

**ESRP Storage Program**  
**EMC Celerra NS20 (8,000 User) Storage Solution for**  
**Microsoft Exchange Server 2007 SP1**

**Tested with:** ESRP – Storage Version 2.1  
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## Overview

This document provides information on a EMC<sup>®</sup> Celerra<sup>®</sup> NS20 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 [Contact Information](#).

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

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## Features

This document describes an approach that can be used to configure Microsoft Exchange 2007 with EMC's Celerra NS20 storage system. The EMC Celerra NS20 meets the storage needs of a wide range of applications that include:

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

In addition, the NS20 supports a wide range of server operating environments like Microsoft Windows, Linux, Solaris, AIX, and HP-UX.

The Celerra NS20 is a high-performance, full function IP storage platform. It delivers NAS and iSCSI capabilities to consolidate application storage and file servers. Easy to deploy and simple to manage, the NS20 is all-in-one IP storage for customers looking for enterprise-class capabilities packaged for specific

applications, departments, or locations. The NS20FC provides customers the flexibility to combine Fibre Channel SAN connectivity with a NAS environment. The NS20FC is the most cost-effective way to add NAS and iSCSI to an existing SAN. Both offerings are available in single – and dual-blade configurations.

Regardless of the configuration, Celerra platforms offer a full suite of advanced functionality:

- Robust snap and replication capabilities offer protection of data.
- Celerra File Mover API allows automated policy-based movement of files between tiers of storage.
- File Level Retention provides disk-based WORM functionality, which is useful for archiving Exchange e-mails
- Automated Volume Management and Virtual Provisioning improve storage utilization.

The performance results and best practices discussed in this document provide proven guidelines for configuring the Celerra NS20 for high-performance Exchange environments. For this solution, an integrated Celerra NS20 storage system was used and configured for 8,000 Exchange 2007 users. Each of the 8,000 users had a profile of 0.5 IOPS and a 250 MB mailbox.

## Solution Description

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

One method often used to simplify the sizing and configuration of large amounts of EMC Celerra NS20 storage for use with Microsoft Exchange Server 2007 is to define a unit of measure. This unit of measure is known as a **building block**. The Microsoft Exchange Server 2007 building block is defined as six disk spindles, four spindles for Exchange database and two spindles for Exchange log.

The testing in this document proves that eight building blocks (32 spindles for the databases and 16 spindles for logs) meet and exceed the Microsoft Exchange server recommended metrics for reliability, scalability, and performance.

This unit of measure or building block needs to be scalable. In that way, an organization can simply take this block of work and multiply it by some factor until the desired number of Microsoft Exchange Server users has been properly met or configured to satisfy the Microsoft Exchange Server recommended performance metrics.

If each unit is properly configured, it will match the Microsoft Exchange server recommendations for a healthy-performing system – from both a disk and an end-user perspective.

In this particular testing, two servers were used to simulate the Exchange environment. [Table 1](#) describes the characteristics of the storage configuration defined on each server.

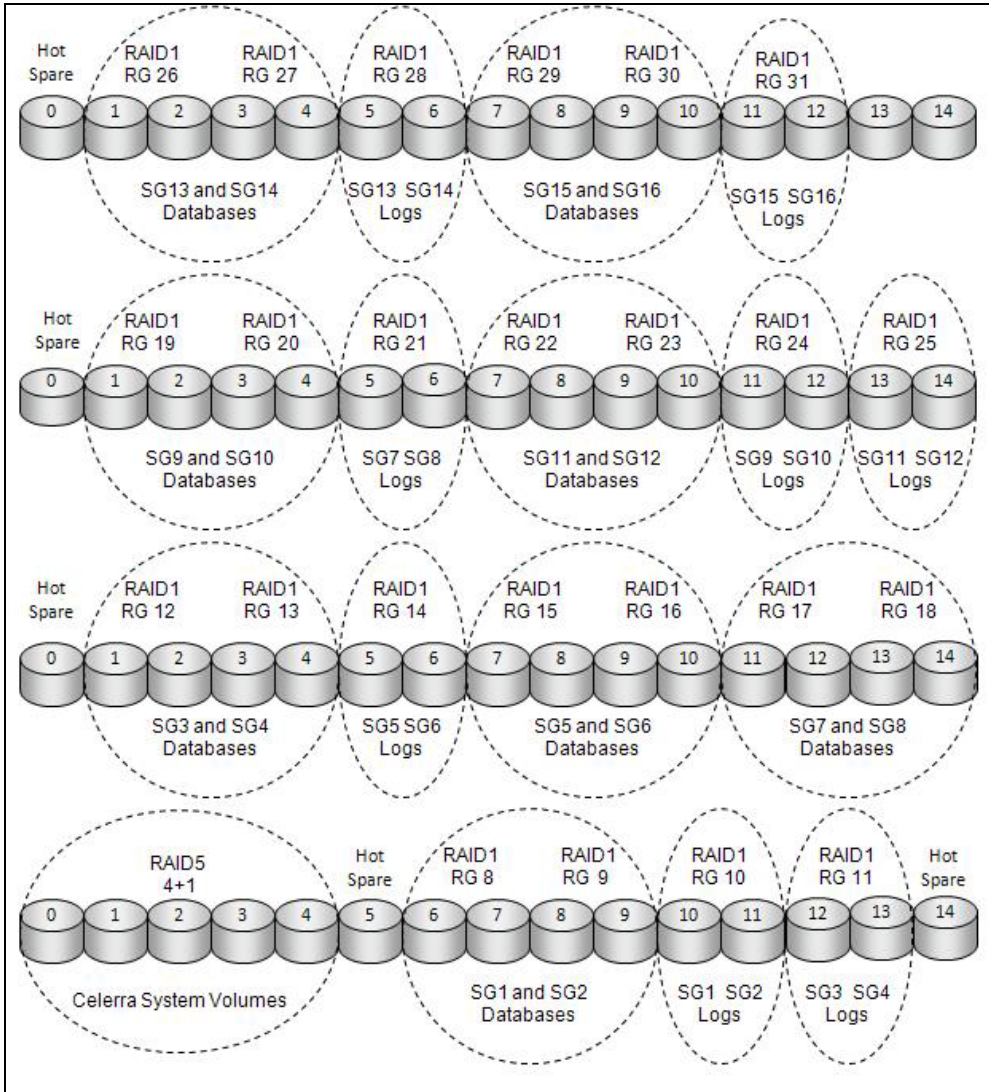
Number of users	4,000
Number of Exchange Servers	1
IOPS per user	0.5
Mailbox size	250 MB
Number of disks required for Logs and Database	24(16 for database & 8 for log)
Disk Type	300 GB 15K Fibre channel
RAID Type	1

**Table 1 Single Server Characteristics**

Using the performance characteristics of the Celerra NS20 architecture and the I/O capability of the 300 GB, 15k disk drives, 48 spindles are required to provide the necessary performance to match the I/O requirements of 8,000 0.5 IOPS users with a 1:1 read/write ratio.

For each server, the Exchange databases reside on 16 spindles and the logs on eight spindles. This is equivalent to four building blocks. This design is then duplicated for the second server, resulting in eight building blocks. This configuration can support 8,000 users at 0.5 IOPS.

See [Figure 1](#) on [page 7](#) for a view of the eight building block disk layout on a Celerra NS20.



**Figure 1 Disk Configuration**

The Exchange databases for SG1 and SG2 are striped over four disk spindles from two 1+1 RAID 1 groups. The Exchange databases for SG3 and SG4 are striped over another four disk spindles from an additional two 1+1 RAID 1 groups. The logs for SG1 and SG2 will be stored on a single 1+1 RAID 1 group. The logs for SG3 and SG4 will be stored on another single 1+1 RAID 1 group.

The same configuration is followed for the remaining building block configuration (Database & Log Storage groups).

The ESRP-Storage program focuses on storage solutions testing to address performance and reliability issues with storage design. However, storage is not the only factor to take into consideration when designing a scalable Exchange solution. Other factors that 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

Due to such variables, 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***

The solution is intended for medium-to-large Enterprise Exchange customers who would like to consolidate their Exchange users on a high-performance, highly available storage platform. This configuration is designed to support 8,000 Exchange users, with the following assumptions:

- 2 Exchange Jetstress Servers
- 4,000 users per Exchange server
- User I/O profile for testing – 0.42 (0.5 IOPs tested)
- User mailbox size for testing - 250 MB
- 8 Exchange storage groups per server
- 1 Mailbox database per storage group

## *Tested Deployment*

The following tables summarize the testing environment:

### **Simulated Exchange Configuration**

[Table 2](#) lists the simulated Exchange configuration details

Number of Exchange mailboxes simulated	8000
Number of hosts	2
Number of mailboxes/host	4000
Number of storage groups/host	8
Number of mailbox stores/storage group	1
Number of mailboxes/mailbox store	500
Number of mailbox store LUNs/storage group	1
Simulated profile: I/O's per second per mailbox (IOPS, include 20% headroom)	0.5
Database LUN size	237.8 GB
Log LUN size	119 GB
Backup LUN size/storage group	N/A
Total database size for performance testing	3044.4 GB
% formatted storage capacity used by Exchange database**	80%

**Table 2 Simulated Exchange Configuration**

\*\*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

Table 3 lists the hardware used in the environment.

Storage Connectivity (Fiber Channel, SAS, SATA, iSCSI)	iSCSI
Storage model and OS/firmware revision	EMC Celerra Version 5.6.37.6
Storage cache	2 GB Spilt for Write/Read
Number of storage controllers	4 (2 Frontend, 2 Backend)
Number of storage ports	4 (8 total but 4 are passive/redundant)
Maximum bandwidth of storage connectivity to host	4 x 1 Gb iSCSI Total Bandwidth 4 Gb/s
Switch type/model/firmware revision	Dell PowerConnect 5324 Gigabit Ethernet x2 Firmware version 2.0.0.40
HBA model and firmware	Intel Pro/1000 PT Quad Port Srv.
Number of HBAs/host	2 Quad Port HBAs
Host server type	Dell PowerEdge 6850
Total number of disks tested in solution	48
Maximum number of spindles can be hosted in the storage	60

Table 3 Hardware (list of all hardware used for the test)

## Primary Storage Software

Table 4 lists the software used in the environment.

HBA driver	Microsoft iSCSI Initiator 2.06-build3497, Driver Version : 9.10.8.0
HBA QueueTarget Setting	Not Applicable
HBA QueueDepth Setting	Not applicable
Multi-Pathing	Multiple connections per session
Host OS	Microsoft Windows Server 2003 R@ Enterprise X64 Edition SP2
ESE.dll file version	08.01.0240.005
Replication solution name/version	N/A

Table 4 Primary Storage Software

## Primary Storage Disk Configuration (Mailbox Store Disks)

Table 5 lists the disk configuration (mailbox store disks) for the environment.

Disk type, speed and firmware revision	4 Gbps FC 15k rpm -60AC
Raw capacity per disk (GB)	300GB
Number of physical disks in test	32 (16 per host)
total raw storage capacity (GB)	9600 GB
Disk slice size (GB)	Not applicable
Number of slices per LUN or number of disks per LUN	2 Disks per LUN
Raid level	RAID 1
Total formatted capacity	3804.8 GB
Storage capacity utilization	39.63%
Database capacity utilization	31.7%

**Table 5 Storage Disk Configuration (mailbox store)**

## Primary Storage Disk Configuration (Transactional Log Disks)

Table 6 lists the disk configuration (transactional log disks) for the environment.

Disk type, speed and firmware revision	4 Gbps FC 15k rpm -60AC
Raw capacity per disk (GB)	300 GB
Number of Spindles in test	16 (8 per host)
total raw storage capacity (GB)	4800 GB
Disk slice size (GB)	Not Applicable
Number of slices per LUN or number of disks per LUN	2 Disks per LUN
Raid level	RAID 1
Total formatted capacity	1902 GB

**Table 6 Storage Disk Configuration (Transactional Log Disks)**

### *Streaming backup*

N/A

### *Replication Configuration*

N/A

## Best Practices

Exchange server is a disk-intensive application. Based on the testing run using the ESRP framework, EMC recommends the Exchange 2007 best practices to improve the storage performance following 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*

1. Use DISKPART (in Microsoft Windows Server 2003 R2 Enterprise X64 Edition SP2) to align all Microsoft Exchange related disks. Use a value of 64 for iSCSI LUNs to align the NTFS partitions at a 64 KB boundary.
2. Isolate the Microsoft Exchange Server database workload from other I/O-intensive applications or workloads. This ensures the highest levels of performance for Microsoft Exchange and simplifies troubleshooting in the event of a disk-related Microsoft Exchange performance problem.
3. The Microsoft Exchange Server logs and databases should be separated onto different physical disks and in different RAID groups.
4. Size and configure the environment based on disk spindle performance as a primary consideration, with spindle or storage capacity a secondary issue. In other words, size for performance first and make the capacity requirements work.

### *Backup strategy*

A well-designed and implemented disaster recovery strategy should be a top priority for every Microsoft Exchange Server deployment. Proper planning must be done prior to configuration in order to meet required service-level agreements (SLAs) for server downtime. Various backup and restore strategies can be implemented, depending on the requirements of the environment. EMC offers multiple solutions to protect an Exchange environment. EMC Replication Manager can manage snapshot and replication in an Exchange environment. EMC NetWorker<sup>®</sup> allows an Exchange environment to be backed up to tape or to disk. Both of these products work in conjunction with Volume Shadow Copy Services (VSS) as proven techniques, having undergone vigorous testing.

## Test Result Summary

This section provides a high level summary of the test data from ESRP, as well as links to the detailed reports, which are generated by the ESRP testing Framework.

### *Reliability*

A number of the tests in the framework are designed to test reliability over a 24-hour period. The goal of these tests is to verify that the storage can handle high I/O load for long period of time. Following the stress test, both the log and database are analyzed for integrity to ensure that there is no database/log corruption.

The reliability test on the Celerra NS20 provided the following results:

- No errors were reported in the event log file for the storage reliability testing
- No errors were reported for the database and log checksum.

The following tests are out-of-scope of this test scenario:

- Back-to-disk test
- Database checksum on the remote storage database

The Jetstress performance results (24-hour performance test) can be found in ["Appendix A: Stress Test Reports" on Page 16](#).

