Dell PowerVault MD3220i
2000 Mailbox Resiliency
Exchange 2010 Storage Solution

Tested with: ESRP – Storage Version 3.0
Tested Date: June 16, 2011

Microsoft GOLD CERTIFIED Partner

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Content

Overview

This document provides information on Dell's 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 http://www.dell.com/exchange

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

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PowerVault Series Storage Array Features

The Dell™ PowerVault™ MD3220i is a dedicated, high-availability (HA), next-generation shared-storage array designed to offer improved performance and capacity for storage consolidation and server virtualization, deployment flexibility and scalability. Following are a few advantages of using PowerVault MD3220i.

MD3220i helps reduce the effort required to store and manage your data. These arrays raise the bar for performance, flexibility and scalability.
Supports up to 32 physical servers when connected to one or more 1 Gb Ethernet switches

- Scales up to 96 hard disk drive (HDD) storage capacity with PowerVault MD1200 and/or MD1220 enclosures
- Cuts management complexity with a single management interface and a single system to back up
- The MD3200i/MD3220i arrays offer several advantages over Fibre Channel systems to support your virtual server environment.

1 Gb Ethernet is a mature, well-understood technology that is less complicated than Fibre Channel technology.

- Ethernet hardware is cost-effective and readily available.
- Widespread familiarity with Ethernet technology can help cut training time and costs.

The MD3200i/MD3220i arrays are managed by next-generation MD Storage Manager software, an intuitive, easy-to-use client-based Java application. Two different management paths offer easy user interaction, even for those with only a basic familiarity of storage systems.

- The enterprise window feature monitors multiple systems through a single interface.
- Wizard-based array management helps simplify the configuration process.
- Software detects and alerts you of any problems and launches an automatic Recovery Guru to help troubleshoot and resolve the issues.

MD3200i/MD3220i arrays enable you to mix and match components to create your optimal tiered-storage environment. You can deploy up to 96 HDDs by simply plugging in PowerVault MD1200 and/or PowerVault MD1220 enclosures behind MD3200i arrays. This means you can scale your system with a mix of both 3.5” and 2.5” hard drives. In dual-controller systems, you can hot plug additional storage enclosures without shutting down the system. The MD3200i/MD3220i arrays deliver an excellent performance/price ratio. Four iSCSI ports per controller enable twice the throughput compared to previous Dell 3000i iSCSI arrays. Increased cache sizes of up to 2GB per controller meet large database application needs. SSD support optimizes the system for the most demanding I/O applications. The MD3200i/MD3220i's optional data protection features include snapshots, virtual disk copy (VDC) and self-encrypting drives (SEDs) with Secure Erase. Each virtual disk supports up to eight snapshots, with a total of 128 snapshots per system. These are typically used when data needs to be

"frozen" in time. Virtual disk copy is full replication of an existing virtual disk at any point in time, often used for decision support and application development testing. If a drive is removed, the SED, which encrypts data written to the drive and decrypts data read from the drive, "locks" to prevent unauthorized access.

Solution Description

The Dell™ PowerVault™ MD3220i is a modular disk storage expansion enclosure for PowerEdge™ servers capable of housing up to (24) 2.5-inch disk drives in a single 2U rack able chassis. The enclosure can support 1 Terabyte Near-Line SAS (7200 RPM) as well as 10K and 15K RPM SAS drives ranging in capacities up to 600GB.

Dell™ PowerVault™ MD3220i Product Page

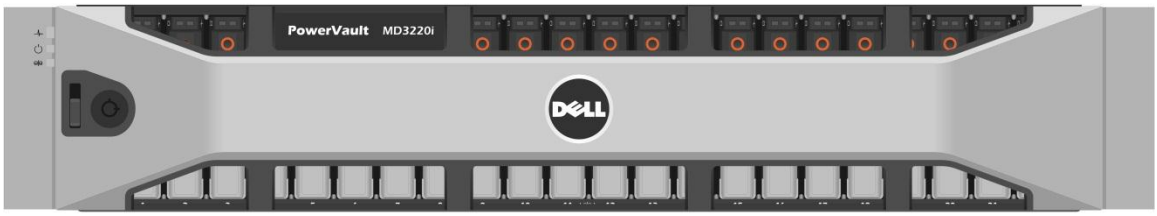


Figure 1:Dell PowerVault MD3220i enclosure with (24) 2.5-inch drives

The tested user profile was 0.20 IOPS per user with a 3GB mailbox size. This IO profile for Exchange 2010 represents about 200 messages (sent/received) per mailbox per day. Using 7.2K RPM drives, we achieved more than enough performance – Approximately 20% more than the target of 400 IOPS.

Microsoft Exchange Server System:

Server	Dell™ PowerEdge™ R710
CPU	2 Intel® Xeon Processors E5620 @ 2.40Ghz
Memory	12GB memory
NIC	Broadcom NeXtreme II
Internal Disk	1 Seagate 146GB 15K RPM SAS(ST9146852SS)

Storage System:

Storage System	Dell™ PowerVault™ MD3220i
Disks	24 Seagate 1TB 7.2K RPM NL-SAS (ST91000640SS) Drives

