

ESRP Storage Program
EMC CX-3-20 (1000 User) iSCSI Storage Solution for
Microsoft Exchange Server 2007

Tested with: ESRP – Storage Version 2.0
Tested Date: 03/21/07

EMC believes the information in this publication is accurate as of its publication date. The information is subject to change without notice.

THE INFORMATION IN THIS PUBLICATION IS PROVIDED "AS IS." EMC CORPORATION MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WITH RESPECT TO THE INFORMATION IN THIS PUBLICATION, AND SPECIFICALLY DISCLAIMS IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Use, copying, and distribution of any EMC software described in this publication requires an applicable software license.

EMC², EMC, EMC ControlCenter, AlphaStor, ApplicationXtender, Avamar, Captiva, Catalog Solution, Celerra, Centera, CentraStar, CLARAlert, CLARiiON, ClientPak, CodeLink, Connectrix, Co-StandbyServer, Dantz, Direct Matrix Architecture, DiskXtender, DiskXtender 2000, Documentum, EmailXaminer, EmailXtender, EmailXtract, eRoom, FLARE, HighRoad, InputAccel, Invista, Max Retriever, Navisphere, NetWorker, nLayers, OpenScale, Powerlink, PowerPath, Rainfinity, RepliStor, ResourcePak, Retrospect, Smarts, SnapShotServer, SnapView/IP, SRDF, Symmetrix, TimeFinder, VisualSAN, VSAM-Assist, WebXtender, where information lives, Xtender, and Xtender Solutions are registered trademarks and EMC Developers Program, EMC OnCourse, EMC Proven, EMC Snap, EMC Storage Administrator, Acartus, Access Logix, ArchiveXtender, Authentic Problems, Automated Resource Manager, AutoStart, AutoSwap, AVALONidm, C-Clip, Celerra Replicator, CLARevent, Codebook Correlation Technology, Common Information Model, CopyCross, CopyPoint, DatabaseXtender, Direct Matrix, EDM, E-Lab, Enginuity, FarPoint, Global File Virtualization, Graphic Visualization, InfoMover, Infoscapes, MediaStor, MirrorView, NetWin, OnAlert, PowerSnap, RepliCare, SafeLine, SAN Advisor, SAN Copy, SAN Manager, SDMS, SnapImage, SnapSure, SnapView, StorageScope, SupportMate, SymmAPI, SymmEnabler, Symmetrix DMX, UltraPoint, UltraScale, Viewlets, and VisualSRM are trademarks of EMC Corporation.

All other trademarks used herein are the property of their respective owners.

Copyright © 1998-2007 EMC Corporation. All rights reserved.

Printed 5/30/2007

H2828

Table of Contents

| | |
|--|----|
| Overview..... | 4 |
| Disclaimer..... | 4 |
| Features..... | 4 |
| Solution Description..... | 5 |
| Targeted Customer Profile | 7 |
| Tested Deployment..... | 7 |
| Simulated Exchange Configuration | 7 |
| Primary Storage Hardware | 7 |
| Primary Storage Software | 8 |
| Primary Storage Disk Configuration (Mailbox Store Disks)..... | 8 |
| Primary Storage Disk Configuration (Transactional Log Disks) | 8 |
| Streaming Backup | 9 |
| Disk Configuration (Streaming Backup to disk)..... | 9 |
| Best Practices..... | 9 |
| Core Storage/Replication..... | 9 |
| Backup strategy | 10 |
| Test Result Summary | 10 |
| Reliability | 10 |
| Primary Storage Performance Results | 10 |
| Individual Server Metrics | 10 |
| Streaming Backup Performance..... | 11 |
| Database Read-only Performance | 11 |
| Log Read-only Performance | 11 |
| Backup to Disk Performance | 11 |
| Conclusion | 11 |
| Contact Information | 12 |
| Appendix A: Stress Testing | 13 |
| Stress Test Result Report..... | 13 |
| Database Checksum Results | 15 |
| Appendix B: Performance Testing..... | 18 |
| Performance Test Result Report | 18 |
| Test Result Report..... | 20 |
| Appendix C: Streaming Backup Testing..... | 23 |
| Streaming Backup Test Result Report | 23 |
| Appendix D: Soft Recovery Testing..... | 25 |
| SoftRecovery Test Result Report | 25 |
| Performance Test Result Report | 27 |
| Database Checksum Results | 29 |
| Appendix E: Maximum Solution IOPS Testing..... | 32 |
| Performance Test Result Report | 32 |
| Database Checksum Results | 35 |

Overview

This document provides information on EMC CX3-20 (1000 User) iSCSI Storage Solution for Microsoft Exchange Server 2007, based on the *Microsoft Exchange Solution Reviewed Program (ESRP) – Storage* program*. For any questions or comments regarding the contents of this document, see the section [Contact Information](#).

*The *ESRP – Storage* program was developed by Microsoft Corporation to provide a common storage testing framework for EMC 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>

Disclaimer

This document has been produced independently of Microsoft Corporation. Microsoft Corporation expressly disclaims responsibility for, and makes no warranty, express or implied, with respect to, the accuracy of the contents of this document.

The information contained in this document represents the current view of EMC on the issues discussed as of the date of publication. Due to changing market conditions, it should not be interpreted to be a commitment on the part of EMC, and EMC cannot guarantee the accuracy of any information presented after the date of publication.

Features

This document describes an approach that can be used to configure Exchange solutions around EMC's CLARiiON CX3-20 storage systems. Built on the innovative EMC CLARiiON CX3 UltraScale architecture, the EMC CX-3-20 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 CX3-20 supports a wide range of server operating environments such as: Microsoft Windows, Linux, Solaris, AIX, HP-UX, and VMware ESX Server.

The CLARiiON CX3-20 Fibre Channel (FC)/iSCSI array offers both 4 Gb/s FC and 1 Gb/s iSCSI ports fully integrated in the same array, enabling the customers to leverage their networked storage investments over a broader range of servers and applications with complete flexibility and without additional hardware. A total of 8 iSCSI ports (4 per SP) and 4 Fibre Channel ports (2 per SP) are available on each CX3-20 array.

The CLARiiON CX3-20 Fibre Channel (FC)/iSCSI array gives customers an advantage, irrespective of whether or not they currently have iSCSI or FC deployed. For customers who are implementing networked storage for the first time and are considering iSCSI, the CLARiiON CX3-20 Fibre Channel(FC)/iSCSI

array provides scalable iSCSI storage as well as the flexibility and investment protection of integrated FC support, should the customers' business and application needs grow. For customers with existing FC deployments, the CLARiiON CX3-20 Fibre Channel (FC)/iSCSI array offers the opportunity to expand the reach of their networked storage environment economically with iSCSI, while maintaining complete flexibility with regard to how the incremental capacity is shared across server platforms and interconnects.

With the EMC CX3-20, you can choose the drive options that meet your specific needs, thereby providing the flexibility to offer multiple levels of performance in one system. The CX3-20 supports both high-performance and high-capacity disk drives in the same system, can scale from 365 GB to 59 TB, and supports 128 high-availability hosts. It supports 4 Gb/s (15k RPM) FC drives for demanding applications requiring maximum performance.

2 Gb/s FC (10k RPM) serves applications that require a balance between performance and costs. Alternatively, low-cost 2 Gb/s FC drives (7.2k RPM) can be chosen for Tier 2 applications such as disk-based backup, requiring high capacities and low cost.

The CX3-20 delivers tiered storage that enables you to provide the right level of performance to the right applications. The system also delivers exceptional 4 Gb/s performance throughout the entire system without compromises or bottlenecks. Performance boosting features include four front-end and two backend 4 Gb/s ports, along with the 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 EMC CX3-20 for a high-performance Exchange environment. For this solution, a CX3-20 *EMC CLARiiON CX3-20 Storage Solution for Microsoft Exchange Server* storage system was used and configured for 1000 Exchange 2007 users. The server was connected to the CX3-20 through iSCSI using dedicated NICs used for iSCSI with the Microsoft iSCSI software initiator (V2.0.4), and an iSCSI VLAN. Each of the 1000 users is profiled using a value of 1 IOPS per user and a 250 MB mailbox requirement.

Solution Description

The solution described is for utilizing a single CX3-20 and a single disk enclosure (DEA), utilizing 17:146 GB 15,000 RPM FC drives, thus giving the customer the most performance and fault tolerance utilizing Raid 10 for the Exchange Databases and Log files and Raid 5 for backup to disk volumes.

Log files are placed on the first four drives 0_0-0_3 in a Raid 1_0 configuration, and Backup to Disk are placed on drives 0_5-0_9. Database Drives are then placed on drives 0_10-0_13, 1_10-1_13 with drive 0_14, and 1_14 left for hot spares.

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 method described in this ESRP submission is the building block method. The building block method is used to simplify the sizing and configuration when using low number of disks to ensure the highest performance while staying fault tolerant.

