

# **FUJITSU ETERNUS2000 Storage System model 100 2500 Mailbox Exchange Server 2007 Storage Solution**



**Tested with: ESRP – Storage Version 2.0  
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## Overview

This document provides information on FUJITSU storage solution for Microsoft Exchange Server, based the *Microsoft Exchange Solution Reviewed Program (ESRP) – Storage program\**. For any questions or comments regarding the contents of this document, see [Contact for Additional 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>

## Disclaimer

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

## Features

This document describes an Exchange storage solution for 2500 users on FUJITSU ETERNUS2000 model 100 Storage System. The tested user profile was 0.32 IOPS per user with mailbox limit of 200MB.

ETERNUS2000 Storage system is a compact, cost-effective entry level storage system with high-level system reliability and scalability. Advanced Copy Feature implemented on ETERNUS2000 enables high-speed backup solution. Ideal for small/medium size enterprises and distributed system environment.

## Solution Description

The tested configuration consists of one ETERNUS2000 storage system model100 with 15 high-speed SAS disks. ETERNUS2000 model100 maximum configuration offers up to 18TB storage capacity with up to 24 drives.

ETERNUS2000 is connected to Primergy RX300S3 by two 4Gbps fibre channel paths.(Figure 1)



ETERNUS2000 storage system model 100 can connect with maximum four 4Gpbs Fibre Channel, 3Gpbs SAS or 1Gpbs iSCSI host paths. And it has 2GB battery backed cache.

To support 2500 user mailbox, our tested configuration uses 15 146GB/15krpm disks for database, logs and hot-spare disk. Physical disk layout is shown in Figure 2. Database uses 10 146GB/15krpm disks, it consists of one RAID1+0. Log uses 4 146GB/15krpm disks, it also consists of one RAID1+0.

Each RAID contains five LUNs. The RAID for database contains five LUNs of 133GB each and the RAID for Logs contains five 50GB LUNs.

Drive Enclosure

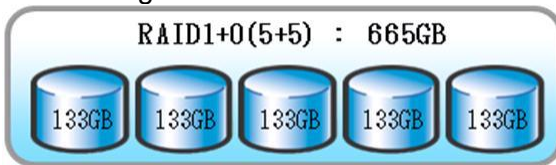
-	-	-	-
-	-	-	-
Database(146GB)	Database(146GB)	Hot Spare(146GB)	-

Controller Enclosure

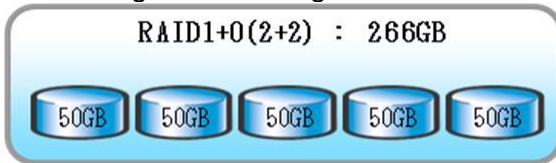
Database(146GB)	Database(146GB)	Database(146GB)	Database(146GB)
Database(146GB)	Database(146GB)	Database(146GB)	Database(146GB)
Log(146GB)	Log(146GB)	Log(146GB)	Log(146GB)

**Figure 2**

LUN Configuration for database



LUN configuration for log



**Figure 3**

ETERNUS2000 model 100with ETERNUS Multipath Driver is listed in the Microsoft Windows® Server Catalog below.

<http://www.windowsservercatalog.com/item.aspx?itemId=a04d839e-e0f9-63d3-57d7-6107b3969ea2>

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

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

### ***Targeted Customer Profile***

This solution is designed to meet the needs from small-size Exchange systems. The tested configuration is sized to 2500 user with following parameters.

- One Exchange Server
- 2500 users
- 200MB mailbox size limit
- 0.384 IOPS user profile (with 20% headroom included)
- 5 storage groups per server
- 1 databases per storage group
- 100GB per database

### ***Tested Deployment***

The following tables summarize the testing environment:

#### **Simulated Exchange Configuration:**

Number of Exchange mailboxes simulated	2500
Number of hosts	1
Number of mailboxes/host	2500
Number of storage groups/host	5
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)	0.384 IOPS/user (with 20% headroom included)
Database LUN size	665 GB
Log LUN size	250 GB

Backup LUN size/storage group	N/A
Total database size for performance testing	500 GB
% storage capacity used by Exchange database**	500 GB / 665 GB = 75%

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

### Primary Storage Hardware

Storage Connectivity (Fiber Channel, SAS, SATA, iSCSI)	Fibre Channel
Storage model and OS/firmware revision	Fujitsu ETERNUS2000 model 100 Firmware rev:V10L22-0000 <a href="http://www.windowsservercatalog.com/item.aspx?idItem=a04d839e-e0f9-63d3-57d7-6107b3969ea2">http://www.windowsservercatalog.com/item.aspx?idItem=a04d839e-e0f9-63d3-57d7-6107b3969ea2</a>
Storage cache	2 GB
Number of storage controllers	2
Number of storage ports	2
Maximum bandwidth of storage connectivity to host	2 x 4Gbit
Switch type/model/firmware revision	No Switch – Direct Attach
HBA model and firmware	PG-FC202 (Emulex LPe1150-F4 4Gb 1port FC: PCIe SFF HBA) Firmware:2.50A6
Number of HBA's/Host	2
Host server type	Fujitsu PRIMERGY RX300S3 PGR30337S Dual Core Intel Xeon 5110 1.6GHz 16GB RAM
Total number of disks tested in solution	14 (plus 1 hot spare)
Maximum number of spindles can be hosted in the storage	24

**Primary Storage Software**

HBA driver	FC(PG-FC202) Storport Miniport Driver 7-1.20A3
HBA QueueTarget Setting	1
HBA QueueDepth Setting	40
Multi-Pathing	ETERNUS Multipath Manager V2.0L13 ,fail over and load balancing.
Host OS	Microsoft Windows Server 2003 R2, Enterprise x64, Service Pack 2
ESE.dll file version	08.01.0240.005
Replication solution name/version	N/A

**Primary Storage Disk Configuration (Mailbox Store Disks)**

Disk type, speed and firmware revision	ST3146855SS (SAS,15k) Firmware: 8F07
Raw capacity per disk (GB)	146 GB
Number of physical disks in test	10
total raw storage capacity (GB)	1460 GB
Disk slice size (GB)	N/A
Number of disks per LUN	10
Raid level	RAID 10, storage level
Total formatted capacity	665 GB
Storage capacity utilization	665 / 1460 = 50%
Database capacity utilization	500 / 1460 = 34%

**Primary Storage Disk Configuration (Transactional Log Disks)**

Disk type, speed and firmware revision	ST3146855SS (SAS,15k) Firmware: 8F07
Raw capacity per disk (GB)	146 GB
Number of Spindles in test	4
total raw storage capacity (GB)	584 GB
Disk slice size (GB)	N/A
Number of disks per LUN	4
Raid level	RAID 10, storage level
Total formatted capacity	250 GB

**Best Practices**

Exchange server is a disk-intensive application. Based on the testing run using the ESRP framework, we would recommend the 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 Microsoft Diskpart Utility to align the sectors of all Exchange 2007 storage volumes before formatting. The Diskpart value should be set to 64. Commands used to set the disks as follows:

```
List disk  
Select disk <x>  
Create partition primary align=64
```

Format the Exchange database volumes at 64K allocation unit size, Command used to format these volumes as follows:

```
FORMAT volumes /FS:NTFS /A:64K
```

Please see Microsoft Exchange team blog site, "Partition Alignment" and "Partition Allocation Unit Size".