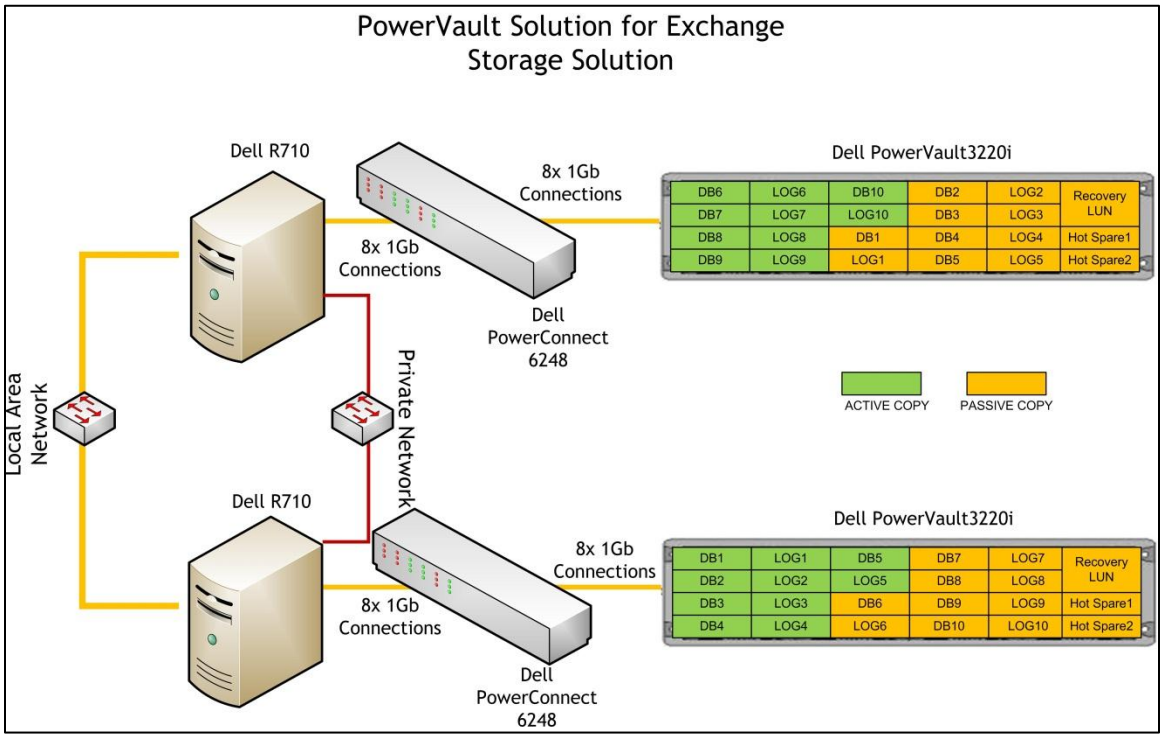
Storage Configuration:

The storage configuration per enclosure was as follows:

- 11 RAID 10 volumes were created from 2 physical disks from 0 through 22 on the PowerVault™ MD3220i enclosure. Remaining 2 drives were used as hot spares. These volumes were used for Exchange Information stores, transaction logs and Recovery LUN.

The hardware environment is described in the table below.

Storage	Drives	Server	Ethernet Connections
MD3220i storage array Divided into 11 volumes consisting 2 drives each out of which one was recovery LUN and 2 drives were used as hot spares	24 NL-SAS 1TB drives	Dell R710 Server	1 quad-port NIC and 4 on-board ethernet ports



Exchange Storage Group Layout

To perform the tests, 22 drives in MD3220i were divided into 11 disk groups with 2 drives each leaving 2 drives as hot spares. RAID 1 volumes were created from each disk group and each contained a database and log file. One out of the eleven volumes was set as a recovery LUN. The simulated environment tested for the worst case scenario. That is to say 2,000 active mailboxes on a single PowerVault MD3220i; a total of 10 Exchange databases each hosting 200 mailboxes were attached to a single Exchange 2010 Server.

The proposed solution in optimal mode would use two Exchange 2010 Servers each attached to a single MD3220i configured with ten (10) RAID1 volumes. Both Exchange 2010 Servers would then host 5 active and 5 passive db and log copies as indicated in the topology figure above. In total, 10 active and 10 passive database and log copies were maintained across both storage arrays.

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 an Exchange solution. Other factors which affect the performance of the storage solution are:

- Server processor utilization
- Server physical and virtual memory limitations
- Resource requirements for other applications
- Directory and network service latencies
- Network infrastructure limitations
- Client usage profiles

All these factors are beyond the scope for ESRP-Storage. Therefore, the ESRP requirements of simulating number of mailboxes, size of mailbox, and mailbox I/O profile hosted per server as part of the tested configuration may not necessarily be viable for some customer deployments.
For more information on identifying and addressing performance bottlenecks in an Exchange system, please read the article Microsoft Troubleshooting Microsoft Exchange Server Performance, available at:

http://technet.microsoft.com/en-us/library/dd335215.aspx

Targeted Customer Profile

The PowerVault Series storage solution is intended for small, medium, and up to large Microsoft Exchange Server 2010 organizations that want reliable, high-performance, and easy-to-manage drive storage. The tested configuration can support the following:

- 2 tested Exchange 2010 servers
- 2,000 user mailboxes
- 0.20 I/O per second per user 1000 MB mailbox quota per user
- 10 databases with 2 copies per server
- 1TB maximum database size tested
- Mailbox Resiliency provides high availability and is the primary data protection mechanism.

Tested Deployment

The following tables summarize the testing environment.

Simulated Exchange Configuration

Number of Exchange mailboxes simulated	2000
Number of Database Availability Groups	1

(DAGs)	
Number of servers/DAG	2
Number of active mailboxes/server	2000
Number of databases/host	10
Number of copies/database	2
Number of mailboxes/database	200
Simulated profile: I/O's per second per mailbox (IOPS, include 30% headroom)	0.20
Database LUN size	931.01 GB
Log LUN size	N/A
Total database size for performance testing	602 GB
% storage capacity used by Exchange database**	602/931.01= 64.66%

Primary Storage Hardware

Storage Connectivity (Fiber Channel, SAS, SATA, iSCSI)	iSCSI
Storage model and OS/firmware revision	PowerVault MD3220i Firmware Version: 07.70.06.63
Storage cache	4 GB
Number of storage controllers	2
Number of storage ports	8
Maximum bandwidth of storage connectivity to host	1Gb Ethernet
Switch type/model/firmware revision	PowerConnect 6248
HBA model and firmware	Intel Quad port NIC
Number of HBA's/host	1
Host server type	Dell™ PowerEdge™ R710 2 Intel® Xeon Processors E5620 @ 2.40Ghz
Total number of disks tested in solution	24
Maximum number of spindles can be hosted in the storage	24

Primary Storage Software

HBA driver	Intel Driver Version 11.7.32.0
HBA QueueTarget Setting	N/A
HBA QueueDepth Setting	N/A
Multi-Path I/O	Microsoft iSCSI Initiator
Host OS	Windows Server 2008 R2 Enterprise X64 Edition
ESE.dll file version	14.01.0225.017
Replication solution name/version	N/A

