NetApp FAS3220 21,000-Mailbox Exchange 2010 Mailbox Resiliency Storage Solution

Tested with: ESRP–Storage Version 3.0
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Overview

This document provides information on a NetApp® FAS3220 FCP mailbox resiliency storage solution for Microsoft® Exchange Server, based on 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://technet.microsoft.com/en-us/exchange/ff182054.aspx.

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

Features

This document describes the testing of a 21,000-mailbox resiliency (2-copy) database availability group (DAG) configuration for Exchange Server 2010 with a NetApp FAS3220 storage system.

The NetApp FAS3220 is the new entry platform in the FAS3200 family with enhanced scalability and flexibility option with NetApp's unified storage architecture. The FAS3200 series performance is driven by a 64-bit architecture that uses high throughput, low latency links and PCI Express for all internal and external data transfers. With the FAS3200 series and Data ONTAP 8.1.2 you can efficiently consolidate SAN, NAS, primary, and secondary storage on a single platform. The FAS3220 system is designed to provide customers with the scalability to ensure that they are able to meet the demands of growing workloads. NetApp has designed FAS3200 systems to make them easy for you to install, configure, manage, and upgrade so you can quickly adapt your storage infrastructure to meet your changing business needs. You can minimize the use of data center resources including power,

cooling, and floor space-by taking advantage of a comprehensive set of storage-saving software features in Data ONTAP like Deduplication and Thin Provisioning.

- Deduplication enables you to store only one copy of each unique data object, substantially reducing capacity requirements.
- Thin provisioning helps avoid the costly overprovisioning and time-consuming reconfiguration that is typical with other storage solutions.

Customers can also easily expand data management capabilities as their needs grow by adding optional software features that provide enterprise-proven capabilities for automated provisioning and restoration; simple, efficient disaster recovery; automated application; and virtual machine-aware backup, recovery, and cloning.

For the purposes of this tested Exchange deployment, various NetApp best practice recommendations for an Exchange deployment were followed. The FAS3220 being tested used standard NetApp features such as Flash Cache, FlexVol® flexible volumes and RAID-DP® technologies.

Flash Cache speeds access to data through intelligent caching of recently read user data and NetApp metadata in the storage controller. No setup or ongoing administration is needed, although you have the option to tune the operation of Flash Cache.

FlexVol volumes enable the creation of logical storage volumes across a large pool of disk drives known as an aggregate. FlexVol volumes provide three core advantages for workloads such as Microsoft Exchange:

1. Using FlexVol volumes, the capacity and performance bandwidth of a large collection of fast drives can be made available to all volumes. Even very small FlexVol volumes have the performance benefit of a very large number of drives.
2. A large number of volumes may be created, all with independent Snapshot copy schedules, mirroring events, and so on.
3. All FlexVol volumes can be managed independently, while receiving the maximum I/O benefit of a much larger pool of drives.

RAID-DP is a high-performance implementation of RAID 6 that provides double parity across the disk subsystem and protects against the failure of up to two disks per RAID group. Calculations have shown double parity RAID offers over 160 times the protection against data loss than RAID 10 and almost 4,000 times the protection against data loss than RAID 5. The performance results listed in this report were produced with RAID-DP enabled.

For this ESRP testing environment, NetApp SnapManager® for Microsoft Exchange (SME) was not required. SnapManager for Exchange is an Exchange software backup and recovery management solution that integrates NetApp Snapshot backups with Microsoft Exchange Server via the Microsoft standard and approved Volume Shadow Copy Services (VSS) snapshot interface. NetApp highly recommends SnapManager for Exchange as part of a production Exchange deployment.

This ESRP testing topology uses a single DAG containing six mailbox servers. The detailed DAG architecture is specified in the next section.

Solution Description

This section outlines the Exchange 2010 mailbox resiliency solution NetApp used to run the ESRP tests.

Storage:

- A pair of FAS3220 storage controllers
- Data ONTAP 8.1.2X15 operating in Cluster-Mode
- SAS, 900GB 10K RPM drives
- Link to FAS3220 Windows Server® Catalog listing: http://www.windowsservercatalog.com/item.aspx?idItem=524efcc8-eb52-f414-7e5e-3a23807624bd&bCatID=1282

Switches:

- A pair Brocade 4100 4Gbps FC switches

Figure 1 depicts the DAG architecture and the topology of the Exchange 2010 mailbox resiliency solution using the NetApp FAS3220 storage system. The FAS3220 system consists of two storage controllers that form a two-node cluster: FAS3220-1 and FAS3220-2.

Data ONTAP 8 operating in Cluster-Mode allows two or more controllers (or nodes) operate as one shared resource pool or storage cluster. The storage cluster can be expanded, contracted, and subdivided nondisruptively into one or more secure partitions, or Vserver. A Vserver is a logical storage container that includes allocated storage resources from within the cluster as well as security parameters such as rights and permissions.

The green line in Figure 1 indicates the cluster interconnect, a 10Gbps, private, dedicated, redundant, high-throughput network for communication and data motion between the cluster nodes.

The Vservers in Figure 1 behave like virtual storage controllers, providing hosts data access to the storage resources inside the cluster.

Note, information on how to administer NetApp storage cluster and Vserver is beyond the scope of this report. Please consult NetApp product documentation for details.

The first Exchange data copy (active copy) is on the FAS3220-1. The second Exchange data copy (passive copy) is on the FAS3220-2.

