read).
10/28/2007 7:17:23 AM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.1 seconds/write).
10/28/2007 7:17:24 AM -- Operation mix: Sessions 1, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
10/28/2007 7:17:24 AM -- Performance logging begins (interval: 15000 ms).
10/28/2007 7:17:24 AM -- Attaining prerequisites:
10/28/2007 7:51:41 AM -- \Database(JetstressCmd)\Database Cache Size, Last: 966475800.0 (lower bound: 966367600.0, upper bound: none)
10/29/2007 7:51:43 AM -- Performance logging ends.
10/29/2007 7:51:43 AM -- JetInterop batch transaction stats: 118347, 118336, 118656, and 119198.
10/29/2007 7:51:43 AM -- Dispatching transactions ends.
10/29/2007 7:51:43 AM -- Shutting down databases ...
10/29/2007 7:52:28 AM -- Instance2512.1 (complete), Instance2512.2 (complete), Instance2512.3 (complete), and Instance2512.4 (complete)
10/29/2007 7:52:29 AM -- Performance logging begins (interval: 15000 ms).
10/29/2007 7:52:29 AM -- Verifying database checksums ...
10/29/2007 8:48:19 AM -- T:\SG1DB (100% processed), T:\SG2DB (100% processed), S:\SG3DB (100% processed), and S:\SG4DB (100% processed)
10/29/2007 8:48:20 AM -- Performance logging ends.
10/29/2007 8:48:20 AM -- [G:\Itstress\DBChecksum 2007 10 29 7 52 28.blg](#) has 223 samples.

Microsoft Exchange Server Jetstress soft recovery test results

Soft recovery test result report

Test summary

Overall Test Result **Pass**

Machine Name 6TTRGD1

Test Description

Test Start Time 10/11/2007 7:53:32 PM

Test End Time 10/11/2007 8:57:50 PM

Jetstress Version 08.01.0177.000

Ese Version 08.00.0685.024

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

Performance Log C:\Q4\Jetstress\4SG\1t\soft\Performance_2007_10_11_19_53_42.blg

Database sizing and throughput

Achieved I/O per Second 322.124

Capacity Percentage 100%

Throughput Percentage 100%

Initial database size 412311683072

Final database size 413949558784

Database files (count) 4

Jetstress system parameters

Thread count 1 (per-storage group)

Log buffers 9000

Minimum database cache 128.0 MB

Maximum database cache 1024.0 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 (T:\SG1DB) | 0.008 | 0.003 | 40.668 | 38.901 | (n/a) |
| Database (T:\SG2DB) | 0.008 | 0.003 | 41.288 | 39.943 | (n/a) |
| Database (S:\SG3DB) | 0.009 | 0.003 | 40.867 | 39.114 | (n/a) |
| Database (S:\SG4DB) | 0.008 | 0.003 | 41.165 | 40.178 | (n/a) |
| Log (S:\SG1LG) | 0.001 | 0.001 | 0.032 | 29.600 | 9640.031 |
| Log (S:\SG2LG) | 0.001 | 0.001 | 0.033 | 29.833 | 10130.359 |
| Log (T:\SG3LG) | 0.001 | 0.001 | 0.032 | 29.827 | 9866.105 |
| Log (T:\SG4LG) | 0.001 | 0.001 | 0.034 | 29.787 | 10132.623 |

Host system performance

| Counter | Average | Minimum | Maximum |
|---------------------------------|--------------|--------------|--------------|
| % Processor Time | 0.961 | 0.000 | 12.773 |
| Available MBytes | 14848.438 | 14699.000 | 15722.000 |
| Free System Page Table Entries | 16758132.289 | 16758131.000 | 16758161.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 58006480.000 | 56291328.000 | 58257408.000 |
| Pool Paged Bytes | 46266688.000 | 45547520.000 | 46657536.000 |
| Database Page Fault Stalls/sec | 0.000 | 0.000 | 0.000 |