### *Primary Storage Performance Results*

The Primary Storage performance testing is designed to exercise the storage with maximum sustainable Exchange-type I/O for two hours. The test is used to show how long it takes for the storage to respond to an I/O under load. The data included in the following tables is a sample taken from each of the attached hosts. It is the average of all the logical disks in the two-hour test duration.

Each server is listed separately, and the aggregate numbers across all the servers is listed in the section that follows.

### Individual Server Metrics:

This information in these tables includes the sum of I/Os across storage groups and the average latency across all storage groups on a per-server basis.

On EX1PMX01:

<b>Database I/O</b>	
Average Database Disk Transfers/sec	2163.388
Average Database Disk Reads/sec	1090.51
Average Database Disk Writes/sec	1072.878
Average Database Disk Read Latency (ms)	17
Average Database Disk Write Latency (ms)	8
<b>Transaction Log I/O</b>	
Average Log Disk Writes/sec	595.884
Average Log Disk Write Latency (ms)	4

On EX1PMX02:

<b>Database I/O</b>	
Average Database Disk Transfers/sec	2179.778
Average Database Disk Reads/sec	1099.404
Average Database Disk Writes/sec	1080.374
Average Database Disk Read Latency (ms)	17
Average Database Disk Write Latency (ms)	8
<b>Transaction Log I/O</b>	
Average Log Disk Writes/sec	598.533
Average Log Disk Write Latency (ms)	4

### Aggregate Performance across all servers Metrics:

The information in this table includes the sum of I/Os across servers in the solution, and average latency across all servers in the solution.

<b>Database I/O</b>	
Database Disks Transfers/sec	4343.17
Database Disks Reads/sec	2189.91
Database Disks Writes/sec	2153.25
Average Database Disk Read Latency (ms)	17
Average Database Disk Write Latency (ms)	8
<b>Transaction Log I/O</b>	
Log Disks Writes/sec	1194.42
Average Log Disk Write Latency (ms)	4

The Jetstress performance results (2-hour performance test) can be found in ["Appendix B: Performance Test Reports \(2 hrs\)" on Page 24](#).

Also, refer to ["Appendix E: Maximum Solution IOPS Testing" on Page 46](#) to find results that characterize the maximum performance of the disk layout.

## ***Streaming Backup/Recovery Performance***

There are two tests in this section. First one 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***

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.

On EX1PMX01

MB read/sec per storage group	20.66
MB read/sec total	165.29

On EX1PMX02

MB read/sec per storage group	20.21
MB read/sec total	161.67

The Jetstress Streaming Backup Test results can be found in [“Appendix C: Database Read-only Performance” on Page 33](#).

### ***Log Read-only Performance***

To see the Jetstress Soft Recovery Test results, see the section [“Appendix D: Log Read-only Performance Test Reports” on Page 36](#).

Log Read-only Performance Test measures the log replay rate for each Storage group. The test also exercises the log file checksum performance, DB checksum performance, and log generation performance. After the Log Read-only Performance Test, all databases will be cleanly shut down, and the log files are deleted.

The following table shows the average rate for 500 log files played in a single storage group for each server. Each log file is 1 MB in size.

On EX1PMX01

Average time to play one log file (sec)	3.01
---	------

On EX1PMX02

Average time to play one log file (sec)	2.97
---	------

## ***Conclusion***

As this document illustrates, EMC's Celerra NS20 is more than capable of supporting deployments of up to 8,000 users at 0.5 IOPs per user. A careful analysis of each environment must be performed in order to understand the specific requirements of the architecture and to adapt a solution that best fits those needs. The information included in this document verifies that the NS20 can support a high-performance Exchange configuration. This solution does not include local or remote replication. The addition of those features may affect performance.

Note that neither local nor remote replication were part of the solution.

This document is developed by EMC, and reviewed by the Microsoft Exchange Product team. The test results/data presented in this document are based on the tests introduced in the ESRP framework. The 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 benchmark program; tests are not designed to get the maximum throughput for a given solution. Rather, it is focused on producing recommendations from vendors for the Exchange application. Therefore, the data presented in this document should not be used for direct comparisons among the solutions.

## ***Contact Information***

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# Appendix A: Stress Test Reports (24 hrs Performance Test)

Server EX1PMX01

Microsoft Exchange Server 2007 Jetstress

## Stress Test Result Report

Test Summary

**Overall Test Result** Pass

**Machine Name** EX1PMX01

### Test Description

**Test Start Time** 6/23/2008 11:59:04 PM

**Test End Time** 6/25/2008 12:05:27 AM

**Jetstress Version** 08.02.0050.000

**Ese Version** 08.01.0240.005

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

**Performance Log** [C:\Program Files\Exchange Jetstress\Stress\\_2008\\_6\\_23\\_23\\_59\\_26.blg](C:\Program Files\Exchange Jetstress\Stress_2008_6_23_23_59_26.blg)  
[C:\Program Files\Exchange Jetstress\DBChecksum\\_2008\\_6\\_25\\_0\\_5\\_27.blg](C:\Program Files\Exchange Jetstress\DBChecksum_2008_6_25_0_5_27.blg)

Database Sizing and Throughput

**Achieved I/O per Second** 2121.292

**Capacity Percentage** 100%

**Throughput Percentage** 100%

**Initial database size** 1634448048128

**Final database size** 1712633020416

**Database files (count)** 8

Jetstress System Parameters

**Thread count** 11 (per-storage group)

**Log buffers** 9000

**Minimum database cache** 256.0 MB

**Maximum database cache** 2048.0 MB

**Insert operations** 40%

**Delete operations** 30%

**Replace operations** 5%

**Read operations** 25%

**Lazy commits** 55%

#### Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (B:)	0.017	0.008	139.052	127.824	(n/a)
Database (D:)	0.017	0.008	138.869	127.019	(n/a)
Database (E:)	0.017	0.008	138.427	126.390	(n/a)
Database (F:)	0.017	0.008	138.725	126.244	(n/a)
Database (G:)	0.017	0.008	138.664	126.329	(n/a)
Database (H:)	0.017	0.008	138.823	126.292	(n/a)
Database (I:)	0.017	0.008	138.425	125.769	(n/a)
Database (J:)	0.017	0.008	138.527	125.914	(n/a)
Log (O:)	0.000	0.004	0.000	71.811	4967.680
Log (P:)	0.000	0.004	0.000	71.608	4979.871
Log (Q:)	0.000	0.004	0.000	71.603	4980.200
Log (R:)	1.47749000521467E-06	0.004	1.15787099800179E-05	71.454	4972.470
Log (S:)	0.000	0.004	0.000	71.523	4975.950
Log (T:)	0.000	0.004	0.000	71.508	4968.598
Log (U:)	0.000	0.004	0.000	71.444	4981.633
Log (V:)	0.000	0.004	0.000	71.486	4960.578

#### Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.522	1.286	4.356
Available MBytes	61272.368	61241.000	61503.000
Free System Page Table Entries	16755671.982	16755651.000	16755672.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	95058251.011	93945856.000	95744000.000
Pool Paged Bytes	58931177.221	58499072.000	60403712.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

#### Test Log

6/23/2008 11:59:04 PM -- Jetstress testing begins ...  
6/23/2008 11:59:04 PM -- Prepare testing begins ...  
6/23/2008 11:59:14 PM -- Attaching databases ...  
6/23/2008 11:59:14 PM -- Prepare testing ends.  
6/23/2008 11:59:14 PM -- Dispatching transactions begins ...  
6/23/2008 11:59:14 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
6/23/2008 11:59:14 PM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
6/23/2008 11:59:26 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.1 seconds/read).  
6/23/2008 11:59:26 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.1 seconds/write).  
6/23/2008 11:59:27 PM -- Operation mix: Sessions 11, Inserts 40%, Deletes 30%, Replaces 5%, Reads 25%, Lazy Commits 55%.  
6/23/2008 11:59:27 PM -- Performance logging begins (interval: 15000 ms).  
6/23/2008 11:59:27 PM -- Attaining prerequisites:  
6/24/2008 12:05:20 AM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1934688000.0 (lower bound: 1932735000.0, upper bound: none)  
6/25/2008 12:05:21 AM -- Performance logging ends.  
6/25/2008 12:05:24 AM -- JetInterop batch transaction stats: 337944, 337915, 336661, 336960, 336746,

337032, 336763, and 336668.  
6/25/2008 12:05:25 AM -- Dispatching transactions ends.  
6/25/2008 12:05:25 AM -- Shutting down databases ...  
6/25/2008 12:05:27 AM -- Instance2780.1 (complete), Instance2780.2 (complete), Instance2780.3 (complete), Instance2780.4 (complete), Instance2780.5 (complete), Instance2780.6 (complete), Instance2780.7 (complete), and Instance2780.8 (complete)  
6/25/2008 12:05:27 AM -- Performance logging begins (interval: 30000 ms).  
6/25/2008 12:05:27 AM -- Verifying database checksums ...  
6/25/2008 3:06:32 AM -- B: (100% processed), D: (100% processed), E: (100% processed), F: (100% processed), G: (100% processed), H: (100% processed), I: (100% processed), and J: (100% processed)  
6/25/2008 3:06:33 AM -- Performance logging ends.  
6/25/2008 3:06:33 AM -- [C:\Program Files\Exchange Jetstress\DBChecksum\\_2008\\_6\\_25\\_0\\_5\\_27.blg](C:\Program Files\Exchange Jetstress\DBChecksum_2008_6_25_0_5_27.blg) has 362 samples.  
6/25/2008 3:07:16 AM -- [C:\Program Files\Exchange Jetstress\DBChecksum\\_2008\\_6\\_25\\_0\\_5\\_27.html](C:\Program Files\Exchange Jetstress\DBChecksum_2008_6_25_0_5_27.html) is saved.  
6/25/2008 3:07:16 AM -- Verifying log checksums ...  
6/25/2008 3:07:18 AM -- O:\ (2 logs passed), P:\ (2 logs passed), Q:\ (2 logs passed), R:\ (2 logs passed), S:\ (2 logs passed), T:\ (3 logs passed), U:\ (2 logs passed), and V:\ (2 logs passed)  
6/25/2008 3:07:18 AM -- [C:\Program Files\Exchange Jetstress\Stress\\_2008\\_6\\_23\\_23\\_59\\_26.blg](C:\Program Files\Exchange Jetstress\Stress_2008_6_23_23_59_26.blg) has 5777 samples.

## Server -EX1PMX02

Test Summary

**Overall Test Result** Pass

**Machine Name** EX1PMX02  
**Test Description**  
**Test Start Time** 6/23/2008 11:58:33 PM  
**Test End Time** 6/25/2008 12:05:50 AM  
**Jetstress Version** 08.02.0050.000  
**Ese Version** 08.01.0240.005  
**Operating System** Microsoft Windows Server 2003 R2 Service Pack 2 (5.2.3790.131072)  
**Performance Log** [C:\Program Files\Exchange Jetstress\Stress\\_2008\\_6\\_23\\_23\\_58\\_52.blg](C:\Program Files\Exchange Jetstress\Stress_2008_6_23_23_58_52.blg)  
[C:\Program Files\Exchange Jetstress\DBChecksum\\_2008\\_6\\_25\\_0\\_5\\_50.blg](C:\Program Files\Exchange Jetstress\DBChecksum_2008_6_25_0_5_50.blg)

Database Sizing and Throughput

**Achieved I/O per Second** 2113.199  
**Capacity Percentage** 100%  
**Throughput Percentage** 100%  
**Initial database size** 1634481602560  
**Final database size** 1712364584960  
**Database files (count)** 8

Jetstress System Parameters

**Thread count** 11 (per-storage group)  
**Log buffers** 9000  
**Minimum database cache** 256.0 MB  
**Maximum database cache** 2048.0 MB  
**Insert operations** 40%  
**Delete operations** 30%

**Replace operations**            5%  
**Read operations**                25%  
**Lazy commits**                    55%

Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (B:)	0.016	0.008	138.808	126.120	(n/a)
Database (D:)	0.016	0.008	138.935	126.335	(n/a)
Database (E:)	0.016	0.008	138.716	125.650	(n/a)
Database (F:)	0.016	0.008	138.982	125.560	(n/a)
Database (G:)	0.016	0.008	138.103	124.439	(n/a)
Database (H:)	0.016	0.008	138.687	124.897	(n/a)
Database (I:)	0.016	0.008	138.996	125.286	(n/a)
Database (J:)	0.017	0.008	138.706	124.978	(n/a)
Log (O:)	0.000	0.004	0.000	71.533	4977.971
Log (P:)	0.000	0.004	0.000	71.767	4973.463
Log (Q:)	0.000	0.004	0.000	71.465	4968.888
Log (R:)	2.22492612549974E-06	0.004	2.3157227485833E-05	71.364	4968.972
Log (S:)	0.000	0.004	0.000	71.206	4958.780
Log (T:)	0.000	0.004	0.000	71.245	4967.765
Log (U:)	8.16965061706936E-07	0.004	1.15785751472069E-05	71.352	4961.174
Log (V:)	0.000	0.004	0.000	71.368	4965.990

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.277	1.242	4.615
Available MBytes	61440.200	61416.000	61631.000
Free System Page Table Entries	16757520.000	16757520.000	16757520.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	97739707.306	97255424.000	98291712.000
Pool Paged Bytes	52371720.809	51773440.000	55083008.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

6/23/2008 11:58:33 PM -- Jetstress testing begins ...  
 6/23/2008 11:58:33 PM -- Prepare testing begins ...  
 6/23/2008 11:58:42 PM -- Attaching databases ...  
 6/23/2008 11:58:42 PM -- Prepare testing ends.  
 6/23/2008 11:58:42 PM -- Dispatching transactions begins ...  
 6/23/2008 11:58:42 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
 6/23/2008 11:58:42 PM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
 6/23/2008 11:58:52 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.1 seconds/read).  
 6/23/2008 11:58:52 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.1 seconds/write).  
 6/23/2008 11:58:53 PM -- Operation mix: Sessions 11, Inserts 40%, Deletes 30%, Replaces 5%, Reads 25%, Lazy Commits 55%.  
 6/23/2008 11:58:53 PM -- Performance logging begins (interval: 15000 ms).

