DELL™ PowerEdge™ T610

500 Mailbox Resiliency Exchange 2010 Storage Solution

Tested with: ESRP – Storage Version 3.0
Tested Date: <30/03/2010>

Content

Overview

This document provides information on Dell 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

Features

This white paper describes a tested and validated storage solution. It includes two Dell PowerEdge™ T610 servers for 500 mailboxes Exchange Server 2010 environment configured in a Data Availability Group (DAG). A DAG is the new high availability mechanism in Microsoft Exchange 2010. This model of mailbox resiliency supports multiple copies of Exchange database (up to 16) in a DAG. There is only one active copy of a given Exchange 2010 database at any given time. Secondary copies are periodically synched with the primary copy. Mail clients access the primary (active) copy, and database changes to the primary copy are copied to the secondary (passive) copies in the form of transaction logs. The copied log records are played on the secondary copy to keep the secondary database copies consistent with the primary copy.

The secondary hosts are configured to be identical to the primary. The primary and secondary copy storages do not share storage array controllers or disks. In this configuration, each PowerEdge T610 hosts one active copy of an Exchange 2010 database and transaction logs and one passive copy of the peer node's active database. Each database hosts 250 users with 4GB mailbox each.

The tested user profile here was 0.15 IOPS per user (0.15 IOPS per user with 20% headroom.)

Dell PowerEdge T610 provides SAS based internal storage with RAID

- Capable of housing up to ten 3.5-inch Near-Line SAS disk drives

- Host based RAID options with Dell PERC 6/i

The PowerEdge T610 DAG solution presented in this paper utilizes a total of 8 disks per DAG member - 6 disks for Exchange database and transaction logs, 2 additional drives are used for operating system and application files.

Solution Description

The Dell™ PowerEdge T610 server is the building block for this solution and is capable of meeting the high performance requirements of messaging deployments. For more information see Dell PowerEdge T610.
Dell PERC 6/i RAID controller is used in the PowerEdge T610 hosting the Exchange server. The presented solution is for up to 500 mailboxes.
The tested user profile was 0.15 IOPS per user (0.15 IOPS per user with 20% headroom) with a 4 GB mailbox size.

Recommended Hardware Configuration:

Microsoft Exchange Server System:	Dell PowerEdge T610 Server (MAC8)
CPU	2×2.4GHz Intel Quad-core CPU
Memory	(2 x 8GB) = 16GB DDR2
NIC	Broadcom NeXtreme II
RAID Controller	PERC 6i (FW Version 2.13.0.64)
Internal Disks	2 × 146 GB SAS 3.5" drive ,7.2k rpm RAID1 (Operating System)

Storage System	Dell PowerEdge T610 Server internal storage with RAID
Disks	(6 ×1) TB SAS 3.5" drive, RAID -5, 7.2K rpm (DB+LOG)
RAID Controller	PERC 6/i (FW Version 2.13.0.64)

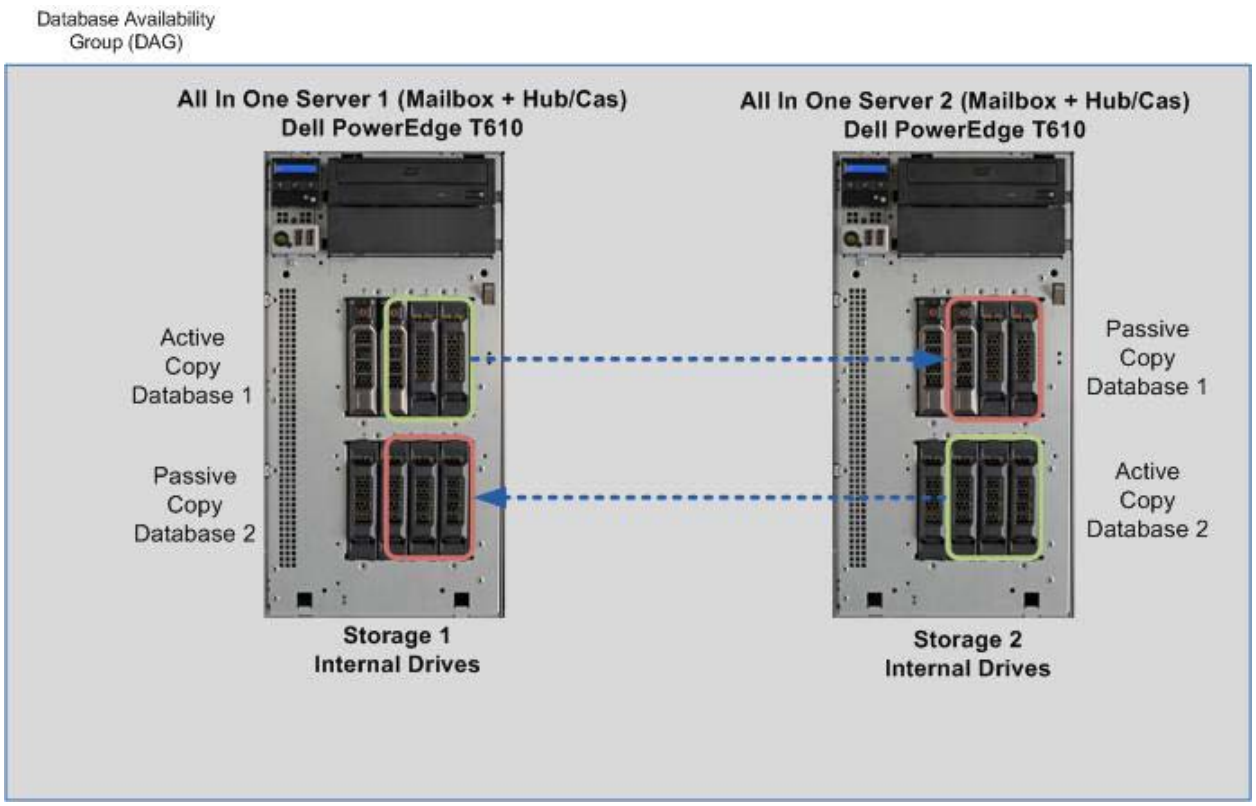

Figure 1: Graphical representation of DAG solution

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.