Test Log

```

10/11/2007 7:53:32 PM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c
"C:\Q4\Jetstress\4SG\1t\soft\soft.xml"
10/11/2007 7:53:32 PM -- Jetstress testing begins ...
10/11/2007 7:53:32 PM -- Prepare testing begins ...
10/11/2007 7:53:37 PM -- Attaching databases ...
10/11/2007 7:53:37 PM -- Prepare testing ends.
10/11/2007 7:53:37 PM -- Dispatching transactions begins ...
10/11/2007 7:53:37 PM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)
10/11/2007 7:53:37 PM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)
10/11/2007 7:53:42 PM -- Database read latency thresholds: (average: 0.02 seconds/read,
maximum: 0.05 seconds/read).
10/11/2007 7:53:42 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum:
0.05 seconds/write).
10/11/2007 7:53:43 PM -- Operation mix: Sessions 1, Inserts 25%, Deletes 10%, Replaces 50%,
Reads 15%, Lazy Commits 80%.
10/11/2007 7:53:43 PM -- Performance logging begins (interval: 15000 ms).
10/11/2007 7:53:43 PM -- Generating log files ...
10/11/2007 8:57:46 PM -- S:\SG1LG (100.2% generated), S:\SG2LG (103.2% generated),

```

T:\SG3LG (100.8% generated), and T:\SG4LG (103.8% generated)
10/11/2007 8:57:47 PM -- Performance logging ends.
10/11/2007 8:57:47 PM -- JetInterop batch transaction stats: 9830, 9973, 9934, and 9846.
10/11/2007 8:57:48 PM -- Dispatching transactions ends.
10/11/2007 8:57:48 PM -- Shutting down databases ...
10/11/2007 8:57:50 PM -- Instance1620.1 (complete), Instance1620.2 (complete), Instance1620.3 (complete), and Instance1620.4 (complete)
10/11/2007 8:57:50 PM -- C:\Q4\Jetstress\4SG\1t\soft\Performance_2007_10_11_19_53_42.blg has 256 samples.
10/11/2007 8:57:50 PM -- Creating test report ...
10/11/2007 8:57:51 PM -- Volume T:\SG1DB has 0.0081 for Avg. Disk sec/Read.
10/11/2007 8:57:51 PM -- Volume T:\SG2DB has 0.0078 for Avg. Disk sec/Read.
10/11/2007 8:57:51 PM -- Volume S:\SG3DB has 0.0089 for Avg. Disk sec/Read.
10/11/2007 8:57:51 PM -- Volume S:\SG4DB has 0.0076 for Avg. Disk sec/Read.
10/11/2007 8:57:51 PM -- Volume S:\SG1LG has 0.0008 for Avg. Disk sec/Write.
10/11/2007 8:57:51 PM -- Volume S:\SG1LG has 0.0008 for Avg. Disk sec/Read.
10/11/2007 8:57:51 PM -- Volume S:\SG2LG has 0.0009 for Avg. Disk sec/Write.
10/11/2007 8:57:51 PM -- Volume S:\SG2LG has 0.0006 for Avg. Disk sec/Read.
10/11/2007 8:57:51 PM -- Volume T:\SG3LG has 0.0009 for Avg. Disk sec/Write.
10/11/2007 8:57:51 PM -- Volume T:\SG3LG has 0.0009 for Avg. Disk sec/Read.
10/11/2007 8:57:51 PM -- Volume T:\SG4LG has 0.0009 for Avg. Disk sec/Write.
10/11/2007 8:57:51 PM -- Volume T:\SG4LG has 0.0010 for Avg. Disk sec/Read.
10/11/2007 8:57:51 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
10/11/2007 8:57:51 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.
10/11/2007 8:57:51 PM -- C:\Q4\Jetstress\4SG\1t\soft\Performance_2007_10_11_19_53_42.xml has 255 samples queried.

Microsoft Exchange Server Jetstress

Soft recovery test result report

Soft recovery statistics - All

| Database Instance | Log files replayed | Elapsed seconds |
|-------------------|--------------------|-----------------|
| Instance1620.1 | 500 | 282.5 |
| Instance1620.2 | 515 | 278.25 |
| Instance1620.3 | 504 | 288.5 |
| Instance1620.4 | 518 | 274.5 |

Disk subsystem performance

| LogicalDisk | Avg. Disk sec/Read | Avg. Disk sec/Write | Disk Reads/sec | Disk Writes/sec | Avg. Disk Bytes/Write |
|---------------------|--------------------|---------------------|----------------|-----------------|-----------------------|
| Database (T:\SG1DB) | 0.086 | 0.027 | 406.978 | 7.139 | (n/a) |
| Database (T:\SG2DB) | 0.085 | 0.027 | 405.157 | 7.414 | (n/a) |
| Database (S:\SG3DB) | 0.103 | 0.032 | 402.301 | 7.087 | (n/a) |
| Database (S:\SG4DB) | 0.074 | 0.022 | 407.920 | 7.466 | (n/a) |
| Log (S:\SG1LG) | 0.001 | 0.001 | 57.225 | 2.161 | 3600.866 |
| Log (S:\SG2LG) | 0.001 | 0.001 | 59.414 | 2.283 | 4003.164 |
| Log (T:\SG3LG) | 0.001 | 0.001 | 57.926 | 2.073 | 3801.690 |
| Log (T:\SG4LG) | 0.001 | 0.001 | 59.781 | 2.297 | 4497.935 |