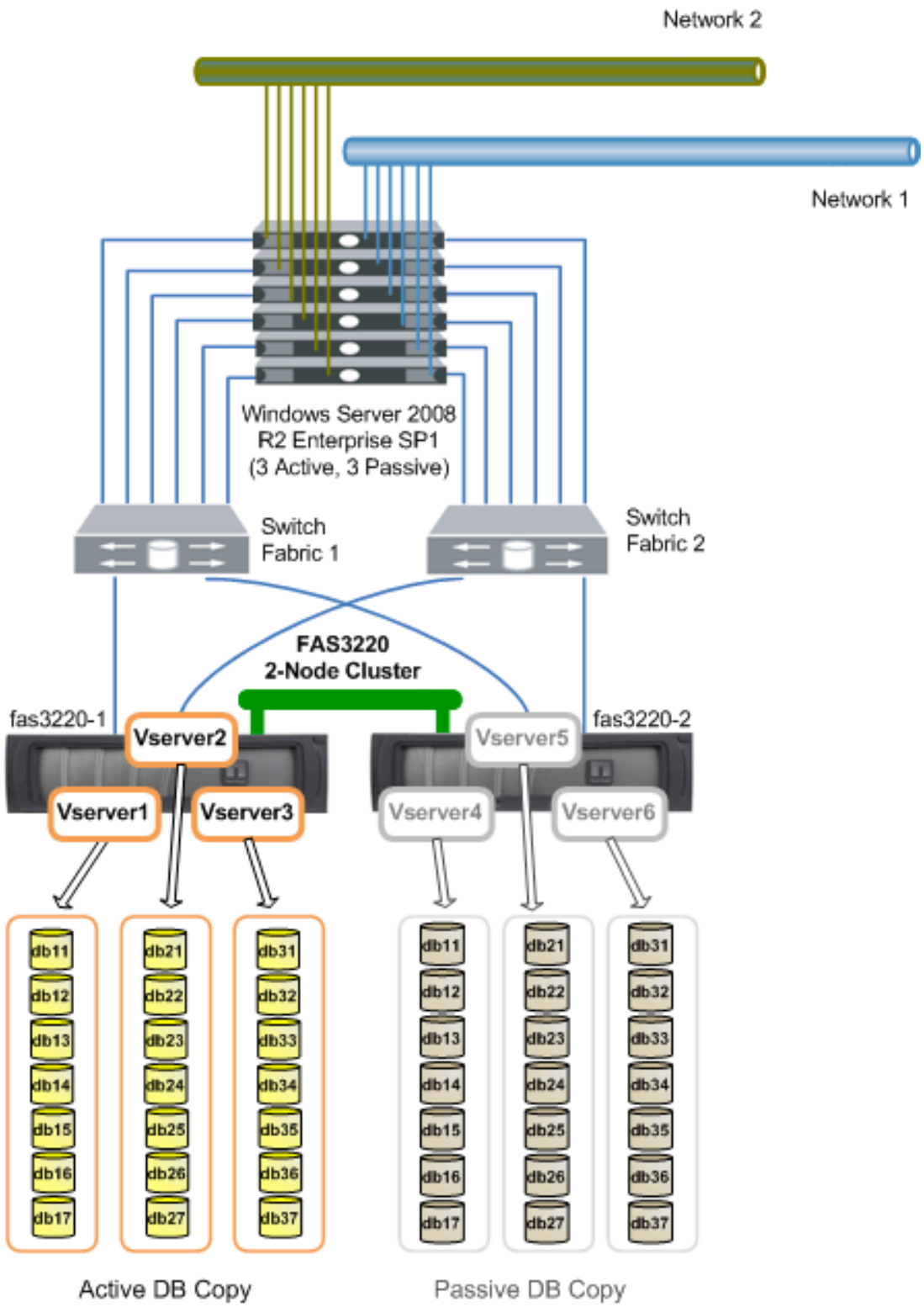

Figure 1) Topology and DAG architecture of the FAS3220 mailbox resiliency ESRP testing.

Only the primary copy storage is described below. The secondary copy storage (shown grayed out in Figure 1) is configured identically (from the host on down to the spindle, including brand, model, firmware, drivers, and so on).

The FAS3220-1 storage controller was configured with three aggregates. Each aggregate provides storage, with its corresponding Vserver provides data access for one of the three active servers. Each active server hosts 7,000 mailboxes. The details about the placement of aggregates, volumes, and LUNs are enumerated in the table following.

Controller Name	Aggregate	RAID Type	Number of Data Drives	Number of Parity Drives	VServer	Volume	LUN	Size of LUNs
FAS3220-1	**aggr1**	**RAID-DP**	**18**	**2**	**Vserver1**	**db11_fv**	**DB11**	**1.6TB**
						…	**…**	**…**
						db17_fv	**DB!7**	**1.6TB**
						log11_fv	**LOG11**	**24GB**
						…	**…**	**…**
						log17_fv	**LOG17**	**24GB**
	aggr2	**RAID-DP**	**18**	**2**	**Vserver2**	**db21_fv**	**DB21**	**1.6TB**
						…	**…**	**…**
						db27_fv	**DB27**	**1.6TB**
						log21_fv	**LOG21**	**24GB**
						…	**…**	**…**
						log27_fv	**LOG27**	**24GB**
	aggr3	**RAID-DP**	**18**	**2**	**Vserver3**	**db31_fv**	**DB31**	**1.6TB**
						…	**…**	**…**
						db37_fv	**DB37**	**1.6TB**
						log31_fv	**LOG31**	**24GB**
						…	**…**	**…**
						log37_fv	**LOG37**	**24GB**

The DAG configuration is as follows:

- Three active mailbox servers: 3650-4, 3650-5 and 3650-6
- 1,000 mailboxes per database
- Twenty one active databases total for 21,000 active mailboxes (7,000 active mailboxes per server):
    - DB11, DB12, …, and DB17 hosted on 3650-4

    - DB21, DB22, …, and DB27 hosted on 3650-5
    - DB31, DB32, …, and DB37 hosted on 3650-6
- Twenty one passive databases total (shown in gray in Figure 1): hosted by three additional servers; the passive database is on a separate aggregate and on the separate but identical storage controller: FAS3220-2
- Two copies of databases

For a Mailbox Resiliency configuration, databases and log files can be placed on the same set of disk drives (see http://technet.microsoft.com/en-us/library/ee832792.aspx). Therefore, each active server's seven database LUNs and seven log LUNs are placed on the same aggregate, as shown in the table above.

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 that affect the server scalability are server processor utilization, server physical and virtual memory limitations, resource requirements for other applications, directory and network service latencies, network infrastructure limitations, replication and recovery requirements, and client usage profiles. All these factors are beyond the scope of ESRP–Storage. Therefore, the number of mailboxes hosted per server as part of the tested configuration may not necessarily be viable for some customer deployments.

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

Targeted Customer Profile

This solution is designed for a small enterprise Exchange environment. The target customer would typically be one looking for a scalable, reliable, high-performance, and highly available Exchange storage solution. The solution tested is designed for:

- 21,000 mailboxes
- 6 servers (3 tested)
- 0.100 IOPS (0.120 tested for additional 20% head room)
- 1.5GB mailboxes

- Maintaining ample controller head room available for storage infrastructure activities such as data replication and disk reconstructs
- 24/7 background database maintenance (BDM)
- Mailbox Resiliency (2-copy)

Tested Deployment

The following tables summarize the testing environment.