6/23/2008 11:58:53 PM -- Attaining prerequisites:  
6/24/2008 12:04:47 AM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last:  
1939268000.0 (lower bound: 1932735000.0, upper bound: none)  
6/25/2008 12:04:48 AM -- Performance logging ends.  
6/25/2008 12:05:47 AM -- JetInterop batch transaction stats: 336223, 336776, 335724, 336622, 334236,  
335532, 336071, and 335574.  
6/25/2008 12:05:49 AM -- Dispatching transactions ends.  
6/25/2008 12:05:49 AM -- Shutting down databases ...  
6/25/2008 12:05:50 AM -- Instance2396.1 (complete), Instance2396.2 (complete), Instance2396.3  
(complete), Instance2396.4 (complete), Instance2396.5 (complete), Instance2396.6 (complete),  
Instance2396.7 (complete), and Instance2396.8 (complete)  
6/25/2008 12:05:51 AM -- Performance logging begins (interval: 30000 ms).  
6/25/2008 12:05:51 AM -- Verifying database checksums ...  
6/25/2008 3:09:10 AM -- B: (100% processed), D: (100% processed), E: (100% processed), F: (100%  
processed), G: (100% processed), H: (100% processed), I: (100% processed), and J: (100% processed)  
6/25/2008 3:09:11 AM -- Performance logging ends.  
6/25/2008 3:09:11 AM -- [C:\Program Files\Exchange Jetstress\DBChecksum\\_2008\\_6\\_25\\_0\\_5\\_50.blg](C:\Program Files\Exchange Jetstress\DBChecksum_2008_6_25_0_5_50.blg)  
has 366 samples.  
6/25/2008 3:09:51 AM -- [C:\Program Files\Exchange Jetstress\DBChecksum\\_2008\\_6\\_25\\_0\\_5\\_50.html](C:\Program Files\Exchange Jetstress\DBChecksum_2008_6_25_0_5_50.html)  
is saved.  
6/25/2008 3:09:51 AM -- Verifying log checksums ...  
6/25/2008 3:09:53 AM -- O:\ (2 logs passed), P:\ (2 logs passed), Q:\ (2 logs passed), R:\ (3 logs  
passed), S:\ (2 logs passed), T:\ (2 logs passed), U:\ (2 logs passed), and V:\ (2 logs passed)  
6/25/2008 3:09:53 AM -- [C:\Program Files\Exchange Jetstress\Stress\\_2008\\_6\\_23\\_23\\_58\\_52.blg](C:\Program Files\Exchange Jetstress\Stress_2008_6_23_23_58_52.blg) has  
5777 samples.  
6/25/2008 3:09:53 AM -- Creating test report ...  
6/25/2008 3:13:32 AM -- Volume B: has 0.0165 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume D: has 0.0164 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume E: has 0.0164 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume F: has 0.0164 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume G: has 0.0164 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume H: has 0.0165 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume I: has 0.0164 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume J: has 0.0165 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume O: has 0.0038 for Avg. Disk sec/Write.  
6/25/2008 3:13:32 AM -- Volume O: has 0.0000 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume P: has 0.0038 for Avg. Disk sec/Write.  
6/25/2008 3:13:32 AM -- Volume P: has 0.0000 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume Q: has 0.0038 for Avg. Disk sec/Write.  
6/25/2008 3:13:32 AM -- Volume Q: has 0.0000 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume R: has 0.0038 for Avg. Disk sec/Write.  
6/25/2008 3:13:32 AM -- Volume R: has 0.0000 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume S: has 0.0038 for Avg. Disk sec/Write.  
6/25/2008 3:13:32 AM -- Volume S: has 0.0000 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume T: has 0.0038 for Avg. Disk sec/Write.  
6/25/2008 3:13:32 AM -- Volume T: has 0.0000 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume U: has 0.0038 for Avg. Disk sec/Write.  
6/25/2008 3:13:32 AM -- Volume U: has 0.0000 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Volume V: has 0.0038 for Avg. Disk sec/Write.  
6/25/2008 3:13:32 AM -- Volume V: has 0.0000 for Avg. Disk sec/Read.  
6/25/2008 3:13:32 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
6/25/2008 3:13:32 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.  
6/25/2008 3:13:32 AM -- [C:\Program Files\Exchange Jetstress\Stress\\_2008\\_6\\_23\\_23\\_58\\_52.xml](C:\Program Files\Exchange Jetstress\Stress_2008_6_23_23_58_52.xml) has  
5753 samples queried.

Server – EX1PMX01

Test Result Report - Checksum

Checksum Statistics - All

Database	Seen pages	Bad pages	Correctable pages	Wrong page no pages	File length / seconds taken
B:\Jetstress1.edb	26135490	0	0	0	204183 MBytes / 10850 seconds
D:\Jetstress1.edb	26133698	0	0	0	204169 MBytes / 10864 seconds
E:\Jetstress1.edb	26137538	0	0	0	204199 MBytes / 10853 seconds
F:\Jetstress1.edb	26131138	0	0	0	204149 MBytes / 10853 seconds
G:\Jetstress1.edb	26130114	0	0	0	204141 MBytes / 10856 seconds
H:\Jetstress1.edb	26131138	0	0	0	204149 MBytes / 10857 seconds
I:\Jetstress1.edb	26134466	0	0	0	204175 MBytes / 10855 seconds
J:\Jetstress1.edb	26128066	0	0	0	204125 MBytes / 10864 seconds
(Sum)	209061648	0	0	0	1633294 MBytes / 10864 seconds

Disk Subsystem Performance (of checksum)

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec
B:	0.100	0.000	301.082	0.000
D:	0.103	0.000	300.298	0.000
E:	0.104	0.000	301.046	0.000
F:	0.105	0.000	300.931	0.000
G:	0.105	0.000	300.768	0.000
H:	0.105	0.000	300.710	0.000
I:	0.104	0.000	300.870	0.000
J:	0.102	0.000	300.314	0.000

Memory System Performance (of checksum)

Counter	Average	Minimum	Maximum
% Processor Time	6.513	5.197	7.873
Available MBytes	63328.903	63316.000	63344.000
Free System Page Table Entries	16755182.000	16755182.000	16755182.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	95329760.884	95309824.000	95449088.000
Pool Paged Bytes	61441482.254	61394944.000	62459904.000

Test Log

6/23/2008 11:59:04 PM -- Jetstress testing begins ...  
 6/23/2008 11:59:04 PM -- Prepare testing begins ...  
 6/23/2008 11:59:14 PM -- Attaching databases ...  
 6/23/2008 11:59:14 PM -- Prepare testing ends.  
 6/23/2008 11:59:14 PM -- Dispatching transactions begins ...  
 6/23/2008 11:59:14 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
 6/23/2008 11:59:14 PM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
 6/23/2008 11:59:26 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.1 seconds/read).  
 6/23/2008 11:59:26 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.1 seconds/write).

6/23/2008 11:59:27 PM -- Operation mix: Sessions 11, Inserts 40%, Deletes 30%, Replaces 5%, Reads 25%, Lazy Commits 55%.

6/23/2008 11:59:27 PM -- Performance logging begins (interval: 15000 ms).

6/23/2008 11:59:27 PM -- Attaining prerequisites:

6/24/2008 12:05:20 AM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1934688000.0 (lower bound: 1932735000.0, upper bound: none)

6/25/2008 12:05:21 AM -- Performance logging ends.

6/25/2008 12:05:24 AM -- JetInterop batch transaction stats: 337944, 337915, 336661, 336960, 336746, 337032, 336763, and 336668.

6/25/2008 12:05:25 AM -- Dispatching transactions ends.

6/25/2008 12:05:25 AM -- Shutting down databases ...

6/25/2008 12:05:27 AM -- Instance2780.1 (complete), Instance2780.2 (complete), Instance2780.3 (complete), Instance2780.4 (complete), Instance2780.5 (complete), Instance2780.6 (complete), Instance2780.7 (complete), and Instance2780.8 (complete)

6/25/2008 12:05:27 AM -- Performance logging begins (interval: 30000 ms).

6/25/2008 12:05:27 AM -- Verifying database checksums ...

6/25/2008 3:06:32 AM -- B: (100% processed), D: (100% processed), E: (100% processed), F: (100% processed), G: (100% processed), H: (100% processed), I: (100% processed), and J: (100% processed)

6/25/2008 3:06:33 AM -- Performance logging ends.

6/25/2008 3:06:33 AM -- [C:\Program Files\Exchange Jetstress\DBChecksum\\_2008\\_6\\_25\\_0\\_5\\_27.blg](C:\Program Files\Exchange Jetstress\DBChecksum_2008_6_25_0_5_27.blg) has 362 samples.

## Server – EX1PMX02

### Test Result Report – Checksum

#### Checksum Statistics - All

Database	Seen pages	Bad pages	Correctable pages	Wrong page no pages	File length / seconds taken
B:\Jetstress1.edb	26132418	0	0	0	204159 MBytes / 10998 seconds
D:\Jetstress1.edb	26135490	0	0	0	204183 MBytes / 10995 seconds
E:\Jetstress1.edb	26129346	0	0	0	204135 MBytes / 10954 seconds
F:\Jetstress1.edb	26129858	0	0	0	204139 MBytes / 10952 seconds
G:\Jetstress1.edb	26124226	0	0	0	204095 MBytes / 10936 seconds
H:\Jetstress1.edb	26130370	0	0	0	204143 MBytes / 10951 seconds
I:\Jetstress1.edb	26122946	0	0	0	204085 MBytes / 10969 seconds
J:\Jetstress1.edb	26124226	0	0	0	204095 MBytes / 10972 seconds
(Sum)	209028880	0	0	0	1633038 MBytes / 10998 seconds

#### Disk Subsystem Performance (of checksum)

Logical Disk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec
B:	0.102	0.000	295.749	0.001
D:	0.105	0.000	296.353	0.001
E:	0.105	0.000	298.080	0.001
F:	0.106	0.000	298.208	0.001
G:	0.106	0.000	298.524	0.001
H:	0.106	0.000	298.241	0.001
I:	0.105	0.000	297.130	0.001
J:	0.103	0.000	296.890	0.001

Memory System Performance (of checksum)

Counter	Average	Minimum	Maximum
% Processor Time	5.325	4.114	6.536
Available MBytes	63567.210	63562.000	63580.000
Free System Page Table Entries	16756890.000	16756890.000	16756890.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	97935639.781	97910784.000	98004992.000
Pool Paged Bytes	54744450.098	54693888.000	55762944.000

Test Log

6/23/2008 11:58:33 PM -- Jetstress testing begins ...  
6/23/2008 11:58:33 PM -- Prepare testing begins ...  
6/23/2008 11:58:42 PM -- Attaching databases ...  
6/23/2008 11:58:42 PM -- Prepare testing ends.  
6/23/2008 11:58:42 PM -- Dispatching transactions begins ...  
6/23/2008 11:58:42 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
6/23/2008 11:58:42 PM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
6/23/2008 11:58:52 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.1 seconds/read).  
6/23/2008 11:58:52 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.1 seconds/write).  
6/23/2008 11:58:53 PM -- Operation mix: Sessions 11, Inserts 40%, Deletes 30%, Replaces 5%, Reads 25%, Lazy Commits 55%.  
6/23/2008 11:58:53 PM -- Performance logging begins (interval: 15000 ms).  
6/23/2008 11:58:53 PM -- Attaining prerequisites:  
6/24/2008 12:04:47 AM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1939268000.0 (lower bound: 1932735000.0, upper bound: none)  
6/25/2008 12:04:48 AM -- Performance logging ends.  
6/25/2008 12:05:47 AM -- JetInterop batch transaction stats: 336223, 336776, 335724, 336622, 334236, 335532, 336071, and 335574.  
6/25/2008 12:05:49 AM -- Dispatching transactions ends.  
6/25/2008 12:05:49 AM -- Shutting down databases ...  
6/25/2008 12:05:50 AM -- Instance2396.1 (complete), Instance2396.2 (complete), Instance2396.3 (complete), Instance2396.4 (complete), Instance2396.5 (complete), Instance2396.6 (complete), Instance2396.7 (complete), and Instance2396.8 (complete)  
6/25/2008 12:05:51 AM -- Performance logging begins (interval: 30000 ms).  
6/25/2008 12:05:51 AM -- Verifying database checksums ...  
6/25/2008 3:09:10 AM -- B: (100% processed), D: (100% processed), E: (100% processed), F: (100% processed), G: (100% processed), H: (100% processed), I: (100% processed), and J: (100% processed)  
6/25/2008 3:09:11 AM -- Performance logging ends.  
6/25/2008 3:09:11 AM -- [C:\Program Files\Exchange Jetstress\DBChecksum\\_2008\\_6\\_25\\_0\\_5\\_50.blg](C:\Program Files\Exchange Jetstress\DBChecksum_2008_6_25_0_5_50.blg) has 366 samples.