Tested Deployment

The following tables summarize the testing environment:

Simulated Exchange Configuration:

Number of Exchange mailboxes simulated	500
Number of Database Availability Groups (DAGs)	1
Number of servers/DAG	2
Number of active mailboxes/server	1
Number of databases/host	2
Number of copies/database	2
Number of mailboxes/database	250

Simulated profile: I/O's per second per mailbox (IOPS, include 20% headroom)	0.15
Database LUN size	1.81GB (3 Disks x 1TB) [DB+LOG]
Log LUN size	1.81GB (3 Disks x 1TB) [DB+LOG]
Total database size for performance testing	1 TB
% storage capacity used by Exchange database**	~54%

**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.

Storage Hardware

Storage Connectivity (Fiber Channel, SAS, SATA, iSCSI)	NL SAS
Storage model and OS/firmware revision	Internal Storage and OS is WS08 SP2, v.659
Storage cache	256 MB
Number of storage controllers	Perc 6i
Number of storage ports	N/A
Maximum bandwidth of storage connectivity to host	3 Gb/s SAS
Switch type/model/firmware revision	N/A
HBA model and firmware	Perc 6i
Number of HBA's/nost	1
Host server type	**Dell T610** Processor:2×2.13GHz Intel Quad-core RAM:(2 x 8GB)+(4 x 4GB)=32GB DDR2
Total number of disks tested in solution	6
Maximum number of spindles can be hosted in the storage	8

Storage Software

HBA driver	2.24.0.64, A03
HBA QueueTarget Setting	N/A
HBA QueueDepth Setting	N/A
Multi-Pathing	N/A
Host OS	Windows 2008 SP2, v.659
ESE.dll file version	14.0.639.11
Replication solution name/version	N/A

Storage Disk Configuration (Mailbox Store Disks)

Disk type, speed and firmware revision	NL SAS drive of 1TB each, 7.2K RPM
Raw capacity per disk (GB)	1TB
Number of physical disks in test	6(DB+LOG)+2(OS)=8
Total raw storage capacity (GB)	6TB
Disk slice size (GB)	1TB
Number of slices per LUN or number of disks per LUN	3
Raid level	RAID5
Total formatted capacity	1.81TB x 2
Storage capacity utilization	~60%
Database capacity utilization	~54%

Storage Disk Configuration (Transactional Log Disks)

Disk type, speed and firmware revision	NL SAS drive of 1TB each, 7.2K RPM
Raw capacity per disk (GB)	1TB
Number of Spindles in test	6(DB+LOG)+2(OS)=8
total raw storage capacity (GB)	6TB
Disk slice size (GB)	1TB
Number of slices per LUN or number of disks per LUN	3
Raid level	RAID5
Total formatted capacity	1.81TB x 2

Solution Constraints

The storage solution presented in this paper uses RAID5 containers for the exchange database and logs. Although RAID5 provides a better value in terms of capacity, as compared to RAID1 or RAID10, it does not perform as well in terms of I/O throughput. There are two reasons for this: First, under normal operating conditions, RAID5 has to do extra work because it has to generate and update parity information. Parity information is what makes RAID5 fault tolerant and RAID recovery possible. Second, in case of disk failures, a RAID5 container has the added task of restoring data and parity it in addition to serving IO normal I/O requests and this can significantly deteriorate the performance during rebuild. Additionally, a RAID5 volume can only tolerate a single disk failure as compared to RAID10 which can survive up to N disk failures for an N+N RAID10 volume.

RAID5 Performance

	Optimal	Degraded	Rebuilding
Database IOPs	147	129	108
Database Read Latency (milliseconds)	14.9	18.8	25.0
Database write Latency(milliseconds)	0.35	0.33	0.39

As seen in the RAID5 performance table, performance is reduced significantly during a RAID5 rebuild cycle. In the optimal state, the RAID5 database disks provide 147 IOPS with a read latency of 14.9 milliseconds and write latency of 0.35 milliseconds. In degraded state the IO throughput reduces to 129 IOPS and the database read latency increases to 18.8 milliseconds. During the rebuild cycle the throughput is further reduced to 108 IOPS with read latency of 25milliseconds and write latency of 0.39 milliseconds. The disk throughput reduces by about 27% during the rebuild cycle as compared to the optimal state.

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 2010 best practices on storage design, please visit http://technet.microsoft.com/en-us/library/dd346703.aspx

1. Exchange 2010 is an IO intensive application. Sharing Exchange 2010 storage resources with other applications may negatively impact the performance of Exchange 2010 deployment and therefore is not recommended.
2. In our testing, the database and log folders shared the same physical disk. Other testing indicated that separating the database folders from log folders on to different set of disks does not provide a noticeable performance advantage. In an Exchange Server 2010 resiliency solution, separating the database and log folders is no longer a required best practice.
3. For Exchange 2010 Database, it is recommended that the size of elements within a RAID stripe be set 512K for best performance.
4. Windows NTFS allocation unit size for Exchange 2010 database partitions should be set to 64K for best performance. For log partitions, if separated from database, the default allocation unit size should be used.
5. Exchange Server 2010 storage latencies are most often related the number of disks available for given a workload. Windows Performance Monitor may

be used to monitor Exchange Server 2010 database counters. Average database read latencies (Avg. Disk sec/Read) should not exceed 20ms.