<http://technet.microsoft.com/en-us/library/aa998219.aspx>

2. Isolate all Exchange volumes from other applications. Sharing the disks with other application may cause Exchange performance decrease.
3. Isolate Exchange database volumes from log volumes on separate physical disks. Database and logs should be placed on different physical RAIDs. It will cause performance improvement and decrease the risk of unrecoverable physical or logical crashes.
4. Use hardware RAID10 as both database and logs for best performance and reliability.
5. Our recommendation of LUN size of database and logs are 100GB-200GB. Recommended size LUN typically requires 1or 2 hours as offline maintenance time. Too big LUN size cause very long offline maintenance time.
6. Our recommendation is a 1:1 relationship between Storage Group and Store. It makes restore operation safely when database crashes.
7. Install hot-spare disk to keep redundancy of hardware RAID even if HDD fault occurs.
8. ETERNUS2000 model 100 can expand LUN size. And also RAID configuration can be expanded by adding disk. Those operations can be executed concurrently with I/O operation. When number of users or capacity of mailbox increase, ETERNUS2000 can increase LUN size by these features.
9. Troubleshooting high latency on ETERNUS2000 is done using performance monitoring feature of Fujitsu ETERNUS SF Storage Cruiser or other standard performance monitoring tools. These tools can help finding a performance bottleneck. It may be some hardware RAIDs or controller with very heavy load.

**Backup strategy**

Advanced Copy feature is an option of ETERNUS2000. It includes One Point Copy (OPC) function. OPC and ETERNUS SF Advanced Copy Manager (ACM) can backup Exchange volumes very quickly with using Microsoft VSS technology. This backup is done online without stopping Exchange Server operation. Backup performed by OPC and ACM is done on ETERNUS2000, and doesn't use any Server CPU, Network and I/O path.

RAID5 is recommended for backup volumes when you require cost-effective backup storage, and RAID1+0 is recommended when you require good performance and reliability backup storage. RAID 5 volumes shows as good performance as RAID1+0 when it is performed as OPC Target volume. But RAID5 shows worse performance for disk I/O.

For example, to backup database and logs of tested configuration by OPC, five 300GB disks are added to the configuration as backup volumes. These disks make hardware RAID of RAID5 (4+1). Physical disk layout of the configuration is shown in Figure 4.

OPC Support online backup for Exchange Server 2007, it needs following procedure. Current version of ACM only support clustered mailbox. This limitation will be eliminated soon.

**Procedure to backup Exchange Server by OPC.**(ACM commands are underlined in this example.)

- Register ETERNUS VSS hardware provider to VSS.  
C:\> eternus\_provider install
- Install Exchange Server management tool to backup server.
- Register copy pair to ETERNUS VSS provider. Original Volume is g1d1 and target volume is g1d11 in this example.  
✧ C:\> eternus\_copyset -set -o g1d1@<EXCHANGE SERVER NAME> -t g1d11@<BACKUP SERVER NAME> -c QOPC -g BK1
- Register information of storage group.  
✧ C:\> set SWSTGNODE=nodeAGT (set logical node name to environment variable)  
✧ C:\> swsrpdinfo\_exchange -evs VSVR -sgname <STORAGE GROUP NAME>
- Initiate OPC backup exchange server data.  
✧ C:\> set SWSTGNODE=nodeAGT  
✧ C:\> swsrpvssbackup\_exchange -evs VSVR -sgname <STORAGE GROUP NAME> -copygrp BK1

Disk layout  
Drive Enclosure

HotSpare(300GB)	-	-	-
Backup(300GB)	Backup(300GB)	Backup(300GB)	Backup(300GB)
Database(146GB)	Database(146GB)	HotSpare(146GB)	Backup(300GB)

Controller Enclosure

Database(146GB)	Database(146GB)	Database(146GB)	Database(146GB)
Database(146GB)	Database(146GB)	Database(146GB)	Database(146GB)
Log(146GB)	Log(146GB)	Log(146GB)	Log(146GB)

Figure 4

Backup volumes for database and logs require the same capacity as online volumes when backup is done by OPC. One RAID5 is divided into five 50GB LUNs for log backup and five 133GB LUNs for database backup. Figure 5 shows the configuration of LUNs for backup.

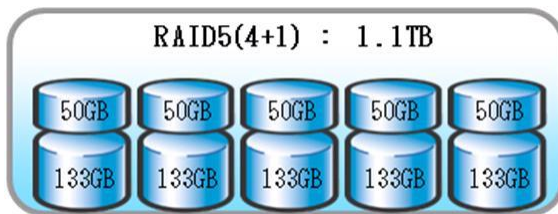


Figure 5

## Contact for Additional Information

<http://www.fujitsu.com/global/services/computing/storage/system/eternus2000/>

## Test Result Summary

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

## **Reliability**

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

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

- Any errors reported in the saved eventlog file?  
No errors were reported in the eventlog file.
- Any errors reported in during the [database](#) and [log](#) checksum process?  
No errors were reported in the database and log checksum process.
- If backup to disk test is done, any errors reported during the process?  
Backup to disk was not tested

## **Primary Storage [Performance Results](#)**

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

### **Individual Server Metrics:**

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

<b>Database I/O</b>	
Database Disks Transfers/sec	1059.353
Database Disks Reads/sec	658.178
Database Disks Writes/sec	403.175
Average Database Disk Read Latency (ms)	14
Average Database Disk Write Latency (ms)	9.2
<b>Transaction Log I/O</b>	
Log Disks Writes/sec	404.225
Average Log Disk Write Latency (ms)	0

## **Streaming Backup/Recovery Performance**

For the Version 1.0 release, only streaming backup type is supported for testing in the framework. There are two tests in this section. First one is to measure the read IO performance metrics by running checksum on all the databases and log files. The second test is to measure the end to end performance when the databases are backed up to disks.

### Database Read-only Performance

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

MB read/sec per storage group	3.984
MB read/sec total	19.92

### Log Read-only Performance

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

Average time to play one Log file (sec)	0.58
---	------

## **Conclusion**

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

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

## Appendix A. Test Results

### Microsoft Exchange Server **Jetstress**

#### *Performance Test Result Report*

##### Test Summary

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

**Machine Name** RX300S3

##### Test Description

**Test Start Time** 2008/02/26 9:46:09

**Test End Time** 2008/02/26 11:58:42

**Jetstress Version** 08.01.0177.000

**Ese Version** 08.01.0240.005

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

**Performance Log** [D:\Jetstress\1-2-2h\Tuning\\_2008\\_2\\_26\\_9\\_53\\_15.blg](D:\Jetstress\1-2-2h\Tuning_2008_2_26_9_53_15.blg)  
[D:\Jetstress\1-2-2h\Performance\\_2008\\_2\\_26\\_9\\_58\\_23.blg](D:\Jetstress\1-2-2h\Performance_2008_2_26_9_58_23.blg)  
[D:\Jetstress\1-2-2h\DBChecksum\\_2008\\_2\\_26\\_11\\_58\\_42.blg](D:\Jetstress\1-2-2h\DBChecksum_2008_2_26_11_58_42.blg)

##### Database Sizing and Throughput

**Achieved I/O per Second** 1059.353

**Target I/O per Second** 960

**Initial database size** 524302499840

**Final database size** 536822497280

**Database files (count)** 5

##### Jetstress System Parameters

**Thread count** 6 (per-storage group)

**Log buffers** 9000

**Minimum database cache** 160.0 MB

**Maximum database cache** 1280.0 MB

**Insert operations** 25%

**Delete operations** 10%

**Replace operations** 50%

**Read operations** 15%

**Lazy commits** 80%

##### Disk Subsystem Performance

<b>LogicalDisk</b>	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
<b>Database (K:)</b>	0.014	0.009	131.446	81.090	(n/a)

<b>Database (L:)</b>	0.013	0.009	130.673	80.397	(n/a)
<b>Database (M:)</b>	0.014	0.009	131.177	80.879	(n/a)
<b>Database (N:)</b>	0.014	0.009	131.749	80.736	(n/a)
<b>Database (O:)</b>	0.015	0.010	131.133	80.073	(n/a)
<b>Log (F:)</b>	0.000	0.000	0.000	80.883	11200.778
<b>Log (G:)</b>	0.000	0.000	0.000	80.475	11267.192
<b>Log (H:)</b>	0.000	0.000	0.000	80.924	11273.389
<b>Log (I:)</b>	4.18410041841004E-07	0.000	0.000	80.847	11204.544
<b>Log (J:)</b>	0.000	0.000	0.000	81.096	11165.089