## Appendix B: Performance Test Reports (2 hrs)

### Performance Test Result Report

Server EX1PMX01

Test Summary

**Overall Test Result** Pass

**Machine Name** EX1PMX01

**Test Description**

**Test Start Time** 7/1/2008 11:29:47 PM

**Test End Time** 7/2/2008 3:30:02 AM

**Jetstress Version** 08.02.0050.000

**Ese Version** 08.01.0240.005

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

**Performance Log** [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_7\\_1\\_23\\_30\\_8.blg](C:\Program Files\Exchange Jetstress\Performance_2008_7_1_23_30_8.blg)  
[C:\Program Files\Exchange Jetstress\DBChecksum\\_2008\\_7\\_2\\_3\\_30\\_2.blg](C:\Program Files\Exchange Jetstress\DBChecksum_2008_7_2_3_30_2.blg)

Database Sizing and Throughput

**Achieved I/O per Second** 2163.39

**Capacity Percentage** 100%

**Throughput Percentage** 100%

**Initial database size** 1634448048128

**Final database size** 1649077780480

**Database files (count)** 8

Jetstress System Parameters

**Thread count** 11 (per-storage group)

**Log buffers** 9000

**Minimum database cache** 256.0 MB

**Maximum database cache** 2048.0 MB

**Insert operations** 40%

**Delete operations** 30%

**Replace operations** 5%

**Read operations** 25%

**Lazy commits** 55%

#### Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (B:)	0.017	0.008	136.532	135.612	(n/a)
Database (D:)	0.017	0.009	136.583	134.766	(n/a)
Database (E:)	0.017	0.008	136.248	134.309	(n/a)
Database (F:)	0.017	0.008	137.028	135.039	(n/a)
Database (G:)	0.017	0.008	135.496	132.261	(n/a)
Database (H:)	0.017	0.008	136.419	133.350	(n/a)
Database (I:)	0.017	0.008	136.271	134.283	(n/a)
Database (J:)	0.017	0.008	135.933	133.258	(n/a)
Log (O:)	0.000	0.004	0.000	74.861	5087.765
Log (P:)	0.000	0.004	0.000	74.593	5151.034
Log (Q:)	0.000	0.004	0.000	74.274	5111.605
Log (R:)	0.000	0.004	0.000	74.606	5075.661
Log (S:)	0.000	0.004	0.000	74.013	5102.631
Log (T:)	0.000	0.004	0.000	74.568	5063.940
Log (U:)	0.000	0.004	0.000	74.501	5076.614
Log (V:)	0.000	0.004	0.000	74.468	5090.928

#### Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.354	1.203	4.158
Available MBytes	61251.060	61244.000	61438.000
Free System Page Table Entries	16756071.956	16756051.000	16756072.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	94477832.533	93700096.000	94613504.000
Pool Paged Bytes	60347494.400	60108800.000	60755968.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

#### Test Log

7/1/2008 11:29:47 PM -- Jetstress testing begins ...  
 7/1/2008 11:29:47 PM -- Prepare testing begins ...  
 7/1/2008 11:29:58 PM -- Attaching databases ...  
 7/1/2008 11:29:58 PM -- Prepare testing ends.  
 7/1/2008 11:29:58 PM -- Dispatching transactions begins ...  
 7/1/2008 11:29:58 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
 7/1/2008 11:29:58 PM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
 7/1/2008 11:30:08 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).  
 7/1/2008 11:30:08 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).  
 7/1/2008 11:30:09 PM -- Operation mix: Sessions 11, Inserts 40%, Deletes 30%, Replaces 5%, Reads 25%, Lazy Commits 55%.  
 7/1/2008 11:30:09 PM -- Performance logging begins (interval: 15000 ms).  
 7/1/2008 11:30:09 PM -- Attaining prerequisites:  
 7/1/2008 11:36:04 PM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last:

1940988000.0 (lower bound: 1932735000.0, upper bound: none)  
7/2/2008 1:36:05 AM -- Performance logging ends.  
7/2/2008 3:30:00 AM -- JetInterop batch transaction stats: 58466, 58227, 58337, 58393, 58165, 58355, 58566, and 58658.  
7/2/2008 3:30:01 AM -- Dispatching transactions ends.  
7/2/2008 3:30:01 AM -- Shutting down databases ...  
7/2/2008 3:30:02 AM -- Instance264.1 (complete), Instance264.2 (complete), Instance264.3 (complete), Instance264.4 (complete), Instance264.5 (complete), Instance264.6 (complete), Instance264.7 (complete), and Instance264.8 (complete)  
7/2/2008 3:30:03 AM -- Performance logging begins (interval: 30000 ms).  
7/2/2008 3:30:03 AM -- Verifying database checksums ...  
7/2/2008 6:24:36 AM -- B: (100% processed), D: (100% processed), E: (100% processed), F: (100% processed), G: (100% processed), H: (100% processed), I: (100% processed), and J: (100% processed)  
7/2/2008 6:24:37 AM -- Performance logging ends.  
7/2/2008 6:24:37 AM -- <C:\Program Files\Exchange Jetstress\DBChecksum 2008 7 2 3 30 2.blg> has 349 samples.  
7/2/2008 6:25:19 AM -- <C:\Program Files\Exchange Jetstress\DBChecksum 2008 7 2 3 30 2.html> is saved.  
7/2/2008 6:25:19 AM -- Verifying log checksums ...  
7/2/2008 6:25:21 AM -- O:\ (2 logs passed), P:\ (2 logs passed), Q:\ (2 logs passed), R:\ (2 logs passed), S:\ (2 logs passed), T:\ (3 logs passed), U:\ (2 logs passed), and V:\ (3 logs passed)  
7/2/2008 6:25:21 AM -- <C:\Program Files\Exchange Jetstress\Performance 2008 7 1 23 30 8.blg> has 503 samples.  
7/2/2008 6:25:21 AM -- Creating test report ...  
7/2/2008 6:25:40 AM -- Volume B: has 0.0169 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume D: has 0.0168 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume E: has 0.0169 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume F: has 0.0168 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume G: has 0.0167 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume H: has 0.0168 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume I: has 0.0165 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume J: has 0.0169 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume O: has 0.0040 for Avg. Disk sec/Write.  
7/2/2008 6:25:40 AM -- Volume O: has 0.0000 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume P: has 0.0040 for Avg. Disk sec/Write.  
7/2/2008 6:25:40 AM -- Volume P: has 0.0000 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume Q: has 0.0040 for Avg. Disk sec/Write.  
7/2/2008 6:25:40 AM -- Volume Q: has 0.0000 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume R: has 0.0040 for Avg. Disk sec/Write.  
7/2/2008 6:25:40 AM -- Volume R: has 0.0000 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume S: has 0.0040 for Avg. Disk sec/Write.  
7/2/2008 6:25:40 AM -- Volume S: has 0.0000 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume T: has 0.0040 for Avg. Disk sec/Write.  
7/2/2008 6:25:40 AM -- Volume T: has 0.0000 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume U: has 0.0040 for Avg. Disk sec/Write.  
7/2/2008 6:25:40 AM -- Volume U: has 0.0000 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Volume V: has 0.0040 for Avg. Disk sec/Write.  
7/2/2008 6:25:40 AM -- Volume V: has 0.0000 for Avg. Disk sec/Read.  
7/2/2008 6:25:40 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
7/2/2008 6:25:40 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.  
7/2/2008 6:25:40 AM -- <C:\Program Files\Exchange Jetstress\Performance 2008 7 1 23 30 8.xml> has 479 samples queried.

Server EX1PMX02

### Test Summary

Overall Test Result **Pass**

Machine Name EX1PMX02

#### Test Description

Test Start Time 7/1/2008 11:28:53 PM

Test End Time 7/2/2008 3:30:38 AM

Jetstress Version 08.02.0050.000

Ese Version 08.01.0240.005

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

Performance Log [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_7\\_1\\_23\\_29\\_11.blg](C:\Program Files\Exchange Jetstress\Performance_2008_7_1_23_29_11.blg)  
[C:\Program Files\Exchange Jetstress\DBChecksum\\_2008\\_7\\_2\\_3\\_30\\_38.blg](C:\Program Files\Exchange Jetstress\DBChecksum_2008_7_2_3_30_38.blg)

#### Database Sizing and Throughput

Achieved I/O per Second 2179.777

Capacity Percentage 100%

Throughput Percentage 100%

Initial database size 1634448048128

Final database size 1649201512448

Database files (count) 8

#### Jetstress System Parameters

Thread count 11 (per-storage group)

Log buffers 9000

Minimum database cache 256.0 MB

Maximum database cache 2048.0 MB

Insert operations 40%

Delete operations 30%

Replace operations 5%

Read operations 25%

Lazy commits 55%

#### Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (B:)	0.017	0.008	137.745	136.242	(n/a)
Database (D:)	0.017	0.008	138.406	136.867	(n/a)
Database (E:)	0.017	0.008	136.584	134.329	(n/a)
Database (F:)	0.017	0.008	137.256	134.581	(n/a)
Database (G:)	0.017	0.008	138.034	135.342	(n/a)
Database (H:)	0.017	0.008	136.601	133.322	(n/a)
Database (I:)	0.017	0.008	137.304	134.897	(n/a)
Database (J:)	0.017	0.008	137.474	134.794	(n/a)
Log (O:)	0.000	0.004	0.000	74.867	5086.852
Log (P:)	0.000	0.004	0.000	75.336	5112.481
Log (Q:)	0.000	0.004	0.000	74.577	5113.757
Log (R:)	0.000	0.004	0.000	74.449	5007.940
Log (S:)	0.000	0.004	0.000	74.954	5044.992
Log (T:)	0.000	0.004	0.000	74.738	5064.887
Log (U:)	0.000	0.004	0.000	75.114	5098.724
Log (V:)	0.000	0.004	0.000	74.498	5069.174

#### Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.162	1.443	3.221
Available MBytes	61318.871	61312.000	61533.000
Free System Page Table Entries	16757520.000	16757520.000	16757520.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	97494382.933	96100352.000	97820672.000
Pool Paged Bytes	54591172.267	54390784.000	55037952.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

#### Test Log

7/1/2008 11:28:52 PM -- Jetstress testing begins ...  
7/1/2008 11:28:53 PM -- Prepare testing begins ...  
7/1/2008 11:29:02 PM -- Attaching databases ...  
7/1/2008 11:29:02 PM -- Prepare testing ends.  
7/1/2008 11:29:02 PM -- Dispatching transactions begins ...  
7/1/2008 11:29:02 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
7/1/2008 11:29:02 PM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
7/1/2008 11:29:11 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).  
7/1/2008 11:29:11 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).  
7/1/2008 11:29:13 PM -- Operation mix: Sessions 11, Inserts 40%, Deletes 30%, Replaces 5%, Reads 25%, Lazy Commits 55%.  
7/1/2008 11:29:13 PM -- Performance logging begins (interval: 15000 ms).  
7/1/2008 11:29:13 PM -- Attaining prerequisites:

7/1/2008 11:34:57 PM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1933459000.0 (lower bound: 1932735000.0, upper bound: none)  
 7/2/2008 1:34:59 AM -- Performance logging ends.  
 7/2/2008 3:30:36 AM -- JetInterop batch transaction stats: 59163, 59363, 59057, 59033, 59149, 58671, 59078, and 59010.  
 7/2/2008 3:30:36 AM -- Dispatching transactions ends.  
 7/2/2008 3:30:36 AM -- Shutting down databases ...  
 7/2/2008 3:30:38 AM -- Instance2256.1 (complete), Instance2256.2 (complete), Instance2256.3 (complete), Instance2256.4 (complete), Instance2256.5 (complete), Instance2256.6 (complete), Instance2256.7 (complete), and Instance2256.8 (complete)  
 7/2/2008 3:30:39 AM -- Performance logging begins (interval: 30000 ms).  
 7/2/2008 3:30:39 AM -- Verifying database checksums ...  
 7/2/2008 6:27:11 AM -- B: (100% processed), D: (100% processed), E: (100% processed), F: (100% processed), G: (100% processed), H: (100% processed), I: (100% processed), and J: (100% processed)  
 7/2/2008 6:27:12 AM -- Performance logging ends.  
 7/2/2008 6:27:12 AM -- <C:\Program Files\Exchange Jetstress\DBChecksum 2008 7 2 3 30 38.blg> has 353 samples.  
 7/2/2008 6:27:51 AM -- <C:\Program Files\Exchange Jetstress\DBChecksum 2008 7 2 3 30 38.html> is saved.  
 7/2/2008 6:27:51 AM -- Verifying log checksums ...  
 7/2/2008 6:27:53 AM -- O:\ (2 logs passed), P:\ (2 logs passed), Q:\ (2 logs passed), R:\ (2 logs passed), S:\ (2 logs passed), T:\ (2 logs passed), U:\ (2 logs passed), and V:\ (2 logs passed)  
 7/2/2008 6:27:53 AM -- <C:\Program Files\Exchange Jetstress\Performance 2008 7 1 23 29 11.blg> has 502 samples.  
 7/2/2008 6:27:53 AM -- Creating test report ...  
 7/2/2008 6:28:10 AM -- Volume B: has 0.0169 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume D: has 0.0170 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume E: has 0.0169 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume F: has 0.0166 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume G: has 0.0167 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume H: has 0.0165 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume I: has 0.0168 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume J: has 0.0166 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume O: has 0.0040 for Avg. Disk sec/Write.  
 7/2/2008 6:28:10 AM -- Volume O: has 0.0000 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume P: has 0.0040 for Avg. Disk sec/Write.  
 7/2/2008 6:28:10 AM -- Volume P: has 0.0000 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume Q: has 0.0040 for Avg. Disk sec/Write.  
 7/2/2008 6:28:10 AM -- Volume Q: has 0.0000 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume R: has 0.0040 for Avg. Disk sec/Write.  
 7/2/2008 6:28:10 AM -- Volume R: has 0.0000 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume S: has 0.0040 for Avg. Disk sec/Write.  
 7/2/2008 6:28:10 AM -- Volume S: has 0.0000 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume T: has 0.0040 for Avg. Disk sec/Write.  
 7/2/2008 6:28:10 AM -- Volume T: has 0.0000 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume U: has 0.0040 for Avg. Disk sec/Write.  
 7/2/2008 6:28:10 AM -- Volume U: has 0.0000 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Volume V: has 0.0040 for Avg. Disk sec/Write.  
 7/2/2008 6:28:10 AM -- Volume V: has 0.0000 for Avg. Disk sec/Read.  
 7/2/2008 6:28:10 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
 7/2/2008 6:28:10 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.  
 7/2/2008 6:28:10 AM -- <C:\Program Files\Exchange Jetstress\Performance 2008 7 1 23 29 11.xml> has 479 samples queried.