Simulated Exchange Configuration

Number of Exchange mailboxes simulated	21,000
Number of Database Availability Groups (DAGs)	1
Number of servers/DAG	6
Number of active mailboxes/server	7,000
Number of databases/host	7
Number of copies/database	2
Number of mailboxes/database	1,000
Simulated profile: I/Os per second per mailbox (IOPS include 20% head room)	0.120 IOPs per mailbox (0.10 IOPs plus 20% head room added)
Database LUN size	1.6TB
Log LUN size	24GB
Total database size for performance testing	31,500GB
% storage capacity used by Exchange database**	92%

**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 (Fibre Channel, SAS, SATA, iSCSI)	Fibre Channel SAN
Storage model and OS/firmware revision	FAS3220 Data ONTAP 8.1.2 Cluster-Mode
Storage cache	524GB per controller (12 GB, plus 512GB Flash Cache)
Number of storage controllers	2 (1 tested)
Number of storage ports	2 4Gb/sec FC ports per controller

Maximum bandwidth of storage connectivity to host	16Gbps (4 x 4Gb/sec per port)
Switch type/model/firmware revision	Brocade 4100 FC Switch, v6.1.1b
HBA model and firmware	Emulex LP11002, v2.72a2
Number of HBAs/host	2 per host
Host server type	IBM x3650, 4 x 3.6 GHz CPU, 18GB RAM
Total number of disks tested in solution	60
Maximum number of spindles can be hosted in the storage	480

Storage Software

HBA driver	STOR miniport v7.2.20.006
HBA QueueTarget Setting	N/A
HBA QueueDepth Setting	254
Multi-Pathing	Data ONTAP DSM 3.5 for Windows MPIO
Host OS	Windows Server 2008 R2 Enterprise SP1
ESE.dll file version	14.01.0322.000
Replication solution name/version	N/A

Storage Disk Configuration (Mailbox Store Disks)

Disk type, speed, and firmware revision	SAS 900GB 10K RPM – FW NA00
Raw capacity per disk (GB)	900GB
Number of physical disks in test	60
Total raw storage capacity (GB)	54,000GB
Disk slice size (GB)	N/A
Number of slices per LUN or number of disks per LUN	Three aggregates (each consisting of one 20-disk RAID-DP group) per controller
Raid level	RAID-DP
Total formatted capacity	34,406GB
Storage capacity utilization	64%
Database capacity utilization	58%

Storage Disk Configuration (Transactional Log Disks Utilizing Same Disks as Mailbox Store Database)

Disk type, speed, and firmware revision	SAS 900GB 10K RPM – FW NA00
Raw capacity per disk (GB)	900GB
Number of spindles in test	60

Total raw storage capacity (GB)	54,000GB
Disk slice size (GB)	N/A
Number of slices per LUN or number of disks per LUN	Three aggregates (each consisting of one 20-disk RAID-DP group) per controller
Raid level	RAID-DP
Total formatted capacity	504GB

Best Practices

Exchange Server is a disk-sensitive application. Based on the testing run using the ESRP framework, NetApp recommends the following to improve storage performance.

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

Sizing

Performance, stability, disaster recovery procedures, and general Exchange maintenance all benefit from proper Exchange sizing. NetApp has studied the I/O patterns of Exchange systems running on NetApp storage. When a customer approaches NetApp for an Exchange storage solution, NetApp leverages this knowledge and expertise to properly size the storage specifically to the customer's environment. Several factors are taken into consideration in this process, including but not limited to:

- Number of mailboxes
- Mailbox size
- IOPS per mailbox
- Storage platform type
- Physical drive type
- Backup retention time

Layout

Another key consideration for Exchange Server 2010 is the layout of the databases, volumes, and LUNs. NetApp storage solutions can take full advantage of the performance benefits of aggregates and flexible volumes. And following proper layout guidelines is essential for a high-performing, low-latency Exchange solution. Consult with your NetApp Exchange specialist about proper layout to enable your Exchange deployment on NetApp storage to perform optimally in your environment.

Mailbox Resiliency

For this ESRP submission, we followed these NetApp Exchange best practices.

- Use dedicated FlexVol volumes for databases.
- Use dedicated FlexVol volumes for transaction logs.
- Spindle counts for databases and log files are derived from consulting with NetApp Exchange specialists. Further information on Exchange sizing is available from your local NetApp Exchange specialist.

Backup strategy

N/A.

Contact for Additional Information

Link to appropriate storage specs on netapp.com
NetApp Data ONTAP 8
NetApp Flash Cache
FlexVol and FlexClone® technologies
SnapDrive software
SnapManager for Exchange software
NetApp RAID-DP

Test Result Summary

This section provides a high-level summary of the test data from ESRP and the link to the detailed html reports that are generated by the 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 for checking reliability test runs for 24 hours. The goal is to verify that the storage can handle a high-I/O load for a long period of time. Both log and database files will be analyzed for integrity after the stress test so that there is no database/log corruption.

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

- No errors were reported in any of the event logs collected for the reliability tests.
- No errors were reported during the database and log checksum process.

Storage Performance Results

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

Individual Server Metrics:
The sum of I/Os across storage groups and the average latency across all storage groups on a per-server basis.

Host 3650-4

Database I/O	
Database Disks Transfers/sec	1255.57
Database Disks Reads/sec	783.05
Database Disks Writes/sec	472.52
Average Database Disk Read Latency (ms)	15.25
Average Database Disk Write Latency (ms)	5.38
Transaction Log I/O	
Log Disks Writes/sec	372.98
Average Log Disk Write Latency (ms)	1.36

Host 3650-5

Database I/O	
Database Disks Transfers/sec	1241.66
Database Disks Reads/sec	772.80
Database Disks Writes/sec	468.86
Average Database Disk Read Latency (ms)	15.27
Average Database Disk Write Latency (ms)	5.21
Transaction Log I/O	
Log Disks Writes/sec	369.90
Average Log Disk Write Latency (ms)	1.38

Host 3650-6

Database I/O	
Database Disks Transfers/sec	1260.51
Database Disks Reads/sec	784.44
Database Disks Writes/sec	476.07
Average Database Disk Read Latency (ms)	15.15
Average Database Disk Write Latency (ms)	5.57
Transaction Log I/O	
Log Disks Writes/sec	375.90
Average Log Disk Write Latency (ms)	1.38

Aggregate Performance Across All Servers Metrics:
This is the sum of I/Os across the three active servers in the solution and the average latency across the three servers in the solution.

Database I/O	
Database Disks Transfers/sec	3757.74
Database Disks Reads/sec	2340.29
Database Disks Writes/sec	1417.45
Average Database Disk Read Latency (ms)	15.22
Average Database Disk Write Latency (ms)	5.39
Transaction Log I/O	
Log Disks Writes/sec	1118.78
Average Log Disk Write Latency (ms)	1.37

Database Backup/Recovery Performance

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

Database Read-Only Performance

This test measures the maximum rate at which databases can be backed up via VSS. The following table shows the average rate for a single database file.

Host 3650-4

MB read/sec per database	28.653
MB read/sec total per server	200.570

Host 3650-5

MB read/sec per database	28.661
MB read/sec total per server	200.630

Host 3650-6

MB read/sec per database	29.983
MB read/sec total per server	209.880

Transaction Log Recovery/Replay Performance

This test measures 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 1MB in size.

Host 3650-4

Average time to play one log file (sec)	2.039

Host 3650-5

Average time to play one log file (sec)	2.109

Host 3650-6

Average time to play one log file (sec)	2.164

Conclusion

This document demonstrates that the NetApp FAS3220 is a high-performance, highly reliable, and high-efficiency storage system capable of supporting 21,000 Exchange 2010 users at 0.120 IOPs per user and a 1.5GB mailbox size in the Mailbox Resiliency configuration. Moreover, the tested solution has large IOPS headroom since it achieved 49% more IOPS than targeted.