This unit of measure (or Building Block) is designed to be scalable based on IO and latency requirements of the customer. The building blocks are designed around the Exchange Database drives in 4 drive increments using Raid 1_0, and the Exchange log files are placed onto a 4 drive Raid 1_0 configuration which is capable of holding multiple building blocks SG log files.

The building block is designed with the ability to grow and expand into larger building block deployment models detailed in the EMC ESRP submissions for greater than 4000 users.

http://www.emc.com/techlib/pdf/20084_CX3-20c_iSCSI_4000_Users_Storage_Solution_for_Microsoft_Exchange_Server.pdf

The building blocks help to simplify the design and configuration of a highly available, high performance configuration as a company grows and email requirements increase.

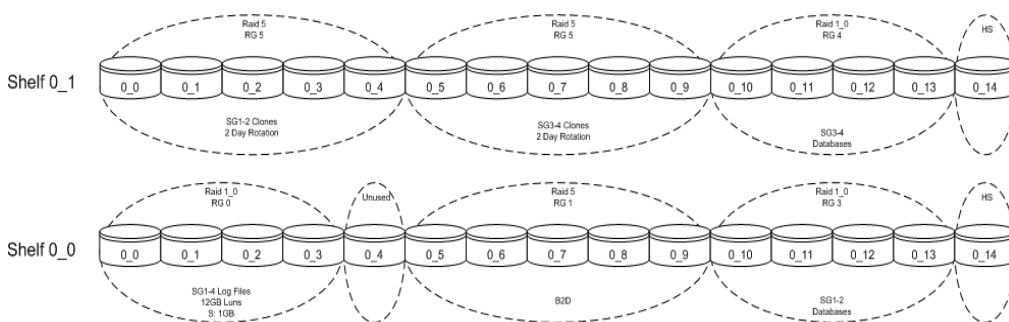


Figure 1 – Building Block 2

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
- 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 businesses hosting 1000 Exchange mailboxes. The configuration used for testing is as below:

- Number of mailbox servers presented to the storage array — 1
- User IO profile for testing — 0.42
- User mailbox size for testing — 250 MB
- Backup strategy for testing — Streaming Backup to Disk
- Time for Restore — 2.5 hours per SG, Tested 100 GB database per SG

Tested Deployment

The following tables summarize the testing environment:

Simulated Exchange Configuration

| | |
|--|--------|
| Number of Exchange mailboxes simulated | 1000 |
| Number of hosts | 1 |
| Number of mailboxes/host | 1000 |
| Number of storage groups/host | 2 |
| Number of mailbox stores/storage group | 1 |
| Number of mailboxes/mailbox store | 250 |
| Number of mailbox store LUNs/storage group | 1 |
| Simulated profile: I/O's 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 | 547 GB |
| Total database size for performance testing | 100 GB |
| % Storage capacity used by Exchange database** | 83% |

** 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

| | |
|--|---|
| Storage Connectivity (Fibre Channel, SAS, SATA, iSCSI) | iSCSI |
| Storage model and OS/firmware revision | CX3-20 Flare .24 |
| Storage cache | 1 GB |
| 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 2.21 Build No. 3.04 |
| HBA model and firmware | Intel(R) PRO/1000 MT Dual Port Server Adapter |
| Number of HBA's/host | 2 |

| | |
|--|--|
| Host server type | Dell PowerEdge 2950 2: Dual Core [01]: EM64T Family 6 Model 15 Stepping 6 GenuineIntel ~2328 Mhz [02]: EM64T Family 6 Model 15 Stepping 6 GenuineIntel ~2328 Mhz [03]: EM64T Family 6 Model 15 Stepping 6 GenuineIntel ~2328 Mhz [04]: EM64T Family 6 Model 15 Stepping 6 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

| | |
|-----------------------------------|--|
| HBA driver | c:\windows\system32\drivers\e1g5132e.sys (8.4.21.0 built by: WinDDK, 220.25 KB (225,536 bytes), 3/14/2007 6:00 PM) |
| HBA QueueTarget Setting | Not Applicable |
| HBA QueueDepth Setting | Not Applicable |
| Multi-Pathing | Microsoft iSCSI Initiator v 2.0.4, PowerPath 4.6 |
| Host OS | Microsoft® Windows® Server 2003, Enterprise Edition x64 SP1 5.2.3790 Service Pack 1 Build 3790 |
| ESE.dll file version | 08.00.0685.024 |
| Replication solution name/version | Not Applicable |

Primary Storage Disk Configuration (Mailbox Store Disks)

| | |
|---|-----------------------------------|
| Disk type, speed and firmware revision | 4 Gbps FC SCSI 15,000 RPM – 60 AC |
| Raw capacity per disk (GB) | 146 GB |
| Number of physical disks in test | 8 |
| total raw storage capacity (GB) | 584 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 | 2 |
| LUN Size in GB | 120 |
| Raid level | Raid 1_0 |
| Total formatted capacity | 480 GB |
| Storage capacity utilization | 46% |
| Database capacity utilization | 83 GB |

Primary Storage Disk Configuration (Transactional Log Disks)

| | |
|---|-----------------------------------|
| Disk type, speed and firmware revision | 4 Gbps FC SCSI 15,000 RPM – 60 AC |
| Raw capacity per disk (GB) | 146 GB |
| Number of spindles in test | 4 |
| total raw storage capacity (GB) | 584 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)

| | |
|---|-----------------------------------|
| Disk type, speed and firmware revision | 4 Gbps FC SCSI 15,000 RPM – 60 AC |
| Raw capacity per disk (GB) | 146 GB |
| Number of spindles in test | 5 |
| Total raw storage capacity (GB) | 730 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 | 532 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 SP1 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 <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 using PowerPath 4.6 utilizing a balanced path approach. Logging in with NIC0 into the A0(Spa) and B3(Spb), and NIC1 into B0(Spb) and A3(Spa).
6. Tuning the CX3-20 storage system parameters is important in 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.msp>

Multi-site data replication support for Exchange
<http://support.microsoft.com/?kbid=895847>

Backup strategy

This solution utilized Raid 5 for the backup to disk LUNs to maximize space, and then, using 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. The Appendix section has the detailed html reports that are generated by the ESRP testing framework.

Reliability

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

The following list provides an overview:

- Any errors reported in the saved eventlog file? None
- Any errors reported in during the database and log? None
- If backup to disk test is done, any errors reported during the process? None
- Any errors during database checksum on the remote storage database? None

Primary Storage Performance Results

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

Individual Server Metrics

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

| Database I/O | |
|-------------------------------------|---------|
| Average Database Disk Transfers/sec | 539.715 |
| Average Database Disk Reads/sec | 280.12 |
| Average Database Disk Writes/sec | 259.595 |

| | |
|--|---------|
| Average Database Disk Read Latency (ms) | 9 |
| Average Database Disk Write Latency (ms) | 5 |
| Transaction Log I/O | |
| Average Log Disk Writes/sec | 168.416 |
| Average Log Disk Write Latency (ms) | 1 |

Streaming Backup Performance

For the Version 1.0 release, only streaming backup type is supported for testing in the framework. There are two tests in this section. The first one is to measure the read IO 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

The test is to measure the maximum rate at which databases could be streaming backed up. The following table shows the average rate for a single database file.

| | |
|-------------------------------|-----------------|
| MB read/sec per storage group | 25.76 |
| MB read/sec total | 103.04 |
| File size/sec taken | 393195.08/15262 |

Log Read-only Performance

The test is to measure the maximum rate at which 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.

| | |
|---|------------|
| Average time to play one log file (sec) | 0.41550791 |
|---|------------|

Backup to Disk Performance

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

| | |
|--|-------------|
| Total database size per storage group (GB) | 394.78308 |
| Time taken to backup each storage group | 2:43:37 |
| Average MB backed up/sec per storage group | 10.17036538 |

Conclusion

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

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:

United States: (800) 782-4362 (SVC-4EMC)
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>

Appendix A: Stress Testing

Stress Test Result Report

Test Summary

| | |
|----------------------------|--|
| Overall Test Result | Pass |
| Machine Name | 82D77C1 |
| Test Description | |
| Test Start Time | 3/31/2007 12:18:51 PM |
| Test End Time | 4/1/2007 12:29:03 PM |
| Jetstress Version | 08.01.0075.000 |
| Ese Version | 08.00.0685.024 |
| Operating System | Microsoft Windows Server 2003 Service Pack 1 (5.2.3790.65536) |
| Performance Log | C:\Jetstress\2thread\stress2t\Stress_2007_3_31_12_18_53.blg C:\Jetstress\2thread\stress2t\DBChecksum_2007_4_1_12_29_3.blg |

Database Sizing and Throughput

| | |
|--------------------------------|--------------|
| Achieved I/O per Second | 524.93 |
| Capacity Percentage | 100% |
| Throughput Percentage | 100% |
| Initial database size | 412303294464 |
| Final database size | 465317724160 |
| Database files (count) | 4 |