Host system performance

| Counter | Average | Minimum | Maximum |
|---------------------------------|--------------|--------------|--------------|
| % Processor Time | 5.243 | 2.148 | 12.012 |
| Available MBytes | 14866.729 | 14678.000 | 15724.000 |
| Free System Page Table Entries | 16758131.000 | 16758131.000 | 16758131.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 61300053.333 | 61038592.000 | 62406656.000 |
| Pool Paged Bytes | 46403896.889 | 46170112.000 | 46739456.000 |
| Database Page Fault Stalls/sec | 0.000 | 0.000 | 0.000 |

Test Log

10/11/2007 7:53:32 PM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c "C:\Q4\Jetstress\4SG\1t\soft\soft.xml"
 10/11/2007 7:53:32 PM -- Jetstress testing begins ...
 10/11/2007 7:53:32 PM -- Prepare testing begins ...
 10/11/2007 7:53:37 PM -- Attaching databases ...
 10/11/2007 7:53:37 PM -- Prepare testing ends.

10/11/2007 7:53:37 PM -- Dispatching transactions begins ...
 10/11/2007 7:53:37 PM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)
 10/11/2007 7:53:37 PM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)
 10/11/2007 7:53:42 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).
 10/11/2007 7:53:42 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).
 10/11/2007 7:53:43 PM -- Operation mix: Sessions 1, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
 10/11/2007 7:53:43 PM -- Performance logging begins (interval: 15000 ms).
 10/11/2007 7:53:43 PM -- Generating log files ...
 10/11/2007 8:57:46 PM -- S:\SG1LG (100.2% generated), S:\SG2LG (103.2% generated), T:\SG3LG (100.8% generated), and T:\SG4LG (103.8% generated)
 10/11/2007 8:57:47 PM -- Performance logging ends.
 10/11/2007 8:57:47 PM -- JetInterop batch transaction stats: 9830, 9973, 9934, and 9846.
 10/11/2007 8:57:48 PM -- Dispatching transactions ends.
 10/11/2007 8:57:48 PM -- Shutting down databases ...
 10/11/2007 8:57:50 PM -- Instance1620.1 (complete), Instance1620.2 (complete), Instance1620.3 (complete), and Instance1620.4 (complete)
 10/11/2007 8:57:50 PM -- C:\Q4\Jetstress\4SG\1t\soft\Performance_2007_10_11_19_53_42.blg has 256 samples.
 10/11/2007 8:57:50 PM -- Creating test report ...
 10/11/2007 8:57:51 PM -- Volume T:\SG1DB has 0.0081 for Avg. Disk sec/Read.
 10/11/2007 8:57:51 PM -- Volume T:\SG2DB has 0.0078 for Avg. Disk sec/Read.
 10/11/2007 8:57:51 PM -- Volume S:\SG3DB has 0.0089 for Avg. Disk sec/Read.
 10/11/2007 8:57:51 PM -- Volume S:\SG4DB has 0.0076 for Avg. Disk sec/Read.
 10/11/2007 8:57:51 PM -- Volume S:\SG1LG has 0.0008 for Avg. Disk sec/Write.
 10/11/2007 8:57:51 PM -- Volume S:\SG1LG has 0.0008 for Avg. Disk sec/Read.
 10/11/2007 8:57:51 PM -- Volume S:\SG2LG has 0.0009 for Avg. Disk sec/Write.
 10/11/2007 8:57:51 PM -- Volume S:\SG2LG has 0.0006 for Avg. Disk sec/Read.
 10/11/2007 8:57:51 PM -- Volume T:\SG3LG has 0.0009 for Avg. Disk sec/Write.
 10/11/2007 8:57:51 PM -- Volume T:\SG3LG has 0.0009 for Avg. Disk sec/Read.
 10/11/2007 8:57:51 PM -- Volume T:\SG4LG has 0.0009 for Avg. Disk sec/Write.
 10/11/2007 8:57:51 PM -- Volume T:\SG4LG has 0.0010 for Avg. Disk sec/Read.
 10/11/2007 8:57:51 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
 10/11/2007 8:57:51 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.
 10/11/2007 8:57:51 PM -- C:\Q4\Jetstress\4SG\1t\soft\Performance_2007_10_11_19_53_42.xml has 255 samples queried.
 10/11/2007 8:57:51 PM -- C:\Q4\Jetstress\4SG\1t\soft\Performance_2007_10_11_19_53_42.html is saved.
 10/11/2007 8:57:52 PM -- Performance logging begins (interval: 2000 ms).
 10/11/2007 8:57:52 PM -- Recovering databases ...
 10/11/2007 9:02:42 PM -- Performance logging ends.
 10/11/2007 9:02:42 PM -- Instance1620.1 (282.5), Instance1620.2 (278.25), Instance1620.3 (288.5), and Instance1620.4 (274.5)
 10/11/2007 9:02:42 PM -- C:\Q4\Jetstress\4SG\1t\soft\SoftRecovery_2007_10_11_20_57_51.blg has 144 samples.
 10/11/2007 9:02:42 PM -- Creating test report ...