## Host System Performance

Counter	Average	Minimum	Maximum
<b>% Processor Time</b>	4.525	2.865	6.875
<b>Available MBytes</b>	14044.263	14041.000	14047.000
<b>Free System Page Table Entries</b>	16758700.000	16758700.000	16758700.000
<b>Transition Pages RePurposed/sec</b>	0.000	0.000	0.000
<b>Pool Nonpaged Bytes</b>	49719496.952	49127424.000	49897472.000
<b>Pool Paged Bytes</b>	43678410.021	42852352.000	43728896.000
<b>Database Page Fault Stalls/sec</b>	0.000	0.000	0.000

Test Log2008/02/26 9:46:09 -- Jetstress testing begins ...  
2008/02/26 9:46:09 -- Prepare testing begins ...  
2008/02/26 9:46:16 -- Attaching databases ...  
2008/02/26 9:46:16 -- Prepare testing ends.  
2008/02/26 9:46:16 -- Dispatching transactions begins ...  
2008/02/26 9:46:16 -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)  
2008/02/26 9:46:16 -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)  
2008/02/26 9:46:21 -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).  
2008/02/26 9:46:21 -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).  
2008/02/26 9:46:21 -- Attaining prerequisites:  
2008/02/26 9:53:15 -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1208287000.0 (lower bound: 1207960000.0, upper bound: none)  
2008/02/26 9:53:17 -- Performance logging begins (interval: 5000 ms).  
2008/02/26 9:53:17 -- Automatic tuning begins ...  
2008/02/26 9:53:48 -- Volume K: has 0.00002 for read latency slope.  
2008/02/26 9:53:48 -- Volume L: has 0.00017 for read latency slope.  
2008/02/26 9:53:48 -- Volume M: has 0.00018 for read latency slope.  
2008/02/26 9:53:48 -- Volume N: has 0.00004 for read latency slope.  
2008/02/26 9:53:48 -- Volume O: has 0.00009 for read latency slope.  
2008/02/26 9:55:49 -- 529 batch transactions/sec and 4 sessions have 853 IOPS.  
2008/02/26 9:55:49 -- 4 sessions have actual 853 IOPS (target IOPS: 960)  
2008/02/26 9:55:49 -- Volume K: has 0.0121 for Avg. Disk sec/Read.  
2008/02/26 9:55:49 -- Volume L: has 0.0117 for Avg. Disk sec/Read.  
2008/02/26 9:55:49 -- Volume M: has 0.0117 for Avg. Disk sec/Read.

2008/02/26 9:55:49 -- Volume N: has 0.0118 for Avg. Disk sec/Read.  
 2008/02/26 9:55:49 -- Volume O: has 0.0142 for Avg. Disk sec/Read.  
 2008/02/26 9:55:49 -- Volume F: has 0.0004 for Avg. Disk sec/Write.  
 2008/02/26 9:55:49 -- Volume F: has 0.0000 for Avg. Disk sec/Read.  
 2008/02/26 9:55:49 -- Volume G: has 0.0004 for Avg. Disk sec/Write.  
 2008/02/26 9:55:49 -- Volume G: has 0.0000 for Avg. Disk sec/Read.  
 2008/02/26 9:55:49 -- Volume H: has 0.0004 for Avg. Disk sec/Write.  
 2008/02/26 9:55:49 -- Volume H: has 0.0000 for Avg. Disk sec/Read.  
 2008/02/26 9:55:49 -- Volume I: has 0.0005 for Avg. Disk sec/Write.  
 2008/02/26 9:55:49 -- Volume I: has 0.0000 for Avg. Disk sec/Read.  
 2008/02/26 9:55:49 -- Volume J: has 0.0005 for Avg. Disk sec/Write.  
 2008/02/26 9:55:49 -- Volume J: has 0.0000 for Avg. Disk sec/Read.  
 2008/02/26 9:55:50 -- Operation mix: Sessions 6, Inserts 25%, Deletes 10%, Replaces 50%,  
 Reads 15%, Lazy Commits 80%.  
 2008/02/26 9:56:20 -- Volume K: has 0.00038 for read latency slope.  
 2008/02/26 9:56:20 -- Volume L: has 0.00010 for read latency slope.  
 2008/02/26 9:56:20 -- Volume M: has 0.00012 for read latency slope.  
 2008/02/26 9:56:20 -- Volume N: has 0.00026 for read latency slope.  
 2008/02/26 9:56:20 -- Volume O: has 0.00019 for read latency slope.  
 2008/02/26 9:58:22 -- 634 batch transactions/sec and 6 sessions have 1014 IOPS.  
 2008/02/26 9:58:22 -- 6 sessions have actual 1014 IOPS (target IOPS: 960)  
 2008/02/26 9:58:22 -- Volume K: has 0.0151 for Avg. Disk sec/Read.  
 2008/02/26 9:58:22 -- Volume L: has 0.0136 for Avg. Disk sec/Read.  
 2008/02/26 9:58:22 -- Volume M: has 0.0142 for Avg. Disk sec/Read.  
 2008/02/26 9:58:22 -- Volume N: has 0.0147 for Avg. Disk sec/Read.  
 2008/02/26 9:58:22 -- Volume O: has 0.0167 for Avg. Disk sec/Read.  
 2008/02/26 9:58:22 -- Volume F: has 0.0005 for Avg. Disk sec/Write.  
 2008/02/26 9:58:22 -- Volume F: has 0.0000 for Avg. Disk sec/Read.  
 2008/02/26 9:58:22 -- Volume G: has 0.0005 for Avg. Disk sec/Write.  
 2008/02/26 9:58:22 -- Volume G: has 0.0000 for Avg. Disk sec/Read.  
 2008/02/26 9:58:22 -- Volume H: has 0.0005 for Avg. Disk sec/Write.  
 2008/02/26 9:58:22 -- Volume H: has 0.0000 for Avg. Disk sec/Read.  
 2008/02/26 9:58:22 -- Volume I: has 0.0005 for Avg. Disk sec/Write.  
 2008/02/26 9:58:22 -- Volume I: has 0.0000 for Avg. Disk sec/Read.  
 2008/02/26 9:58:22 -- Volume J: has 0.0005 for Avg. Disk sec/Write.  
 2008/02/26 9:58:22 -- Volume J: has 0.0000 for Avg. Disk sec/Read.  
 2008/02/26 9:58:23 -- Performance logging ends.  
 2008/02/26 9:58:23 -- Automatic tuning succeeded.  
 2008/02/26 9:58:24 -- Operation mix: Sessions 6, Inserts 25%, Deletes 10%, Replaces 50%,  
 Reads 15%, Lazy Commits 80%.  
 2008/02/26 9:58:24 -- Performance logging begins (interval: 15000 ms).  
 2008/02/26 9:58:24 -- Attaining prerequisites:  
 2008/02/26 9:58:24 -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last:  
 1342177000.0 (lower bound: 1207960000.0, upper bound: none)  
 2008/02/26 11:58:25 -- Performance logging ends.  
 2008/02/26 11:58:25 -- JetInterop batch transaction stats: 59046, 59036, 59424, 59213, and  
 59053.  
 2008/02/26 11:58:25 -- Dispatching transactions ends.  
 2008/02/26 11:58:25 -- Shutting down databases ...  
 2008/02/26 11:58:42 -- Instance2464.1 (complete), Instance2464.2 (complete),  
 Instance2464.3 (complete), Instance2464.4 (complete), and Instance2464.5 (complete)  
 2008/02/26 11:58:43 -- Performance logging begins (interval: 15000 ms).  
 2008/02/26 11:58:43 -- Verifying database checksums ...  
 2008/02/26 12:39:40 -- K: (100% processed), L: (100% processed), M: (100% processed), N:  
 (100% processed), and O: (100% processed)  
 2008/02/26 12:39:42 -- Performance logging ends.  
 2008/02/26 12:39:42 -- [D:\Jetstress\1-2-2h\DBChecksum\\_2008\\_2\\_26\\_11\\_58\\_42.blg](D:\Jetstress\1-2-2h\DBChecksum_2008_2_26_11_58_42.blg) has  
 163 samples.  
 2008/02/26 12:39:46 -- [D:\Jetstress\1-2-2h\DBChecksum\\_2008\\_2\\_26\\_11\\_58\\_42.html](D:\Jetstress\1-2-2h\DBChecksum_2008_2_26_11_58_42.html) is