Server – EX1PMX01

Test Result Report –Checksum

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
B:\Jetstress1.edb	25163954	0	0	0	196593 MBytes / 10451 seconds
D:\Jetstress1.edb	25165234	0	0	0	196603 MBytes / 10468 seconds
E:\Jetstress1.edb	25163442	0	0	0	196589 MBytes / 10451 seconds
F:\Jetstress1.edb	25159858	0	0	0	196561 MBytes / 10452 seconds
G:\Jetstress1.edb	25161650	0	0	0	196575 MBytes / 10461 seconds
H:\Jetstress1.edb	25162674	0	0	0	196583 MBytes / 10462 seconds
I:\Jetstress1.edb	25162162	0	0	0	196579 MBytes / 10465 seconds
J:\Jetstress1.edb	25164466	0	0	0	196597 MBytes / 10472 seconds
(Sum)	201303440	0	0	0	1572683 MBytes / 10472 seconds

Disk Subsystem Performance (of checksum)

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec
B:	0.100	0.000	301.060	0.000
D:	0.103	0.000	299.873	0.000
E:	0.104	0.000	301.009	0.000
F:	0.105	0.000	300.947	0.000
G:	0.105	0.000	300.516	0.000
H:	0.105	0.000	300.453	0.000
I:	0.104	0.000	300.272	0.000
J:	0.102	0.000	300.122	0.000

Memory System Performance (of checksum)

Counter	Average	Minimum	Maximum
% Processor Time	6.474	5.203	7.629
Available MBytes	63383.052	63370.000	63401.000
Free System Page Table Entries	16755512.000	16755512.000	16755512.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	95005335.106	94949376.000	95129600.000
Pool Paged Bytes	60666736.229	60149760.000	61235200.000

## Test Log

7/1/2008 11:29:47 PM -- Jetstress testing begins ...  
7/1/2008 11:29:47 PM -- Prepare testing begins ...  
7/1/2008 11:29:58 PM -- Attaching databases ...  
7/1/2008 11:29:58 PM -- Prepare testing ends.  
7/1/2008 11:29:58 PM -- Dispatching transactions begins ...  
7/1/2008 11:29:58 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
7/1/2008 11:29:58 PM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
7/1/2008 11:30:08 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).  
7/1/2008 11:30:08 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).  
7/1/2008 11:30:09 PM -- Operation mix: Sessions 11, Inserts 40%, Deletes 30%, Replaces 5%, Reads 25%, Lazy Commits 55%.  
7/1/2008 11:30:09 PM -- Performance logging begins (interval: 15000 ms).  
7/1/2008 11:30:09 PM -- Attaining prerequisites:  
7/1/2008 11:36:04 PM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1940988000.0 (lower bound: 1932735000.0, upper bound: none)  
7/2/2008 1:36:05 AM -- Performance logging ends.  
7/2/2008 3:30:00 AM -- JetInterop batch transaction stats: 58466, 58227, 58337, 58393, 58165, 58355, 58566, and 58658.  
7/2/2008 3:30:01 AM -- Dispatching transactions ends.  
7/2/2008 3:30:01 AM -- Shutting down databases ...  
7/2/2008 3:30:02 AM -- Instance264.1 (complete), Instance264.2 (complete), Instance264.3 (complete), Instance264.4 (complete), Instance264.5 (complete), Instance264.6 (complete), Instance264.7 (complete), and Instance264.8 (complete)  
7/2/2008 3:30:03 AM -- Performance logging begins (interval: 30000 ms).  
7/2/2008 3:30:03 AM -- Verifying database checksums ...  
7/2/2008 6:24:36 AM -- B: (100% processed), D: (100% processed), E: (MB% processed), F: (100% processed), G: (100% processed), H: (100% processed), I: (100% processed), and J: (100% processed)  
7/2/2008 6:24:37 AM -- Performance logging ends.  
7/2/2008 6:24:37 AM -- <C:\Program Files\Exchange Jetstress\DBChecksum 2008 7 2 3 30 2.blg> has 349 samples.

## Server – EX1PMX02

### Test Result Report –Checksum

#### 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
B:\Jetstress1.edb	25164978	0	0	0	196601 MBytes / 10592 seconds
D:\Jetstress1.edb	25166770	0	0	0	196615 MBytes / 10585 seconds
E:\Jetstress1.edb	25167538	0	0	0	196621 MBytes / 10525 seconds
F:\Jetstress1.edb	25161650	0	0	0	196575 MBytes / 10518 seconds
G:\Jetstress1.edb	25164210	0	0	0	196595 MBytes / 10507 seconds
H:\Jetstress1.edb	25162674	0	0	0	196583 MBytes / 10524 seconds
I:\Jetstress1.edb	25166770	0	0	0	196615 MBytes / 10549 seconds
J:\Jetstress1.edb	25163954	0	0	0	196593 MBytes / 10553 seconds
(Sum)	201318544	0	0	0	1572801 MBytes / 10592 seconds

Disk Subsystem Performance (of checksum)

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec
B:	0.102	0.000	296.866	0.000
D:	0.104	0.000	296.392	0.000
E:	0.105	0.000	298.818	0.000
F:	0.106	0.000	298.993	0.000
G:	0.106	0.000	299.363	0.000
H:	0.105	0.000	298.790	0.000
I:	0.105	0.000	298.004	0.000
J:	0.102	0.000	297.727	0.000

Memory System Performance (of checksum)

Counter	Average	Minimum	Maximum
% Processor Time	5.322	2.427	6.425
Available MBytes	63454.105	63443.000	63472.000
Free System Page Table Entries	16756890.000	16756890.000	16756890.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	97712133.802	97693696.000	97759232.000
Pool Paged Bytes	55109649.405	54870016.000	55447552.000

Test Log

7/1/2008 11:28:52 PM -- Jetstress testing begins ...  
 7/1/2008 11:28:53 PM -- Prepare testing begins ...  
 7/1/2008 11:29:02 PM -- Attaching databases ...  
 7/1/2008 11:29:02 PM -- Prepare testing ends.  
 7/1/2008 11:29:02 PM -- Dispatching transactions begins ...  
 7/1/2008 11:29:02 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
 7/1/2008 11:29:02 PM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
 7/1/2008 11:29:11 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).  
 7/1/2008 11:29:11 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).  
 7/1/2008 11:29:13 PM -- Operation mix: Sessions 11, Inserts 40%, Deletes 30%, Replaces 5%, Reads 25%, Lazy Commits 55%.  
 7/1/2008 11:29:13 PM -- Performance logging begins (interval: 15000 ms).  
 7/1/2008 11:29:13 PM -- Attaining prerequisites:  
 7/1/2008 11:34:57 PM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1933459000.0 (lower bound: 1932735000.0, upper bound: none)  
 7/2/2008 1:34:59 AM -- Performance logging ends.  
 7/2/2008 3:30:36 AM -- JetInterop batch transaction stats: 59163, 59363, 59057, 59033, 59149, 58671, 59078, and 59010.  
 7/2/2008 3:30:36 AM -- Dispatching transactions ends.  
 7/2/2008 3:30:36 AM -- Shutting down databases ...  
 7/2/2008 3:30:38 AM -- Instance2256.1 (complete), Instance2256.2 (complete), Instance2256.3 (complete), Instance2256.4 (complete), Instance2256.5 (complete), Instance2256.6 (complete), Instance2256.7 (complete), and Instance2256.8 (complete)  
 7/2/2008 3:30:39 AM -- Performance logging begins (interval: 30000 ms).  
 7/2/2008 3:30:39 AM -- Verifying database checksums ...  
 7/2/2008 6:27:11 AM -- B: (100% processed), D: (100% processed), E: (100% processed), F: (100% processed), G: (100% processed), H: (100% processed), I: (100% processed), and J: (100% processed)  
 7/2/2008 6:27:12 AM -- Performance logging ends.

## Appendix C: Database Read-only Performance

Server EX1PMX01

### Streaming backup Test Result Report

Streaming Backup Statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance2832.1	194839.40	02:28:20	21.89
Instance2832.2	194839.40	02:36:02	20.81
Instance2832.3	194839.40	02:38:53	20.44
Instance2832.4	194839.40	02:38:55	20.43
Instance2832.5	194839.40	02:39:02	20.42
Instance2832.6	194839.40	02:38:46	20.45
Instance2832.7	194839.40	02:38:53	20.44
Instance2832.8	194839.40	02:39:06	20.41

Jetstress System Parameters

<b>Thread count</b>	11 (per-storage group)
<b>Log buffers</b>	9000
<b>Minimum database cache</b>	256.0 MB
<b>Maximum database cache</b>	2048.0 MB
<b>Insert operations</b>	40%
<b>Delete operations</b>	30%
<b>Replace operations</b>	5%
<b>Read operations</b>	25%
<b>Lazy commits</b>	55%

Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (B:)	0.005	0.000	163.248	0.005	(n/a)
Database (D:)	0.006	8.25540784136999E-05	163.300	0.006	(n/a)
Database (E:)	0.006	3.94391352755613E-05	163.360	0.003	(n/a)
Database (F:)	0.006	3.44111461619348E-05	163.353	0.003	(n/a)
Database (G:)	0.006	7.09428671573782E-05	163.125	0.002	(n/a)
Database (H:)	0.006	6.26553502578739E-05	163.373	0.004	(n/a)
Database (I:)	0.006	3.89567998597967E-05	163.349	0.003	(n/a)

<b>Database (J:)</b>	0.006	3.1770066596565E-05	162.967	0.001	(n/a)
<b>Log (O:)</b>	0.000	0.000	0.000	0.004	45.162
<b>Log (P:)</b>	0.000	6.91319663512093E-05	0.000	0.004	48.067
<b>Log (Q:)</b>	0.000	5.91332432026438E-05	0.000	0.003	33.110
<b>Log (R:)</b>	0.000	3.04911833697323E-05	0.000	0.003	32.676
<b>Log (S:)</b>	0.000	5.06083821541235E-05	0.000	0.001	25.842
<b>Log (T:)</b>	0.000	3.81235143899831E-05	0.000	0.003	34.108
<b>Log (U:)</b>	0.000	5.83671323418958E-05	0.000	0.003	33.110
<b>Log (V:)</b>	0.000	2.86615592609283E-05	0.000	0.001	25.842

#### Host System Performance

Counter	Average	Minimum	Maximum
<b>% Processor Time</b>	6.446	4.061	7.389
<b>Available MBytes</b>	63431.198	63402.000	63439.000
<b>Free System Page Table Entries</b>	16756422.000	16756422.000	16756422.000
<b>Transition Pages RePurposed/sec</b>	0.000	0.000	0.000
<b>Pool Nonpaged Bytes</b>	88457254.642	88424448.000	88653824.000
<b>Pool Paged Bytes</b>	58285732.226	57806848.000	58851328.000
<b>Database Page Fault Stalls/sec</b>	0.000	0.000	0.000

#### Test Log

7/31/2008 12:00:32 AM -- Jetstress testing begins ...  
7/31/2008 12:00:32 AM -- Prepare testing begins ...  
7/31/2008 12:00:41 AM -- Attaching databases ...  
7/31/2008 12:00:41 AM -- Prepare testing ends.  
7/31/2008 12:00:51 AM -- Performance logging begins (interval: 30000 ms).  
7/31/2008 12:00:51 AM -- Streaming backup databases ...  
7/31/2008 2:39:58 AM -- Performance logging ends.  
7/31/2008 2:39:58 AM -- Instance2832.1 (100% processed), Instance2832.2 (100% processed), Instance2832.3 (100% processed), Instance2832.4 (100% processed), Instance2832.5 (100% processed), Instance2832.6 (100% processed), Instance2832.7 (100% processed), and Instance2832.8 (100% processed)  
7/31/2008 2:39:58 AM -- C:\Program Files\Exchange Jetstress\StreamingBackup\_2008\_7\_31\_0\_0\_41.blg has 318 samples.  
7/31/2008 2:39:58 AM -- Creating test report ...

Server -EX1PMX02

Streaming backup Test Result Report

Streaming Backup Statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance2180.1	194837.40	02:41:51	20.06
Instance2180.2	194837.40	02:43:12	19.90
Instance2180.3	194837.40	02:40:20	20.25
Instance2180.4	194837.40	02:40:08	20.28
Instance2180.5	194837.40	02:39:49	20.32
Instance2180.6	194837.40	02:39:59	20.30
Instance2180.7	194837.40	02:40:07	20.28
Instance2180.8	194837.40	02:40:13	20.27

Jetstress System Parameters

Thread count	11 (per-storage group)
Log buffers	9000
Minimum database cache	256.0 MB
Maximum database cache	2048.0 MB
Insert operations	40%
Delete operations	30%
Replace operations	5%
Read operations	25%
Lazy commits	55%

Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (B:)	0.006	6.9524827024827E-05	159.274	0.005	(n/a)
Database (D:)	0.006	3.14230769230769E-05	158.822	0.002	(n/a)
Database (E:)	0.006	6.13947252747253E-05	159.267	0.006	(n/a)
Database (F:)	0.006	5.12725274725275E-05	159.274	0.006	(n/a)
Database (G:)	0.006	7.32086759394452E-05	159.262	0.006	(n/a)
Database (H:)	0.006	5.34801488833747E-05	159.267	0.006	(n/a)
Database (I:)	0.006	6.70241758241758E-05	159.263	0.006	(n/a)
Database (J:)	0.006	4.76916971916972E-05	159.267	0.006	(n/a)
Log (O:)	0.000	0.000	0.000	0.005	83.197
Log (P:)	0.000	7.12615384615385E-05	0.000	0.002	50.412
Log (Q:)	0.000	0.000	0.000	0.005	70.846
Log (R:)	0.000	9.26658341658342E-05	0.000	0.005	71.608
Log (S:)	0.000	0.000	0.000	0.005	84.621

Log (T:)	0.000	0.000	0.000	0.005	72.018
Log (U:)	0.000	7.06139194139194E-05	0.000	0.005	72.018
Log (V:)	0.000	6.51019647019647E-05	0.000	0.005	72.181

#### Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	5.488	1.646	6.294
Available MBytes	63451.365	63444.000	63455.000
Free System Page Table Entries	16757870.000	16757870.000	16757870.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	92292102.282	92266496.000	92340224.000
Pool Paged Bytes	55086928.098	54583296.000	55676928.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

#### Test Log

7/30/2008 11:58:44 PM -- Jetstress testing begins ...  
7/30/2008 11:58:44 PM -- Prepare testing begins ...  
7/30/2008 11:58:53 PM -- Attaching databases ...  
7/30/2008 11:58:53 PM -- Prepare testing ends.  
7/30/2008 11:59:03 PM -- Performance logging begins (interval: 30000 ms).  
7/30/2008 11:59:03 PM -- Streaming backup databases ...  
7/31/2008 2:42:16 AM -- Performance logging ends.  
7/31/2008 2:42:16 AM -- Instance2180.1 (100% processed), Instance2180.2 (100% processed), Instance2180.3 (100% processed), Instance2180.4 (100% processed), Instance2180.5 (100% processed), Instance2180.6 (100% processed), Instance2180.7 (100% processed), and Instance2180.8 (100% processed)  
7/31/2008 2:42:16 AM -- C:\Program Files\Exchange Jetstress\StreamingBackup\_2008\_7\_30\_23\_58\_53.blg has 326 samples.  
7/31/2008 2:42:16 AM -- Creating test report ...