Jetstress System Parameters

| | |
|-------------------------------|-----------------------|
| Thread count | 2 (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 (c:\sg1db) | 0.009 | 0.005 | 68.321 | 62.430 | (n/a) |
| Database (c:\sg2db) | 0.009 | 0.005 | 68.732 | 62.344 | (n/a) |
| Database (c:\sg3db) | 0.009 | 0.005 | 68.856 | 62.459 | (n/a) |
| Database (c:\sg4db) | 0.009 | 0.005 | 69.057 | 62.731 | (n/a) |
| Log (c:\sg1lg) | 0.000 | 0.001 | 0.000 | 39.426 | 10491.827 |
| Log (c:\sg2lg) | 0.000 | 0.001 | 0.000 | 39.440 | 10490.353 |
| Log (c:\sg3lg) | 0.000 | 0.001 | 0.000 | 39.496 | 10522.398 |
| Log (c:\sg4lg) | 0.000 | 0.001 | 0.000 | 39.529 | 10556.040 |

Host System Performance

| Counter | Average | Minimum | Maximum |
|---------------------------------|--------------|--------------|--------------|
| % Processor Time | 1.942 | 0.154 | 4.790 |
| Available MBytes | 14350.083 | 14335.000 | 14361.000 |
| Free System Page Table Entries | 16758876.000 | 16758876.000 | 16758876.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 48317136.213 | 48222208.000 | 48492544.000 |
| Pool Paged Bytes | 49004950.187 | 48857088.000 | 49623040.000 |
| Database Page Fault Stalls/sec | 0.000 | 0.000 | 0.000 |

Test Log

3/31/2007 12:18:51 PM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c "C:\Jetstress\2thread\stress2t\stress2t.xml"

3/31/2007 12:18:51 PM -- Jetstress testing begins ...

3/31/2007 12:18:51 PM -- Prepare testing begins ...

3/31/2007 12:18:53 PM -- Attaching databases ...

3/31/2007 12:18:53 PM -- Prepare testing ends.

3/31/2007 12:18:53 PM -- Dispatching transactions begins ...

3/31/2007 12:18:53 PM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)

3/31/2007 12:18:53 PM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)

3/31/2007 12:18:53 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.1 seconds/read).

3/31/2007 12:18:53 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.1 seconds/write).

3/31/2007 12:18:54 PM -- Operation mix: Sessions 2, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

3/31/2007 12:18:54 PM -- Performance logging begins (interval: 15000 ms).

3/31/2007 12:18:54 PM -- Attaining prerequisites:

3/31/2007 12:28:58 PM -- \Database(JetstressCmd)\Database Cache Size, Last: 966647800.0

(lower bound: 966367600.0, upper bound: none)
 4/1/2007 12:28:59 PM -- Performance logging ends.
 4/1/2007 12:28:59 PM -- JetInterop batch transaction stats: 322354, 322735, 324000, and 323290.
 4/1/2007 12:29:00 PM -- Dispatching transactions ends.
 4/1/2007 12:29:00 PM -- Shutting down databases ...
 4/1/2007 12:29:03 PM -- Instance1876.1 (complete), Instance1876.2 (complete), Instance1876.3 (complete), and Instance1876.4 (complete)
 4/1/2007 12:29:04 PM -- Performance logging begins (interval: 15000 ms).
 4/1/2007 12:29:04 PM -- Verifying database checksums ...
 4/1/2007 1:06:19 PM -- c:\sg1db (100% processed), c:\sg2db (100% processed), c:\sg3db (100% processed), and c:\sg4db (100% processed)
 4/1/2007 1:06:20 PM -- Performance logging ends.
 4/1/2007 1:06:20 PM -- C:\Jetstress\2thread\stress2t\DBChecksum_2007_4_1_12_29_3.blg has 149 samples.
 4/1/2007 1:06:22 PM -- C:\Jetstress\2thread\stress2t\DBChecksum_2007_4_1_12_29_3.html is saved.
 4/1/2007 1:06:22 PM -- Verifying log checksums ...
 4/1/2007 1:06:27 PM -- c:\sg1lg (22 logs passed), c:\sg2lg (21 logs passed), c:\sg3lg (22 logs passed), and c:\sg4lg (22 logs passed)
 4/1/2007 1:06:27 PM -- C:\Jetstress\2thread\stress2t\Stress_2007_3_31_12_18_53.blg has 5800 samples.
 4/1/2007 1:06:27 PM -- Creating test report ...
 4/1/2007 1:07:07 PM -- Volume c:\sg1db has 0.0092 for Avg. Disk sec/Read.
 4/1/2007 1:07:07 PM -- Volume c:\sg2db has 0.0094 for Avg. Disk sec/Read.
 4/1/2007 1:07:07 PM -- Volume c:\sg3db has 0.0091 for Avg. Disk sec/Read.
 4/1/2007 1:07:07 PM -- Volume c:\sg4db has 0.0093 for Avg. Disk sec/Read.
 4/1/2007 1:07:07 PM -- Volume c:\sg1lg has 0.0014 for Avg. Disk sec/Write.
 4/1/2007 1:07:07 PM -- Volume c:\sg1lg has 0.0000 for Avg. Disk sec/Read.
 4/1/2007 1:07:07 PM -- Volume c:\sg2lg has 0.0014 for Avg. Disk sec/Write.
 4/1/2007 1:07:07 PM -- Volume c:\sg2lg has 0.0000 for Avg. Disk sec/Read.
 4/1/2007 1:07:07 PM -- Volume c:\sg3lg has 0.0014 for Avg. Disk sec/Write.
 4/1/2007 1:07:07 PM -- Volume c:\sg3lg has 0.0000 for Avg. Disk sec/Read.
 4/1/2007 1:07:07 PM -- Volume c:\sg4lg has 0.0014 for Avg. Disk sec/Write.
 4/1/2007 1:07:07 PM -- Volume c:\sg4lg has 0.0000 for Avg. Disk sec/Read.
 4/1/2007 1:07:07 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
 4/1/2007 1:07:07 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.

Database Checksum Results

Checksum Statistics - All

| Database | Seen pages | Bad pages | Correctable pages | Wrong page no pages | File length / seconds taken |
|-------------------------|------------|-----------|-------------------|---------------------|-----------------------------|
| c:\sg1db\Jetstress1.edb | 14205554 | 0 | 0 | 0 | 388 MBytes / 2234 seconds |
| c:\sg2db\Jetstress1.edb | 14193266 | 0 | 0 | 0 | 292 MBytes / 2212 seconds |
| c:\sg3db\Jetstress1.edb | 14198386 | 0 | 0 | 0 | 332 MBytes / 2234 seconds |
| c:\sg4db\Jetstress1.edb | 14204274 | 0 | 0 | 0 | 378 MBytes / 2180 seconds |
| (Sum) | 56801480 | 0 | 0 | 0 | 1393 MBytes / 8863 seconds |

Disk Subsystem Performance (of checksum)

| LogicalDisk | Avg. Disk sec/Read | Avg. Disk sec/Write | Disk Reads/sec | Disk Writes/sec |
|-------------|--------------------|---------------------|----------------|-----------------|
| c:\sg1db | 0.117 | 0.001 | 796.582 | 0.003 |
| c:\sg2db | 0.115 | 0.001 | 795.546 | 0.001 |
| c:\sg3db | 0.114 | 0.000 | 796.793 | 0.000 |
| c:\sg4db | 0.113 | 0.001 | 796.602 | 0.004 |

Memory System Performance (of checksum)

| Counter | Average | Minimum | Maximum |
|---------------------------------|--------------|--------------|--------------|
| % Processor Time | 24.807 | 18.952 | 28.592 |
| Available MBytes | 15161.215 | 15148.000 | 15351.000 |
| Free System Page Table Entries | 16758588.148 | 16758586.000 | 16758746.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 64638893.530 | 61841408.000 | 66084864.000 |
| Pool Paged Bytes | 50408317.423 | 50376704.000 | 50925568.000 |

Test Log

3/31/2007 12:18:51 PM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c "C:\Jetstress\2thread\stress2t\stress2t.xml"

3/31/2007 12:18:51 PM -- Jetstress testing begins ...

3/31/2007 12:18:51 PM -- Prepare testing begins ...

3/31/2007 12:18:53 PM -- Attaching databases ...

3/31/2007 12:18:53 PM -- Prepare testing ends.

3/31/2007 12:18:53 PM -- Dispatching transactions begins ...

3/31/2007 12:18:53 PM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)

3/31/2007 12:18:53 PM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)

3/31/2007 12:18:53 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.1 seconds/read).

3/31/2007 12:18:53 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.1 seconds/write).

3/31/2007 12:18:54 PM -- Operation mix: Sessions 2, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

3/31/2007 12:18:54 PM -- Performance logging begins (interval: 15000 ms).

3/31/2007 12:18:54 PM -- Attaining prerequisites:

3/31/2007 12:28:58 PM -- \Database(JetstressCmd)\Database Cache Size, Last: 966647800.0 (lower bound: 966367600.0, upper bound: none)

4/1/2007 12:28:59 PM -- Performance logging ends.