Primary Storage Disk Configuration (Mailbox Store Disks)

Disk type, speed and firmware revision	Seagate 1TB 7.2K RPM NL-SAS ST91000640SS; FW AS01
Raw capacity per disk (GB)	931.51GB
Number of physical disks in test	24
Total raw storage capacity (GB)	22356.31GB
Disk slice size (GB)	N/A
Number of slices per LUN or number of disks per LUN	N/A
Raid level	RAID 10
Total formatted capacity	10241.11GB
Storage capacity utilization	10241.11GB/22356.31GB = 45.80% Formatted capacity/total raw capacity
Database capacity utilization	9830.4GB/17881.39GB = 54.97% utilized Database size/total raw capacity

Best Practices

Microsoft Exchange Server is a drive-intensive application. Based on the tests using the ESRP framework, Dell recommends the following best practices to improve storage performance.

- Use 64K allocation size for all the volumes
- Size and configure first for I/O performance, then for storage capacity.
- Use Microsoft iSCSI software initiators in Exchange configurations. In these tests, the Microsoft iSCSI software initiator was used.
- Place SAN infrastructure on VLANs or subnets that differ from other production network traffic.
- Use non-blocking Gigabit Ethernet switches.

For additional best practices on storage design in Exchange 2010, see the URL:
http://technet.microsoft.com/en-us/library/bb124518.aspx

Additional Information

For more information, see the Dell website (www.dell.com). In addition, Dell PowerVault 3220i technical documents can be found here.

Backup Strategy

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 the ESRP testing framework. See Appendix A for detailed information about test results.

Reliability Results

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

The following list provides an overview:

- 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 I/O for over two hours. The test shows how long it takes for the storage to respond to an I/O under load. The data below is the sum of all of the logical drive I/Os and the average of all the logical drives' I/O latency during the test (which was run for six hours). Each server is listed separately and the aggregate numbers across all servers are also presented.

Individual Server Metrics

Database I/O	
Database Disks Transfers/sec	481.83
Average Database Disks Reads/sec	286.20
Average Database Disks Writes/sec	195.63
Average Database Disk Read Latency (ms)	17.78
Average Database Disk Write Latency (ms)	14.23
Transaction Log I/O	
Log Disks Writes/sec	17.72
Average Log Disk Write Latency (ms)	2.79

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	36.67(Average)
MB read/sec total per server	366.75

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)	3.02 (avg. resp. to replay log/avg. # of logs replayed)

Conclusion

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

The ESRP Storage program is not designed to be a benchmarking program. Its tests are not designed for achieving the maximum throughput for a given solution. Rather, they are focused on producing recommendations from vendors for the Exchange application. Therefore, the data presented in this document should not be used for direct comparisons among the solutions.

Appendix A: Stress Testing

Microsoft Exchange Jetstress 2010
Stress Test Result Report
Test Summary

Overall Test Result	Pass
Machine Name	WIN-MDAA8648KFN
Test Description	.20 profile 3gb mailbox size 2000 mailboxes 2DAGS 24 hour
Test Start Time	4/7/2011 11:17:42 AM
Test End Time	4/8/2011 11:25:46 AM
Collection Start Time	4/7/2011 11:25:31 AM
Collection End Time	4/8/2011 11:25:22 AM
Jetstress Version	14.01.0225.017
ESE Version	14.01.0218.012
Operating System	Windows Server 2008 R2 Enterprise (6.1.7600.0)

Database Sizing and Throughput

Achieved Transactional I/O per Second	489.703
Target Transactional I/O per Second	400
Initial Database Size (bytes)	6446502248448
Final Database Size (bytes)	6465896710144
Database Files (Count)	10

Jetstress System Parameters

Thread Count	3 (per database)
Minimum Database Cache	320.0 MB
Maximum Database Cache	2560.0 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

Instance1432.1	Log path: C:\Databases\DB1	
	Database: C:\Databases\DB1\Jetstress001001.edb	
Instance1432.2	Log path: C:\Databases\DB2	
	Database: C:\Databases\DB2\Jetstress002001.edb	
Instance1432.3	Log path: C:\Databases\DB3	
	Database: C:\Databases\DB3\Jetstress003001.edb	
Instance1432.4	Log path: C:\Databases\DB4	
	Database: C:\Databases\DB4\Jetstress004001.edb	
Instance1432.5	Log path: C:\Databases\DB5	
	Database: C:\Databases\DB5\Jetstress005001.edb	
Instance1432.6	Log path: C:\Databases\DB6	
	Database: C:\Databases\DB6\Jetstress006001.edb	
Instance1432.7	Log path: C:\Databases\DB7	
	Database: C:\Databases\DB7\Jetstress007001.edb	
Instance1432.8	Log path: C:\Databases\DB8	
	Database: C:\Databases\DB8\Jetstress008001.edb	

Instance1432.9 Log path: C:\Databases\DB9
Database: C:\Databases\DB9\Jetstress009001.edb

Instance1432.10 Log path: C:\Databases\DB10
Database: C:\Databases\DB10\Jetstress010001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O DB Reads Avg Latency (msec)	I/O DB Writes Average Latency (msec)	I/O DB Reads/sec	I/O DB Writes/sec	I/O DB Reads Avg Bytes	I/O DB Writes Average Bytes	I/O Log Reads Avg Latency (msec)	I/O Log Writes Avg Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Avg Bytes
Instance1432.1	17.9	15.1	29.1	19.9	38207.0	36483.8	0.0	2.7	0.0	17.1	0.0
Instance1432.2	17.6	16.9	29.1	19.9	38041.3	36476.2	0.0	2.9	0.0	17.2	0.0
Instance1432.3	17.7	16.3	29.0	19.8	38278.0	36449.5	0.0	2.9	0.0	17.1	0.0
Instance1432.4	18.0	15.0	29.1	19.9	38010.2	36473.3	0.0	2.7	0.0	17.1	0.0
Instance1432.5	17.5	14.3	29.0	19.8	38354.1	36467.8	0.0	2.8	0.0	17.1	0.0
Instance1432.6	17.7	15.7	29.2	19.9	37885.6	36477.2	0.0	2.8	0.0	17.2	0.0
Instance1432.7	17.7	14.2	29.1	19.9	38192.7	36486.7	0.0	2.8	0.0	17.1	0.0
Instance1432.8	17.8	13.5	29.1	19.8	38338.7	36496.7	0.0	2.7	0.0	17.1	0.0
Instance1432.9	17.6	15.6	29.1	19.8	38065.1	36479.1	0.0	2.9	0.0	17.1	0.0
Instance1432.10	17.8	13.0	29.2	19.9	38199.0	36477.4	0.0	2.8	0.0	17.2	0.0