## Appendix D: Log Read-only Performance Test Reports

### Server EX1PMX01

#### SoftRecovery Test Result Report

##### Test Summary

**Overall Test Result** Pass

**Machine Name** EX1PMX01

##### Test Description

**Test Start Time** 6/27/2008 12:12:42 AM

**Test End Time** 6/27/2008 1:04:33 AM

**Jetstress Version** 08.02.0050.000

**Ese Version** 08.01.0240.005

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

**Performance Log** [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_6\\_27\\_0\\_13\\_2.blg](C:\Program Files\Exchange Jetstress\Performance_2008_6_27_0_13_2.blg)

Database Sizing and Throughput

**Achieved I/O per Second** 2192.063  
**Capacity Percentage** 100%  
**Throughput Percentage** 100%  
**Initial database size** 1634464825344  
**Final database size** 1637719605248  
**Database files (count)** 8

Jetstress System Parameters

**Thread count** 11 (per-storage group)  
**Log buffers** 9000  
**Minimum database cache** 256.0 MB  
**Maximum database cache** 2048.0 MB  
**Insert operations** 40%  
**Delete operations** 30%  
**Replace operations** 5%  
**Read operations** 25%  
**Lazy commits** 55%

Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (B:)	0.017	0.009	133.662	133.607	(n/a)
Database (D:)	0.017	0.008	136.659	139.570	(n/a)
Database (E:)	0.016	0.009	135.751	137.556	(n/a)
Database (F:)	0.017	0.008	136.772	138.873	(n/a)
Database (G:)	0.017	0.008	136.963	137.300	(n/a)
Database (H:)	0.017	0.008	136.281	138.320	(n/a)
Database (I:)	0.017	0.008	139.527	140.627	(n/a)
Database (J:)	0.017	0.008	135.181	135.413	(n/a)
Log (O:)	0.005	0.004	0.040	73.321	5037.673
Log (P:)	0.006	0.004	0.043	76.113	5154.714
Log (Q:)	0.005	0.004	0.041	75.300	5073.541
Log (R:)	0.005	0.004	0.043	76.204	5181.964
Log (S:)	0.006	0.004	0.042	75.392	5097.786
Log (T:)	0.004	0.004	0.042	75.615	5066.911
Log (U:)	0.005	0.004	0.041	76.091	4998.355
Log (V:)	0.005	0.004	0.042	75.557	5095.131

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.953	1.665	5.358
Available MBytes	61441.088	61245.000	63215.000
Free System Page Table Entries	16756074.390	16756072.000	16756282.000
Transition Pages	0.000	0.000	0.000

RePurposed/sec			
Pool Nonpaged Bytes	94269839.610	90587136.000	94650368.000
Pool Paged Bytes	59849273.444	59498496.000	60473344.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

#### Test Log

6/27/2008 12:12:42 AM -- Jetstress testing begins ...  
6/27/2008 12:12:42 AM -- Prepare testing begins ...  
6/27/2008 12:12:52 AM -- Attaching databases ...  
6/27/2008 12:12:52 AM -- Prepare testing ends.  
6/27/2008 12:12:52 AM -- Dispatching transactions begins ...  
6/27/2008 12:12:52 AM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
6/27/2008 12:12:52 AM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
6/27/2008 12:13:02 AM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).  
6/27/2008 12:13:02 AM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).  
6/27/2008 12:13:03 AM -- Operation mix: Sessions 11, Inserts 40%, Deletes 30%, Replaces 5%, Reads 25%, Lazy Commits 55%.  
6/27/2008 12:13:03 AM -- Performance logging begins (interval: 15000 ms).  
6/27/2008 12:13:03 AM -- Generating log files ...  
6/27/2008 1:04:30 AM -- O:\ (100.2% generated), P:\ (106.2% generated), Q:\ (103.0% generated), R:\ (106.8% generated), S:\ (104.0% generated), T:\ (103.4% generated), U:\ (102.6% generated), and V:\ (104.4% generated)  
6/27/2008 1:04:31 AM -- Performance logging ends.  
6/27/2008 1:04:31 AM -- JetInterop batch transaction stats: 12452, 12784, 12659, 12848, 12691, 12792, 12949, and 12753.  
6/27/2008 1:04:31 AM -- Dispatching transactions ends.  
6/27/2008 1:04:31 AM -- Shutting down databases ...  
6/27/2008 1:04:33 AM -- Instance1860.1 (complete), Instance1860.2 (complete), Instance1860.3 (complete), Instance1860.4 (complete), Instance1860.5 (complete), Instance1860.6 (complete), Instance1860.7 (complete), and Instance1860.8 (complete)  
6/27/2008 1:04:33 AM -- [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_6\\_27\\_0\\_13\\_2.blg](C:\Program Files\Exchange Jetstress\Performance_2008_6_27_0_13_2.blg) has 205 samples.  
6/27/2008 1:04:33 AM -- Creating test report ...  
6/27/2008 1:04:38 AM -- Volume B: has 0.0166 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume D: has 0.0167 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume E: has 0.0164 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume F: has 0.0168 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume G: has 0.0171 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume H: has 0.0169 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume I: has 0.0170 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume J: has 0.0166 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume O: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:04:38 AM -- Volume O: has 0.0047 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume P: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:04:38 AM -- Volume P: has 0.0057 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume Q: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:04:38 AM -- Volume Q: has 0.0051 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume R: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:04:38 AM -- Volume R: has 0.0048 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume S: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:04:38 AM -- Volume S: has 0.0058 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume T: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:04:38 AM -- Volume T: has 0.0043 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume U: has 0.0042 for Avg. Disk sec/Write.

6/27/2008 1:04:38 AM -- Volume U: has 0.0048 for Avg. Disk sec/Read.  
 6/27/2008 1:04:38 AM -- Volume V: has 0.0042 for Avg. Disk sec/Write.  
 6/27/2008 1:04:38 AM -- Volume V: has 0.0050 for Avg. Disk sec/Read.  
 6/27/2008 1:04:38 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
 6/27/2008 1:04:38 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.  
 6/27/2008 1:04:38 AM -- [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_6\\_27\\_0\\_13\\_2.xml](C:\Program Files\Exchange Jetstress\Performance_2008_6_27_0_13_2.xml)  
 has 204 samples queried.

**Server – EX1PMX02**

**SoftRecovery Test Result Report**

Test Summary

**Overall Test Result** Pass

**Machine Name** EX1PMX02

**Test Description**

**Test Start Time** 6/27/2008 12:12:25 AM

**Test End Time** 6/27/2008 1:02:22 AM

**Jetstress Version** 08.02.0050.000

**Ese Version** 08.01.0240.005

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

**Performance Log** [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_6\\_27\\_0\\_12\\_44.blg](C:\Program Files\Exchange Jetstress\Performance_2008_6_27_0_12_44.blg)

Database Sizing and Throughput

**Achieved I/O per Second** 2242.117

**Capacity Percentage** 100%

**Throughput Percentage** 100%

**Initial database size** 1634464825344

**Final database size** 1637654593536

**Database files (count)** 8

Jetstress System Parameters

**Thread count** 11 (per-storage group)

**Log buffers** 9000

**Minimum database cache** 256.0 MB

**Maximum database cache** 2048.0 MB

**Insert operations** 40%

**Delete operations** 30%

**Replace operations** 5%

**Read operations** 25%

**Lazy commits** 55%

Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (B:)	0.017	0.008	137.148	140.187	(n/a)
Database (D:)	0.017	0.008	138.649	141.229	(n/a)
Database (E:)	0.017	0.008	139.613	141.851	(n/a)
Database (F:)	0.017	0.008	137.370	140.677	(n/a)
Database (G:)	0.017	0.008	141.169	143.666	(n/a)

<b>Database (H:)</b>	0.017	0.008	139.061	142.015	(n/a)
<b>Database (I:)</b>	0.017	0.008	137.915	141.283	(n/a)
<b>Database (J:)</b>	0.017	0.008	138.906	141.379	(n/a)
<b>Log (O:)</b>	0.006	0.004	0.043	76.899	5093.847
<b>Log (P:)</b>	0.005	0.004	0.043	77.342	5091.013
<b>Log (Q:)</b>	0.006	0.004	0.042	77.372	5006.739
<b>Log (R:)</b>	0.005	0.004	0.042	77.081	5019.479
<b>Log (S:)</b>	0.006	0.004	0.043	78.053	5077.139
<b>Log (T:)</b>	0.006	0.004	0.042	77.636	4960.427
<b>Log (U:)</b>	0.005	0.004	0.043	77.635	5126.467
<b>Log (V:)</b>	0.006	0.004	0.043	77.012	5034.878

#### Host System Performance

Counter	Average	Minimum	Maximum
<b>% Processor Time</b>	2.366	1.638	5.124
<b>Available MBytes</b>	61454.934	61325.000	63290.000
<b>Free System Page Table Entries</b>	16757532.475	16757530.000	16757740.000
<b>Transition Pages RePurposed/sec</b>	0.000	0.000	0.000
<b>Pool Nonpaged Bytes</b>	97659459.232	94887936.000	97910784.000
<b>Pool Paged Bytes</b>	53539540.040	52412416.000	54050816.000
<b>Database Page Fault Stalls/sec</b>	0.000	0.000	0.000

#### Test Log

6/27/2008 12:12:25 AM -- Jetstress testing begins ...  
6/27/2008 12:12:25 AM -- Prepare testing begins ...  
6/27/2008 12:12:34 AM -- Attaching databases ...  
6/27/2008 12:12:34 AM -- Prepare testing ends.  
6/27/2008 12:12:34 AM -- Dispatching transactions begins ...  
6/27/2008 12:12:35 AM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
6/27/2008 12:12:35 AM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
6/27/2008 12:12:44 AM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).  
6/27/2008 12:12:44 AM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).  
6/27/2008 12:12:45 AM -- Operation mix: Sessions 11, Inserts 40%, Deletes 30%, Replaces 5%, Reads 25%, Lazy Commits 55%.  
6/27/2008 12:12:45 AM -- Performance logging begins (interval: 15000 ms).  
6/27/2008 12:12:45 AM -- Generating log files ...  
6/27/2008 1:02:19 AM -- O:\ (102.0% generated), P:\ (102.4% generated), Q:\ (100.6% generated), R:\ (100.6% generated), S:\ (103.0% generated), T:\ (100.2% generated), U:\ (103.6% generated), and V:\ (101.0% generated)  
6/27/2008 1:02:20 AM -- Performance logging ends.  
6/27/2008 1:02:20 AM -- JetInterop batch transaction stats: 12529, 12523, 12580, 12398, 12785, 12548, 12556, and 12543.  
6/27/2008 1:02:21 AM -- Dispatching transactions ends.  
6/27/2008 1:02:21 AM -- Shutting down databases ...  
6/27/2008 1:02:22 AM -- Instance2260.1 (complete), Instance2260.2 (complete), Instance2260.3 (complete), Instance2260.4 (complete), Instance2260.5 (complete), Instance2260.6 (complete), Instance2260.7 (complete), and Instance2260.8 (complete)  
6/27/2008 1:02:22 AM -- [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_6\\_27\\_0\\_12\\_44.blg](C:\Program Files\Exchange Jetstress\Performance_2008_6_27_0_12_44.blg) has 198 samples.  
6/27/2008 1:02:22 AM -- Creating test report ...  
6/27/2008 1:02:26 AM -- Volume B: has 0.0166 for Avg. Disk sec/Read.

6/27/2008 1:02:26 AM -- Volume D: has 0.0169 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume E: has 0.0166 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume F: has 0.0169 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume G: has 0.0172 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume H: has 0.0165 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume I: has 0.0168 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume J: has 0.0170 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume O: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume O: has 0.0056 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume P: has 0.0041 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume P: has 0.0053 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume Q: has 0.0041 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume Q: has 0.0055 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume R: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume R: has 0.0052 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume S: has 0.0041 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume S: has 0.0056 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume T: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume T: has 0.0058 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume U: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume U: has 0.0052 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume V: has 0.0041 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume V: has 0.0056 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
6/27/2008 1:02:26 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.  
6/27/2008 1:02:26 AM -- [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_6\\_27\\_0\\_12\\_44.xml](C:\Program Files\Exchange Jetstress\Performance_2008_6_27_0_12_44.xml)  
has 197 samples queried.