saved.  
2008/02/26 12:39:46 -- Verifying log checksums ...  
2008/02/26 12:39:51 -- F:\ (22 logs passed), G:\ (22 logs passed), H:\ (22 logs passed), I:\ (22 logs passed), and J:\ (22 logs passed)  
2008/02/26 12:39:51 -- <D:\Jetstress\1-2-2h\Performance 2008 2 26 9 58 23.blg> has 479 samples.  
2008/02/26 12:39:51 -- Creating test report ...  
2008/02/26 12:39:54 -- Volume K: has 0.0141 for Avg. Disk sec/Read.  
2008/02/26 12:39:54 -- Volume L: has 0.0132 for Avg. Disk sec/Read.  
2008/02/26 12:39:54 -- Volume M: has 0.0138 for Avg. Disk sec/Read.  
2008/02/26 12:39:54 -- Volume N: has 0.0135 for Avg. Disk sec/Read.  
2008/02/26 12:39:54 -- Volume O: has 0.0152 for Avg. Disk sec/Read.  
2008/02/26 12:39:54 -- Volume F: has 0.0005 for Avg. Disk sec/Write.  
2008/02/26 12:39:54 -- Volume F: has 0.0000 for Avg. Disk sec/Read.  
2008/02/26 12:39:54 -- Volume G: has 0.0005 for Avg. Disk sec/Write.  
2008/02/26 12:39:54 -- Volume G: has 0.0000 for Avg. Disk sec/Read.  
2008/02/26 12:39:54 -- Volume H: has 0.0005 for Avg. Disk sec/Write.  
2008/02/26 12:39:54 -- Volume H: has 0.0000 for Avg. Disk sec/Read.  
2008/02/26 12:39:54 -- Volume I: has 0.0005 for Avg. Disk sec/Write.  
2008/02/26 12:39:54 -- Volume I: has 0.0000 for Avg. Disk sec/Read.  
2008/02/26 12:39:54 -- Volume J: has 0.0005 for Avg. Disk sec/Write.  
2008/02/26 12:39:54 -- Volume J: has 0.0000 for Avg. Disk sec/Read.  
2008/02/26 12:39:54 -- Test has 0 Maximum Database Page Fault Stalls/sec.  
2008/02/26 12:39:54 -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.  
2008/02/26 12:39:54 -- <D:\Jetstress\1-2-2h\Performance 2008 2 26 9 58 23.xml> has 478 samples queried.

**Microsoft Exchange Server Jetstress****Test Result Report**

Checksum Statistics - All

Database	Seen pages	Bad pages	Correctable pages	Wrong page no pages	File length / seconds taken
<b>K:\Jetstress1.edb</b>	13102946	0	0	0	102366 MBytes / 2332 seconds
<b>L:\Jetstress1.edb</b>	13104738	0	0	0	102380 MBytes / 2261 seconds
<b>M:\Jetstress1.edb</b>	13111906	0	0	0	102436 MBytes / 2403 seconds
<b>N:\Jetstress1.edb</b>	13105250	0	0	0	102384 MBytes / 2356 seconds
<b>O:\Jetstress1.edb</b>	13105250	0	0	0	102384 MBytes / 2455 seconds
<b>(Sum)</b>	65530090	0	0	0	511953 MBytes / 2457 seconds

Disk Subsystem Performance (of checksum)

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec
<b>K:</b>	0.083	0.000	701.775	0.002
<b>L:</b>	0.083	0.000	725.194	0.001
<b>M:</b>	0.084	0.000	681.124	0.001
<b>N:</b>	0.084	0.000	695.467	0.001
<b>O:</b>	0.085	0.000	656.695	0.000

Memory System Performance (of checksum)

Counter	Average	Minimum	Maximum
<b>% Processor Time</b>	12.772	9.635	15.677
<b>Available MBytes</b>	15087.564	15072.000	15334.000
<b>Free System Page Table Entries</b>	16758700.000	16758700.000	16758700.000
<b>Transition Pages RePurposed/sec</b>	0.000	0.000	0.000
<b>Pool Nonpaged Bytes</b>	69203704.147	64749568.000	69693440.000
<b>Pool Paged Bytes</b>	43099569.472	43089920.000	43466752.000

Test Log2008/02/26 9:46:09 -- Jetstress testing begins ...

2008/02/26 9:46:09 -- Prepare testing begins ...

2008/02/26 9:46:16 -- Attaching databases ...

2008/02/26 9:46:16 -- Prepare testing ends.

2008/02/26 9:46:16 -- Dispatching transactions begins ...

2008/02/26 9:46:16 -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)

2008/02/26 9:46:16 -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)

2008/02/26 9:46:21 -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).

2008/02/26 9:46:21 -- Log write latency thresholds: (average: 0.01 seconds/write, maximum:

0.05 seconds/write).

2008/02/26 9:46:21 -- Attaining prerequisites:

2008/02/26 9:53:15 -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1208287000.0 (lower bound: 1207960000.0, upper bound: none)

2008/02/26 9:53:17 -- Performance logging begins (interval: 5000 ms).

2008/02/26 9:53:17 -- Automatic tuning begins ...

2008/02/26 9:53:48 -- Volume K: has 0.00002 for read latency slope.

2008/02/26 9:53:48 -- Volume L: has 0.00017 for read latency slope.

2008/02/26 9:53:48 -- Volume M: has 0.00018 for read latency slope.

2008/02/26 9:53:48 -- Volume N: has 0.00004 for read latency slope.

2008/02/26 9:53:48 -- Volume O: has 0.00009 for read latency slope.

2008/02/26 9:55:49 -- 529 batch transactions/sec and 4 sessions have 853 IOPS.

2008/02/26 9:55:49 -- 4 sessions have actual 853 IOPS (target IOPS: 960)

2008/02/26 9:55:49 -- Volume K: has 0.0121 for Avg. Disk sec/Read.

2008/02/26 9:55:49 -- Volume L: has 0.0117 for Avg. Disk sec/Read.

2008/02/26 9:55:49 -- Volume M: has 0.0117 for Avg. Disk sec/Read.

2008/02/26 9:55:49 -- Volume N: has 0.0118 for Avg. Disk sec/Read.

2008/02/26 9:55:49 -- Volume O: has 0.0142 for Avg. Disk sec/Read.

2008/02/26 9:55:49 -- Volume F: has 0.0004 for Avg. Disk sec/Write.

2008/02/26 9:55:49 -- Volume F: has 0.0000 for Avg. Disk sec/Read.

2008/02/26 9:55:49 -- Volume G: has 0.0004 for Avg. Disk sec/Write.

2008/02/26 9:55:49 -- Volume G: has 0.0000 for Avg. Disk sec/Read.

2008/02/26 9:55:49 -- Volume H: has 0.0004 for Avg. Disk sec/Write.

2008/02/26 9:55:49 -- Volume H: has 0.0000 for Avg. Disk sec/Read.

2008/02/26 9:55:49 -- Volume I: has 0.0005 for Avg. Disk sec/Write.

2008/02/26 9:55:49 -- Volume I: has 0.0000 for Avg. Disk sec/Read.

2008/02/26 9:55:49 -- Volume J: has 0.0005 for Avg. Disk sec/Write.

2008/02/26 9:55:49 -- Volume J: has 0.0000 for Avg. Disk sec/Read.

2008/02/26 9:55:50 -- Operation mix: Sessions 6, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2008/02/26 9:56:20 -- Volume K: has 0.00038 for read latency slope.

2008/02/26 9:56:20 -- Volume L: has 0.00010 for read latency slope.