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance1432.1	23.511	261512.851
Instance1432.2	23.561	261526.852
Instance1432.3	23.536	261487.147
Instance1432.4	23.506	261511.639
Instance1432.5	23.721	261522.249
Instance1432.6	23.501	261494.857
Instance1432.7	23.660	261512.172
Instance1432.8	23.622	261526.517
Instance1432.9	23.569	261507.031
Instance1432.10	23.585	261516.681

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance1432.1	0.331	128788.159
Instance1432.2	0.333	129462.947

Instance1432.3	0.332	129040.869
Instance1432.4	0.332	129327.236
Instance1432.5	0.331	128391.610
Instance1432.6	0.333	129612.695
Instance1432.7	0.331	128980.342
Instance1432.8	0.332	129015.576
Instance1432.9	0.332	129064.239
Instance1432.10	0.333	129124.058

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
Instance1432.1	17.870	15.117	52.607	19.880	138006.841	36483.837	3.427	2.707	0.331	17.103	128788.159	4787.995
Instance1432.2	17.555	16.905	52.694	19.908	137966.694	36476.183	3.272	2.902	0.333	17.173	129462.947	4798.240
Instance1432.3	17.672	16.294	52.583	19.849	138187.150	36449.515	3.474	2.850	0.332	17.149	129040.869	4785.379
Instance1432.4	17.988	14.965	52.581	19.865	137923.068	36473.346	3.545	2.739	0.332	17.128	129327.236	4789.027
Instance1432.5	17.503	14.294	52.724	19.816	138759.188	36467.774	3.284	2.757	0.331	17.054	128391.610	4805.635
Instance1432.6	17.728	15.700	52.669	19.940	137659.893	36477.242	3.147	2.845	0.333	17.241	129612.695	4778.569
Instance1432.7	17.650	14.178	52.777	19.876	138305.989	36486.679	3.132	2.774	0.331	17.091	128980.342	4792.387
Instance1432.8	17.765	13.525	52.685	19.833	138409.768	36496.734	3.318	2.714	0.332	17.115	129015.576	4793.611
Instance1432.9	17.641	15.613	52.645	19.847	138102.211	36479.080	3.292	2.906	0.332	17.079	129064.239	4806.405
Instance1432.10	17.788	13.033	52.767	19.931	138013.897	36477.404	3.306	2.780	0.333	17.150	129124.058	4807.890

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.241	0.000	8.030
Available Mbytes	8528.776	8517.000	8756.000
Free System Page Table Entries	33555614.423	33555601.000	33556122.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	171899672.464	171466752.000	173342720.000
Pool Paged Bytes	106512337.657	106086400.000	107241472.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

4/7/2011 11:17:42 AM -- Jetstress testing begins ...
4/7/2011 11:17:42 AM -- Preparing for testing ...
4/7/2011 11:18:13 AM -- Attaching databases ...
4/7/2011 11:18:13 AM -- Preparations for testing are complete.
4/7/2011 11:18:13 AM -- Starting transaction dispatch ..
4/7/2011 11:18:13 AM -- Database cache settings: (minimum: 320.0 MB, maximum: 2.5 GB)
4/7/2011 11:18:13 AM -- Database flush thresholds: (start: 25.6 MB, stop: 51.2 MB)

4/7/2011 11:18:25 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
4/7/2011 11:18:25 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
4/7/2011 11:18:38 AM -- Operation mix: Sessions 3, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
4/7/2011 11:18:38 AM -- Performance logging started (interval: 15000 ms).
4/7/2011 11:18:38 AM -- Attaining prerequisites:
4/7/2011 11:25:31 AM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 2424574000.0 (lower bound: 2415919000.0, upper bound: none)
4/8/2011 11:25:31 AM -- Performance logging has ended.
4/8/2011 11:25:31 AM -- JetInterop batch transaction stats: 138811, 139214, 138904, 138633, 138783, 139309, 138717, 138351, 138633 and 138948.
4/8/2011 11:25:33 AM -- Dispatching transactions ends.
4/8/2011 11:25:33 AM -- Shutting down databases ...
4/8/2011 11:25:46 AM -- Instance1432.1 (complete), Instance1432.2 (complete), Instance1432.3 (complete), Instance1432.4 (complete), Instance1432.5 (complete), Instance1432.6 (complete), Instance1432.7 (complete), Instance1432.8 (complete), Instance1432.9 (complete) and Instance1432.10 (complete)
4/8/2011 11:25:46 AM -- has 5772 samples.
4/8/2011 11:25:46 AM -- Creating test report ...
4/8/2011 11:26:29 AM -- Instance1432.1 has 17.9 for I/O Database Reads Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.1 has 2.7 for I/O Log Writes Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.1 has 2.7 for I/O Log Reads Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.2 has 17.6 for I/O Database Reads Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.2 has 2.9 for I/O Log Writes Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.2 has 2.9 for I/O Log Reads Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.3 has 17.7 for I/O Database Reads Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.3 has 2.9 for I/O Log Writes Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.3 has 2.9 for I/O Log Reads Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.4 has 18.0 for I/O Database Reads Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.4 has 2.7 for I/O Log Writes Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.4 has 2.7 for I/O Log Reads Average Latency.
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4/8/2011 11:26:29 AM -- Instance1432.8 has 17.8 for I/O Database Reads Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.8 has 2.7 for I/O Log Writes Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.8 has 2.7 for I/O Log Reads Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.9 has 17.6 for I/O Database Reads Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.9 has 2.9 for I/O Log Writes Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.9 has 2.9 for I/O Log Reads Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.10 has 17.8 for I/O Database Reads Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.10 has 2.8 for I/O Log Writes Average Latency.
4/8/2011 11:26:29 AM -- Instance1432.10 has 2.8 for I/O Log Reads Average Latency.
4/8/2011 11:26:29 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
4/8/2011 11:26:29 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
4/8/2011 11:26:29 AM -- has 5744 samples queried.