6. Please list out some common performance troubleshooting techniques for the solution. Such as what tools to use, how to interpret the values from the tool. What are some of the common causes for poor performance?

Backup strategy

To protect e-mail data from potential disasters having a well designed and implemented backup solution is critical. Depending on the requirements of an environment different backup strategies may be implemented such as:

- Backup to disk
- Backup to tape
- LAN/SAN based backup etc.

In this solution, DAG is used to maintain a passive database copy on a separate storage system. This passive copy of the database may be used to perform to tape or disk.

The tests performed for backup include: backup-to-disk (read only) and log replay. The backup-to-disk test measures the read I/O performance by running a checksum on all the databases and log files. This test can help determine what kind of database read throughput can be achieved during backups. The backup speed and throughput achieved will depend upon the backup device used. The log replay test was used to measure the maximum rate at which the log files can be played against the databases. This is used to determine the restore times and also database write throughput can be achieved during a log recovery.

Contact for Additional Information

For additional information please visit Dell™ and Exchange Server 2010

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 event log file? No errors reported on event log.

  No
- Any errors reported in during the database and log checksum process?

  No

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. Each server is listed separately and the aggregate numbers across all servers is listed as well.

Individual Server Metrics:

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

Database I/O	
Database Disks Transfers/sec	132.9
Database Disks Reads/sec	79.6
Database Disks Writes/sec	53.3
Average Database Disk Read Latency (ms)	18.4
Average Database Disk Write Latency (ms)	2.96
Transaction Log I/O	
Log Disks Writes/sec	53
Average Log Disk Write Latency (ms)	1.58

Aggregate Performance across all servers Metrics:

The sum of I/O's across servers in solution and the average latency across all servers in solution.

Database I/O	
Database Disks Transfers/sec	132.9

Database Disks Reads/sec	79.6
Database Disks Writes/sec	53.3
Average Database Disk Read Latency (ms)	18.4
Average Database Disk Write Latency (ms)	2.96
Transaction Log I/O	
Log Disks Writes/sec	53
Average Log Disk Write Latency (ms)	1.58

Replicated Storage Performance Results

The Replicated Storage (e.g. storage based replication target). These performance tests measure the performance of the Secondary Storage. The performance tests are identical to that of the Primary Storage and verify that the Secondary Storage is capable of being transitioned to become the Primary Storage. Each server is listed separately and the aggregate numbers across all servers is listed as well.

Individual Server Metrics:

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

Database I/O	
Database Disks Transfers/sec	132.9
Database Disks Reads/sec	79.6
Database Disks Writes/sec	53.3
Average Database Disk Read Latency (ms)	18.4
Average Database Disk Write Latency (ms)	2.96
Transaction Log I/O	
Log Disks Writes/sec	53
Average Log Disk Write Latency (ms)	1.58

Aggregate Performance across all servers Metrics:

The sum of I/O's across servers in solution and the average latency across all all servers in solution.

Database I/O	
Database Disks Transfers/sec	132.9

Database Disks Reads/sec	79.6
Database Disks Writes/sec	53.3
Average Database Disk Read Latency (ms)	18.368
Average Database Disk Write Latency (ms)	2.96
Transaction Log I/O	
Log Disks Writes/sec	53
Average Log Disk Write Latency (ms)	1.58

Database Backup/Recovery Performance

There are two tests reports in this section. The first one is to measure the sequential read rate of the database files, and the second is to measure the recovery/replay performance (playing transaction logs in to the database).

Database Read-only Performance

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

MB read/sec per database	45
MB read/sec total per server	90

Transaction Log Recovery/Replay 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)	4

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: Stress Testing

Stress Test Result Report

Test Summary

Overall Test Result	**Pass**
Machine Name	EXCHANGE2010
Test Description	
Test Start Time	3/29/2010 2:24:53 PM
Test End Time	3/30/2010 2:30:45 PM
Collection Start Time	3/29/2010 2:30:28 PM
Collection End Time	3/30/2010 2:30:27 PM
Jetstress Version	14.01.0043.000
Ese Version	14.00.0639.011
Operating System	Windows Server (R) 2008 Enterprise Service Pack 2, v.659 (6.0.6002.131072)
Performance Log	C:\Exchange Jetstress\New Test\Stress\Stress_2010_3_29_14_24_58.blg C:\Exchange Jetstress\New Test\Stress\DBChecksum_2010_3_30_14_30_45.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second	122.993
Target Transactional I/O per Second	75
Initial Database Size (bytes)	1574041681920
Final Database Size (bytes)	1578781245440
Database Files (Count)	2

Jetstress System Parameters

Thread Count	2 (per database)
Minimum Database Cache	64.0 MB
Maximum Database Cache	512.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%
Run Background Database Maintenance	True
Number of Copies per Database	2

Database Configuration

Instance1660.1	Log Path: D:\Log1 Database: D:\DB1\Jetstress001001.edb
Instance1660.2	Log Path: G:\Log2 Database: G:\DB2\Jetstress002001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance1660.1	19.521	3.270	36.948	24.636	35185.773	36126.746	0.000	2.314	0.000	22.162	0.000	4522.184
Instance1660.2	19.299	3.007	36.839	24.571	35154.356	36135.295	0.000	2.205	0.000	22.172	0.000	4515.450

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance1660.1	22.413	261626.022
Instance1660.2	22.932	261605.433

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance1660.1	0.404	156973.177
Instance1660.2	0.403	156660.925

Total I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes

Instance1660.1	19.521	3.270	59.361	24.636	120684.786	36126.746	15.084	2.314	0.404	22.162	156973.177	4522.184
Instance1660.2	19.299	3.007	59.772	24.571	122036.089	36135.295	14.809	2.205	0.403	22.172	156660.925	4515.450