## Server – EX1PMX01

### SoftRecovery Test Result Report – Checksum

#### Soft-Recovery Statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance1860.1	500	1537.4476804
Instance1860.2	531	1572.9469988
Instance1860.3	514	1572.1970132
Instance1860.4	533	1568.6970804
Instance1860.5	519	1570.4470468
Instance1860.6	516	1513.198146
Instance1860.7	512	1550.697426
Instance1860.8	521	1557.6972916

#### Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (B:)	0.209	0.061	137.531	3.461	(n/a)
Database (D:)	0.223	0.054	141.293	3.595	(n/a)
Database (E:)	0.215	0.055	141.150	3.530	(n/a)
Database (F:)	0.217	0.055	142.309	3.670	(n/a)
Database (G:)	0.224	0.054	140.948	3.558	(n/a)
Database (H:)	0.212	0.055	140.258	3.565	(n/a)
Database (I:)	0.210	0.055	142.236	3.544	(n/a)

<b>Database (J:)</b>	0.211	0.051	139.676	3.593	(n/a)
<b>Log (O:)</b>	0.041	0.086	10.534	0.911	3899.212
<b>Log (P:)</b>	0.043	0.087	11.073	0.948	4057.280
<b>Log (Q:)</b>	0.044	0.089	10.809	0.944	3981.378
<b>Log (R:)</b>	0.043	0.092	11.230	0.938	4003.018
<b>Log (S:)</b>	0.043	0.088	10.912	0.922	3941.068
<b>Log (T:)</b>	0.043	0.078	10.872	0.927	3949.304
<b>Log (U:)</b>	0.044	0.086	10.787	0.933	3932.911
<b>Log (V:)</b>	0.046	0.090	10.976	0.944	3939.990

#### Host System Performance

Counter	Average	Minimum	Maximum
<b>% Processor Time</b>	1.786	0.000	7.689
<b>Available MBytes</b>	61666.133	61318.000	63314.000
<b>Free System Page Table Entries</b>	16756072.000	16756072.000	16756072.000
<b>Transition Pages RePurposed/sec</b>	0.000	0.000	0.000
<b>Pool Nonpaged Bytes</b>	98231277.668	94556160.000	98512896.000
<b>Pool Paged Bytes</b>	60093180.726	59727872.000	60825600.000
<b>Database Page Fault Stalls/sec</b>	0.000	0.000	0.000

#### Test Log

6/27/2008 12:12:42 AM -- Jetstress testing begins ...  
6/27/2008 12:12:42 AM -- Prepare testing begins ...  
6/27/2008 12:12:52 AM -- Attaching databases ...  
6/27/2008 12:12:52 AM -- Prepare testing ends.  
6/27/2008 12:12:52 AM -- Dispatching transactions begins ...  
6/27/2008 12:12:52 AM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
6/27/2008 12:12:52 AM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
6/27/2008 12:13:02 AM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).  
6/27/2008 12:13:02 AM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).  
6/27/2008 12:13:03 AM -- Operation mix: Sessions 11, Inserts 40%, Deletes 30%, Replaces 5%, Reads 25%, Lazy Commits 55%.  
6/27/2008 12:13:03 AM -- Performance logging begins (interval: 15000 ms).  
6/27/2008 12:13:03 AM -- Generating log files ...  
6/27/2008 1:04:30 AM -- O:\ (100.2% generated), P:\ (106.2% generated), Q:\ (103.0% generated), R:\ (106.8% generated), S:\ (104.0% generated), T:\ (103.4% generated), U:\ (102.6% generated), and V:\ (104.4% generated)  
6/27/2008 1:04:31 AM -- Performance logging ends.  
6/27/2008 1:04:31 AM -- JetInterop batch transaction stats: 12452, 12784, 12659, 12848, 12691, 12792, 12949, and 12753.  
6/27/2008 1:04:31 AM -- Dispatching transactions ends.  
6/27/2008 1:04:31 AM -- Shutting down databases ...  
6/27/2008 1:04:33 AM -- Instance1860.1 (complete), Instance1860.2 (complete), Instance1860.3 (complete), Instance1860.4 (complete), Instance1860.5 (complete), Instance1860.6 (complete), Instance1860.7 (complete), and Instance1860.8 (complete)  
6/27/2008 1:04:33 AM -- [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_6\\_27\\_0\\_13\\_2.blg](C:\Program Files\Exchange Jetstress\Performance_2008_6_27_0_13_2.blg) has 205 samples.  
6/27/2008 1:04:33 AM -- Creating test report ...  
6/27/2008 1:04:38 AM -- Volume B: has 0.0166 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume D: has 0.0167 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume E: has 0.0164 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume F: has 0.0168 for Avg. Disk sec/Read.

6/27/2008 1:04:38 AM -- Volume G: has 0.0171 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume H: has 0.0169 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume I: has 0.0170 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume J: has 0.0166 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume O: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:04:38 AM -- Volume O: has 0.0047 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume P: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:04:38 AM -- Volume P: has 0.0057 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume Q: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:04:38 AM -- Volume Q: has 0.0051 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume R: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:04:38 AM -- Volume R: has 0.0048 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume S: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:04:38 AM -- Volume S: has 0.0058 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume T: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:04:38 AM -- Volume T: has 0.0043 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume U: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:04:38 AM -- Volume U: has 0.0048 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Volume V: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:04:38 AM -- Volume V: has 0.0050 for Avg. Disk sec/Read.  
6/27/2008 1:04:38 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
6/27/2008 1:04:38 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.  
6/27/2008 1:04:38 AM -- [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_6\\_27\\_0\\_13\\_2.xml](C:\Program Files\Exchange Jetstress\Performance_2008_6_27_0_13_2.xml)  
has 204 samples queried.  
6/27/2008 1:04:41 AM -- [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_6\\_27\\_0\\_13\\_2.html](C:\Program Files\Exchange Jetstress\Performance_2008_6_27_0_13_2.html)  
is saved.  
6/27/2008 1:31:41 AM -- Performance logging begins (interval: 4000 ms).  
6/27/2008 1:31:41 AM -- Recovering databases ...  
6/27/2008 1:57:55 AM -- Performance logging ends.  
6/27/2008 1:57:55 AM -- Instance1860.1 (1537.4476804), Instance1860.2 (1572.9469988),  
Instance1860.3 (1572.1970132), Instance1860.4 (1568.6970804), Instance1860.5 (1570.4470468),  
Instance1860.6 (1513.198146), Instance1860.7 (1550.697426), and Instance1860.8 (1557.6972916)  
6/27/2008 1:57:55 AM -- [C:\Program Files\Exchange Jetstress\SoftRecovery\\_2008\\_6\\_27\\_1\\_31\\_40.blg](C:\Program Files\Exchange Jetstress\SoftRecovery_2008_6_27_1_31_40.blg)  
has 391 samples.  
6/27/2008 1:57:55 AM -- Creating test report ...

## Server-EX1PMX02

### SoftRecovery Test Result Report -Checksum

Soft-Recovery Statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance2260.1	509	1525.4970156
Instance2260.2	512	1531.9969324
Instance2260.3	502	1509.4972204
Instance2260.4	502	1492.7474348
Instance2260.5	514	1525.9970092
Instance2260.6	500	1499.2473516
Instance2260.7	518	1502.2473132
Instance2260.8	505	1498.747358

#### Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (B:)	0.219	0.063	141.630	3.602	(n/a)
Database (D:)	0.221	0.056	141.469	3.565	(n/a)
Database (E:)	0.222	0.057	142.760	3.578	(n/a)
Database (F:)	0.221	0.050	140.610	3.565	(n/a)
Database (G:)	0.230	0.052	144.460	3.636	(n/a)
Database (H:)	0.222	0.057	142.129	3.566	(n/a)
Database (I:)	0.230	0.057	142.222	3.672	(n/a)
Database (J:)	0.220	0.053	141.712	3.573	(n/a)
Log (O:)	0.044	0.093	11.018	0.946	4017.563
Log (P:)	0.043	0.103	10.953	0.938	4027.453
Log (Q:)	0.042	0.091	10.866	0.955	3909.754
Log (R:)	0.044	0.091	10.836	0.941	3993.160
Log (S:)	0.043	0.101	11.126	0.961	4047.797
Log (T:)	0.042	0.095	10.822	0.917	3937.244
Log (U:)	0.043	0.086	11.212	0.983	3958.152
Log (V:)	0.044	0.086	10.885	0.940	3909.339

#### Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	1.619	0.000	5.497
Available MBytes	61705.812	61434.000	63517.000
Free System Page Table Entries	16757520.026	16757520.000	16757530.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	101558036.105	97890304.000	101740544.000
Pool Paged Bytes	56318702.576	53960704.000	56782848.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

#### Test Log

6/27/2008 12:12:25 AM -- Jetstress testing begins ...  
6/27/2008 12:12:25 AM -- Prepare testing begins ...  
6/27/2008 12:12:34 AM -- Attaching databases ...  
6/27/2008 12:12:34 AM -- Prepare testing ends.  
6/27/2008 12:12:34 AM -- Dispatching transactions begins ...  
6/27/2008 12:12:35 AM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
6/27/2008 12:12:35 AM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
6/27/2008 12:12:44 AM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).  
6/27/2008 12:12:44 AM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).  
6/27/2008 12:12:45 AM -- Operation mix: Sessions 11, Inserts 40%, Deletes 30%, Replaces 5%, Reads 25%, Lazy Commits 55%.  
6/27/2008 12:12:45 AM -- Performance logging begins (interval: 15000 ms).  
6/27/2008 12:12:45 AM -- Generating log files ...  
6/27/2008 1:02:19 AM -- O:\ (102.0% generated), P:\ (102.4% generated), Q:\ (100.6% generated),

R:\ (100.6% generated), S:\ (103.0% generated), T:\ (100.2% generated), U:\ (103.6% generated), and V:\ (101.0% generated)  
6/27/2008 1:02:20 AM -- Performance logging ends.  
6/27/2008 1:02:20 AM -- JetInterop batch transaction stats: 12529, 12523, 12580, 12398, 12785, 12548, 12556, and 12543.  
6/27/2008 1:02:21 AM -- Dispatching transactions ends.  
6/27/2008 1:02:21 AM -- Shutting down databases ...  
6/27/2008 1:02:22 AM -- Instance2260.1 (complete), Instance2260.2 (complete), Instance2260.3 (complete), Instance2260.4 (complete), Instance2260.5 (complete), Instance2260.6 (complete), Instance2260.7 (complete), and Instance2260.8 (complete)  
6/27/2008 1:02:22 AM -- [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_6\\_27\\_0\\_12\\_44.blg](C:\Program Files\Exchange Jetstress\Performance_2008_6_27_0_12_44.blg) has 198 samples.  
6/27/2008 1:02:22 AM -- Creating test report ...  
6/27/2008 1:02:26 AM -- Volume B: has 0.0166 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume D: has 0.0169 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume E: has 0.0166 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume F: has 0.0169 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume G: has 0.0172 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume H: has 0.0165 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume I: has 0.0168 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume J: has 0.0170 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume O: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume O: has 0.0056 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume P: has 0.0041 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume P: has 0.0053 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume Q: has 0.0041 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume Q: has 0.0055 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume R: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume R: has 0.0052 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume S: has 0.0041 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume S: has 0.0056 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume T: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume T: has 0.0058 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume U: has 0.0042 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume U: has 0.0052 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Volume V: has 0.0041 for Avg. Disk sec/Write.  
6/27/2008 1:02:26 AM -- Volume V: has 0.0056 for Avg. Disk sec/Read.  
6/27/2008 1:02:26 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
6/27/2008 1:02:26 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.  
6/27/2008 1:02:26 AM -- [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_6\\_27\\_0\\_12\\_44.xml](C:\Program Files\Exchange Jetstress\Performance_2008_6_27_0_12_44.xml) has 197 samples queried.  
6/27/2008 1:02:29 AM -- [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_6\\_27\\_0\\_12\\_44.html](C:\Program Files\Exchange Jetstress\Performance_2008_6_27_0_12_44.html) is saved.  
6/27/2008 1:32:04 AM -- Performance logging begins (interval: 4000 ms).  
6/27/2008 1:32:04 AM -- Recovering databases ...  
6/27/2008 1:57:37 AM -- Performance logging ends.  
6/27/2008 1:57:37 AM -- Instance2260.1 (1525.4970156), Instance2260.2 (1531.9969324), Instance2260.3 (1509.4972204), Instance2260.4 (1492.7474348), Instance2260.5 (1525.9970092), Instance2260.6 (1499.2473516), Instance2260.7 (1502.2473132), and Instance2260.8 (1498.747358)  
6/27/2008 1:57:37 AM -- [C:\Program Files\Exchange Jetstress\SoftRecovery\\_2008\\_6\\_27\\_1\\_32\\_3.blg](C:\Program Files\Exchange Jetstress\SoftRecovery_2008_6_27_1_32_3.blg) has 382 samples.

## Appendix E: Maximum Solution IOPS Testing

The building block described under is the EMC recommended configuration for 8,000 Exchange user workload at 0.5 IOPS per user. The result shown in Appendix A illustrates that this configuration achieved excellent results, with considerable room for growth.

Often the observed user workload in customer environments is greater than expected. For example, the use of Blackberry or MAPI journaling devices can significantly increase the I/O workload generated by a set of users. EMC prides itself on delivering solutions that meet and exceed customer requirements and hence the configurations are designed with considerable headroom.

After providing that the building block could easily satisfy the ESRP criteria, subsequent tests were run to determine the upper limits of the configuration. The number of Jetstress threads was increased from 11 to 14 without modifying any of the other components. The achieved IOPS increased from 4343 to 4859, a 12% increase. While this workload is not recommended for customers, as it is close to the maximum acceptable latency for ESRP, it highlights the headroom in the recommended building block.

### Maximum Performance Test Report

Server-EX1PMX01

Microsoft Exchange Server **Jetstress**

Performance Test Result Report  
Test Summary

**Overall Test Result** Pass

**Machine Name** EX1PMX01

#### Test Description

**Test Start Time** 6/17/2008 11:47:55 PM

**Test End Time** 6/18/2008 1:55:15 AM

**Jetstress Version** 08.02.0050.000

**Ese Version** 08.01.0240.005

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

**Performance Log** [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_6\\_17\\_23\\_48\\_16.blg](C:\Program Files\Exchange Jetstress\Performance_2008_6_17_23_48_16.blg)  
[C:\Program Files\Exchange Jetstress\DBChecksum\\_2008\\_6\\_18\\_1\\_55\\_15.blg](C:\Program Files\Exchange Jetstress\DBChecksum_2008_6_18_1_55_15.blg)

Database Sizing and Throughput

**Achieved I/O per Second** 2422.18  
**Capacity Percentage** 100%  
**Throughput Percentage** 100%  
**Initial database size** 1634448048128  
**Final database size** 1643140743168  
**Database files (count)** 8

Jetstress System Parameters

**Thread count** 14 (per-storage group)  
**Log buffers** 9000  
**Minimum database cache** 256.0 MB  
**Maximum database cache** 2048.0 MB  
**Insert operations** 40%  
**Delete operations** 30%  
**Replace operations** 5%  
**Read operations** 25%  
**Lazy commits** 55%

Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (B:)	0.020	0.010	148.828	156.497	(n/a)
Database (D:)	0.020	0.010	148.876	155.626	(n/a)
Database (E:)	0.019	0.010	147.934	154.298	(n/a)
Database (F:)	0.020	0.010	147.604	154.824	(n/a)
Database (G:)	0.019	0.010	147.733	153.197	(n/a)
Database (H:)	0.020	0.010	147.652	154.698	(n/a)
Database (I:)	0.020	0.010	148.088	155.050	(n/a)
Database (J:)	0.020	0.010	147.965	153.310	(n/a)
Log (O:)	0.000	0.005	0.000	76.150	5442.724
Log (P:)	1.419624217119E-05	0.005	0.000	76.074	5451.389
Log (Q:)	0.000	0.005	0.000	75.729	5409.951
Log (R:)	0.000	0.005	0.000	75.662	5534.224
Log (S:)	0.000	0.005	0.000	75.190	5462.903
Log (T:)	0.000	0.005	0.000	75.747	5512.523
Log (U:)	0.000	0.005	0.000	75.876	5516.878
Log (V:)	0.000	0.005	0.000	75.291	5474.900