Appendix B: Performance Testing

Microsoft Exchange Jetstress 2010

Performance Test Result Report

Test Summary

Overall Test Result	Pass
Machine Name	WIN-MDAA8648KFN
Test Description	.20 profile 3gb mailbox size 2000 mailboxes 2DAGS
Test Start Time	4/6/2011 2:24:14 PM
Test End Time	4/6/2011 4:32:01 PM
Collection Start Time	4/6/2011 2:31:47 PM
Collection End Time	4/6/2011 4:31:33 PM
Jetstress Version	14.01.0225.017
ESE Version	14.01.0218.012
Operating System	Windows Server 2008 R2 Enterprise (6.1.7600.0)

Database Sizing and Throughput

Achieved Transactional I/O per Second	481.835
Target Transactional I/O per Second	400
Initial Database Size (bytes)	6444740640768
Final Database Size (bytes)	6446502248448
Database Files (Count)	10

Jetstress System Parameters

Thread Count	3 (per database)
Minimum Database Cache	320.0 MB
Maximum Database Cache	2560.0 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

Instance1432.1 Log path: C:\Databases\DB1

Database: C:\Databases\DB1\Jetstress001001.edb

Instance1432.2 Log path: C:\Databases\DB2
Database: C:\Databases\DB2\Jetstress002001.edb

Instance1432.3 Log path: C:\Databases\DB3
Database: C:\Databases\DB3\Jetstress003001.edb

Instance1432.4 Log path: C:\Databases\DB4
Database: C:\Databases\DB4\Jetstress004001.edb

Instance1432.5 Log path: C:\Databases\DB5
Database: C:\Databases\DB5\Jetstress005001.edb

Instance1432.6 Log path: C:\Databases\DB6
Database: C:\Databases\DB6\Jetstress006001.edb

Instance1432.7 Log path: C:\Databases\DB7
Database: C:\Databases\DB7\Jetstress007001.edb

Instance1432.8 Log path: C:\Databases\DB8
Database: C:\Databases\DB8\Jetstress008001.edb

Instance1432.9 Log path: C:\Databases\DB9
Database: C:\Databases\DB9\Jetstress009001.edb

Instance1432.10 Log path: C:\Databases\DB10
Database: C:\Databases\DB10\Jetstress010001.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
Instance1432.1	17.997	15.277	28.730	19.649	38409.338	37238.944	0.000	2.676	0.000	18.014	0.000	4852.252
Instance1432.2	17.579	14.651	28.789	19.603	38357.384	37256.537	0.000	2.710	0.000	17.672	0.000	4830.595
Instance1432.3	17.668	14.467	28.227	19.231	38747.746	37229.487	0.000	2.781	0.000	17.393	0.000	4877.456
Instance1432.4	18.005	14.466	28.399	19.388	37968.778	37317.635	0.000	2.841	0.000	17.620	0.000	4857.607
Instance1432.5	17.759	13.547	28.899	19.736	37697.942	37328.616	0.000	2.672	0.000	18.014	0.000	4784.781
Instance1432.6	17.696	14.859	28.460	19.465	37720.208	37297.740	0.000	2.973	0.000	17.657	0.000	4834.084
Instance1432.7	17.801	13.746	28.587	19.409	38509.634	37149.332	0.000	2.689	0.000	17.448	0.000	4828.638
Instance1432.8	17.931	13.440	28.982	19.857	37502.862	37131.214	0.000	2.828	0.000	17.821	0.000	4802.473
Instance1432.9	17.633	16.034	28.454	19.506	37666.240	37293.633	0.000	2.902	0.000	17.879	0.000	4849.362
Instance1432.10	17.813	11.872	28.677	19.787	37593.733	37234.970	0.000	2.853	0.000	17.766	0.000	4847.531

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance1432.1	23.572	261446.397
Instance1432.2	23.578	261555.651
Instance1432.3	23.617	261402.203
Instance1432.4	23.532	261532.435
Instance1432.5	23.714	261511.752
Instance1432.6	23.582	261512.584
Instance1432.7	23.731	261493.304
Instance1432.8	23.541	261504.014
Instance1432.9	23.646	261537.851
Instance1432.10	23.700	261456.860

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance1432.1	0.355	138405.300
Instance1432.2	0.344	133574.300
Instance1432.3	0.343	132613.844
Instance1432.4	0.344	131638.742
Instance1432.5	0.350	135539.149
Instance1432.6	0.345	132952.485
Instance1432.7	0.340	132554.689
Instance1432.8	0.346	135036.953
Instance1432.9	0.353	136514.251
Instance1432.10	0.349	134956.951

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
Instance1432.1	17.997	15.277	52.303	19.649	138929.898	37238.944	3.854	2.676	0.355	18.014	138405.300	4852.252
Instance1432.2	17.579	14.651	52.367	19.603	138852.640	37256.537	3.783	2.710	0.344	17.672	133574.300	4830.595
Instance1432.3	17.668	14.467	51.844	19.231	140175.305	37229.487	3.188	2.781	0.343	17.393	132613.844	4877.456
Instance1432.4	18.005	14.466	51.931	19.388	139273.490	37317.635	3.828	2.841	0.344	17.620	131638.742	4857.607
Instance1432.5	17.759	13.547	52.613	19.736	138575.350	37328.616	3.519	2.672	0.350	18.014	135539.149	4784.781
Instance1432.6	17.696	14.859	52.043	19.465	139128.254	37297.740	3.087	2.973	0.345	17.657	132952.485	4834.084