Microsoft Exchange Server Jetstress streaming backup test results

Streaming backup test result report

Streaming backup statistics - All

| Database Instance | Database Size (MBytes) | Elapsed Backup Time | MBytes Transferred/sec |
|-------------------|------------------------|---------------------|------------------------|
| Instance2604.1 | 98300.77 | 02:37:49 | 10.38 |
| Instance2604.2 | 98300.77 | 02:32:53 | 10.72 |
| Instance2604.3 | 98300.77 | 02:34:02 | 10.64 |
| Instance2604.4 | 98300.77 | 02:38:29 | 10.34 |

Jetstress system parameters

| | |
|------------------------|-----------------------|
| Thread count | 1 (per-storage group) |
| Log buffers | 9000 |
| Minimum database cache | 128.0 MB |
| Maximum database cache | 1024.0 MB |
| Insert operations | 25% |
| Delete operations | 10% |
| Replace operations | 50% |
| Read operations | 15% |
| Lazy commits | 80% |

Disk subsystem performance

| Database ==> Instances | Database Reads Latency | Database Writes Latency | Database Reads/sec | Database Writes/sec | Log Reads Latency | Log Writes Latency | Log Reads/sec | Log Writes/sec | Log Writes Bytes |
|------------------------|------------------------|-------------------------|--------------------|---------------------|-------------------|--------------------|---------------|----------------|------------------|
| Instance2604.1 | 6.902 | 0.114 | 83.629 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Instance2604.2 | 6.412 | 0.000 | 86.302 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Instance2604.3 | 6.325 | 0.012 | 85.670 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Instance2604.4 | 6.859 | 0.000 | 83.153 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Host system performance

| Counter | Average | Minimum | Maximum |
|---------------------------------|---------------|--------------|---------------|
| % Processor Time | 31.888 | 14.297 | 56.452 |
| Available MBytes | 15256.769 | 14976.000 | 15780.000 |
| Free System Page Table Entries | 16758298.067 | 16758271.000 | 16758431.000 |
| Transition Pages RePurposed/sec | 10289.233 | 0.000 | 23667.301 |
| Pool Nonpaged Bytes | 71932993.641 | 57696256.000 | 78999552.000 |
| Pool Paged Bytes | 571517538.462 | 44216320.000 | 846614528.000 |
| Database Page Fault Stalls/sec | 0.000 | 0.000 | 0.000 |

Test Log

10/12/2007 3:08:37 PM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c "C:\Q4\Jetstress\4SG\1t\b2d\b2d.xml"
10/12/2007 3:08:37 PM -- Jetstress testing begins ...
10/12/2007 3:08:37 PM -- Prepare testing begins ...
10/12/2007 3:08:42 PM -- Attaching databases ...
10/12/2007 3:08:42 PM -- Prepare testing ends.
10/12/2007 3:08:47 PM -- Performance logging begins (interval: 15000 ms).
10/12/2007 3:08:47 PM -- Streaming backup databases ...
10/12/2007 5:47:18 PM -- Performance logging ends.
10/12/2007 5:47:18 PM -- Instance2604.1 (100% processed), Instance2604.2 (100% processed), Instance2604.3 (100% processed), and Instance2604.4 (100% processed)
10/12/2007 5:47:18 PM --
[C:\Q4\Jetstress\4SG\1t\b2d\StreamingBackup_2007_10_12_15_8_42.blg](#) has 624 samples.
10/12/2007 5:47:18 PM -- Creating test report ...