2008/02/26 9:56:20 -- Volume M: has 0.00012 for read latency slope.

2008/02/26 9:56:20 -- Volume N: has 0.00026 for read latency slope.

2008/02/26 9:56:20 -- Volume O: has 0.00019 for read latency slope.

2008/02/26 9:58:22 -- 634 batch transactions/sec and 6 sessions have 1014 IOPS.

2008/02/26 9:58:22 -- 6 sessions have actual 1014 IOPS (target IOPS: 960)

2008/02/26 9:58:22 -- Volume K: has 0.0151 for Avg. Disk sec/Read.

2008/02/26 9:58:22 -- Volume L: has 0.0136 for Avg. Disk sec/Read.

2008/02/26 9:58:22 -- Volume M: has 0.0142 for Avg. Disk sec/Read.

2008/02/26 9:58:22 -- Volume N: has 0.0147 for Avg. Disk sec/Read.

2008/02/26 9:58:22 -- Volume O: has 0.0167 for Avg. Disk sec/Read.

2008/02/26 9:58:22 -- Volume F: has 0.0005 for Avg. Disk sec/Write.

2008/02/26 9:58:22 -- Volume F: has 0.0000 for Avg. Disk sec/Read.

2008/02/26 9:58:22 -- Volume G: has 0.0005 for Avg. Disk sec/Write.

2008/02/26 9:58:22 -- Volume G: has 0.0000 for Avg. Disk sec/Read.

2008/02/26 9:58:22 -- Volume H: has 0.0005 for Avg. Disk sec/Write.

2008/02/26 9:58:22 -- Volume H: has 0.0000 for Avg. Disk sec/Read.

2008/02/26 9:58:22 -- Volume I: has 0.0005 for Avg. Disk sec/Write.

2008/02/26 9:58:22 -- Volume I: has 0.0000 for Avg. Disk sec/Read.

2008/02/26 9:58:22 -- Volume J: has 0.0005 for Avg. Disk sec/Write.

2008/02/26 9:58:22 -- Volume J: has 0.0000 for Avg. Disk sec/Read.

2008/02/26 9:58:23 -- Performance logging ends.

2008/02/26 9:58:23 -- Automatic tuning succeeded.

2008/02/26 9:58:24 -- Operation mix: Sessions 6, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

2008/02/26 9:58:24 -- Performance logging begins (interval: 15000 ms).

2008/02/26 9:58:24 -- Attaining prerequisites:

2008/02/26 9:58:24 -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last:

1342177000.0 (lower bound: 1207960000.0, upper bound: none)  
2008/02/26 11:58:25 -- Performance logging ends.  
2008/02/26 11:58:25 -- JetInterop batch transaction stats: 59046, 59036, 59424, 59213, and 59053.  
2008/02/26 11:58:25 -- Dispatching transactions ends.  
2008/02/26 11:58:25 -- Shutting down databases ...  
2008/02/26 11:58:42 -- Instance2464.1 (complete), Instance2464.2 (complete), Instance2464.3 (complete), Instance2464.4 (complete), and Instance2464.5 (complete)  
2008/02/26 11:58:43 -- Performance logging begins (interval: 15000 ms).  
2008/02/26 11:58:43 -- Verifying database checksums ...  
2008/02/26 12:39:40 -- K: (100% processed), L: (100% processed), M: (100% processed), N: (100% processed), and O: (100% processed)  
2008/02/26 12:39:42 -- Performance logging ends.  
2008/02/26 12:39:42 -- [D:\Jetstress\1-2-2h\DBChecksum\\_2008\\_2\\_26\\_11\\_58\\_42.blg](D:\Jetstress\1-2-2h\DBChecksum_2008_2_26_11_58_42.blg) has 163 samples.

**Microsoft Exchange Server Jetstress*****Stress Test Result Report***

## Test Summary

**Overall Test Result** **Pass****Machine Name** RX300S3**Test Description****Test Start Time** 2008/02/26 12:53:14**Test End Time** 2008/02/27 12:59:24**Jetstress Version** 08.01.0177.000**Ese Version** 08.01.0240.005**Operating System** Microsoft Windows Server 2003 R2 Service Pack 2  
(5.2.3790.131072)**Performance Log** [D:\Jetstress\1-3-24h\Stress\\_2008\\_2\\_26\\_12\\_53\\_26.blg](D:\Jetstress\1-3-24h\Stress_2008_2_26_12_53_26.blg)  
[D:\Jetstress\1-3-24h\DBChecksum\\_2008\\_2\\_27\\_12\\_59\\_24.blg](D:\Jetstress\1-3-24h\DBChecksum_2008_2_27_12_59_24.blg)

## Database Sizing and Throughput

**Achieved I/O per Second** 1044.405**Target I/O per Second** 960**Initial database size** 536822497280**Final database size** 658690752512**Database files (count)** 5

## Jetstress System Parameters

**Thread count** 6 (per-storage group)**Log buffers** 9000**Minimum database cache** 160.0 MB**Maximum database cache** 1280.0 MB**Insert operations** 25%**Delete operations** 10%**Replace operations** 50%**Read operations** 15%**Lazy commits** 80%

## Disk Subsystem Performance

<b>LogicalDisk</b>	<b>Avg. Disk sec/Read</b>	<b>Avg. Disk sec/Write</b>	<b>Disk Reads/sec</b>	<b>Disk Writes/sec</b>	<b>Avg. Disk Bytes/Write</b>
<b>Database (K:)</b>	0.014	0.009	131.155	77.807	(n/a)
<b>Database (L:)</b>	0.013	0.009	131.170	77.738	(n/a)
<b>Database</b>	0.014	0.010	131.492	77.764	(n/a)

<b>(M:)</b>					
<b>Database</b>	0.013	0.010	130.827	77.220	(n/a)
<b>(N:)</b>					
<b>Database</b>	0.015	0.010	131.545	77.686	(n/a)
<b>(O:)</b>					
<b>Log (F:)</b>	0.000	0.000	0.000	73.575	10938.338
<b>Log (G:)</b>	0.000	0.000	0.000	73.660	10977.342
<b>Log (H:)</b>	0.000	0.000	0.000	73.932	10934.174
<b>Log (I:)</b>	0.000	0.000	0.000	73.497	10941.700
<b>Log (J:)</b>	0.000	0.000	0.000	74.017	10916.623

Host System Performance

Counter	Average	Minimum	Maximum
<b>% Processor Time</b>	4.446	2.552	7.448
<b>Available MBytes</b>	14031.317	14014.000	14145.000
<b>Free System Page Table Entries</b>	16758540.500	16758540.000	16758700.000
<b>Transition Pages RePurposed/sec</b>	0.000	0.000	0.000
<b>Pool Nonpaged Bytes</b>	54801942.044	54734848.000	55242752.000
<b>Pool Paged Bytes</b>	44154811.022	43937792.000	44711936.000
<b>Database Page Fault Stalls/sec</b>	0.000	0.000	0.000

Test Log2008/02/26 12:53:14 -- Jetstress testing begins ...  
 2008/02/26 12:53:14 -- Prepare testing begins ...  
 2008/02/26 12:53:21 -- Attaching databases ...  
 2008/02/26 12:53:21 -- Prepare testing ends.  
 2008/02/26 12:53:21 -- Dispatching transactions begins ...  
 2008/02/26 12:53:21 -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)  
 2008/02/26 12:53:21 -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)  
 2008/02/26 12:53:26 -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.1 seconds/read).  
 2008/02/26 12:53:26 -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.1 seconds/write).  
 2008/02/26 12:53:27 -- Operation mix: Sessions 6, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.  
 2008/02/26 12:53:27 -- Performance logging begins (interval: 15000 ms).  
 2008/02/26 12:53:27 -- Attaining prerequisites:  
 2008/02/26 12:59:03 -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1208525000.0 (lower bound: 1207960000.0, upper bound: none)  
 2008/02/27 12:59:05 -- Performance logging ends.  
 2008/02/27 12:59:05 -- JetInterop batch transaction stats: 591515, 591947, 592898, 591069, and 592245.  
 2008/02/27 12:59:05 -- Dispatching transactions ends.  
 2008/02/27 12:59:05 -- Shutting down databases ...  
 2008/02/27 12:59:24 -- Instance1408.1 (complete), Instance1408.2 (complete), Instance1408.3 (complete), Instance1408.4 (complete), and Instance1408.5 (complete)  
 2008/02/27 12:59:25 -- Performance logging begins (interval: 30000 ms).  
 2008/02/27 12:59:25 -- Verifying database checksums ...  
 2008/02/27 13:49:42 -- K: (100% processed), L: (100% processed), M: (100% processed), N: (100% processed), and O: (100% processed)  
 2008/02/27 13:49:43 -- Performance logging ends.  
 2008/02/27 13:49:43 -- [D:\Jetstress\1-3-24h\DBCchecksum\\_2008\\_2\\_27\\_12\\_59\\_24.blg](#) has