Instance1432.7	17.801	13.746	52.318	19.409	139652.749	37149.332	3.043	2.689	0.340	17.448	132554.689	4828.638
Instance1432.8	17.931	13.440	52.524	19.857	137901.537	37131.214	3.517	2.828	0.346	17.821	135036.953	4802.473
Instance1432.9	17.633	16.034	52.100	19.506	139273.060	37293.633	3.278	2.902	0.353	17.879	136514.251	4849.362
Instance1432.10	17.813	11.872	52.377	19.787	138888.584	37234.970	3.579	2.853	0.349	17.766	134956.951	4847.531

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.197	1.329	3.170
Available Mbytes	8534.343	8518.000	8717.000
Free System Page Table Entries	33555615.452	33555604.000	33556119.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	171830404.820	171425792.000	173043712.000
Pool Paged Bytes	106007282.075	105967616.000	106078208.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

4/6/2011 2:24:14 PM -- Jetstress testing begins ...
4/6/2011 2:24:14 PM -- Preparing for testing ...
4/6/2011 2:24:32 PM -- Attaching databases ...
4/6/2011 2:24:32 PM -- Preparations for testing are complete.
4/6/2011 2:24:32 PM -- Starting transaction dispatch ..
4/6/2011 2:24:32 PM -- Database cache settings: (minimum: 320.0 MB, maximum: 2.5 GB)
4/6/2011 2:24:32 PM -- Database flush thresholds: (start: 25.6 MB, stop: 51.2 MB)
4/6/2011 2:24:47 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
4/6/2011 2:24:47 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
4/6/2011 2:24:58 PM -- Operation mix: Sessions 3, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
4/6/2011 2:24:58 PM -- Performance logging started (interval: 15000 ms).
4/6/2011 2:24:58 PM -- Attaining prerequisites:
4/6/2011 2:31:47 PM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 2429231000.0 (lower bound: 2415919000.0, upper bound: none)
4/6/2011 4:31:47 PM -- Performance logging has ended.
4/6/2011 4:31:47 PM -- JetInterop batch transaction stats: 12682, 12603, 12616, 12556, 12736, 12690, 12432, 12729, 12770 and 12766.
4/6/2011 4:31:49 PM -- Dispatching transactions ends.
4/6/2011 4:31:49 PM -- Shutting down databases ...
4/6/2011 4:32:01 PM -- Instance1432.1 (complete), Instance1432.2 (complete), Instance1432.3 (complete), Instance1432.4 (complete), Instance1432.5 (complete), Instance1432.6 (complete), Instance1432.7 (complete), Instance1432.8 (complete), Instance1432.9 (complete) and Instance1432.10 (complete)
4/6/2011 4:32:01 PM -- has 505 samples.
4/6/2011 4:32:01 PM -- Creating test report ...
4/6/2011 4:32:04 PM -- Instance1432.1 has 18.0 for I/O Database Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.1 has 2.7 for I/O Log Writes Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.1 has 2.7 for I/O Log Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.2 has 17.6 for I/O Database Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.2 has 2.7 for I/O Log Writes Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.2 has 2.7 for I/O Log Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.3 has 17.7 for I/O Database Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.3 has 2.8 for I/O Log Writes Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.3 has 2.8 for I/O Log Reads Average Latency.

4/6/2011 4:32:04 PM -- Instance1432.4 has 18.0 for I/O Database Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.4 has 2.8 for I/O Log Writes Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.4 has 2.8 for I/O Log Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.5 has 17.8 for I/O Database Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.5 has 2.7 for I/O Log Writes Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.5 has 2.7 for I/O Log Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.6 has 17.7 for I/O Database Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.6 has 3.0 for I/O Log Writes Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.6 has 3.0 for I/O Log Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.7 has 17.8 for I/O Database Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.7 has 2.7 for I/O Log Writes Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.7 has 2.7 for I/O Log Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.8 has 17.9 for I/O Database Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.8 has 2.8 for I/O Log Writes Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.8 has 2.8 for I/O Log Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.9 has 17.6 for I/O Database Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.9 has 2.9 for I/O Log Writes Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.9 has 2.9 for I/O Log Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.10 has 17.8 for I/O Database Reads Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.10 has 2.9 for I/O Log Writes Average Latency.
4/6/2011 4:32:04 PM -- Instance1432.10 has 2.9 for I/O Log Reads Average Latency.
4/6/2011 4:32:04 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
4/6/2011 4:32:04 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
4/6/2011 4:32:04 PM -- has 477 samples queried.

Appendix C: Backup Testing

Microsoft Exchange Jetstress 2010

Database backup Test Result Report Database Backup Statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance1432.1	616921.59	10:52:35	15.76
Instance1432.2	616929.59	03:42:02	46.31
Instance1432.3	616913.59	04:05:58	41.80
Instance1432.4	616937.59	04:13:04	40.63
Instance1432.5	616921.59	04:07:46	41.50
Instance1432.6	616921.59	14:40:51	11.67
Instance1432.7	616905.59	04:08:33	41.37
Instance1432.8	616921.59	04:10:08	41.10
Instance1432.9	616921.59	03:44:58	45.70
Instance1432.10	616913.59	04:11:21	40.91

Jetstress System Parameters

Thread Count	3 (per database)
Minimum Database Cache	320.0 MB
Maximum Database Cache	2560.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%

Read Operations	35%
Lazy Commits	70%

Database Configuration

Instance1432.1 Log path: C:\Databases\DB1
Database: C:\Databases\DB1\Jetstress001001.edb

Instance1432.2 Log path: C:\Databases\DB2
Database: C:\Databases\DB2\Jetstress002001.edb

Instance1432.3 Log path: C:\Databases\DB3
Database: C:\Databases\DB3\Jetstress003001.edb

Instance1432.4 Log path: C:\Databases\DB4
Database: C:\Databases\DB4\Jetstress004001.edb

Instance1432.5 Log path: C:\Databases\DB5
Database: C:\Databases\DB5\Jetstress005001.edb

Instance1432.6 Log path: C:\Databases\DB6
Database: C:\Databases\DB6\Jetstress006001.edb

Instance1432.7 Log path: C:\Databases\DB7
Database: C:\Databases\DB7\Jetstress007001.edb

Instance1432.8 Log path: C:\Databases\DB8
Database: C:\Databases\DB8\Jetstress008001.edb

Instance1432.9 Log path: C:\Databases\DB9
Database: C:\Databases\DB9\Jetstress009001.edb