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

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

NetApp offers its customers complete sizing information for Exchange Server deployments through its systems engineers. Contact your local NetApp sales office for additional information.

Appendix A – Test Results

This section includes representative test results from one of the three active servers under test: 3650-4. It is also representative of all three servers' test results, which are virtually identical.

24-Hour Stress/Reliability Test Results

Microsoft Exchange Server Jetstress - DBChecksum

Test Result Report (from server 3650-4)

Checksum Statistics - All

Database	Seen pages	Bad pages	Correctable pages	Wrong page-number pages	File length / seconds taken
c:\mount\db11\Jetstress001001.edb	49335650	0	0	0	1541739 MB/55189 sec
c:\mount\db12\Jetstress002001.edb	49335906	0	0	0	1541747 MB/55156 sec
c:\mount\db13\Jetstress003001.edb	49334882	0	0	0	1541715 MB/55170 sec
c:\mount\db14\Jetstress004001.edb	49336930	0	0	0	1541779 MB/55118 sec
c:\mount\db15\Jetstress005001.edb	49336418	0	0	0	1541763 MB/55081 sec
c:\mount\db16\Jetstress006001.edb	49335138	0	0	0	1541723 MB/55096 sec
c:\mount\db17\Jetstress007001.edb	49335906	0	0	0	1541747 MB/54983 sec
(Sum)	345350830	0	0	0	10792213 MB/55189 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
c:\mount\db11	0.078	0.000	446.249	0.000	65536.000
c:\mount\db12	0.080	0.000	446.913	0.000	65536.000
c:\mount\db13	0.081	0.000	446.910	0.000	65536.000
c:\mount\db14	0.081	0.000	447.311	0.000	65536.000
c:\mount\db15	0.081	0.000	447.742	0.000	65536.000
c:\mount\db16	0.080	0.000	447.520	0.000	65536.000
c:\mount\db17	0.078	0.000	448.491	0.000	65536.000

Memory System Performance (of checksum)

Counter	Average	Minimum	Maximum
% Processor Time	5.983	3.703	7.016
Available MBytes	16543.626	16529.000	16553.000
Free System Page Table Entries	33555386.192	33555337.000	33555850.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	52742391.365	52690944.000	53166080.000
Pool Paged Bytes	137812556.326	137687040.000	140775424.000

Test Log

10/5/2012 2:04:24 PM -- Jetstress testing begins ...
10/5/2012 2:04:24 PM -- Preparing for testing ...
10/5/2012 2:04:31 PM -- Attaching databases ...
10/5/2012 2:04:31 PM -- Preparations for testing are complete.
10/5/2012 2:04:31 PM -- Starting transaction dispatch ..
10/5/2012 2:04:31 PM -- Database cache settings: (minimum: 224.0 MB, maximum: 1.8 GB)
10/5/2012 2:04:31 PM -- Database flush thresholds: (start: 17.9 MB, stop: 35.8 MB)
10/5/2012 2:04:39 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
10/5/2012 2:04:39 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
10/5/2012 2:04:47 PM -- Operation mix: Sessions 6, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
10/5/2012 2:04:47 PM -- Performance logging started (interval: 15000 ms).
10/5/2012 2:04:47 PM -- Attaining prerequisites:
10/5/2012 2:08:18 PM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1701138000.0 (lower bound: 1691143000.0, upper bound: none)
10/6/2012 2:08:19 PM -- Performance logging has ended.
10/6/2012 2:08:19 PM -- JetInterop batch transaction stats: 429395, 429184, 428299, 430265, 431206, 428743 and 429345.
10/6/2012 2:08:19 PM -- Dispatching transactions ends.
10/6/2012 2:08:19 PM -- Shutting down databases ...
10/6/2012 2:08:23 PM -- Instance4024.1 (complete), Instance4024.2 (complete), Instance4024.3 (complete), Instance4024.4 (complete), Instance4024.5 (complete), Instance4024.6 (complete) and Instance4024.7 (complete)
10/6/2012 2:08:23 PM -- C:\Program Files\Exchange Jetstress\results\Stress_2012_10_5_14_4_39.blg has 5765 samples.
10/6/2012 2:08:23 PM -- Creating test report ...
10/6/2012 2:09:14 PM -- Instance4024.1 has 15.8 for I/O Database Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.1 has 1.3 for I/O Log Writes Average Latency.

10/6/2012 2:09:14 PM -- Instance4024.1 has 1.3 for I/O Log Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.2 has 15.8 for I/O Database Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.2 has 1.3 for I/O Log Writes Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.2 has 1.3 for I/O Log Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.3 has 15.9 for I/O Database Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.3 has 1.3 for I/O Log Writes Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.3 has 1.3 for I/O Log Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.4 has 15.8 for I/O Database Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.4 has 1.3 for I/O Log Writes Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.4 has 1.3 for I/O Log Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.5 has 15.9 for I/O Database Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.5 has 1.3 for I/O Log Writes Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.5 has 1.3 for I/O Log Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.6 has 15.8 for I/O Database Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.6 has 1.3 for I/O Log Writes Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.6 has 1.3 for I/O Log Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.7 has 15.9 for I/O Database Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.7 has 1.3 for I/O Log Writes Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.7 has 1.3 for I/O Log Reads Average Latency.
10/6/2012 2:09:14 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
10/6/2012 2:09:14 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
10/6/2012 2:09:14 PM -- C:\Program Files\Exchange Jetstress\results\Stress_2012_10_5_14_4_39.xml has 5750 samples queried.
10/6/2012 2:09:14 PM -- C:\Program Files\Exchange Jetstress\results\Stress_2012_10_5_14_4_39.html was saved.
10/6/2012 2:09:15 PM -- Performance logging started (interval: 30000 ms).
10/6/2012 2:09:15 PM -- Verifying database checksums ...
10/7/2012 5:29:05 AM -- c:\mount\db11 (100% processed), c:\mount\db12 (100% processed), c:\mount\db13 (100% processed), c:\mount\db14 (100% processed), c:\mount\db15 (100% processed), c:\mount\db16 (100% processed) and c:\mount\db17 (100% processed)
10/7/2012 5:29:05 AM -- Performance logging has ended.
10/7/2012 5:29:05 AM -- C:\Program Files\Exchange Jetstress\results\DBChecksum_2012_10_6_14_9_14.blg has 1838 samples.