100 samples.  
2008/02/27 13:49:46 -- [D:\Jetstress\1-3-24h\DBChecksum 2008 2 27 12 59 24.html](#) is saved.  
2008/02/27 13:49:46 -- Verifying log checksums ...  
2008/02/27 13:49:52 -- F:\ (22 logs passed), G:\ (22 logs passed), H:\ (22 logs passed), I:\ (22 logs passed), and J:\ (22 logs passed)  
2008/02/27 13:49:52 -- [D:\Jetstress\1-3-24h\Stress 2008 2 26 12 53 26.blg](#) has 5782 samples.  
2008/02/27 13:49:52 -- Creating test report ...  
2008/02/27 13:50:20 -- Volume K: has 0.0140 for Avg. Disk sec/Read.  
2008/02/27 13:50:20 -- Volume L: has 0.0131 for Avg. Disk sec/Read.  
2008/02/27 13:50:20 -- Volume M: has 0.0138 for Avg. Disk sec/Read.  
2008/02/27 13:50:20 -- Volume N: has 0.0135 for Avg. Disk sec/Read.  
2008/02/27 13:50:20 -- Volume O: has 0.0151 for Avg. Disk sec/Read.  
2008/02/27 13:50:20 -- Volume F: has 0.0005 for Avg. Disk sec/Write.  
2008/02/27 13:50:20 -- Volume F: has 0.0000 for Avg. Disk sec/Read.  
2008/02/27 13:50:20 -- Volume G: has 0.0005 for Avg. Disk sec/Write.  
2008/02/27 13:50:20 -- Volume G: has 0.0000 for Avg. Disk sec/Read.  
2008/02/27 13:50:20 -- Volume H: has 0.0005 for Avg. Disk sec/Write.  
2008/02/27 13:50:20 -- Volume H: has 0.0000 for Avg. Disk sec/Read.  
2008/02/27 13:50:20 -- Volume I: has 0.0005 for Avg. Disk sec/Write.  
2008/02/27 13:50:20 -- Volume I: has 0.0000 for Avg. Disk sec/Read.  
2008/02/27 13:50:20 -- Volume J: has 0.0005 for Avg. Disk sec/Write.  
2008/02/27 13:50:20 -- Volume J: has 0.0000 for Avg. Disk sec/Read.  
2008/02/27 13:50:20 -- Test has 0 Maximum Database Page Fault Stalls/sec.  
2008/02/27 13:50:20 -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.  
2008/02/27 13:50:20 -- [D:\Jetstress\1-3-24h\Stress 2008 2 26 12 53 26.xml](#) has 5759 samples queried.

**Microsoft Exchange Server Jetstress****Test Result Report**

Checksum Statistics - All

Database	Seen pages	Bad pages	Correctable pages	Wrong page no pages	File length / seconds taken
<b>K:\Jetstress1.edb</b>	16065394	0	0	0	125510 MBytes / 2856 seconds
<b>L:\Jetstress1.edb</b>	16095858	0	0	0	125748 MBytes / 2787 seconds
<b>M:\Jetstress1.edb</b>	16089202	0	0	0	125696 MBytes / 2939 seconds
<b>N:\Jetstress1.edb</b>	16076146	0	0	0	125594 MBytes / 2868 seconds
<b>O:\Jetstress1.edb</b>	16079986	0	0	0	125624 MBytes / 3016 seconds
<b>(Sum)</b>	80406586	0	0	0	628176 MBytes / 3016 seconds

Disk Subsystem Performance (of checksum)

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec
<b>K:</b>	0.083	0.001	703.349	0.003
<b>L:</b>	0.083	0.001	722.269	0.003
<b>M:</b>	0.084	0.001	684.537	0.003
<b>N:</b>	0.084	0.001	698.955	0.003
<b>O:</b>	0.085	0.001	654.500	0.002

Memory System Performance (of checksum)

Counter	Average	Minimum	Maximum
<b>% Processor Time</b>	12.820	10.208	14.401
<b>Available MBytes</b>	15063.490	15047.000	15308.000
<b>Free System Page Table Entries</b>	16758350.000	16758350.000	16758350.000
<b>Transition Pages RePurposed/sec</b>	0.000	0.000	0.000
<b>Pool Nonpaged Bytes</b>	69559173.120	65236992.000	70258688.000
<b>Pool Paged Bytes</b>	45251297.280	45043712.000	45449216.000

Test Log2008/02/26 12:53:14 -- Jetstress testing begins ...

2008/02/26 12:53:14 -- Prepare testing begins ...

2008/02/26 12:53:21 -- Attaching databases ...

2008/02/26 12:53:21 -- Prepare testing ends.

2008/02/26 12:53:21 -- Dispatching transactions begins ...

2008/02/26 12:53:21 -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)

2008/02/26 12:53:21 -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)

2008/02/26 12:53:26 -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.1 seconds/read).

2008/02/26 12:53:26 -- Log write latency thresholds: (average: 0.01 seconds/write,

maximum: 0.1 seconds/write).  
2008/02/26 12:53:27 -- Operation mix: Sessions 6, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.  
2008/02/26 12:53:27 -- Performance logging begins (interval: 15000 ms).  
2008/02/26 12:53:27 -- Attaining prerequisites:  
2008/02/26 12:59:03 -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1208525000.0 (lower bound: 1207960000.0, upper bound: none)  
2008/02/27 12:59:05 -- Performance logging ends.  
2008/02/27 12:59:05 -- JetInterop batch transaction stats: 591515, 591947, 592898, 591069, and 592245.  
2008/02/27 12:59:05 -- Dispatching transactions ends.  
2008/02/27 12:59:05 -- Shutting down databases ...  
2008/02/27 12:59:24 -- Instance1408.1 (complete), Instance1408.2 (complete), Instance1408.3 (complete), Instance1408.4 (complete), and Instance1408.5 (complete)  
2008/02/27 12:59:25 -- Performance logging begins (interval: 30000 ms).  
2008/02/27 12:59:25 -- Verifying database checksums ...  
2008/02/27 13:49:42 -- K: (100% processed), L: (100% processed), M: (100% processed), N: (100% processed), and O: (100% processed)  
2008/02/27 13:49:43 -- Performance logging ends.  
2008/02/27 13:49:43 -- <D:\Jetstress\1-3-24h\DBChecksum 2008 2 27 12 59 24.blg> has 100 samples.