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.962	1.821	5.133
Available MBytes	61180.077	61170.000	61398.000
Free System Page Table Entries	16755536.290	16755492.000	16755562.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	94954316.800	93622272.000	95256576.000
Pool Paged Bytes	59958775.467	59523072.000	60538880.000

Database Page Fault Stalls/sec 0.000 0.000 0.000

#### Test Log

6/17/2008 11:47:55 PM -- Jetstress testing begins ...  
6/17/2008 11:47:55 PM -- Prepare testing begins ...  
6/17/2008 11:48:05 PM -- Attaching databases ...  
6/17/2008 11:48:05 PM -- Prepare testing ends.  
6/17/2008 11:48:05 PM -- Dispatching transactions begins ...  
6/17/2008 11:48:05 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
6/17/2008 11:48:05 PM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
6/17/2008 11:48:16 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).  
6/17/2008 11:48:16 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).  
6/17/2008 11:48:17 PM -- Operation mix: Sessions 14, Inserts 40%, Deletes 30%, Replaces 5%, Reads 25%, Lazy Commits 55%.  
6/17/2008 11:48:17 PM -- Performance logging begins (interval: 15000 ms).  
6/17/2008 11:48:17 PM -- Attaining prerequisites:  
6/17/2008 11:53:46 PM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1935737000.0 (lower bound: 1932735000.0, upper bound: none)  
6/18/2008 1:53:47 AM -- Performance logging ends.  
6/18/2008 1:55:13 AM -- JetInterop batch transaction stats: 34396, 34369, 34266, 34283, 34099, 34304, 34275, and 34266.  
6/18/2008 1:55:14 AM -- Dispatching transactions ends.  
6/18/2008 1:55:14 AM -- Shutting down databases ...  
6/18/2008 1:55:15 AM -- Instance1040.1 (complete), Instance1040.2 (complete), Instance1040.3 (complete), Instance1040.4 (complete), Instance1040.5 (complete), Instance1040.6 (complete), Instance1040.7 (complete), and Instance1040.8 (complete)  
6/18/2008 1:55:16 AM -- Performance logging begins (interval: 30000 ms).  
6/18/2008 1:55:16 AM -- Verifying database checksums ...  
6/18/2008 4:48:59 AM -- B: (100% processed), D: (100% processed), E: (100% processed), F: (100% processed), G: (100% processed), H: (100% processed), I: (100% processed), and J: (100% processed)  
6/18/2008 4:49:00 AM -- Performance logging ends.  
6/18/2008 4:49:00 AM -- [C:\Program Files\Exchange Jetstress\DBChecksum\\_2008\\_6\\_18\\_1\\_55\\_15.blg](C:\Program Files\Exchange Jetstress\DBChecksum_2008_6_18_1_55_15.blg) has 347 samples.  
6/18/2008 4:49:46 AM -- [C:\Program Files\Exchange Jetstress\DBChecksum\\_2008\\_6\\_18\\_1\\_55\\_15.html](C:\Program Files\Exchange Jetstress\DBChecksum_2008_6_18_1_55_15.html) is saved.  
6/18/2008 4:49:46 AM -- Verifying log checksums ...  
6/18/2008 4:49:47 AM -- O:\ (2 logs passed), P:\ (2 logs passed), Q:\ (2 logs passed), R:\ (2 logs passed), S:\ (2 logs passed), T:\ (2 logs passed), U:\ (2 logs passed), and V:\ (2 logs passed)  
6/18/2008 4:49:47 AM -- [C:\Program Files\Exchange Jetstress\Performance\\_2008\\_6\\_17\\_23\\_48\\_16.blg](C:\Program Files\Exchange Jetstress\Performance_2008_6_17_23_48_16.blg) has 501 samples.  
6/18/2008 4:49:47 AM -- Creating test report ...  
6/18/2008 4:50:07 AM -- Volume B: has 0.0196 for Avg. Disk sec/Read.  
6/18/2008 4:50:07 AM -- Volume D: has 0.0197 for Avg. Disk sec/Read.  
6/18/2008 4:50:07 AM -- Volume E: has 0.0194 for Avg. Disk sec/Read.  
6/18/2008 4:50:07 AM -- Volume F: has 0.0197 for Avg. Disk sec/Read.  
6/18/2008 4:50:07 AM -- Volume G: has 0.0194 for Avg. Disk sec/Read.  
6/18/2008 4:50:07 AM -- Volume H: has 0.0195 for Avg. Disk sec/Read.  
6/18/2008 4:50:07 AM -- Volume I: has 0.0195 for Avg. Disk sec/Read.  
6/18/2008 4:50:07 AM -- Volume J: has 0.0198 for Avg. Disk sec/Read.  
6/18/2008 4:50:07 AM -- Volume O: has 0.0052 for Avg. Disk sec/Write.  
6/18/2008 4:50:07 AM -- Volume O: has 0.0000 for Avg. Disk sec/Read.  
6/18/2008 4:50:07 AM -- Volume P: has 0.0052 for Avg. Disk sec/Write.  
6/18/2008 4:50:07 AM -- Volume P: has 0.0000 for Avg. Disk sec/Read.  
6/18/2008 4:50:07 AM -- Volume Q: has 0.0052 for Avg. Disk sec/Write.  
6/18/2008 4:50:07 AM -- Volume Q: has 0.0000 for Avg. Disk sec/Read.  
6/18/2008 4:50:07 AM -- Volume R: has 0.0052 for Avg. Disk sec/Write.

6/18/2008 4:50:07 AM -- Volume R: has 0.0000 for Avg. Disk sec/Read.  
 6/18/2008 4:50:07 AM -- Volume S: has 0.0052 for Avg. Disk sec/Write.  
 6/18/2008 4:50:07 AM -- Volume S: has 0.0000 for Avg. Disk sec/Read.  
 6/18/2008 4:50:07 AM -- Volume T: has 0.0052 for Avg. Disk sec/Write.  
 6/18/2008 4:50:07 AM -- Volume T: has 0.0000 for Avg. Disk sec/Read.  
 6/18/2008 4:50:07 AM -- Volume U: has 0.0052 for Avg. Disk sec/Write.  
 6/18/2008 4:50:07 AM -- Volume U: has 0.0000 for Avg. Disk sec/Read.  
 6/18/2008 4:50:07 AM -- Volume V: has 0.0052 for Avg. Disk sec/Write.  
 6/18/2008 4:50:07 AM -- Volume V: has 0.0000 for Avg. Disk sec/Read.  
 6/18/2008 4:50:07 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
 6/18/2008 4:50:07 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.  
 6/18/2008 4:50:07 AM -- [C:\Program Files\Exchange Jetstress\Performance 2008\\_6\\_17\\_23\\_48\\_16.xml](C:\Program Files\Exchange Jetstress\Performance 2008_6_17_23_48_16.xml) has 479 samples queried.

## Server-EX1PMX02

Microsoft Exchange Server **Jetstress**

Performance Test Result Report

Test Summary

**Overall Test Result** **Pass**

**Machine Name** EX1PMX02

**Test Description**

**Test Start Time** 6/17/2008 11:47:25 PM

**Test End Time** 6/18/2008 1:55:33 AM

**Jetstress Version** 08.02.0050.000

**Ese Version** 08.01.0240.005

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

**Performance Log** [C:\Program Files\Exchange Jetstress\Performance 2008\\_6\\_17\\_23\\_47\\_44.blg](C:\Program Files\Exchange Jetstress\Performance 2008_6_17_23_47_44.blg)  
[C:\Program Files\Exchange Jetstress\DBChecksum 2008\\_6\\_18\\_1\\_55\\_33.blg](C:\Program Files\Exchange Jetstress\DBChecksum 2008_6_18_1_55_33.blg)

Database Sizing and Throughput

**Achieved I/O per Second** 2437.123

**Capacity Percentage** 100%

**Throughput Percentage** 100%

**Initial database size** 1634464825344

**Final database size** 1643298029568

**Database files (count)** 8

Jetstress System Parameters

**Thread count** 14 (per-storage group)

**Log buffers** 9000

**Minimum database cache** 256.0 MB

**Maximum database cache** 2048.0 MB

**Insert operations** 40%

**Delete operations** 30%

**Replace operations** 5%

**Read operations** 25%

**Lazy commits** 55%

#### Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (B:)	0.019	0.010	149.998	156.726	(n/a)
Database (D:)	0.019	0.010	149.457	156.053	(n/a)
Database (E:)	0.019	0.010	149.600	156.092	(n/a)
Database (F:)	0.019	0.010	148.993	154.542	(n/a)
Database (G:)	0.019	0.010	148.101	154.089	(n/a)
Database (H:)	0.019	0.010	148.946	155.286	(n/a)
Database (I:)	0.019	0.010	150.154	156.579	(n/a)
Database (J:)	0.019	0.010	148.448	154.060	(n/a)
Log (O:)	0.000	0.005	0.000	76.694	5454.530
Log (P:)	1.02296450939457E-05	0.005	0.000	76.783	5427.468
Log (Q:)	0.000	0.005	0.000	76.771	5509.812
Log (R:)	0.000	0.005	0.000	76.115	5513.750
Log (S:)	0.000	0.005	0.000	76.245	5446.189
Log (T:)	0.000	0.005	0.000	76.615	5487.147
Log (U:)	0.000	0.005	0.000	76.605	5451.474
Log (V:)	0.000	0.005	0.000	76.291	5490.155

#### Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.494	1.645	3.908
Available MBytes	61310.779	61306.000	61482.000
Free System Page Table Entries	16757314.729	16757310.000	16757320.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	97906884.267	96337920.000	98107392.000
Pool Paged Bytes	56191598.933	55717888.000	56676352.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

#### Test Log

6/17/2008 11:47:25 PM -- Jetstress testing begins ...  
6/17/2008 11:47:25 PM -- Prepare testing begins ...  
6/17/2008 11:47:35 PM -- Attaching databases ...  
6/17/2008 11:47:35 PM -- Prepare testing ends.  
6/17/2008 11:47:35 PM -- Dispatching transactions begins ...  
6/17/2008 11:47:35 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
6/17/2008 11:47:35 PM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
6/17/2008 11:47:44 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).  
6/17/2008 11:47:44 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).  
6/17/2008 11:47:46 PM -- Operation mix: Sessions 14, Inserts 40%, Deletes 30%, Replaces 5%, Reads 25%, Lazy Commits 55%.  
6/17/2008 11:47:46 PM -- Performance logging begins (interval: 15000 ms).  
6/17/2008 11:47:46 PM -- Attaining prerequisites:  
6/17/2008 11:53:09 PM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1935786000.0 (lower bound: 1932735000.0, upper bound: none)  
6/18/2008 1:53:10 AM -- Performance logging ends.  
6/18/2008 1:55:31 AM -- JetInterop batch transaction stats: 34909, 34574, 34907, 34829, 34532, 34762,

34698, and 34382.  
6/18/2008 1:55:32 AM -- Dispatching transactions ends.  
6/18/2008 1:55:32 AM -- Shutting down databases ...  
6/18/2008 1:55:33 AM -- Instance2556.1 (complete), Instance2556.2 (complete), Instance2556.3 (complete), Instance2556.4 (complete), Instance2556.5 (complete), Instance2556.6 (complete), Instance2556.7 (complete), and Instance2556.8 (complete)  
6/18/2008 1:55:34 AM -- Performance logging begins (interval: 30000 ms).  
6/18/2008 1:55:34 AM -- Verifying database checksums ...  
6/18/2008 4:50:51 AM -- B: (100% processed), D: (100% processed), E: (100% processed), F: (100% processed), G: (100% processed), H: (100% processed), I: (100% processed), and J: (100% processed)  
6/18/2008 4:50:52 AM -- Performance logging ends.  
6/18/2008 4:50:52 AM -- [C:\Program Files\Exchange Jetstress\DBChecksum 2008 6 18 1 55 33.blg](#) has 350 samples.  
6/18/2008 4:51:30 AM -- [C:\Program Files\Exchange Jetstress\DBChecksum 2008 6 18 1 55 33.html](#) is saved.  
6/18/2008 4:51:31 AM -- Verifying log checksums ...  
6/18/2008 4:51:32 AM -- O:\ (2 logs passed), P:\ (2 logs passed), Q:\ (2 logs passed), R:\ (2 logs passed), S:\ (2 logs passed), T:\ (2 logs passed), U:\ (2 logs passed), and V:\ (2 logs passed)  
6/18/2008 4:51:32 AM -- [C:\Program Files\Exchange Jetstress\Performance 2008 6 17 23 47 44.blg](#) has 501 samples.  
6/18/2008 4:51:32 AM -- Creating test report ...  
6/18/2008 4:51:50 AM -- Volume B: has 0.0190 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume D: has 0.0192 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume E: has 0.0191 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume F: has 0.0192 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume G: has 0.0190 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume H: has 0.0192 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume I: has 0.0192 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume J: has 0.0192 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume O: has 0.0050 for Avg. Disk sec/Write.  
6/18/2008 4:51:50 AM -- Volume O: has 0.0000 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume P: has 0.0051 for Avg. Disk sec/Write.  
6/18/2008 4:51:50 AM -- Volume P: has 0.0000 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume Q: has 0.0051 for Avg. Disk sec/Write.  
6/18/2008 4:51:50 AM -- Volume Q: has 0.0000 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume R: has 0.0051 for Avg. Disk sec/Write.  
6/18/2008 4:51:50 AM -- Volume R: has 0.0000 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume S: has 0.0051 for Avg. Disk sec/Write.  
6/18/2008 4:51:50 AM -- Volume S: has 0.0000 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume T: has 0.0051 for Avg. Disk sec/Write.  
6/18/2008 4:51:50 AM -- Volume T: has 0.0000 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume U: has 0.0051 for Avg. Disk sec/Write.  
6/18/2008 4:51:50 AM -- Volume U: has 0.0000 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Volume V: has 0.0050 for Avg. Disk sec/Write.  
6/18/2008 4:51:50 AM -- Volume V: has 0.0000 for Avg. Disk sec/Read.  
6/18/2008 4:51:50 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
6/18/2008 4:51:50 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.  
6/18/2008 4:51:50 AM -- [C:\Program Files\Exchange Jetstress\Performance 2008 6 17 23 47 44.xml](#) has 479 samples queried.