Microsoft Exchange Server Jetstress - Stress

Stress Test Result Report (from server 3650-4)

Test Summary

Overall Test Result	**Pass**
Machine Name	3650-4
Test Description	
Test Start Time	10/5/2012 2:04:24 PM
Test End Time	10/6/2012 2:08:23 PM
Collection Start Time	10/5/2012 2:08:18 PM
Collection End Time	10/6/2012 2:08:16 PM
Jetstress Version	14.01.0225.017
ESE Version	14.01.0322.000
Operating System	Windows Server 2008 R2 Enterprise Service Pack 1 (6.1.7601.65536)
Performance Log	C:\Program Files\Exchange Jetstress\results\Stress_2012_10_5_14_4_39.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second	1189.746
Target Transactional I/O per Second	840
Initial Database Size (bytes)	11274370351104
Final Database Size (bytes)	11316455997440
Database Files (Count)	7

Jetstress System Parameters

Thread Count	6 (per database)
Minimum Database Cache	224.0 MB
Maximum Database Cache	1792.0 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

Instance4024.1 Log path: c:\mount\log11
Database: c:\mount\db11\Jetstress001001.edb

Instance4024.2 Log path: c:\mount\log12
Database: c:\mount\db12\Jetstress002001.edb

Instance4024.3 Log path: c:\mount\log13
Database: c:\mount\db13\Jetstress003001.edb

Instance4024.4 Log path: c:\mount\log14
Database: c:\mount\db14\Jetstress004001.edb

Instance4024.5 Log path: c:\mount\log15
Database: c:\mount\db15\Jetstress005001.edb

Instance4024.6 Log path: c:\mount\log16
Database: c:\mount\db16\Jetstress006001.edb

Instance4024.7 Log path: c:\mount\log17
Database: c:\mount\db17\Jetstress007001.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
Instance4024.1	15.850	6.638	106.130	63.528	34158.752	35732.171	0.000	1.323	0.000	52.151	0.000	4848.417
Instance4024.2	15.796	6.121	106.534	63.768	34129.727	35723.126	0.000	1.333	0.000	52.212	0.000	4838.841
Instance4024.3	15.860	5.913	106.028	63.429	34144.145	35728.660	0.000	1.322	0.000	51.966	0.000	4845.383
Instance4024.4	15.805	5.343	106.479	63.754	34131.852	35727.030	0.000	1.334	0.000	52.264	0.000	4854.127
Instance4024.5	15.854	4.887	106.782	63.936	34132.580	35726.883	0.000	1.323	0.000	52.408	0.000	4841.761
Instance4024.6	15.789	4.171	106.033	63.457	34149.101	35732.998	0.000	1.334	0.000	51.913	0.000	4852.433
Instance4024.7	15.860	3.551	106.281	63.607	34157.496	35732.183	0.000	1.319	0.000	52.181	0.000	4849.668

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance4024.1	31.595	261889.997
Instance4024.2	31.604	261889.187
Instance4024.3	31.605	261894.726
Instance4024.4	31.606	261887.534
Instance4024.5	31.608	261888.766
Instance4024.6	31.607	261892.355
Instance4024.7	31.608	261887.870

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance4024.1	1.030	232357.206
Instance4024.2	1.029	232087.008
Instance4024.3	1.026	232402.668
Instance4024.4	1.034	232479.256
Instance4024.5	1.034	232256.953
Instance4024.6	1.026	232359.802
Instance4024.7	1.031	232409.657

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
Instance4024.1	15.850	6.638	137.726	63.528	86402.051	35732.171	10.559	1.323	1.030	52.151	232357.206	4848.417
Instance4024.2	15.796	6.121	138.138	63.768	86238.425	35723.126	9.961	1.333	1.029	52.212	232087.008	4838.841
Instance4024.3	15.860	5.913	137.633	63.429	86443.203	35728.660	10.238	1.322	1.026	51.966	232402.668	4845.383
Instance4024.4	15.805	5.343	138.085	63.754	86262.879	35727.030	10.280	1.334	1.034	52.264	232479.256	4854.127
Instance4024.5	15.854	4.887	138.390	63.936	86151.072	35726.883	10.084	1.323	1.034	52.408	232256.953	4841.761
Instance4024.6	15.789	4.171	137.641	63.457	86447.012	35732.998	10.025	1.334	1.026	51.913	232359.802	4852.433
Instance4024.7	15.860	3.551	137.889	63.607	86359.403	35732.183	10.109	1.319	1.031	52.181	232409.657	4849.668

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	3.600	1.843	5.607
Available MBytes	14688.523	14636.000	14856.000
Free System Page Table Entries	33555337.973	33555276.000	33555340.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	51032719.246	50188288.000	51392512.000
Pool Paged Bytes	134051541.934	133820416.000	166723584.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

10/5/2012 2:04:24 PM -- Jetstress testing begins ...
10/5/2012 2:04:24 PM -- Preparing for testing ...
10/5/2012 2:04:31 PM -- Attaching databases ...
10/5/2012 2:04:31 PM -- Preparations for testing are complete.
10/5/2012 2:04:31 PM -- Starting transaction dispatch ..
10/5/2012 2:04:31 PM -- Database cache settings: (minimum: 224.0 MB, maximum: 1.8 GB)
10/5/2012 2:04:31 PM -- Database flush thresholds: (start: 17.9 MB, stop: 35.8 MB)
10/5/2012 2:04:39 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
10/5/2012 2:04:39 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
10/5/2012 2:04:47 PM -- Operation mix: Sessions 6, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
10/5/2012 2:04:47 PM -- Performance logging started (interval: 15000 ms).
10/5/2012 2:04:47 PM -- Attaining prerequisites:
10/5/2012 2:08:18 PM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1701138000.0 (lower bound: 1691143000.0, upper bound: none)
10/6/2012 2:08:19 PM -- Performance logging has ended.
10/6/2012 2:08:19 PM -- JetInterop batch transaction stats: 429395, 429184, 428299, 430265, 431206, 428743 and 429345.
10/6/2012 2:08:19 PM -- Dispatching transactions ends.
10/6/2012 2:08:19 PM -- Shutting down databases ...
10/6/2012 2:08:23 PM -- Instance4024.1 (complete), Instance4024.2 (complete), Instance4024.3 (complete), Instance4024.4 (complete), Instance4024.5 (complete), Instance4024.6 (complete) and Instance4024.7 (complete)
10/6/2012 2:08:23 PM -- C:\Program Files\Exchange Jetstress\results\Stress_2012_10_5_14_4_39.blg has 5765 samples.
10/6/2012 2:08:23 PM -- Creating test report ...
10/6/2012 2:09:14 PM -- Instance4024.1 has 15.8 for I/O Database Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.1 has 1.3 for I/O Log Writes Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.1 has 1.3 for I/O Log Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.2 has 15.8 for I/O Database Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.2 has 1.3 for I/O Log Writes Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.2 has 1.3 for I/O Log Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.3 has 15.9 for I/O Database Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.3 has 1.3 for I/O Log Writes Average Latency.