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.145	0.045	1.559
Available MBytes	13351.793	13281.000	13417.000
Free System Page Table Entries	33559148.517	33558163.000	33559918.000
Transition Pages RePurposed/sec	0.778	0.000	549.736
Pool Nonpaged Bytes	131375083.371	131219456.000	131612672.000
Pool Paged Bytes	1643550810.342	1643028480.000	1668591616.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log3/29/2010 2:24:53 PM -- Jetstress testing begins ...
3/29/2010 2:24:53 PM -- Prepare testing begins ...
3/29/2010 2:24:56 PM -- Attaching databases ...
3/29/2010 2:24:56 PM -- Prepare testing ends.
3/29/2010 2:24:56 PM -- Dispatching transactions begins ...
3/29/2010 2:24:56 PM -- Database cache settings: (minimum: 64.0 MB, maximum: 512.0 MB)
3/29/2010 2:24:56 PM -- Database flush thresholds: (start: 5.1 MB, stop: 10.2 MB)
3/29/2010 2:24:58 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
3/29/2010 2:24:58 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
3/29/2010 2:24:59 PM -- Operation mix: Sessions 2, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
3/29/2010 2:24:59 PM -- Performance logging begins (interval: 15000 ms).
3/29/2010 2:24:59 PM -- Attaining prerequisites:
3/29/2010 2:30:28 PM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 483811300.0 (lower bound: 483183800.0, upper bound: none)
3/30/2010 2:30:29 PM -- Performance logging ends.
3/30/2010 2:30:29 PM -- JetInterop batch transaction stats: 168511 and 168537.
3/30/2010 2:30:29 PM -- Dispatching transactions ends.
3/30/2010 2:30:29 PM -- Shutting down databases ...
3/30/2010 2:30:45 PM -- Instance1660.1 (complete) and Instance1660.2 (complete)
3/30/2010 2:30:46 PM -- Performance logging begins (interval: 30000 ms).
3/30/2010 2:30:46 PM -- Verifying database checksums ...
3/30/2010 4:17:32 PM -- D: (100% processed) and G: (100% processed)
3/30/2010 4:17:32 PM -- Performance logging ends.
3/30/2010 4:17:32 PM -- C:\Exchange Jetstress\New Test\Stress\DBChecksum_2010_3_30_14_30_45.blg has 213 samples.
3/30/2010 4:17:34 PM -- C:\Exchange Jetstress\New Test\Stress\DBChecksum_2010_3_30_14_30_45.html is saved.
3/30/2010 4:17:34 PM -- Verifying log checksums ...
3/30/2010 4:17:35 PM -- D:\Log1 (8 log(s) processed) and G:\Log2 (8 log(s) processed)
3/30/2010 4:17:35 PM -- C:\Exchange Jetstress\New Test\Stress\Stress_2010_3_29_14_24_58.blg has 5779 samples.
3/30/2010 4:17:35 PM -- Creating test report ...
3/30/2010 4:18:23 PM -- Instance1660.1 has 19.5 for I/O Database Reads Average Latency.
3/30/2010 4:18:23 PM -- Instance1660.1 has 2.3 for I/O Log Writes Average Latency.
3/30/2010 4:18:23 PM -- Instance1660.1 has 2.3 for I/O Log Reads Average Latency.
3/30/2010 4:18:23 PM -- Instance1660.2 has 19.3 for I/O Database Reads Average Latency.
3/30/2010 4:18:23 PM -- Instance1660.2 has 2.2 for I/O Log Writes Average Latency.
3/30/2010 4:18:23 PM -- Instance1660.2 has 2.2 for I/O Log Reads Average Latency.
3/30/2010 4:18:23 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
3/30/2010 4:18:23 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.
3/30/2010 4:18:23 PM -- C:\Exchange Jetstress\New Test\Stress\Stress_2010_3_29_14_24_58.xml has 5757 samples queried.

Test Result Report

Checksum Statistics - All

Database	Seen pages	Bad pages	Correctable pages	Wrong page-number pages	File length / seconds taken
D:\DB1\Jetstress001001.edb	24090162	0	0	0	752817 MBytes / 6406 sec
G:\DB2\Jetstress002001.edb	24090418	0	0	0	752825 MBytes / 5876 sec
(Sum)	48180580	0	0	0	1505643 MBytes / 6406 sec

Disk Subsystem Performance (of checksum)

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Read
D:	0.029	0.000	1880.924	0.000	65536.000
G:	0.026	0.000	2051.104	0.000	65536.000

Memory System Performance (of checksum)

Counter	Average	Minimum	Maximum
% Processor Time	1.681	0.695	1.998
Available MBytes	13865.310	13855.000	13886.000
Free System Page Table Entries	33559388.136	33558993.000	33559618.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	131516637.146	131420160.000	131612672.000
Pool Paged Bytes	1643902312.563	1642999808.000	1643978752.000

Test Log3/29/2010 2:24:53 PM -- Jetstress testing begins ...
3/29/2010 2:24:53 PM -- Prepare testing begins ...