**Microsoft Exchange Server Jetstress****Streaming backup Test Result Report**

Streaming Backup Statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
<b>Instance2236.1</b>	125880.90	08:51:19	3.95
<b>Instance2236.2</b>	126136.90	08:43:43	4.01
<b>Instance2236.3</b>	126046.90	08:44:59	4.00
<b>Instance2236.4</b>	125978.90	08:47:11	3.98
<b>Instance2236.5</b>	126018.90	08:47:34	3.98

Jetstress System Parameters

<b>Thread count</b>	6 (per-storage group)
<b>Log buffers</b>	9000
<b>Minimum database cache</b>	160.0 MB
<b>Maximum database cache</b>	1280.0 MB
<b>Insert operations</b>	25%
<b>Delete operations</b>	10%
<b>Replace operations</b>	50%
<b>Read operations</b>	15%
<b>Lazy commits</b>	80%

Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
<b>Database (K:)</b>	0.002	4.004004004004E-06	31.587	0.000	(n/a)
<b>Database (L:)</b>	0.002	1.35178218511552E-05	31.664	0.002	(n/a)
<b>Database (M:)</b>	0.002	8.67584756473645E-06	31.634	0.001	(n/a)
<b>Database (N:)</b>	0.002	9.51986785320119E-06	31.622	0.002	(n/a)
<b>Database (O:)</b>	0.002	6.81590681590682E-06	31.605	0.002	(n/a)
<b>Log (F:)</b>	0.000	0.000	0.000	0.000	0.000
<b>Log (G:)</b>	0.000	5.98264931598265E-06	0.000	0.001	10.208
<b>Log (H:)</b>	0.000	6.49538427316205E-06	0.000	0.001	6.606
<b>Log (I:)</b>	0.000	4.88020488020488E-06	0.000	0.001	10.778
<b>Log (J:)</b>	0.000	1.12157612157612E-06	0.000	0.001	10.800

06

## Host System Performance

Counter	Average	Minimum	Maximum
<b>% Processor Time</b>	94.375	3.802	99.897
<b>Available MBytes</b>	14289.251	10260.000	15315.000
<b>Free System Page Table Entries</b>	16758314.280	16758310.000	16758350.000
<b>Transition Pages RePurposed/sec</b>	5014.948	0.000	56373.317
<b>Pool Nonpaged Bytes</b>	74894319.616	54218752.000	84647936.000
<b>Pool Paged Bytes</b>	948338970.624	60010496.000	1333334016.000
<b>Database Page Fault Stalls/sec</b>	0.000	0.000	0.000

Test Log2008/02/27 14:49:12 -- Jetstress testing begins ...  
 2008/02/27 14:49:13 -- Prepare testing begins ...  
 2008/02/27 14:49:19 -- Attaching databases ...  
 2008/02/27 14:49:19 -- Prepare testing ends.  
 2008/02/27 14:49:25 -- Performance logging begins (interval: 30000 ms).  
 2008/02/27 14:49:25 -- Streaming backup databases ...  
 2008/02/27 23:40:47 -- Performance logging ends.  
 2008/02/27 23:40:47 -- Instance2236.1 (100% processed), Instance2236.2 (100% processed), Instance2236.3 (100% processed), Instance2236.4 (100% processed), and Instance2236.5 (100% processed)  
 2008/02/27 23:40:47 -- [D:\Jetstress\1-4-backup\StreamingBackup\\_2008\\_2\\_27\\_14\\_49\\_19.blg](#) has 1000 samples.  
 2008/02/27 23:40:47 -- Creating test report ...

**Microsoft Exchange Server Jetstress****SoftRecovery Test Result Report**

## Test Summary

**Overall Test Result** **Pass****Machine Name** RX300S3**Test Description****Test Start Time** 2008/02/27 14:08:33**Test End Time** 2008/02/27 14:33:56**Jetstress Version** 08.01.0177.000**Ese Version** 08.01.0240.005**Operating System** Microsoft Windows Server 2003 R2 Service Pack 2  
(5.2.3790.131072)**Performance Log** [D:\Jetstress\1-4-softrecovery\Performance\\_2008\\_2\\_27\\_14\\_8\\_45.blg](D:\Jetstress\1-4-softrecovery\Performance_2008_2_27_14_8_45.blg)

## Database Sizing and Throughput

**Achieved I/O per Second** 1016.626**Target I/O per Second** 960**Initial database size** 658690752512**Final database size** 660678852608**Database files (count)** 5

## Jetstress System Parameters

**Thread count** 6 (per-storage group)**Log buffers** 9000**Minimum database cache** 160.0 MB**Maximum database cache** 1280.0 MB**Insert operations** 25%**Delete operations** 10%**Replace operations** 50%**Read operations** 15%**Lazy commits** 80%

## Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
Database (K:)	0.014	0.010	129.723	72.434	(n/a)
Database (L:)	0.013	0.010	130.105	73.792	(n/a)
Database	0.013	0.010	134.804	74.802	(n/a)

<b>(M:)</b>					
<b>Database (N:)</b>	0.013	0.010	127.789	72.105	(n/a)
<b>Database (O:)</b>	0.015	0.011	127.914	73.159	(n/a)
<b>Log (F:)</b>	0.000	0.000	0.081	68.343	11000.645
<b>Log (G:)</b>	0.000	0.000	0.083	69.027	11190.251
<b>Log (H:)</b>	0.000	0.000	0.080	69.252	10803.143
<b>Log (I:)</b>	0.000	0.000	0.082	69.836	10878.762
<b>Log (J:)</b>	0.000	0.000	0.084	70.547	10970.427

## Host System Performance

Counter	Average	Minimum	Maximum
<b>% Processor Time</b>	6.690	3.229	19.063
<b>Available MBytes</b>	14191.232	14027.000	15251.000
<b>Free System Page Table Entries</b>	16758350.000	16758350.000	16758350.000
<b>Transition Pages RePurposed/sec</b>	0.000	0.000	0.000
<b>Pool Nonpaged Bytes</b>	56892571.152	56741888.000	57110528.000
<b>Pool Paged Bytes</b>	46068953.212	45150208.000	46161920.000
<b>Database Page Fault Stalls/sec</b>	0.000	0.000	0.000

Test Log2008/02/27 14:08:33 -- Jetstress testing begins ...  
 2008/02/27 14:08:33 -- Prepare testing begins ...  
 2008/02/27 14:08:40 -- Attaching databases ...  
 2008/02/27 14:08:40 -- Prepare testing ends.  
 2008/02/27 14:08:40 -- Dispatching transactions begins ...  
 2008/02/27 14:08:40 -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)  
 2008/02/27 14:08:40 -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)  
 2008/02/27 14:08:45 -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).  
 2008/02/27 14:08:45 -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).  
 2008/02/27 14:08:47 -- Operation mix: Sessions 6, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.  
 2008/02/27 14:08:47 -- Performance logging begins (interval: 15000 ms).  
 2008/02/27 14:08:47 -- Generating log files ...  
 2008/02/27 14:33:37 -- F:\ (100.6% generated), G:\ (103.2% generated), H:\ (100.2% generated), I:\ (101.6% generated), and J:\ (103.6% generated)  
 2008/02/27 14:33:38 -- Performance logging ends.  
 2008/02/27 14:33:38 -- JetInterop batch transaction stats: 9332, 9473, 9545, 9665, and 9512.  
 2008/02/27 14:33:39 -- Dispatching transactions ends.  
 2008/02/27 14:33:39 -- Shutting down databases ...  
 2008/02/27 14:33:56 -- Instance348.1 (complete), Instance348.2 (complete), Instance348.3 (complete), Instance348.4 (complete), and Instance348.5 (complete)  
 2008/02/27 14:33:56 -- [D:\Jetstress\1-4-softrecovery\Performance 2008 2 27 14 8 45.blg](#) has 99 samples.  
 2008/02/27 14:33:56 -- Creating test report ...  
 2008/02/27 14:33:57 -- Volume K: has 0.0139 for Avg. Disk sec/Read.  
 2008/02/27 14:33:57 -- Volume L: has 0.0127 for Avg. Disk sec/Read.  
 2008/02/27 14:33:57 -- Volume M: has 0.0133 for Avg. Disk sec/Read.