4/1/2007 12:28:59 PM -- JetInterop batch transaction stats: 322354, 322735, 324000, and 323290.

4/1/2007 12:29:00 PM -- Dispatching transactions ends.

4/1/2007 12:29:00 PM -- Shutting down databases ...

4/1/2007 12:29:03 PM -- Instance1876.1 (complete), Instance1876.2 (complete), Instance1876.3 (complete), and Instance1876.4 (complete)

4/1/2007 12:29:04 PM -- Performance logging begins (interval: 15000 ms).
4/1/2007 12:29:04 PM -- Verifying database checksums ...
4/1/2007 1:06:19 PM -- c:\sg1db (100% processed), c:\sg2db (100% processed), c:\sg3db
(100% processed), and c:\sg4db (100% processed)
4/1/2007 1:06:20 PM -- Performance logging ends.
4/1/2007 1:06:20 PM -- [C:\Jetstress\2thread\stress2t\DBChecksum_2007_4_1_12_29_3.blg](#)
has 149 samples.

Appendix B: Performance Testing

Performance Test Result Report

Test Summary

| | |
|----------------------------|---|
| Overall Test Result | Pass |
| Machine Name | 82D77C1 |
| Test Description | |
| Test Start Time | 3/29/2007 10:53:01 AM |
| Test End Time | 3/29/2007 1:03:25 PM |
| Jetstress Version | 08.01.0075.000 |
| Ese Version | 08.00.0685.024 |
| Operating System | Microsoft Windows Server 2003 Service Pack 1 (5.2.3790.65536) |
| Performance Log | C:\Jetstress\Perf2t - Direct Connect\Performance_2007_3_29_10_53_2.blg C:\Jetstress\Perf2t - Direct Connect\DBChecksum_2007_3_29_13_3_25.blg |

Database Sizing and Throughput

| | |
|--------------------------------|--------------|
| Achieved I/O per Second | 539.716 |
| Capacity Percentage | 100% |
| Throughput Percentage | 100% |
| Initial database size | 420387815424 |
| Final database size | 425450340352 |
| Database files (count) | 4 |

Jetstress System Parameters

| | |
|-------------------------------|-----------------------|
| Thread count | 2 (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 (c:\sg1db) | 0.009 | 0.005 | 70.983 | 65.338 | (n/a) |
| Database (c:\sg2db) | 0.009 | 0.005 | 68.814 | 64.626 | (n/a) |
| Database (c:\sg3db) | 0.009 | 0.005 | 70.009 | 64.564 | (n/a) |
| Database (c:\sg4db) | 0.009 | 0.005 | 70.314 | 65.067 | (n/a) |
| Log (c:\sg1lg) | 0.000 | 0.001 | 0.000 | 42.164 | 10532.634 |
| Log (c:\sg2lg) | 0 | 0.001 | 0.000 | 42.494 | 10507.482 |
| Log (c:\sg3lg) | 0 | 0.001 | 0.000 | 41.660 | 10572.639 |
| Log (c:\sg4lg) | 0 | 0.001 | 0.000 | 42.098 | 10586.822 |

Host System Performance

| Counter | Average | Minimum | Maximum |
|---------------------------------|--------------|--------------|--------------|
| % Processor Time | 1.774 | 0.284 | 5.649 |
| Available MBytes | 14406.388 | 14221.000 | 15329.000 |
| Free System Page Table Entries | 16756209.000 | 16756209.000 | 16756209.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 51775601.996 | 51712000.000 | 52359168.000 |
| Pool Paged Bytes | 67727933.912 | 61571072.000 | 71708672.000 |
| Database Page Fault Stalls/sec | 0.000 | 0.000 | 0.000 |

Test Log

3/29/2007 10:53:01 AM -- Command Line: C:\PROGRA~1\EXCHAN~1\jetstresscmd /c "C:\Jetstress\Perf2t - Direct Connect\Perf2t.xml"

3/29/2007 10:53:01 AM -- Jetstress testing begins ...

3/29/2007 10:53:01 AM -- Prepare testing begins ...

3/29/2007 10:53:02 AM -- Attaching databases ...

3/29/2007 10:53:02 AM -- Prepare testing ends.

3/29/2007 10:53:02 AM -- Dispatching transactions begins ...

3/29/2007 10:53:02 AM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)

3/29/2007 10:53:02 AM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)

3/29/2007 10:53:02 AM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).

3/29/2007 10:53:02 AM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).

3/29/2007 10:53:03 AM -- Operation mix: Sessions 2, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

3/29/2007 10:53:03 AM -- Performance logging begins (interval: 15000 ms).

3/29/2007 10:53:03 AM -- Attaining prerequisites:

3/29/2007 11:03:20 AM -- \Database(JetstressCmd)\Database Cache Size, Last:

967237600.0 (lower bound: 966367600.0, upper bound: none)
 3/29/2007 1:03:22 PM -- Performance logging ends.
 3/29/2007 1:03:22 PM -- JetInterop batch transaction stats: 30371, 30515, 30136, and 30269.
 3/29/2007 1:03:22 PM -- Dispatching transactions ends.
 3/29/2007 1:03:22 PM -- Shutting down databases ...
 3/29/2007 1:03:25 PM -- Instance448.1 (complete), Instance448.2 (complete), Instance448.3 (complete), and Instance448.4 (complete)
 3/29/2007 1:03:26 PM -- Performance logging begins (interval: 15000 ms).
 3/29/2007 1:03:26 PM -- Verifying database checksums ...
 3/29/2007 1:53:47 PM -- c:\sg1db (100% processed), c:\sg2db (100% processed), c:\sg3db (100% processed), and c:\sg4db (100% processed)
 3/29/2007 1:53:48 PM -- Performance logging ends.
 3/29/2007 1:53:48 PM -- [C:\Jetstress\Perf2t - Direct Connect\DBChecksum 2007_3_29_13_3_25.blg](#) has 199 samples.
 3/29/2007 1:53:50 PM -- [C:\Jetstress\Perf2t - Direct Connect\DBChecksum 2007_3_29_13_3_25.html](#) is saved.
 3/29/2007 1:53:50 PM -- Verifying log checksums ...
 3/29/2007 1:54:05 PM -- c:\sg1lg (22 logs passed), c:\sg2lg (22 logs passed), c:\sg3lg (22 logs passed), and c:\sg4lg (22 logs passed)
 3/29/2007 1:54:05 PM -- [C:\Jetstress\Perf2t - Direct Connect\Performance 2007_3_29_10_53_2.blg](#) has 521 samples.
 3/29/2007 1:54:05 PM -- Creating test report ...
 3/29/2007 1:54:09 PM -- Volume c:\sg1db has 0.0090 for Avg. Disk sec/Read.
 3/29/2007 1:54:09 PM -- Volume c:\sg2db has 0.0089 for Avg. Disk sec/Read.
 3/29/2007 1:54:09 PM -- Volume c:\sg3db has 0.0090 for Avg. Disk sec/Read.
 3/29/2007 1:54:09 PM -- Volume c:\sg4db has 0.0092 for Avg. Disk sec/Read.
 3/29/2007 1:54:09 PM -- Volume c:\sg1lg has 0.0014 for Avg. Disk sec/Write.
 3/29/2007 1:54:09 PM -- Volume c:\sg1lg has 0.0000 for Avg. Disk sec/Read.
 3/29/2007 1:54:09 PM -- Volume c:\sg2lg has 0.0014 for Avg. Disk sec/Write.
 3/29/2007 1:54:09 PM -- Volume c:\sg2lg has 0.0000 for Avg. Disk sec/Read.
 3/29/2007 1:54:09 PM -- Volume c:\sg3lg has 0.0014 for Avg. Disk sec/Write.
 3/29/2007 1:54:09 PM -- Volume c:\sg3lg has 0.0000 for Avg. Disk sec/Read.
 3/29/2007 1:54:09 PM -- Volume c:\sg4lg has 0.0013 for Avg. Disk sec/Write.
 3/29/2007 1:54:09 PM -- Volume c:\sg4lg has 0.0000 for Avg. Disk sec/Read.
 3/29/2007 1:54:09 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
 3/29/2007 1:54:09 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.