3/29/2010 2:24:56 PM -- Attaching databases ...
3/29/2010 2:24:56 PM -- Prepare testing ends.
3/29/2010 2:24:56 PM -- Dispatching transactions begins ...
3/29/2010 2:24:56 PM -- Database cache settings: (minimum: 64.0 MB, maximum: 512.0 MB)
3/29/2010 2:24:56 PM -- Database flush thresholds: (start: 5.1 MB, stop: 10.2 MB)
3/29/2010 2:24:58 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
3/29/2010 2:24:58 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
3/29/2010 2:24:59 PM -- Operation mix: Sessions 2, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
3/29/2010 2:24:59 PM -- Performance logging begins (interval: 15000 ms).
3/29/2010 2:24:59 PM -- Attaining prerequisites:
3/29/2010 2:30:28 PM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 483811300.0 (lower bound: 483183800.0, upper bound: none)
3/30/2010 2:30:29 PM -- Performance logging ends.
3/30/2010 2:30:29 PM -- JetInterop batch transaction stats: 168511 and 168537.
3/30/2010 2:30:29 PM -- Dispatching transactions ends.
3/30/2010 2:30:29 PM -- Shutting down databases ...
3/30/2010 2:30:45 PM -- Instance1660.1 (complete) and Instance1660.2 (complete)
3/30/2010 2:30:46 PM -- Performance logging begins (interval: 30000 ms).
3/30/2010 2:30:46 PM -- Verifying database checksums ...
3/30/2010 4:17:32 PM -- D: (100% processed) and G: (100% processed)
3/30/2010 4:17:32 PM -- Performance logging ends.
3/30/2010 4:17:32 PM -- C:\Exchange Jetstress\New Test\Stress\DBChecksum_2010_3_30_14_30_45.blg has 213 samples.

Appendix B: Performance Testing

Performance Test Result Report

Test Summary

Overall Test Result	**Pass**
Machine Name	EXCHANGE2010
Test Description	
Test Start Time	3/24/2010 11:09:08 AM
Test End Time	3/24/2010 7:34:45 PM
Collection Start Time	3/24/2010 5:34:30 PM
Collection End Time	3/24/2010 7:34:22 PM
Jetstress Version	14.01.0043.000
Ese Version	14.00.0639.011
Operating System	Windows Server (R) 2008 Enterprise Service Pack 2, v.659 (6.0.6002.131072)
Performance Log	C:\Exchange Jetstress\New Test\TestExt6A\Performance_2010_3_24_17_29_31.blg C:\Exchange Jetstress\New Test\TestExt6A\DBChecksum_2010_3_24_19_34_45.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second	132.866
Target Transactional I/O per Second	75
Initial Database Size (bytes)	1572867276800
Final Database Size (bytes)	1573353816064
Database Files (Count)	2

Jetstress System Parameters

Thread Count	2 (per database)
Minimum Database Cache	64.0 MB
Maximum Database Cache	512.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%
Run Background Database Maintenance	True
Number of Copies per Database	2

Database Configuration

Instance1660.1	Log Path: D:\Log1 Database: D:\DB1\Jetstress001001.edb
Instance1660.2	Log Path: G:\Log2 Database: G:\DB2\Jetstress002001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance1660.1	18.499	3.092	40.063	26.782	34931.888	37221.516	0.000	1.601	0.000	26.761	0.000	4510.724
Instance1660.2	18.237	2.829	39.611	26.410	34880.478	37192.613	0.000	1.549	0.000	26.179	0.000	4499.586

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance1660.1	22.836	261630.338
Instance1660.2	23.072	261634.914

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance1660.1	0.487	185745.124
Instance1660.2	0.476	181119.191

Total I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance1660.1	18.499	3.092	62.898	26.782	117236.200	37221.516	15.665	1.601	0.487	26.761	185745.124	4510.724
Instance1660.2	18.237	2.829	62.683	26.410	118343.054	37192.613	10.618	1.549	0.476	26.179	181119.191	4499.586

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.157	0.052	0.468
Available MBytes	14825.473	14811.000	14865.000
Free System Page Table Entries	33558990.860	33558710.000	33559083.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	109029700.267	108986368.000	109047808.000
Pool Paged Bytes	113907131.733	113848320.000	114020352.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log3/24/2010 11:09:08 AM -- Jetstress testing begins ...
3/24/2010 11:09:08 AM -- Prepare testing begins ...
3/24/2010 11:09:08 AM -- Creating D:\DB1\Jetstress001001.edb.
3/24/2010 11:09:08 AM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)
3/24/2010 11:09:08 AM -- Database flush thresholds: (start: 2.5 MB, stop: 5.1 MB)
3/24/2010 1:47:56 PM -- 100.0% of 732.4 GB complete (250309128 records inserted).
3/24/2010 1:47:56 PM -- 100.0% of 732.4 GB complete (250309131 records inserted).
3/24/2010 1:47:59 PM -- Duplicating 1 database(s):
3/24/2010 5:29:27 PM -- 100.0% of 732.4 GB complete (732.4 GB duplicated).
3/24/2010 5:29:29 PM -- Attaching databases ...
3/24/2010 5:29:29 PM -- Prepare testing ends.
3/24/2010 5:29:29 PM -- Dispatching transactions begins ...
3/24/2010 5:29:29 PM -- Database cache settings: (minimum: 64.0 MB, maximum: 512.0 MB)
3/24/2010 5:29:29 PM -- Database flush thresholds: (start: 5.1 MB, stop: 10.2 MB)
3/24/2010 5:29:31 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
3/24/2010 5:29:31 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
3/24/2010 5:29:33 PM -- Operation mix: Sessions 2, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
3/24/2010 5:29:33 PM -- Performance logging begins (interval: 15000 ms).
3/24/2010 5:29:33 PM -- Attaining prerequisites:
3/24/2010 5:34:30 PM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 483377200.0 (lower bound: 483183800.0, upper bound: none)
3/24/2010 7:34:31 PM -- Performance logging ends.
3/24/2010 7:34:31 PM -- JetInterop batch transaction stats: 17269 and 17372.
3/24/2010 7:34:31 PM -- Dispatching transactions ends.
3/24/2010 7:34:31 PM -- Shutting down databases ...
3/24/2010 7:34:45 PM -- Instance1660.1 (complete) and Instance1660.2 (complete)
3/24/2010 7:34:46 PM -- Performance logging begins (interval: 30000 ms).
3/24/2010 7:34:46 PM -- Verifying database checksums ...
3/24/2010 9:20:20 PM -- D: (100% processed) and G: (100% processed)
3/24/2010 9:20:20 PM -- Performance logging ends.
3/24/2010 9:20:20 PM -- C:\Exchange Jetstress\New Test\TestExt6A\DBChecksum_2010_3_24_19_34_45.blg has 211 samples.
3/24/2010 9:20:22 PM -- C:\Exchange Jetstress\New Test\TestExt6A\DBChecksum_2010_3_24_19_34_45.html is saved.
3/24/2010 9:20:22 PM -- Verifying log checksums ...
3/24/2010 9:20:22 PM -- D:\Log1 (7 log(s) processed) and G:\Log2 (7 log(s) processed)
3/24/2010 9:20:22 PM -- C:\Exchange Jetstress\New Test\TestExt6A\Performance_2010_3_24_17_29_31.blg has 499 samples.
3/24/2010 9:20:22 PM -- Creating test report ...
3/24/2010 9:20:26 PM -- Instance1660.1 has 18.5 for I/O Database Reads Average Latency.
3/24/2010 9:20:26 PM -- Instance1660.1 has 1.6 for I/O Log Writes Average Latency.
3/24/2010 9:20:26 PM -- Instance1660.1 has 1.6 for I/O Log Reads Average Latency.
3/24/2010 9:20:26 PM -- Instance1660.2 has 18.2 for I/O Database Reads Average Latency.
3/24/2010 9:20:26 PM -- Instance1660.2 has 1.5 for I/O Log Writes Average Latency.