Instance1432.10 Log path: C:\Databases\DB10
Database: C:\Databases\DB10\Jetstress010001.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
Instance1432.1	1397.810	0.000	62.956	0.000	180802.851	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1432.2	8.361	0.000	185.232	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1432.3	72.869	0.000	167.224	0.000	250374.269	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Instance1432.4	10.446	0.000	162.631	0.000	261103.746	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1432.5	9.151	0.000	165.985	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1432.6	2242.854	0.000	46.611	0.000	162982.589	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1432.7	9.163	0.000	165.472	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1432.8	9.215	0.000	164.411	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1432.9	8.476	0.000	182.740	0.000	261558.857	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1432.10	9.289	0.000	163.542	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	4.583	0.000	17.364
Available MBytes	11190.650	11178.000	11202.000
Free System Page Table Entries	33555615.658	33555601.000	33556122.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	172355150.881	172036096.000	173465600.000
Pool Paged Bytes	112876024.141	112238592.000	113377280.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log**4/10/2011 3:38:35 PM -- Jetstress testing begins ...**
4/10/2011 3:38:35 PM -- Preparing for testing ...
4/10/2011 3:38:46 PM -- Attaching databases ...
4/10/2011 3:38:46 PM -- Preparations for testing are complete.
4/10/2011 3:40:06 PM -- Performance logging started (interval: 30000 ms).
4/10/2011 3:40:06 PM -- Backing up databases ...
4/11/2011 6:20:58 AM -- Performance logging has ended.
4/11/2011 6:20:58 AM -- Instance1432.1 (100% processed), Instance1432.2 (100% processed), Instance1432.3 (100% processed), Instance1432.4 (100% processed), Instance1432.5 (100% processed), Instance1432.6 (100% processed), Instance1432.7 (100% processed), Instance1432.8 (100% processed), Instance1432.9 (100% processed) and Instance1432.10 (100% processed)
4/11/2011 6:20:58 AM -- has 1759 samples.
4/11/2011 6:20:58 AM -- Creating test report ...

Appendix D: Soft Recovery Testing

Microsoft Exchange Jetstress 2010

SoftRecovery Test Result Report

Soft-Recovery Statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance1432.1	508	1528.8806853
Instance1432.2	502	1488.3050141
Instance1432.3	508	1507.9298485
Instance1432.4	518	1722.2118249

Instance1432.5	501	1482.2054033
Instance1432.6	501	1573.699564
Instance1432.7	506	1500.769436
Instance1432.8	509	1519.3334686
Instance1432.9	505	1504.7474429
Instance1432.10	505	1511.1122541

Database Configuration

Instance1432.1 Log path: C:\Databases\DB1
Database: C:\Databases\DB1\Jetstress001001.edb

Instance1432.2 Log path: C:\Databases\DB2
Database: C:\Databases\DB2\Jetstress002001.edb

Instance1432.3 Log path: C:\Databases\DB3
Database: C:\Databases\DB3\Jetstress003001.edb

Instance1432.4 Log path: C:\Databases\DB4
Database: C:\Databases\DB4\Jetstress004001.edb

Instance1432.5 Log path: C:\Databases\DB5
Database: C:\Databases\DB5\Jetstress005001.edb

Instance1432.6 Log path: C:\Databases\DB6
Database: C:\Databases\DB6\Jetstress006001.edb

Instance1432.7 Log path: C:\Databases\DB7
Database: C:\Databases\DB7\Jetstress007001.edb

Instance1432.8 Log path: C:\Databases\DB8
Database: C:\Databases\DB8\Jetstress008001.edb

Instance1432.9 Log path: C:\Databases\DB9
Database: C:\Databases\DB9\Jetstress009001.edb

Instance1432.10 Log path: C:\Databases\DB10
Database: C:\Databases\DB10\Jetstress010001.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
Instance1432.1	25.536	2.049	293.001	1.990	41402.382	32681.312	11.677	0.000	2.986	0.000	231835.903	0.000
Instance1432.2	25.712	1.849	297.202	2.012	41436.650	32678.957	7.743	0.000	3.018	0.000	231855.009	0.000

Instance1432.3	25.281	1.803	302.236	2.017	41414.619	32768.000	7.401	0.000	3.025	0.000	232468.654	0.000
Instance1432.4	24.628	1.832	260.604	1.803	40242.754	29614.272	23.103	0.000	2.704	0.000	208999.287	0.000
Instance1432.5	25.394	1.973	298.815	2.028	41566.187	32589.428	7.736	0.002	3.045	0.008	231286.463	1.395
Instance1432.6	50.734	2.030	282.798	1.908	41213.773	32009.871	7.900	0.000	2.861	0.000	222366.078	0.000
Instance1432.7	25.662	2.005	296.689	2.020	41585.272	32591.353	7.635	0.000	3.030	0.000	231223.485	0.000
Instance1432.8	25.726	2.025	297.843	2.005	41535.917	32768.000	7.747	0.000	3.007	0.000	232481.702	0.000
Instance1432.9	25.922	1.883	293.647	2.010	41381.285	32679.914	7.698	0.000	3.016	0.000	231861.197	0.000
Instance1432.10	25.600	1.954	300.062	2.004	41365.050	32680.385	7.682	0.010	3.005	0.002	231881.170	1.369

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance1432.1	14.777	261732.867
Instance1432.2	14.797	261558.797
Instance1432.3	16.096	261468.591
Instance1432.4	13.487	238724.730
Instance1432.5	14.812	261362.077
Instance1432.6	14.117	252870.001
Instance1432.7	14.794	261659.311
Instance1432.8	14.774	261511.776
Instance1432.9	14.550	261717.326
Instance1432.10	14.765	261433.992