Test Result Report

Checksum Statistics - All

| Database | Seen pages | Bad pages | Correctable pages | Wrong page no pages | File length / seconds taken |
|-------------------------|------------|-----------|-------------------|---------------------|-----------------------------|
| c:\sg1db\Jetstress1.edb | 12980322 | 0 | 0 | 0 | 3104 MBytes / 2992 seconds |
| c:\sg2db\Jetstress1.edb | 12986466 | 0 | 0 | 0 | 3152 MBytes / 2226 seconds |

| | | | | | |
|-------------------------|----------|---|---|---|----------------------------------|
| c:\sg3db\Jetstress1.edb | 12981090 | 0 | 0 | 0 | 3110 MBytes / 3020 seconds |
| c:\sg4db\Jetstress1.edb | 12986978 | 0 | 0 | 0 | 3156 MBytes / 2326 seconds |
| (Sum) | 51934856 | 0 | 0 | 0 | 237 MBytes / 10565 seconds |

Disk Subsystem Performance (of checksum)

| LogicalDisk | Avg. Disk sec/Read | Avg. Disk sec/Write | Disk Reads/sec | Disk Writes/sec |
|-------------|--------------------|---------------------|----------------|-----------------|
| c:\sg1db | 2.444 | 0.068 | 544.122 | 0.001 |
| c:\sg2db | 1.552 | 0.067 | 534.457 | 0.001 |
| c:\sg3db | 3.080 | 0.110 | 543.151 | 0.001 |
| c:\sg4db | 1.801 | 0.029 | 534.041 | 0.001 |

Memory System Performance (of checksum)

| Counter | Average | Minimum | Maximum |
|---------------------------------|--------------|--------------|--------------|
| % Processor Time | 13.783 | 0.000 | 70.632 |
| Available MBytes | 15212.266 | 15143.000 | 15367.000 |
| Free System Page Table Entries | 16756209.000 | 16756209.000 | 16756209.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 66824758.030 | 64774144.000 | 68399104.000 |
| Pool Paged Bytes | 67558106.693 | 66838528.000 | 68136960.000 |

Test Log

```

3/29/2007 10:53:01 AM -- Command Line: C:\PROGRA~1\EXCHAN~1\jetstresscmd /c
"C:\Jetstress\Perf2t - Direct Connect\Perf2t.xml"
3/29/2007 10:53:01 AM -- Jetstress testing begins ...
3/29/2007 10:53:01 AM -- Prepare testing begins ...
3/29/2007 10:53:02 AM -- Attaching databases ...
3/29/2007 10:53:02 AM -- Prepare testing ends.
3/29/2007 10:53:02 AM -- Dispatching transactions begins ...
3/29/2007 10:53:02 AM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)
3/29/2007 10:53:02 AM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)
3/29/2007 10:53:02 AM -- Database read latency thresholds: (average: 0.02 seconds/read,
maximum: 0.05 seconds/read).
3/29/2007 10:53:02 AM -- Log write latency thresholds: (average: 0.01 seconds/write,
maximum: 0.05 seconds/write).
3/29/2007 10:53:03 AM -- Operation mix: Sessions 2, Inserts 25%, Deletes 10%, Replaces
50%, Reads 15%, Lazy Commits 80%.
3/29/2007 10:53:03 AM -- Performance logging begins (interval: 15000 ms).
3/29/2007 10:53:03 AM -- Attaining prerequisites:
3/29/2007 11:03:20 AM -- \Database(JetstressCmd)\Database Cache Size, Last:
967237600.0 (lower bound: 966367600.0, upper bound: none)
3/29/2007 1:03:22 PM -- Performance logging ends.

```

3/29/2007 1:03:22 PM -- JetInterop batch transaction stats: 30371, 30515, 30136, and 30269.
3/29/2007 1:03:22 PM -- Dispatching transactions ends.
3/29/2007 1:03:22 PM -- Shutting down databases ...
3/29/2007 1:03:25 PM -- Instance448.1 (complete), Instance448.2 (complete), Instance448.3 (complete), and Instance448.4 (complete)
3/29/2007 1:03:26 PM -- Performance logging begins (interval: 15000 ms).
3/29/2007 1:03:26 PM -- Verifying database checksums ...
3/29/2007 1:53:47 PM -- c:\sg1db (100% processed), c:\sg2db (100% processed), c:\sg3db (100% processed), and c:\sg4db (100% processed)
3/29/2007 1:53:48 PM -- Performance logging ends.
3/29/2007 1:53:48 PM -- [C:\Jetstress\Perf2t - Direct Connect\DBChecksum_2007_3_29_13_3_25.blg](#) has 199 samples.

Appendix C: Streaming Backup Testing

Streaming Backup Test Result Report

Streaming Backup Statistics - All

| Database Instance | Database Size (MBytes) | Elapsed Backup Time | MBytes Transferred/sec |
|-------------------|------------------------|---------------------|------------------------|
| Instance1112.1 | 98300.77 | 02:10:32 | 12.55 |
| Instance1112.2 | 98300.77 | 03:00:18 | 9.09 |
| Instance1112.3 | 98300.77 | 02:08:17 | 12.77 |
| Instance1112.4 | 98300.77 | 02:59:04 | 9.15 |

Jetstress System Parameters

| | |
|-------------------------------|-----------------------|
| Thread count | 2 (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 Instance | 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 |
|-------------------|------------------------|-------------------------|--------------------|---------------------|-------------------|--------------------|----------------|-----------------|------------------|
| Instance1112.1 | 5.989 | 0.015 | 101.083 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Instance1112.2 | 8.790 | 0.199 | 72.992 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Instance1112.3 | 5.987 | 0.000 | 102.793 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Instance1112.4 | 8.573 | 0.000 | 73.547 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Host System Performance

| Counter | Average | Minimum | Maximum |
|---------------------------------|---------------|--------------|---------------|
| % Processor Time | 55.190 | 23.833 | 90.446 |
| Available MBytes | 14950.892 | 14674.000 | 15332.000 |
| Free System Page Table Entries | 16758663.000 | 16758663.000 | 16758663.000 |
| Transition Pages RePurposed/sec | 9045.810 | 0.000 | 21407.793 |
| Pool Nonpaged Bytes | 60527559.831 | 50655232.000 | 65785856.000 |
| Pool Paged Bytes | 473683331.421 | 61276160.000 | 752951296.000 |
| Database Page Fault Stalls/sec | 0.000 | 0.000 | 0.000 |

Test Log

4/18/2007 2:21:34 AM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c "C:\Jetstress_Results\4SG\2t\stream\stream.xml"
4/18/2007 2:21:34 AM -- Jetstress testing begins ...
4/18/2007 2:21:34 AM -- Prepare testing begins ...
4/18/2007 2:21:35 AM -- Attaching databases ...
4/18/2007 2:21:35 AM -- Prepare testing ends.
4/18/2007 2:21:36 AM -- Performance logging begins (interval: 15000 ms).
4/18/2007 2:21:36 AM -- Streaming backup databases ...
4/18/2007 5:21:56 AM -- Performance logging ends.
4/18/2007 5:21:56 AM -- Instance1112.1 (100% processed), Instance1112.2 (100% processed), Instance1112.3 (100% processed), and Instance1112.4 (100% processed)
4/18/2007 5:21:56 AM --
[C:\Jetstress_Results\4SG\2t\stream\StreamingBackup_2007_4_18_2_21_35.blg](#) has 711 samples.
4/18/2007 5:21:56 AM -- Creating test report ...

Appendix D: Soft Recovery Testing

SoftRecovery Test Result Report

Soft-Recovery Statistics - All

| Database Instance | Log files replayed | Elapsed seconds |
|-------------------|--------------------|-----------------|
| Instance1152.1 | 500 | 204.5130072 |
| Instance1152.2 | 505 | 212.5129048 |
| Instance1152.3 | 536 | 217.5128408 |
| Instance1152.4 | 500 | 213.512892 |

Disk Subsystem Performance

| LogicalDisk | Avg. Disk sec/Read | Avg. Disk sec/Write | Disk Reads/sec | Disk Writes/sec | Avg. Disk Bytes/Write |
|---------------------|--------------------|---------------------|----------------|-----------------|-----------------------|
| Database (c:\sg1db) | 0.066 | 0.021 | 561.141 | 9.510 | (n/a) |
| Database (c:\sg2db) | 0.073 | 0.022 | 555.816 | 9.665 | (n/a) |
| Database (c:\sg3db) | 0.073 | 0.021 | 574.018 | 9.982 | (n/a) |
| Database (c:\sg4db) | 0.070 | 0.020 | 564.464 | 9.544 | (n/a) |
| Log (c:\sg1lg) | 0.001 | 0.001 | 76.488 | 2.916 | 4852.126 |
| Log (c:\sg2lg) | 0.001 | 0.001 | 77.887 | 2.785 | 4394.234 |
| Log (c:\sg3lg) | 0.001 | 0.001 | 81.884 | 2.828 | 4355.747 |
| Log (c:\sg4lg) | 0.001 | 0.001 | 77.121 | 2.804 | 4005.237 |

Host System Performance

| Counter | Average | Minimum | Maximum |
|---------------------------------|---------------|---------------|---------------|
| % Processor Time | 10.211 | 3.124 | 14.452 |
| Available MBytes | 14394.519 | 14210.000 | 15259.000 |
| Free System Page Table Entries | 16755896.000 | 16755896.000 | 16755896.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 59957551.407 | 59363328.000 | 61648896.000 |
| Pool Paged Bytes | 142512696.889 | 142209024.000 | 142774272.000 |
| Database Page Fault Stalls/sec | 0.014 | 0.000 | 1.500 |

Test Log

3/30/2007 1:14:42 PM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c "C:\Jetstress\2thread\Soft2t\soft2t.xml"

3/30/2007 1:14:42 PM -- Jetstress testing begins ...