3/24/2010 9:20:26 PM -- Instance1660.2 has 1.5 for I/O Log Reads Average Latency.
3/24/2010 9:20:26 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
3/24/2010 9:20:26 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.
3/24/2010 9:20:26 PM -- C:\Exchange Jetstress\New Test\TestExt6A\Performance_2010_3_24_17_29_31.xml has 479 samples queried.

Test Result Report

Checksum Statistics - All

Database	Seen pages	Bad pages	Correctable pages	Wrong page-number pages	File length / seconds taken
D:\DB1\Jetstress001001.edb	24007474	0	0	0	750233 MBytes / 6333 sec
G:\DB2\Jetstress002001.edb	24007474	0	0	0	750233 MBytes / 5859 sec
(Sum)	48014948	0	0	0	1500467 MBytes / 6333 sec

Disk Subsystem Performance (of checksum)

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Read
D:	0.028	0.000	1895.472	0.000	65536.000
G:	0.026	0.000	2048.889	0.000	65536.000

Memory System Performance (of checksum)

Counter	Average	Minimum	Maximum
% Processor Time	1.667	0.695	2.060
Available MBytes	15365.171	15351.000	15376.000
Free System Page Table Entries	33558969.877	33558596.000	33559087.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	108986775.659	108986368.000	108998656.000
Pool Paged Bytes	113864529.289	112959488.000	113938432.000

Test Log3/24/2010 11:09:08 AM -- Jetstress testing begins ...
3/24/2010 11:09:08 AM -- Prepare testing begins ...
3/24/2010 11:09:08 AM -- Creating D:\DB1\Jetstress001001.edb.
3/24/2010 11:09:08 AM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)
3/24/2010 11:09:08 AM -- Database flush thresholds: (start: 2.5 MB, stop: 5.1 MB)
3/24/2010 1:47:56 PM -- 100.0% of 732.4 GB complete (250309128 records inserted).
3/24/2010 1:47:56 PM -- 100.0% of 732.4 GB complete (250309131 records inserted).
3/24/2010 1:47:59 PM -- Duplicating 1 database(s):
3/24/2010 5:29:27 PM -- 100.0% of 732.4 GB complete (732.4 GB duplicated).
3/24/2010 5:29:29 PM -- Attaching databases ...
3/24/2010 5:29:29 PM -- Prepare testing ends.
3/24/2010 5:29:29 PM -- Dispatching transactions begins ...
3/24/2010 5:29:29 PM -- Database cache settings: (minimum: 64.0 MB, maximum: 512.0 MB)
3/24/2010 5:29:29 PM -- Database flush thresholds: (start: 5.1 MB, stop: 10.2 MB)
3/24/2010 5:29:31 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
3/24/2010 5:29:31 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
3/24/2010 5:29:33 PM -- Operation mix: Sessions 2, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
3/24/2010 5:29:33 PM -- Performance logging begins (interval: 15000 ms).
3/24/2010 5:29:33 PM -- Attaining prerequisites:
3/24/2010 5:34:30 PM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 483377200.0 (lower bound: 483183800.0, upper bound: none)
3/24/2010 7:34:31 PM -- Performance logging ends.
3/24/2010 7:34:31 PM -- JetInterop batch transaction stats: 17269 and 17372.
3/24/2010 7:34:31 PM -- Dispatching transactions ends.
3/24/2010 7:34:31 PM -- Shutting down databases ...
3/24/2010 7:34:45 PM -- Instance1660.1 (complete) and Instance1660.2 (complete)
3/24/2010 7:34:46 PM -- Performance logging begins (interval: 30000 ms).
3/24/2010 7:34:46 PM -- Verifying database checksums ...
3/24/2010 9:20:20 PM -- D: (100% processed) and G: (100% processed)
3/24/2010 9:20:20 PM -- Performance logging ends.
3/24/2010 9:20:20 PM -- C:\Exchange Jetstress\New Test\TestExt6A\DBChecksum_2010_3_24_19_34_45.blg has 211 samples.