10/6/2012 2:09:14 PM -- Instance4024.3 has 1.3 for I/O Log Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.4 has 15.8 for I/O Database Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.4 has 1.3 for I/O Log Writes Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.4 has 1.3 for I/O Log Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.5 has 15.9 for I/O Database Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.5 has 1.3 for I/O Log Writes Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.5 has 1.3 for I/O Log Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.6 has 15.8 for I/O Database Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.6 has 1.3 for I/O Log Writes Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.6 has 1.3 for I/O Log Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.7 has 15.9 for I/O Database Reads Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.7 has 1.3 for I/O Log Writes Average Latency.
10/6/2012 2:09:14 PM -- Instance4024.7 has 1.3 for I/O Log Reads Average Latency.
10/6/2012 2:09:14 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
10/6/2012 2:09:14 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
10/6/2012 2:09:14 PM -- C:\Program Files\Exchange Jetstress\results\Stress_2012_10_5_14_4_39.xml has 5750 samples queried.

2-Hour Performance Test Results

Microsoft Exchange Server Jetstress - Performance

Performance Test Result Report (from server 3650-4)

Test Summary

Overall Test Result	**Pass**
Machine Name	3650-4
Test Description	
Test Start Time	10/7/2012 7:59:55 AM
Test End Time	10/7/2012 10:02:39 AM
Collection Start Time	10/7/2012 8:02:34 AM
Collection End Time	10/7/2012 10:02:29 AM
Jetstress Version	14.01.0225.017
ESE Version	14.01.0322.000
Operating System	Windows Server 2008 R2 Enterprise Service Pack 1 (6.1.7601.65536)
Performance Log	C:\Program Files\Exchange Jetstress\results\Performance_2012_10_7_8_0_10.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second	1255.573
Target Transactional I/O per Second	840
Initial Database Size (bytes)	11316455997440
Final Database Size (bytes)	11320188928000
Database Files (Count)	7

Jetstress System Parameters

Thread Count	6 (per database)
Minimum Database Cache	224.0 MB
Maximum Database Cache	1792.0 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

Instance4232.1	Log path: c:\mount\log11 Database: c:\mount\db11\Jetstress001001.edb
Instance4232.2	Log path: c:\mount\log12 Database: c:\mount\db12\Jetstress002001.edb
Instance4232.3	Log path: c:\mount\log13 Database: c:\mount\db13\Jetstress003001.edb

Instance4232.4 Log path: c:\mount\log14
Database: c:\mount\db14\Jetstress004001.edb

Instance4232.5 Log path: c:\mount\log15
Database: c:\mount\db15\Jetstress005001.edb

Instance4232.6 Log path: c:\mount\log16
Database: c:\mount\db16\Jetstress006001.edb

Instance4232.7 Log path: c:\mount\log17
Database: c:\mount\db17\Jetstress007001.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
Instance4232.1	15.294	6.863	111.446	67.360	34059.444	35199.186	0.000	1.355	0.000	53.127	0.000	4902.837
Instance4232.2	15.221	6.277	112.561	68.028	33975.086	35177.654	0.000	1.374	0.000	53.600	0.000	4883.156
Instance4232.3	15.299	6.075	112.149	67.591	33870.347	35165.338	0.000	1.358	0.000	53.331	0.000	4876.881
Instance4232.4	15.200	5.447	111.216	67.088	34120.668	35180.412	0.000	1.366	0.000	53.012	0.000	4892.601
Instance4232.5	15.239	5.017	111.496	67.154	34076.624	35192.771	0.000	1.350	0.000	52.756	0.000	4867.273
Instance4232.6	15.213	4.287	111.922	67.648	34190.349	35217.597	0.000	1.372	0.000	53.691	0.000	4912.975
Instance4232.7	15.317	3.672	112.264	67.650	33987.899	35224.668	0.000	1.355	0.000	53.463	0.000	4920.778

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance4232.1	31.593	261927.318
Instance4232.2	31.599	261892.741
Instance4232.3	31.591	261921.058
Instance4232.4	31.603	261889.218
Instance4232.5	31.593	261921.021
Instance4232.6	31.595	261908.037
Instance4232.7	31.607	261878.039

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance4232.1	1.062	232505.302
Instance4232.2	1.069	231974.208
Instance4232.3	1.060	232065.620
Instance4232.4	1.059	231103.539
Instance4232.5	1.047	232498.862
Instance4232.6	1.075	232451.538
Instance4232.7	1.074	232074.516

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
Instance4232.1	15.294	6.863	143.039	67.360	84388.583	35199.186	10.798	1.355	1.062	53.127	232505.302	4902.837
Instance4232.2	15.221	6.277	144.160	68.028	83933.102	35177.654	10.860	1.374	1.069	53.600	231974.208	4883.156
Instance4232.3	15.299	6.075	143.739	67.591	83990.507	35165.338	11.183	1.358	1.060	53.331	232065.620	4876.881
Instance4232.4	15.200	5.447	142.819	67.088	84521.946	35180.412	10.931	1.366	1.059	53.012	231103.539	4892.601
Instance4232.5	15.239	5.017	143.089	67.154	84383.350	35192.771	11.153	1.350	1.047	52.756	232498.862	4867.273
Instance4232.6	15.213	4.287	143.517	67.648	84322.211	35217.597	11.435	1.372	1.075	53.691	232451.538	4912.975

Instance4232.7	15.317	3.672	143.871	67.650	84052.898	35224.668	11.291	1.355	1.074	53.463	232074.516	4920.778

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	3.955	2.206	5.893
Available MBytes	14639.142	14632.000	14662.000
Free System Page Table Entries	33555338.056	33555335.000	33555340.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	53556764.860	53166080.000	53645312.000
Pool Paged Bytes	139330998.246	139190272.000	142176256.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