3/30/2007 1:14:42 PM -- Prepare testing begins ...

3/30/2007 1:14:43 PM -- Attaching databases ...

3/30/2007 1:14:43 PM -- Prepare testing ends.

3/30/2007 1:14:43 PM -- Dispatching transactions begins ...

3/30/2007 1:14:43 PM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)

3/30/2007 1:14:43 PM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)

3/30/2007 1:14:43 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).

3/30/2007 1:14:43 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).

3/30/2007 1:14:44 PM -- Operation mix: Sessions 2, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

3/30/2007 1:14:44 PM -- Performance logging begins (interval: 15000 ms).

3/30/2007 1:14:44 PM -- Generating log files ...

3/30/2007 1:51:42 PM -- c:\sg1lg (100.2% generated), c:\sg2lg (101.2% generated), c:\sg3lg (107.4% generated), and c:\sg4lg (100.2% generated)

3/30/2007 1:51:43 PM -- Performance logging ends.

3/30/2007 1:51:43 PM -- JetInterop batch transaction stats: 9994, 9925, 9978, and 9954.

3/30/2007 1:51:43 PM -- Dispatching transactions ends.

3/30/2007 1:51:43 PM -- Shutting down databases ...

3/30/2007 1:51:46 PM -- Instance1152.1 (complete), Instance1152.2 (complete), Instance1152.3 (complete), and Instance1152.4 (complete)

3/30/2007 1:51:46 PM -- Performance logging begins (interval: 15000 ms).

3/30/2007 1:51:46 PM -- Verifying database checksums ...

3/30/2007 2:24:37 PM -- c:\sg1db (100% processed), c:\sg2db (100% processed), c:\sg3db (100% processed), and c:\sg4db (100% processed)

3/30/2007 2:24:38 PM -- Performance logging ends.

3/30/2007 2:24:38 PM --

[C:\Jetstress\2thread\Soft2t\DBChecksum_2007_3_30_13_51_46.blg](#) has 131 samples.

3/30/2007 2:24:40 PM --

[C:\Jetstress\2thread\Soft2t\DBChecksum_2007_3_30_13_51_46.html](#) is saved.

3/30/2007 2:24:40 PM -- Verifying log checksums ...

3/30/2007 2:25:02 PM -- c:\sg1lg (100 logs passed), c:\sg2lg (100 logs passed), c:\sg3lg (100 logs passed), and c:\sg4lg (100 logs passed)

3/30/2007 2:25:02 PM -- [C:\Jetstress\2thread\Soft2t\Performance_2007_3_30_13_14_43.blg](#) has 147 samples.

3/30/2007 2:25:02 PM -- Creating test report ...

3/30/2007 2:25:02 PM -- Volume c:\sg1db has 0.0086 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Volume c:\sg2db has 0.0084 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Volume c:\sg3db has 0.0086 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Volume c:\sg4db has 0.0088 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Volume c:\sg1lg has 0.0014 for Avg. Disk sec/Write.

3/30/2007 2:25:02 PM -- Volume c:\sg1lg has 0.0019 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Volume c:\sg2lg has 0.0014 for Avg. Disk sec/Write.

3/30/2007 2:25:02 PM -- Volume c:\sg2lg has 0.0013 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Volume c:\sg3lg has 0.0014 for Avg. Disk sec/Write.

3/30/2007 2:25:02 PM -- Volume c:\sg3lg has 0.0014 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Volume c:\sg4lg has 0.0014 for Avg. Disk sec/Write.

3/30/2007 2:25:02 PM -- Volume c:\sg4lg has 0.0012 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.

3/30/2007 2:25:02 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.

3/30/2007 2:25:03 PM --

[C:\Jetstress\2thread\Soft2t\Performance_2007_3_30_13_14_43.html](#) is saved.

3/30/2007 2:25:04 PM -- Performance logging begins (interval: 2000 ms).
 3/30/2007 2:25:04 PM -- Recovering databases ...
 3/30/2007 2:28:43 PM -- Performance logging ends.
 3/30/2007 2:28:43 PM -- Instance1152.1 (204.5130072), Instance1152.2 (212.5129048),
 Instance1152.3 (217.5128408), and Instance1152.4 (213.512892)
 3/30/2007 2:28:43 PM -- C:\Jetstress\2thread\Soft2t\SoftRecovery_2007_3_30_14_25_3.blg
 has 108 samples.
 3/30/2007 2:28:43 PM -- Creating test report ...

Performance Test Result Report

Test Summary

| | |
|----------------------------|--|
| Overall Test Result | Pass |
| Machine Name | 82D77C1 |
| Test Description | |
| Test Start Time | 3/30/2007 1:14:42 PM |
| Test End Time | 3/30/2007 1:51:46 PM |
| Jetstress Version | 08.01.0075.000 |
| Ese Version | 08.00.0685.024 |
| Operating System | Microsoft Windows Server 2003 Service Pack 1 (5.2.3790.65536) |
| Performance Log | C:\Jetstress\2thread\Soft2t\Performance_2007_3_30_13_14_43.blg C:\Jetstress\2thread\Soft2t\DBChecksum_2007_3_30_13_51_46.blg |

Database Sizing and Throughput

| | |
|--------------------------------|--------------|
| Achieved I/O per Second | 553.685 |
| Capacity Percentage | 100% |
| Throughput Percentage | 100% |
| Initial database size | 412303294464 |
| Final database size | 413968433152 |
| Database files (count) | 4 |

Jetstress System Parameters

| | |
|-------------------------------|-----------------------|
| Thread count | 2 (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 (c:\sg1db) | 0.009 | 0.005 | 70.462 | 66.727 | (n/a) |
| Database (c:\sg2db) | 0.008 | 0.005 | 69.450 | 66.868 | (n/a) |
| Database (c:\sg3db) | 0.009 | 0.005 | 72.785 | 71.329 | (n/a) |
| Database (c:\sg4db) | 0.009 | 0.005 | 69.879 | 66.186 | (n/a) |
| Log (c:\sg1lg) | 0.002 | 0.001 | 0.054 | 48.363 | 10431.222 |
| Log (c:\sg2lg) | 0.001 | 0.001 | 0.054 | 48.126 | 10522.700 |
| Log (c:\sg3lg) | 0.001 | 0.001 | 0.058 | 48.631 | 11070.722 |
| Log (c:\sg4lg) | 0.001 | 0.001 | 0.054 | 48.359 | 10425.309 |

Host System Performance

| Counter | Average | Minimum | Maximum |
|---------------------------------|---------------|---------------|---------------|
| % Processor Time | 2.359 | 1.066 | 5.806 |
| Available Mbytes | 14431.891 | 14206.000 | 15177.000 |
| Free System Page Table Entries | 16756136.000 | 16756136.000 | 16756136.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 54544370.068 | 53780480.000 | 54734848.000 |
| Pool Paged Bytes | 142840114.503 | 141258752.000 | 145985536.000 |
| Database Page Fault Stalls/sec | 0.000 | 0.000 | 0.000 |

Test Log

3/30/2007 1:14:42 PM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c "C:\Jetstress\2thread\Soft2t\soft2t.xml"
3/30/2007 1:14:42 PM -- Jetstress testing begins ...
3/30/2007 1:14:42 PM -- Prepare testing begins ...
3/30/2007 1:14:43 PM -- Attaching databases ...
3/30/2007 1:14:43 PM -- Prepare testing ends.
3/30/2007 1:14:43 PM -- Dispatching transactions begins ...
3/30/2007 1:14:43 PM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)
3/30/2007 1:14:43 PM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)

3/30/2007 1:14:43 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).

3/30/2007 1:14:43 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).

3/30/2007 1:14:44 PM -- Operation mix: Sessions 2, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

3/30/2007 1:14:44 PM -- Performance logging begins (interval: 15000 ms).

3/30/2007 1:14:44 PM -- Generating log files ...

3/30/2007 1:51:42 PM -- c:\sg1lg (100.2% generated), c:\sg2lg (101.2% generated), c:\sg3lg (107.4% generated), and c:\sg4lg (100.2% generated)

3/30/2007 1:51:43 PM -- Performance logging ends.

3/30/2007 1:51:43 PM -- JetInterop batch transaction stats: 9994, 9925, 9978, and 9954.

3/30/2007 1:51:43 PM -- Dispatching transactions ends.

3/30/2007 1:51:43 PM -- Shutting down databases ...

3/30/2007 1:51:46 PM -- Instance1152.1 (complete), Instance1152.2 (complete), Instance1152.3 (complete), and Instance1152.4 (complete)

3/30/2007 1:51:46 PM -- Performance logging begins (interval: 15000 ms).

3/30/2007 1:51:46 PM -- Verifying database checksums ...

3/30/2007 2:24:37 PM -- c:\sg1db (100% processed), c:\sg2db (100% processed), c:\sg3db (100% processed), and c:\sg4db (100% processed)

3/30/2007 2:24:38 PM -- Performance logging ends.