Appendix C: Soft Recovery Testing

SoftRecovery Test Result Report Part 1

Test Summary

Overall Test Result	**Pass**
Machine Name	EXCHANGE2010
Test Description	
Test Start Time	3/29/2010 11:07:06 AM
Test End Time	3/29/2010 1:41:15 PM
Collection Start Time	3/29/2010 11:07:28 AM

Collection End Time 3/29/2010 1:40:47 PM
Jetstress Version 14.01.0043.000
Ese Version 14.00.0639.011
Operating System Windows Server (R) 2008 Enterprise Service Pack 2, v.659 (6.0.6002.131072)
Performance Log C:\Exchange Jetstress\New Test\SoftRec\Performance_2010_3_29_11_7_10.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second	143.508
Target Transactional I/O per Second	75
Initial Database Size (bytes)	1573446090752
Final Database Size (bytes)	1574058459136
Database Files (Count)	2

Jetstress System Parameters

Thread Count	2 (per database)
Minimum Database Cache	64.0 MB
Maximum Database Cache	512.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%

Database Configuration

Instance1660.1 Log Path: D:\Log1
Database: D:\DB1\Jetstress001001.edb

Instance1660.2 Log Path: G:\Log2
Database: G:\DB2\Jetstress002001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance1660.1	16.696	3.558	43.152	28.219	32768.000	37236.684	0.000	2.682	0.000	26.522	0.000	4550.834
Instance1660.2	17.208	2.934	43.545	28.592	32768.000	37311.153	0.000	2.729	0.000	27.221	0.000	4508.378

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.151	0.052	0.468
Available MBytes	13374.007	13346.000	13810.000
Free System Page Table Entries	33559000.598	33558676.000	33559148.000
Transition Pages RePurposed/sec	3.237	0.000	351.699
Pool Nonpaged Bytes	130923449.954	130891776.000	130973696.000
Pool Paged Bytes	1642670266.788	1641795584.000	1642713088.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log3/29/2010 11:07:06 AM -- Jetstress testing begins ...
3/29/2010 11:07:06 AM -- Prepare testing begins ...
3/29/2010 11:07:08 AM -- Attaching databases ...
3/29/2010 11:07:08 AM -- Prepare testing ends.
3/29/2010 11:07:08 AM -- Dispatching transactions begins ...
3/29/2010 11:07:08 AM -- Database cache settings: (minimum: 64.0 MB, maximum: 512.0 MB)
3/29/2010 11:07:08 AM -- Database flush thresholds: (start: 5.1 MB, stop: 10.2 MB)
3/29/2010 11:07:10 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
3/29/2010 11:07:10 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
3/29/2010 11:07:13 AM -- Operation mix: Sessions 2, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
3/29/2010 11:07:13 AM -- Performance logging begins (interval: 15000 ms).
3/29/2010 11:07:13 AM -- Generating log files ...
3/29/2010 1:40:59 PM -- D:\Log1 (100.2% generated) and G:\Log2 (102.2% generated)
3/29/2010 1:40:59 PM -- Performance logging ends.
3/29/2010 1:40:59 PM -- JetInterop batch transaction stats: 21820 and 22136.
3/29/2010 1:40:59 PM -- Dispatching transactions ends.
3/29/2010 1:40:59 PM -- Shutting down databases ...
3/29/2010 1:41:15 PM -- Instance1660.1 (complete) and Instance1660.2 (complete)
3/29/2010 1:41:15 PM -- C:\Exchange Jetstress\New Test\SoftRec\Performance_2010_3_29_11_7_10.blg has 614 samples.
3/29/2010 1:41:15 PM -- Creating test report ...
3/29/2010 1:41:19 PM -- Instance1660.1 has 16.7 for I/O Database Reads Average Latency.
3/29/2010 1:41:19 PM -- Instance1660.1 has 2.7 for I/O Log Writes Average Latency.
3/29/2010 1:41:19 PM -- Instance1660.1 has 2.7 for I/O Log Reads Average Latency.
3/29/2010 1:41:19 PM -- Instance1660.2 has 17.2 for I/O Database Reads Average Latency.
3/29/2010 1:41:19 PM -- Instance1660.2 has 2.7 for I/O Log Writes Average Latency.
3/29/2010 1:41:19 PM -- Instance1660.2 has 2.7 for I/O Log Reads Average Latency.

3/29/2010 1:41:19 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
3/29/2010 1:41:19 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.
3/29/2010 1:41:19 PM -- C:\Exchange Jetstress\New Test\SoftRec\Performance_2010_3_29_11_7_10.xml has 613 samples queried.

SoftRecovery Test Result Report Part 2

Soft-Recovery Statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance1660.1	500	1955.0669324
Instance1660.2	510	1955.0669324

Database Configuration

Instance1660.1 Log Path: D:\Log1
Database: D:\DB1\Jetstress001001.edb

Instance1660.2 Log Path: G:\Log2
Database: G:\DB2\Jetstress002001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance1660.1	264.353	40.745	169.122	1.531	46187.030	17498.788	5.536	0.000	2.296	0.000	110819.649	0.000
Instance1660.2	284.320	45.484	170.253	1.562	46296.405	18073.072	5.319	0.074	2.347	0.002	113999.098	0.528

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance1660.1	13.067	261706.794
Instance1660.2	13.039	261679.110

Total I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance1660.1	264.353	40.745	182.190	1.531	61645.066	17498.788	5.536	0.000	2.296	0.000	110819.649	0.000
Instance1660.2	284.320	45.484	183.292	1.562	61618.587	18073.072	5.319	0.074	2.347	0.002	113999.098	0.528