10/7/2012 7:59:55 AM -- Jetstress testing begins ...
10/7/2012 7:59:55 AM -- Preparing for testing ...
10/7/2012 8:00:02 AM -- Attaching databases ...
10/7/2012 8:00:02 AM -- Preparations for testing are complete.
10/7/2012 8:00:02 AM -- Starting transaction dispatch ..
10/7/2012 8:00:02 AM -- Database cache settings: (minimum: 224.0 MB, maximum: 1.8 GB)
10/7/2012 8:00:02 AM -- Database flush thresholds: (start: 17.9 MB, stop: 35.8 MB)
10/7/2012 8:00:10 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
10/7/2012 8:00:10 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
10/7/2012 8:00:17 AM -- Operation mix: Sessions 6, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
10/7/2012 8:00:17 AM -- Performance logging started (interval: 15000 ms).
10/7/2012 8:00:17 AM -- Attaining prerequisites:
10/7/2012 8:02:34 AM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1699201000.0 (lower bound: 1691143000.0, upper bound: none)
10/7/2012 10:02:35 AM -- Performance logging has ended.
10/7/2012 10:02:35 AM -- JetInterop batch transaction stats: 37234, 37454, 37287, 37219, 37304, 37766 and 37515.
10/7/2012 10:02:35 AM -- Dispatching transactions ends.
10/7/2012 10:02:35 AM -- Shutting down databases ...
10/7/2012 10:02:39 AM -- Instance4232.1 (complete), Instance4232.2 (complete), Instance4232.3 (complete), Instance4232.4 (complete), Instance4232.5 (complete), Instance4232.6 (complete) and Instance4232.7 (complete)
10/7/2012 10:02:39 AM -- C:\Program Files\Exchange Jetstress\results\Performance_2012_10_7_8_0_10.blg has 488 samples.
10/7/2012 10:02:39 AM -- Creating test report ...
10/7/2012 10:02:44 AM -- Instance4232.1 has 15.3 for I/O Database Reads Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.1 has 1.4 for I/O Log Writes Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.1 has 1.4 for I/O Log Reads Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.2 has 15.2 for I/O Database Reads Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.2 has 1.4 for I/O Log Writes Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.2 has 1.4 for I/O Log Reads Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.3 has 15.3 for I/O Database Reads Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.3 has 1.4 for I/O Log Writes Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.3 has 1.4 for I/O Log Reads Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.4 has 15.2 for I/O Database Reads Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.4 has 1.4 for I/O Log Writes Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.4 has 1.4 for I/O Log Reads Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.5 has 15.2 for I/O Database Reads Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.5 has 1.3 for I/O Log Writes Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.5 has 1.3 for I/O Log Reads Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.6 has 15.2 for I/O Database Reads Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.6 has 1.4 for I/O Log Writes Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.6 has 1.4 for I/O Log Reads Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.7 has 15.3 for I/O Database Reads Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.7 has 1.4 for I/O Log Writes Average Latency.
10/7/2012 10:02:44 AM -- Instance4232.7 has 1.4 for I/O Log Reads Average Latency.
10/7/2012 10:02:44 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
10/7/2012 10:02:44 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
10/7/2012 10:02:44 AM -- C:\Program Files\Exchange

Jetstress\results\Performance_2012_10_7_8_0_10.xml has 478 samples queried.

Database Backup Test Results

Microsoft Exchange Server Jetstress – Database Backup

Database Backup Test Result Report (from server 3650-4)

Database Backup Statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance8064.1	1542243.09	15:10:12	28.24
Instance8064.2	1542251.09	14:43:57	29.08
Instance8064.3	1542211.09	15:13:28	28.14
Instance8064.4	1542275.09	15:06:07	28.37
Instance8064.5	1542259.09	15:00:51	28.53
Instance8064.6	1542227.09	14:54:32	28.73
Instance8064.7	1542251.09	14:31:47	29.48

Jetstress System Parameters

Thread Count	6 (per database)
Minimum Database Cache	224.0 MB
Maximum Database Cache	1792.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%

Database Configuration

Instance8064.1	Log path: c:\mount\log11 Database: c:\mount\db11\Jetstress001001.edb
Instance8064.2	Log path: c:\mount\log12 Database: c:\mount\db12\Jetstress002001.edb
Instance8064.3	Log path: c:\mount\log13 Database: c:\mount\db13\Jetstress003001.edb
Instance8064.4	Log path: c:\mount\log14 Database: c:\mount\db14\Jetstress004001.edb
Instance8064.5	Log path: c:\mount\log15 Database: c:\mount\db15\Jetstress005001.edb
Instance8064.6	Log path: c:\mount\log16 Database: c:\mount\db16\Jetstress006001.edb
Instance8064.7	Log path: c:\mount\log17 Database: c:\mount\db17\Jetstress007001.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
Instance8064.1	14.573	0.000	112.906	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance8064.2	14.142	0.000	116.303	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance8064.3	14.659	0.000	112.519	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance8064.4	14.478	0.000	113.431	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance8064.5	14.378	0.000	114.091	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance8064.6	14.283	0.000	114.920	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance8064.7	13.991	0.000	117.930	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	3.087	0.987	3.805
Available MBytes	16552.503	16542.000	16556.000
Free System Page Table Entries	33555352.031	33555335.000	33555850.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	53997844.059	53989376.000	54083584.000
Pool Paged Bytes	140451453.966	140304384.000	143433728.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

10/8/2012 6:54:52 AM -- Jetstress testing begins ...
10/8/2012 6:54:52 AM -- Preparing for testing ...
10/8/2012 6:54:59 AM -- Attaching databases ...
10/8/2012 6:54:59 AM -- Preparations for testing are complete.
10/8/2012 6:55:11 AM -- Performance logging started (interval: 30000 ms).
10/8/2012 6:55:11 AM -- Backing up databases ...
10/8/2012 10:08:40 PM -- Performance logging has ended.
10/8/2012 10:08:40 PM -- Instance8064.1 (100% processed), Instance8064.2 (100% processed), Instance8064.3 (100% processed), Instance8064.4 (100% processed), Instance8064.5 (100% processed), Instance8064.6 (100% processed) and Instance8064.7 (100% processed)
10/8/2012 10:08:40 PM -- C:\Program Files\Exchange Jetstress\results\DatabaseBackup_2012_10_8_6_54_59.blg has 1825 samples.
10/8/2012 10:08:40 PM -- Creating test report ...

Soft Recovery Test Results

Microsoft Exchange Server Jetstress – Soft Recovery

SoftRecovery Test Result Report (from server 3650-4)

Soft-Recovery Statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance7452.1	505	1024.7501999
Instance7452.2	509	1057.3698572
Instance7452.3	501	1021.8329948
Instance7452.4	504	1054.983053
Instance7452.5	509	1023.6893981
Instance7452.6	509	1022.6285962
Instance7452.7	508	1023.4241976

Database Configuration

Instance7452.1 Log path: c:\mount\log11
Database: c:\mount\db11\Jetstress001001.edb

Instance7452.2 Log path: c:\mount\log12
Database: c:\mount\db12\Jetstress002001.edb

Instance7452.3 Log path: c:\mount\log13
Database: c:\mount\db13\Jetstress003001.edb

Instance7452.4 Log path: c:\mount\log14
Database: c:\mount\db14\Jetstress004001.edb

Instance7452.5 Log path: c:\mount\log15
Database: c:\mount\db15\Jetstress005001.edb

Instance7452.6 Log path: c:\mount\log16
Database: c:\mount\db16\Jetstress006001.edb

Instance7452.7 Log path: c:\mount\log17
Database: c:\mount\db17\Jetstress007001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O Database Reads	I/O Database Writes	I/O Database	I/O Database	I/O Database Reads	I/O Database Writes	I/O Log Reads Average	I/O Log Writes Average	I/O Log Reads/	I/O Log Writes	I/O Log Reads Average	I/O Log Writes Average