3/30/2007 2:24:38 PM --

C:\Jetstress\2thread\Soft2t\DBChecksum_2007_3_30_13_51_46.blg has 131 samples.

3/30/2007 2:24:40 PM --

C:\Jetstress\2thread\Soft2t\DBChecksum_2007_3_30_13_51_46.html is saved.

3/30/2007 2:24:40 PM -- Verifying log checksums ...

3/30/2007 2:25:02 PM -- c:\sg1lg (100 logs passed), c:\sg2lg (100 logs passed), c:\sg3lg (100 logs passed), and c:\sg4lg (100 logs passed)

3/30/2007 2:25:02 PM -- C:\Jetstress\2thread\Soft2t\Performance_2007_3_30_13_14_43.blg has 147 samples.

3/30/2007 2:25:02 PM -- Creating test report ...

3/30/2007 2:25:02 PM -- Volume c:\sg1db has 0.0086 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Volume c:\sg2db has 0.0084 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Volume c:\sg3db has 0.0086 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Volume c:\sg4db has 0.0088 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Volume c:\sg1lg has 0.0014 for Avg. Disk sec/Write.

3/30/2007 2:25:02 PM -- Volume c:\sg1lg has 0.0019 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Volume c:\sg2lg has 0.0014 for Avg. Disk sec/Write.

3/30/2007 2:25:02 PM -- Volume c:\sg2lg has 0.0013 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Volume c:\sg3lg has 0.0014 for Avg. Disk sec/Write.

3/30/2007 2:25:02 PM -- Volume c:\sg3lg has 0.0014 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Volume c:\sg4lg has 0.0014 for Avg. Disk sec/Write.

3/30/2007 2:25:02 PM -- Volume c:\sg4lg has 0.0012 for Avg. Disk sec/Read.

3/30/2007 2:25:02 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.

3/30/2007 2:25:02 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.

Database Checksum Results

Checksum Statistics - All

| Database | Seen pages | Bad pages | Correctable pages | Wrong page no pages | File length / seconds taken |
|-------------------------|------------|-----------|-------------------|---------------------|-----------------------------|
| c:\sg1db\Jetstress1.edb | 12631394 | 0 | 0 | 0 | 378 MBytes / 1969 seconds |

| | | | | | |
|-------------------------|----------|---|---|---|-------------------------------|
| c:\sg2db\Jetstress1.edb | 12633442 | 0 | 0 | 0 | 394 MBytes / 1942 seconds |
| c:\sg3db\Jetstress1.edb | 12637026 | 0 | 0 | 0 | 422 MBytes / 1970 seconds |
| c:\sg4db\Jetstress1.edb | 12631394 | 0 | 0 | 0 | 378 MBytes / 1907 seconds |
| (Sum) | 50533256 | 0 | 0 | 0 | 1575 MBytes / 7790 seconds |

Disk Subsystem Performance (of checksum)

| LogicalDisk | Avg. Disk sec/Read | Avg. Disk sec/Write | Disk Reads/sec | Disk Writes/sec |
|-------------|--------------------|---------------------|----------------|-----------------|
| c:\sg1db | 0.116 | 0.002 | 802.265 | 0.005 |
| c:\sg2db | 0.112 | 0.001 | 804.838 | 0.001 |
| c:\sg3db | 0.113 | 0.000 | 801.434 | 0.002 |
| c:\sg4db | 0.111 | 0 | 804.493 | 0.001 |

Memory System Performance (of checksum)

| Counter | Average | Minimum | Maximum |
|---------------------------------|---------------|---------------|---------------|
| % Processor Time | 21.630 | 15.025 | 24.791 |
| Available MBytes | 15070.206 | 15049.000 | 15197.000 |
| Free System Page Table Entries | 16755896.000 | 16755896.000 | 16755896.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 67501048.183 | 66469888.000 | 68403200.000 |
| Pool Paged Bytes | 141612884.031 | 141479936.000 | 142712832.000 |

Test Log

3/30/2007 1:14:42 PM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c "C:\Jetstress\2thread\Soft2t\soft2t.xml"

3/30/2007 1:14:42 PM -- Jetstress testing begins ...

3/30/2007 1:14:42 PM -- Prepare testing begins ...

3/30/2007 1:14:43 PM -- Attaching databases ...

3/30/2007 1:14:43 PM -- Prepare testing ends.

3/30/2007 1:14:43 PM -- Dispatching transactions begins ...

3/30/2007 1:14:43 PM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)

3/30/2007 1:14:43 PM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)

3/30/2007 1:14:43 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).

3/30/2007 1:14:43 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).

3/30/2007 1:14:44 PM -- Operation mix: Sessions 2, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

3/30/2007 1:14:44 PM -- Performance logging begins (interval: 15000 ms).

3/30/2007 1:14:44 PM -- Generating log files ...

3/30/2007 1:51:42 PM -- c:\sg1lg (100.2% generated), c:\sg2lg (101.2% generated), c:\sg3lg (107.4% generated), and c:\sg4lg (100.2% generated)

3/30/2007 1:51:43 PM -- Performance logging ends.
3/30/2007 1:51:43 PM -- JetInterop batch transaction stats: 9994, 9925, 9978, and 9954.
3/30/2007 1:51:43 PM -- Dispatching transactions ends.
3/30/2007 1:51:43 PM -- Shutting down databases ...
3/30/2007 1:51:46 PM -- Instance1152.1 (complete), Instance1152.2 (complete),
Instance1152.3 (complete), and Instance1152.4 (complete)
3/30/2007 1:51:46 PM -- Performance logging begins (interval: 15000 ms).
3/30/2007 1:51:46 PM -- Verifying database checksums ...
3/30/2007 2:24:37 PM -- c:\sg1db (100% processed), c:\sg2db (100% processed), c:\sg3db
(100% processed), and c:\sg4db (100% processed)
3/30/2007 2:24:38 PM -- Performance logging ends.
3/30/2007 2:24:38 PM --
[C:\Jetstress\2thread\Soft2t\DBChecksum_2007_3_30_13_51_46.blg](#) has 131 samples.

Appendix E: Maximum Solution IOPS Testing

The purpose of this test is to verify the storage configuration which the customer is planning to deploy. The test run has been successful, which means that the database read latency and log write latency are below 20ms; Database page fault stalls/sec is 0. However, Microsoft strongly recommends that you perform further validation of this storage solution (additional task listed below).

You should refer to the table below to determine if the actual disk IO (achieved IO) has exceeded the targeted IO (expected IO). If not, you may want to increase the thread count to increase the load, provided that the disk latency will not exceed the threshold.

Performance Test Result Report

Test Summary

| | |
|----------------------------|---|
| Overall Test Result | Pass |
| Machine Name | 82D77C1 |
| Test Description | |
| Test Start Time | 4/8/2007 8:28:19 PM |
| Test End Time | 4/8/2007 10:31:48 PM |
| Jetstress Version | 08.01.0075.000 |
| Ese Version | 08.00.0685.024 |
| Operating System | Microsoft Windows Server 2003 Service Pack 1 (5.2.3790.65536) |
| Performance Log | C:\Jetstress\14thread\Performance_2007_4_8_20_28_20.blg C:\Jetstress\14thread\DBChecksum_2007_4_8_22_31_48.blg |

Database Sizing and Throughput

| | |
|--------------------------------|--------------|
| Achieved I/O per Second | 1379.992 |
| Capacity Percentage | 100% |
| Throughput Percentage | 100% |
| Initial database size | 412303294464 |
| Final database size | 425328705536 |
| Database files (count) | 4 |

Jetstress System Parameters

| | |
|-------------------------------|------------------------|
| Thread count | 14 (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 (c:\sg1db) | 0.019 | 0.006 | 180.965 | 163.915 | (n/a) |
| Database (c:\sg2db) | 0.020 | 0.006 | 180.347 | 163.916 | (n/a) |
| Database (c:\sg3db) | 0.019 | 0.006 | 180.395 | 164.732 | (n/a) |
| Database (c:\sg4db) | 0.019 | 0.006 | 181.330 | 164.392 | (n/a) |
| Log (c:\sg1lg) | 0 | 0.002 | 0.000 | 86.551 | 13789.124 |
| Log (c:\sg2lg) | 0.000 | 0.002 | 0.000 | 86.643 | 13791.966 |
| Log (c:\sg3lg) | 0 | 0.002 | 0.000 | 86.353 | 13910.067 |
| Log (c:\sg4lg) | 0 | 0.002 | 0.000 | 87.064 | 13749.507 |

Host System Performance

| Counter | Average | Minimum | Maximum |
|---------------------------------|--------------|--------------|--------------|
| % Processor Time | 6.119 | 4.477 | 11.873 |
| Available MBytes | 14351.371 | 14335.000 | 15277.000 |
| Free System Page Table Entries | 16757803.000 | 16757803.000 | 16757803.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 56173848.406 | 56127488.000 | 56295424.000 |
| Pool Paged Bytes | 51779421.988 | 51568640.000 | 52240384.000 |
| Database Page Fault Stalls/sec | 0.005 | 0.000 | 1.662 |

Test Log

4/8/2007 8:28:19 PM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c "C:\Jetstress\14thread\Perf14t.xml"

4/8/2007 8:28:19 PM -- Jetstress testing begins ...