2008/02/27 14:33:57 -- Volume N: has 0.0130 for Avg. Disk sec/Read.  
2008/02/27 14:33:57 -- Volume O: has 0.0147 for Avg. Disk sec/Read.  
2008/02/27 14:33:57 -- Volume F: has 0.0005 for Avg. Disk sec/Write.  
2008/02/27 14:33:57 -- Volume F: has 0.0003 for Avg. Disk sec/Read.  
2008/02/27 14:33:57 -- Volume G: has 0.0005 for Avg. Disk sec/Write.  
2008/02/27 14:33:57 -- Volume G: has 0.0003 for Avg. Disk sec/Read.  
2008/02/27 14:33:57 -- Volume H: has 0.0005 for Avg. Disk sec/Write.  
2008/02/27 14:33:57 -- Volume H: has 0.0003 for Avg. Disk sec/Read.  
2008/02/27 14:33:57 -- Volume I: has 0.0005 for Avg. Disk sec/Write.  
2008/02/27 14:33:57 -- Volume I: has 0.0003 for Avg. Disk sec/Read.  
2008/02/27 14:33:57 -- Volume J: has 0.0005 for Avg. Disk sec/Write.  
2008/02/27 14:33:57 -- Volume J: has 0.0004 for Avg. Disk sec/Read.  
2008/02/27 14:33:57 -- Test has 0 Maximum Database Page Fault Stalls/sec.  
2008/02/27 14:33:57 -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.  
2008/02/27 14:33:57 -- [D:\Jetstress\1-4-softrecovery\Performance\\_2008\\_2\\_27\\_14\\_8\\_45.xml](#) has 98 samples queried.

**Microsoft Exchange Server Jetstress****SoftRecovery Test Result Report**

Soft-Recovery Statistics - All

Database Instance	Log files replayed	Elapsed seconds
<b>Instance348.1</b>	502	286.765625
<b>Instance348.2</b>	516	291.265625
<b>Instance348.3</b>	500	302.015625
<b>Instance348.4</b>	507	286.765625
<b>Instance348.5</b>	517	303.765625

Disk Subsystem Performance

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Write
<b>Database (K:)</b>	0.102	0.012	513.067	16.070	(n/a)
<b>Database (L:)</b>	0.117	0.012	499.657	16.389	(n/a)
<b>Database (M:)</b>	0.134	0.012	526.890	15.661	(n/a)
<b>Database (N:)</b>	0.105	0.011	495.259	16.076	(n/a)
<b>Database (O:)</b>	0.132	0.012	500.372	16.019	(n/a)
<b>Log (F:)</b>	0.001	0.001	55.837	2.179	4981.762
<b>Log (G:)</b>	0.001	0.000	56.838	2.219	4870.930
<b>Log (H:)</b>	0.001	0.000	54.726	1.949	4265.060
<b>Log (I:)</b>	0.001	0.000	55.836	2.209	4465.336
<b>Log (J:)</b>	0.001	0.000	55.952	1.969	5005.933

Host System Performance

Counter	Average	Minimum	Maximum
<b>% Processor Time</b>	10.688	6.445	15.430
<b>Available MBytes</b>	14225.227	14008.000	15274.000
<b>Free System Page Table Entries</b>	16758350.000	16758350.000	16758350.000
<b>Transition Pages RePurposed/sec</b>	0.000	0.000	0.000
<b>Pool Nonpaged Bytes</b>	55153623.040	54816768.000	56119296.000
<b>Pool Paged Bytes</b>	46089666.560	45338624.000	46137344.000
<b>Database Page Fault Stalls/sec</b>	0.003	0.000	0.250

Test Log2008/02/27 14:08:33 -- Jetstress testing begins ...

2008/02/27 14:08:33 -- Prepare testing begins ...

2008/02/27 14:08:40 -- Attaching databases ...

2008/02/27 14:08:40 -- Prepare testing ends.

2008/02/27 14:08:40 -- Dispatching transactions begins ...  
 2008/02/27 14:08:40 -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)  
 2008/02/27 14:08:40 -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)  
 2008/02/27 14:08:45 -- Database read latency thresholds: (average: 0.02 seconds/read,  
 maximum: 0.05 seconds/read).  
 2008/02/27 14:08:45 -- Log write latency thresholds: (average: 0.01 seconds/write,  
 maximum: 0.05 seconds/write).  
 2008/02/27 14:08:47 -- Operation mix: Sessions 6, Inserts 25%, Deletes 10%, Replaces 50%,  
 Reads 15%, Lazy Commits 80%.  
 2008/02/27 14:08:47 -- Performance logging begins (interval: 15000 ms).  
 2008/02/27 14:08:47 -- Generating log files ...  
 2008/02/27 14:33:37 -- F:\ (100.6% generated), G:\ (103.2% generated), H:\ (100.2%  
 generated), I:\ (101.6% generated), and J:\ (103.6% generated)  
 2008/02/27 14:33:38 -- Performance logging ends.  
 2008/02/27 14:33:38 -- JetInterop batch transaction stats: 9332, 9473, 9545, 9665, and  
 9512.  
 2008/02/27 14:33:39 -- Dispatching transactions ends.  
 2008/02/27 14:33:39 -- Shutting down databases ...  
 2008/02/27 14:33:56 -- Instance348.1 (complete), Instance348.2 (complete), Instance348.3  
 (complete), Instance348.4 (complete), and Instance348.5 (complete)  
 2008/02/27 14:33:56 -- [D:\Jetstress\1-4-softrecovery\Performance 2008 2 27 14 8 45.blg](#)  
 has 99 samples.  
 2008/02/27 14:33:56 -- Creating test report ...  
 2008/02/27 14:33:57 -- Volume K: has 0.0139 for Avg. Disk sec/Read.  
 2008/02/27 14:33:57 -- Volume L: has 0.0127 for Avg. Disk sec/Read.  
 2008/02/27 14:33:57 -- Volume M: has 0.0133 for Avg. Disk sec/Read.  
 2008/02/27 14:33:57 -- Volume N: has 0.0130 for Avg. Disk sec/Read.  
 2008/02/27 14:33:57 -- Volume O: has 0.0147 for Avg. Disk sec/Read.  
 2008/02/27 14:33:57 -- Volume F: has 0.0005 for Avg. Disk sec/Write.  
 2008/02/27 14:33:57 -- Volume F: has 0.0003 for Avg. Disk sec/Read.  
 2008/02/27 14:33:57 -- Volume G: has 0.0005 for Avg. Disk sec/Write.  
 2008/02/27 14:33:57 -- Volume G: has 0.0003 for Avg. Disk sec/Read.  
 2008/02/27 14:33:57 -- Volume H: has 0.0005 for Avg. Disk sec/Write.  
 2008/02/27 14:33:57 -- Volume H: has 0.0003 for Avg. Disk sec/Read.  
 2008/02/27 14:33:57 -- Volume I: has 0.0005 for Avg. Disk sec/Write.  
 2008/02/27 14:33:57 -- Volume I: has 0.0003 for Avg. Disk sec/Read.  
 2008/02/27 14:33:57 -- Volume J: has 0.0005 for Avg. Disk sec/Write.  
 2008/02/27 14:33:57 -- Volume J: has 0.0004 for Avg. Disk sec/Read.  
 2008/02/27 14:33:57 -- Test has 0 Maximum Database Page Fault Stalls/sec.  
 2008/02/27 14:33:57 -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.  
 2008/02/27 14:33:57 -- [D:\Jetstress\1-4-softrecovery\Performance 2008 2 27 14 8 45.xml](#) has 98 samples queried.  
 2008/02/27 14:33:59 -- [D:\Jetstress\1-4-softrecovery\Performance 2008 2 27 14 8 45.html](#) is saved.  
 2008/02/27 14:34:00 -- Performance logging begins (interval: 4000 ms).  
 2008/02/27 14:34:00 -- Recovering databases ...  
 2008/02/27 14:39:05 -- Performance logging ends.  
 2008/02/27 14:39:05 -- Instance348.1 (286.765625), Instance348.2 (291.265625),  
 Instance348.3 (302.015625), Instance348.4 (286.765625), and Instance348.5 (303.765625)  
 2008/02/27 14:39:05 -- [D:\Jetstress\1-4-softrecovery\SoftRecovery 2008 2 27 14 33 59.blg](#) has 75 samples.  
 2008/02/27 14:39:05 -- Creating test report ...