	Average Latency (msec)	Average Latency (msec)	Reads/sec	Writes/sec	Average Bytes	Average Bytes	Latency (msec)	Latency (msec)	sec	/sec	Bytes	Bytes
Instance7452.1	12.153	1.314	448.199	2.948	40890.597	32768.000	14.205	0.000	4.423	0.000	232538.232	0.000
Instance7452.2	12.869	1.365	427.704	2.864	40954.225	32768.000	14.559	0.000	4.296	0.000	232386.251	0.000
Instance7452.3	12.068	1.455	450.575	2.937	40670.700	32768.000	14.939	0.008	4.405	0.003	232500.463	2.024
Instance7452.4	12.673	1.334	438.556	2.853	40995.527	32768.000	14.875	0.000	4.279	0.000	232533.770	0.000
Instance7452.5	11.578	1.337	459.545	2.978	40712.561	32768.000	15.043	0.000	4.467	0.000	231687.876	0.000
Instance7452.6	11.819	1.342	448.775	2.984	40803.898	32768.000	14.952	0.003	4.476	0.003	232471.822	2.024
Instance7452.7	12.172	1.671	441.866	2.978	40953.902	32768.000	14.025	0.000	4.467	0.000	232552.213	0.000

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance7452.1	28.175	261975.413
Instance7452.2	28.249	261875.653
Instance7452.3	28.009	261933.744
Instance7452.4	28.348	261996.872
Instance7452.5	28.817	261956.384
Instance7452.6	28.017	261948.431
Instance7452.7	28.044	261939.461

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
Instance7452.1	12.153	1.314	476.375	2.948	53966.710	32768.000	14.205	0.000	4.423	0.000	232538.232	0.000
Instance7452.2	12.869	1.365	455.953	2.864	54641.528	32768.000	14.559	0.000	4.296	0.000	232386.251	0.000
Instance7452.3	12.068	1.455	478.584	2.937	53620.149	32768.000	14.939	0.008	4.405	0.003	232500.463	2.024
Instance7452.4	12.673	1.334	466.904	2.853	54413.530	32768.000	14.875	0.000	4.279	0.000	232533.770	0.000
Instance7452.5	11.578	1.337	488.361	2.978	53767.555	32768.000	15.043	0.000	4.467	0.000	231687.876	0.000
Instance7452.6	11.819	1.342	476.792	2.984	53798.660	32768.000	14.952	0.003	4.476	0.003	232471.822	2.024
Instance7452.7	12.172	1.671	469.910	2.978	54142.025	32768.000	14.025	0.000	4.467	0.000	232552.213	0.000

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	7.677	2.042	11.434
Available MBytes	14659.366	14608.000	16257.000
Free System Page Table Entries	33555338.198	33555336.000	33555340.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	54887181.679	54702080.000	55091200.000
Pool Paged Bytes	141204988.092	141164544.000	141352960.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

10/8/2012 10:54:47 PM -- Jetstress testing begins ...
10/8/2012 10:54:47 PM -- Preparing for testing ...
10/8/2012 10:54:55 PM -- Attaching databases ...
10/8/2012 10:54:55 PM -- Preparations for testing are complete.
10/8/2012 10:54:55 PM -- Starting transaction dispatch ..
10/8/2012 10:54:55 PM -- Database cache settings: (minimum: 224.0 MB, maximum: 1.8 GB)
10/8/2012 10:54:55 PM -- Database flush thresholds: (start: 17.9 MB, stop: 35.8 MB)
10/8/2012 10:55:03 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
10/8/2012 10:55:03 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
10/8/2012 10:55:08 PM -- Operation mix: Sessions 6, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
10/8/2012 10:55:08 PM -- Performance logging started (interval: 15000 ms).
10/8/2012 10:55:08 PM -- Generating log files ...
10/8/2012 11:52:27 PM -- c:\mount\log11 (101.0% generated), c:\mount\log12 (101.8% generated), c:\mount\log13 (100.2% generated), c:\mount\log14 (100.8% generated), c:\mount\log15 (101.8% generated), c:\mount\log16 (101.8% generated) and c:\mount\log17 (101.6% generated)
10/8/2012 11:52:27 PM -- Performance logging has ended.
10/8/2012 11:52:27 PM -- JetInterop batch transaction stats: 21828, 21959, 21638, 22262, 21912, 21841 and 21906.

10/8/2012 11:52:27 PM -- Dispatching transactions ends.
10/8/2012 11:52:27 PM -- Shutting down databases ...
10/8/2012 11:52:31 PM -- Instance7452.1 (complete), Instance7452.2 (complete), Instance7452.3 (complete), Instance7452.4 (complete), Instance7452.5 (complete), Instance7452.6 (complete) and Instance7452.7 (complete)
10/8/2012 11:52:31 PM -- C:\Program Files\Exchange Jetstress\results\Performance_2012_10_8_22_55_3.blg has 229 samples.
10/8/2012 11:52:31 PM -- Creating test report ...
10/8/2012 11:52:33 PM -- Instance7452.1 has 14.6 for I/O Database Reads Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.1 has 1.2 for I/O Log Writes Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.1 has 1.2 for I/O Log Reads Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.2 has 14.5 for I/O Database Reads Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.2 has 1.2 for I/O Log Writes Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.2 has 1.2 for I/O Log Reads Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.3 has 14.5 for I/O Database Reads Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.3 has 1.2 for I/O Log Writes Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.3 has 1.2 for I/O Log Reads Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.4 has 14.4 for I/O Database Reads Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.4 has 1.3 for I/O Log Writes Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.4 has 1.3 for I/O Log Reads Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.5 has 14.4 for I/O Database Reads Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.5 has 1.2 for I/O Log Writes Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.5 has 1.2 for I/O Log Reads Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.6 has 14.4 for I/O Database Reads Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.6 has 1.2 for I/O Log Writes Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.6 has 1.2 for I/O Log Reads Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.7 has 14.5 for I/O Database Reads Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.7 has 1.2 for I/O Log Writes Average Latency.
10/8/2012 11:52:33 PM -- Instance7452.7 has 1.2 for I/O Log Reads Average Latency.
10/8/2012 11:52:33 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
10/8/2012 11:52:33 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
10/8/2012 11:52:33 PM -- C:\Program Files\Exchange Jetstress\results\Performance_2012_10_8_22_55_3.xml has 228 samples queried.
10/8/2012 11:52:33 PM -- C:\Program Files\Exchange Jetstress\results\Performance_2012_10_8_22_55_3.html was saved.
10/8/2012 11:52:38 PM -- Performance logging started (interval: 4000 ms).
10/8/2012 11:52:38 PM -- Recovering databases ...
10/9/2012 12:10:15 AM -- Performance logging has ended.
10/9/2012 12:10:15 AM -- Instance7452.1 (1024.7501999), Instance7452.2 (1057.3698572), Instance7452.3 (1021.8329948), Instance7452.4 (1054.983053), Instance7452.5 (1023.6893981), Instance7452.6 (1022.6285962) and Instance7452.7 (1023.4241976)
10/9/2012 12:10:16 AM -- C:\Program Files\Exchange Jetstress\results\SoftRecovery_2012_10_8_23_52_33.blg has 262 samples.
10/9/2012 12:10:16 AM -- Creating test report ...