4/8/2007 8:28:19 PM -- Prepare testing begins ...

4/8/2007 8:28:20 PM -- Attaching databases ...

4/8/2007 8:28:20 PM -- Prepare testing ends.

4/8/2007 8:28:20 PM -- Dispatching transactions begins ...

4/8/2007 8:28:20 PM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)

4/8/2007 8:28:20 PM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)

4/8/2007 8:28:20 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).

4/8/2007 8:28:20 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).

4/8/2007 8:28:21 PM -- Operation mix: Sessions 14, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

4/8/2007 8:28:21 PM -- Performance logging begins (interval: 15000 ms).

4/8/2007 8:28:21 PM -- Attaining prerequisites:

4/8/2007 8:31:42 PM -- \Database(JetstressCmd)\Database Cache Size, Last: 966836200.0 (lower bound: 966367600.0, upper bound: none)

4/8/2007 10:31:44 PM -- Performance logging ends.

4/8/2007 10:31:44 PM -- JetInterop batch transaction stats: 78153, 78527, 78435, and 78680.

4/8/2007 10:31:44 PM -- Dispatching transactions ends.

4/8/2007 10:31:44 PM -- Shutting down databases ...

4/8/2007 10:31:48 PM -- Instance2052.1 (complete), Instance2052.2 (complete), Instance2052.3 (complete), and Instance2052.4 (complete)

4/8/2007 10:31:48 PM -- Performance logging begins (interval: 15000 ms).

4/8/2007 10:31:48 PM -- Verifying database checksums ...

4/8/2007 11:05:35 PM -- c:\sg1db (100% processed), c:\sg2db (100% processed), c:\sg3db (100% processed), and c:\sg4db (100% processed)

4/8/2007 11:05:36 PM -- Performance logging ends.

4/8/2007 11:05:36 PM -- C:\Jetstress\14thread\DBChecksum_2007_4_8_22_31_48.blg has 135 samples.

4/8/2007 11:05:37 PM -- C:\Jetstress\14thread\DBChecksum_2007_4_8_22_31_48.html is saved.

4/8/2007 11:05:37 PM -- Verifying log checksums ...

4/8/2007 11:05:42 PM -- c:\sg1lg (22 logs passed), c:\sg2lg (22 logs passed), c:\sg3lg (22 logs passed), and c:\sg4lg (22 logs passed)

4/8/2007 11:05:42 PM -- C:\Jetstress\14thread\Performance_2007_4_8_20_28_20.blg has 493 samples.

4/8/2007 11:05:42 PM -- Creating test report ...

4/8/2007 11:05:44 PM -- Volume c:\sg1db has 0.0194 for Avg. Disk sec/Read.

4/8/2007 11:05:44 PM -- Volume c:\sg2db has 0.0196 for Avg. Disk sec/Read.

4/8/2007 11:05:44 PM -- Volume c:\sg3db has 0.0187 for Avg. Disk sec/Read.

4/8/2007 11:05:44 PM -- Volume c:\sg4db has 0.0194 for Avg. Disk sec/Read.

4/8/2007 11:05:44 PM -- Volume c:\sg1lg has 0.0024 for Avg. Disk sec/Write.

4/8/2007 11:05:44 PM -- Volume c:\sg1lg has 0.0000 for Avg. Disk sec/Read.

4/8/2007 11:05:44 PM -- Volume c:\sg2lg has 0.0024 for Avg. Disk sec/Write.

4/8/2007 11:05:44 PM -- Volume c:\sg2lg has 0.0000 for Avg. Disk sec/Read.

4/8/2007 11:05:44 PM -- Volume c:\sg3lg has 0.0024 for Avg. Disk sec/Write.

4/8/2007 11:05:44 PM -- Volume c:\sg3lg has 0.0000 for Avg. Disk sec/Read.

4/8/2007 11:05:44 PM -- Volume c:\sg4lg has 0.0024 for Avg. Disk sec/Write.

4/8/2007 11:05:44 PM -- Volume c:\sg4lg has 0.0000 for Avg. Disk sec/Read.

4/8/2007 11:05:44 PM -- Test has 1.66226282372375 Maximum Database Page Fault Stalls/sec.

4/8/2007 11:05:44 PM -- Test has 2 Database Page Fault Stalls/sec samples higher than 0.

Database Checksum Results

Checksum Statistics - All

| Database | Seen pages | Bad pages | Correctable pages | Wrong page no pages | File length / seconds taken |
|-------------------------|------------|-----------|-------------------|---------------------|-----------------------------|
| c:\sg1db\Jetstress1.edb | 12976482 | 0 | 0 | 0 | 3074 MBytes / 1985 seconds |
| c:\sg2db\Jetstress1.edb | 12978274 | 0 | 0 | 0 | 3088 MBytes / 2026 seconds |
| c:\sg3db\Jetstress1.edb | 12985186 | 0 | 0 | 0 | 3142 MBytes / 2025 seconds |
| c:\sg4db\Jetstress1.edb | 12980066 | 0 | 0 | 0 | 3102 MBytes / 2006 seconds |
| (Sum) | 51920008 | 0 | 0 | 0 | 121 MBytes / 8043 seconds |

Disk Subsystem Performance (of checksum)

| LogicalDisk | Avg. Disk sec/Read | Avg. Disk sec/Write | Disk Reads/sec | Disk Writes/sec |
|-------------|--------------------|---------------------|----------------|-----------------|
| c:\sg1db | 0.117 | 0.001 | 800.822 | 0.003 |
| c:\sg2db | 0.119 | 0.000 | 802.337 | 0.000 |
| c:\sg3db | 0.115 | 0.000 | 802.181 | 0.000 |
| c:\sg4db | 0.119 | 0.000 | 803.494 | 0.000 |

Memory System Performance (of checksum)

| Counter | Average | Minimum | Maximum |
|---------------------------------|--------------|--------------|--------------|
| % Processor Time | 25.048 | 16.439 | 27.655 |
| Available MBytes | 15169.215 | 15111.000 | 15298.000 |
| Free System Page Table Entries | 16757733.000 | 16757733.000 | 16757733.000 |
| Transition Pages RePurposed/sec | 0.000 | 0.000 | 0.000 |
| Pool Nonpaged Bytes | 65954368.474 | 64659456.000 | 67342336.000 |
| Pool Paged Bytes | 51901204.859 | 51703808.000 | 53620736.000 |

Test Log

4/8/2007 8:28:19 PM -- Command Line: "C:\PROGRA~1\EXCHAN~1\jetstresscmd.exe" /c "C:\Jetstress\14thread\Perf14t.xml"
4/8/2007 8:28:19 PM -- Jetstress testing begins ...
4/8/2007 8:28:19 PM -- Prepare testing begins ...
4/8/2007 8:28:20 PM -- Attaching databases ...
4/8/2007 8:28:20 PM -- Prepare testing ends.
4/8/2007 8:28:20 PM -- Dispatching transactions begins ...
4/8/2007 8:28:20 PM -- Database cache settings: (minimum: 128.0 MB, maximum: 1.0 GB)
4/8/2007 8:28:20 PM -- Database flush thresholds: (start: 10.2 MB, stop: 20.5 MB)
4/8/2007 8:28:20 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).
4/8/2007 8:28:20 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).
4/8/2007 8:28:21 PM -- Operation mix: Sessions 14, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.
4/8/2007 8:28:21 PM -- Performance logging begins (interval: 15000 ms).
4/8/2007 8:28:21 PM -- Attaining prerequisites:
4/8/2007 8:31:42 PM -- \Database(JetstressCmd)\Database Cache Size, Last: 966836200.0 (lower bound: 966367600.0, upper bound: none)
4/8/2007 10:31:44 PM -- Performance logging ends.
4/8/2007 10:31:44 PM -- JetInterop batch transaction stats: 78153, 78527, 78435, and 78680.
4/8/2007 10:31:44 PM -- Dispatching transactions ends.
4/8/2007 10:31:44 PM -- Shutting down databases ...
4/8/2007 10:31:48 PM -- Instance2052.1 (complete), Instance2052.2 (complete), Instance2052.3 (complete), and Instance2052.4 (complete)
4/8/2007 10:31:48 PM -- Performance logging begins (interval: 15000 ms).
4/8/2007 10:31:48 PM -- Verifying database checksums ...
4/8/2007 11:05:35 PM -- c:\sg1db (100% processed), c:\sg2db (100% processed), c:\sg3db (100% processed), and c:\sg4db (100% processed)
4/8/2007 11:05:36 PM -- Performance logging ends.
4/8/2007 11:05:36 PM -- C:\Jetstress\14thread\DBChecksum_2007_4_8_22_31_48.blg has 135 samples.