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.200	0.000	0.824
Available MBytes	13369.674	13352.000	13843.000
Free System Page Table Entries	33558977.114	33558535.000	33559501.000
Transition Pages RePurposed/sec	10.386	0.000	1669.335
Pool Nonpaged Bytes	131293816.750	130904064.000	131715072.000
Pool Paged Bytes	1642813113.079	1641918464.000	1642835968.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log3/29/2010 11:07:06 AM -- Jetstress testing begins ...
3/29/2010 11:07:06 AM -- Prepare testing begins ...
3/29/2010 11:07:08 AM -- Attaching databases ...
3/29/2010 11:07:08 AM -- Prepare testing ends.
3/29/2010 11:07:08 AM -- Dispatching transactions begins ...
3/29/2010 11:07:08 AM -- Database cache settings: (minimum: 64.0 MB, maximum: 512.0 MB)
3/29/2010 11:07:08 AM -- Database flush thresholds: (start: 5.1 MB, stop: 10.2 MB)
3/29/2010 11:07:10 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
3/29/2010 11:07:10 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
3/29/2010 11:07:13 AM -- Operation mix: Sessions 2, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
3/29/2010 11:07:13 AM -- Performance logging begins (interval: 15000 ms).
3/29/2010 11:07:13 AM -- Generating log files ...
3/29/2010 1:40:59 PM -- D:\Log1 (100.2% generated) and G:\Log2 (102.2% generated)
3/29/2010 1:40:59 PM -- Performance logging ends.
3/29/2010 1:40:59 PM -- JetInterop batch transaction stats: 21820 and 22136.
3/29/2010 1:40:59 PM -- Dispatching transactions ends.
3/29/2010 1:40:59 PM -- Shutting down databases ...
3/29/2010 1:41:15 PM -- Instance1660.1 (complete) and Instance1660.2 (complete)
3/29/2010 1:41:15 PM -- C:\Exchange Jetstress\New Test\SoftRec\Performance_2010_3_29_11_7_10.blg has 614 samples.
3/29/2010 1:41:15 PM -- Creating test report ...
3/29/2010 1:41:19 PM -- Instance1660.1 has 16.7 for I/O Database Reads Average Latency.
3/29/2010 1:41:19 PM -- Instance1660.1 has 2.7 for I/O Log Writes Average Latency.
3/29/2010 1:41:19 PM -- Instance1660.1 has 2.7 for I/O Log Reads Average Latency.

3/29/2010 1:41:19 PM -- Instance1660.2 has 17.2 for I/O Database Reads Average Latency.
3/29/2010 1:41:19 PM -- Instance1660.2 has 2.7 for I/O Log Writes Average Latency.
3/29/2010 1:41:19 PM -- Instance1660.2 has 2.7 for I/O Log Reads Average Latency.
3/29/2010 1:41:19 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
3/29/2010 1:41:19 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.
3/29/2010 1:41:19 PM -- C:\Exchange Jetstress\New Test\SoftRec\Performance_2010_3_29_11_7_10.xml has 613 samples queried.
3/29/2010 1:41:19 PM -- C:\Exchange Jetstress\New Test\SoftRec\Performance_2010_3_29_11_7_10.html is saved.
3/29/2010 1:41:21 PM -- Performance logging begins (interval: 2000 ms).
3/29/2010 1:41:21 PM -- Recovering databases ...
3/29/2010 2:13:56 PM -- Performance logging ends.
3/29/2010 2:13:56 PM -- Instance1660.1 (1955.0669324) and Instance1660.2 (1955.0669324)
3/29/2010 2:13:57 PM -- C:\Exchange Jetstress\New Test\SoftRec\SoftRecovery_2010_3_29_13_41_19.blg has 971 samples.
3/29/2010 2:13:57 PM -- Creating test report ...

Appendix D: Backup Testing

Database backup Test Result Report

Database Backup Statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance1660.1	750273.59	18:42:30	11.14
Instance1660.2	750265.59	18:19:28	11.37

Jetstress System Parameters

Thread Count	2 (per database)
Minimum Database Cache	64.0 MB
Maximum Database Cache	512.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%

Database Configuration

Instance1660.1 Log Path: D:\Log1
Backup Path: D:\Bkp1
Database: D:\DB1\Jetstress001001.edb

Instance1660.2 Log Path: G:\Log2
Backup Path: G:\Bkp2
Database: G:\DB2\Jetstress002001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance1660.1	24.446	0.000	44.552	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1660.2	25.695	0.000	45.474	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	4.603	0.292	11.366
Available MBytes	13712.498	12391.000	15307.000
Free System Page Table Entries	33559027.839	33558257.000	33559172.000
Transition Pages RePurposed/sec	5668.740	0.000	9218.383
Pool Nonpaged Bytes	114740459.114	106954752.000	130904064.000
Pool Paged Bytes	1799666128.749	115904512.000	3176271872.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log3/26/2010 11:50:51 AM -- Jetstress testing begins ...
3/26/2010 11:50:51 AM -- Prepare testing begins ...
3/26/2010 11:50:54 AM -- Attaching databases ...
3/26/2010 11:50:54 AM -- Prepare testing ends.
3/26/2010 11:50:58 AM -- Performance logging begins (interval: 30000 ms).
3/26/2010 11:50:58 AM -- Backing up databases ...
3/27/2010 6:33:28 AM -- Performance logging ends.
3/27/2010 6:33:28 AM -- Instance1660.1 (100% processed) and Instance1660.2 (100% processed)
3/27/2010 6:33:28 AM -- C:\Exchange Jetstress\New Test\Bckup\DatabaseBackup_2010_3_26_11_50_54.blg has 2243 samples.
3/27/2010 6:33:28 AM -- Creating test report ...