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
Instance1432.1	25.536	2.049	307.777	1.990	51980.772	32681.312	11.677	0.000	2.986	0.000	231835.903	0.000
Instance1432.2	25.712	1.849	311.999	2.012	51876.534	32678.957	7.743	0.000	3.018	0.000	231855.009	0.000
Instance1432.3	25.281	1.803	318.332	2.017	52541.160	32768.000	7.401	0.000	3.025	0.000	232468.654	0.000
Instance1432.4	24.628	1.832	274.091	1.803	50009.263	29614.272	23.103	0.000	2.704	0.000	208999.287	0.000
Instance1432.5	25.394	1.973	313.627	2.028	51946.760	32589.428	7.736	0.002	3.045	0.008	231286.463	1.395
Instance1432.6	50.734	2.030	296.914	1.908	51276.987	32009.871	7.900	0.000	2.861	0.000	222366.078	0.000
Instance1432.7	25.662	2.005	311.483	2.020	52037.956	32591.353	7.635	0.000	3.030	0.000	231223.485	0.000
Instance1432.8	25.726	2.025	312.617	2.005	51931.767	32768.000	7.747	0.000	3.007	0.000	232481.702	0.000
Instance1432.9	25.922	1.883	308.197	2.010	51783.600	32679.914	7.698	0.000	3.016	0.000	231861.197	0.000
Instance1432.10	25.600	1.954	314.827	2.004	51685.743	32680.385	7.682	0.010	3.005	0.002	231881.170	1.369

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	6.853	0.000	10.077
Available Mbytes	8617.511	8539.000	10903.000

Free System Page Table Entries	33555614.958	33555605.000	33556122.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	173032018.735	172331008.000	173936640.000
Pool Paged Bytes	111550041.930	111513600.000	111591424.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log4/9/2011 10:23:23 AM -- Jetstress testing begins ...
4/9/2011 10:23:23 AM -- Preparing for testing ...
4/9/2011 10:24:35 AM -- Attaching databases ...
4/9/2011 10:24:35 AM -- Preparations for testing are complete.
4/9/2011 10:24:35 AM -- Starting transaction dispatch ..
4/9/2011 10:24:35 AM -- Database cache settings: (minimum: 320.0 MB, maximum: 2.5 GB)
4/9/2011 10:24:35 AM -- Database flush thresholds: (start: 25.6 MB, stop: 51.2 MB)
4/9/2011 10:25:31 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
4/9/2011 10:25:31 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
4/9/2011 10:25:36 AM -- Operation mix: Sessions 3, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
4/9/2011 10:25:36 AM -- Performance logging started (interval: 15000 ms).
4/9/2011 10:25:36 AM -- Generating log files ...
4/9/2011 2:03:46 PM -- C:\Databases\DB1 (101.6% generated), C:\Databases\DB2 (100.2% generated), C:\Databases\DB3 (101.6% generated), C:\Databases\DB4 (103.6% generated), C:\Databases\DB5 (100.2% generated), C:\Databases\DB6 (100.2% generated), C:\Databases\DB7 (101.2% generated), C:\Databases\DB8 (101.8% generated), C:\Databases\DB9 (101.0% generated) and C:\Databases\DB10 (101.0% generated)
4/9/2011 2:03:46 PM -- Performance logging has ended.
4/9/2011 2:03:46 PM -- JetInterop batch transaction stats: 21930, 21821, 22244, 22196, 21941, 21856, 21992, 22114, 21843 and 21950.
4/9/2011 2:03:46 PM -- Dispatching transactions ends.
4/9/2011 2:03:46 PM -- Shutting down databases ...
4/9/2011 2:04:00 PM -- Instance1432.1 (complete), Instance1432.2 (complete), Instance1432.3 (complete), Instance1432.4 (complete), Instance1432.5 (complete), Instance1432.6 (complete), Instance1432.7 (complete), Instance1432.8 (complete), Instance1432.9 (complete) and Instance1432.10 (complete)
4/9/2011 2:04:00 PM -- has 871 samples.
4/9/2011 2:04:00 PM -- Creating test report ...
4/9/2011 2:04:03 PM -- Instance1432.1 has 18.0 for I/O Database Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.1 has 2.0 for I/O Log Writes Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.1 has 2.0 for I/O Log Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.2 has 16.9 for I/O Database Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.2 has 2.1 for I/O Log Writes Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.2 has 2.1 for I/O Log Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.3 has 17.1 for I/O Database Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.3 has 2.3 for I/O Log Writes Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.3 has 2.3 for I/O Log Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.4 has 18.0 for I/O Database Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.4 has 2.1 for I/O Log Writes Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.4 has 2.1 for I/O Log Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.5 has 17.5 for I/O Database Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.5 has 2.1 for I/O Log Writes Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.5 has 2.1 for I/O Log Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.6 has 17.1 for I/O Database Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.6 has 2.5 for I/O Log Writes Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.6 has 2.5 for I/O Log Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.7 has 17.7 for I/O Database Reads Average Latency.

4/9/2011 2:04:03 PM -- Instance1432.7 has 2.1 for I/O Log Writes Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.7 has 2.1 for I/O Log Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.8 has 17.7 for I/O Database Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.8 has 2.1 for I/O Log Writes Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.8 has 2.1 for I/O Log Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.9 has 17.1 for I/O Database Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.9 has 2.3 for I/O Log Writes Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.9 has 2.3 for I/O Log Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.10 has 17.6 for I/O Database Reads Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.10 has 2.1 for I/O Log Writes Average Latency.
4/9/2011 2:04:03 PM -- Instance1432.10 has 2.1 for I/O Log Reads Average Latency.
4/9/2011 2:04:03 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
4/9/2011 2:04:03 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
4/9/2011 2:04:03 PM -- has 870 samples queried.
4/9/2011 2:04:03 PM -- was saved.
4/9/2011 2:04:09 PM -- Performance logging started (interval: 4000 ms).
4/9/2011 2:04:09 PM -- Recovering databases ...
4/9/2011 2:32:51 PM -- Performance logging has ended.
4/9/2011 2:32:51 PM -- Instance1432.1 (1528.8806853), Instance1432.2 (1488.3050141), Instance1432.3 (1507.9298485), Instance1432.4 (1722.2118249), Instance1432.5 (1482.2054033), Instance1432.6 (1573.699564), Instance1432.7 (1500.769436), Instance1432.8 (1519.3334686), Instance1432.9 (1504.7474429) and Instance1432.10 (1511.1122541)
4/9/2011 2:32:51 PM -- has 427 samples.
4/9/2011 2:32:51 PM -- Creating test report ...