



Dell Compellent Storage Center 6.4 25,000 Mailbox Exchange 2013 Resiliency Storage Solution

Microsoft ESRP 4.0

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January 2014

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Revisions

Date	Description
January 2014	Initial release

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1 Executive summary

This document provides information on Dell Compellent's storage solution for Microsoft Exchange Server, based the Microsoft Exchange Solution Reviewed Program (ESRP) – Storage program.

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>

1.1 Simulated environment

The solution presented in this document is designed to simulate a large number of mailboxes hosted on highly redundant hardware. Application level redundancy is augmented with redundant storage to create a highly available and fault tolerant solution.

The Mailbox Resiliency features of Exchange 2013 have greatly enhanced the availability of Exchange Server, while also improving I/O performance. The solution presented here is a Mailbox Resiliency solution utilizing 1 Database Availability Group (DAG) and 2 copies of every database. The tested environment simulates all users in this DAG running on a single Storage Center, or half of the solution. The number of users simulated was 25,000 across 5 servers, with 5,000 users per server. The mailbox size was 2GB per user. Each server has 5 databases, with one copy local and the second copy replicated to the second server. This provides redundancy through hardware and software.

The replication mechanism is the native Exchange 2013 DAG database replication engine. This is a very efficient and reliable replication mechanism and is the recommended method for providing highly-available and redundant Exchange solutions.

1.2 Solution description

Testing was performed on a Dell Compellent Storage Center (SC8000) v6.4, a redundant controller pair, with redundant front-end and back-end connections. The front-end connections are fiber-channel based, over redundant fabrics, with 2 ports per server, and 4 ports per controller. Four 24 bay 2.5" drive enclosures are utilized with each Storage Center.

The disk connectivity is SAS 6Gbps. Disk drive used are SAS 10K 900GB. The spindle count is 82 disks/5 spares for database and logs, on a dedicated disk pool on each Storage Center. As this is a redundant solution, databases and logs are stored together on the same volumes. All volumes are RAID-5.

For information about compatibility please use the following link:

<http://windowsservercatalog.com/item.aspx?idItem=106986ce-14ad-4910-9628-26af9bdd02f3&bCatID=1282>



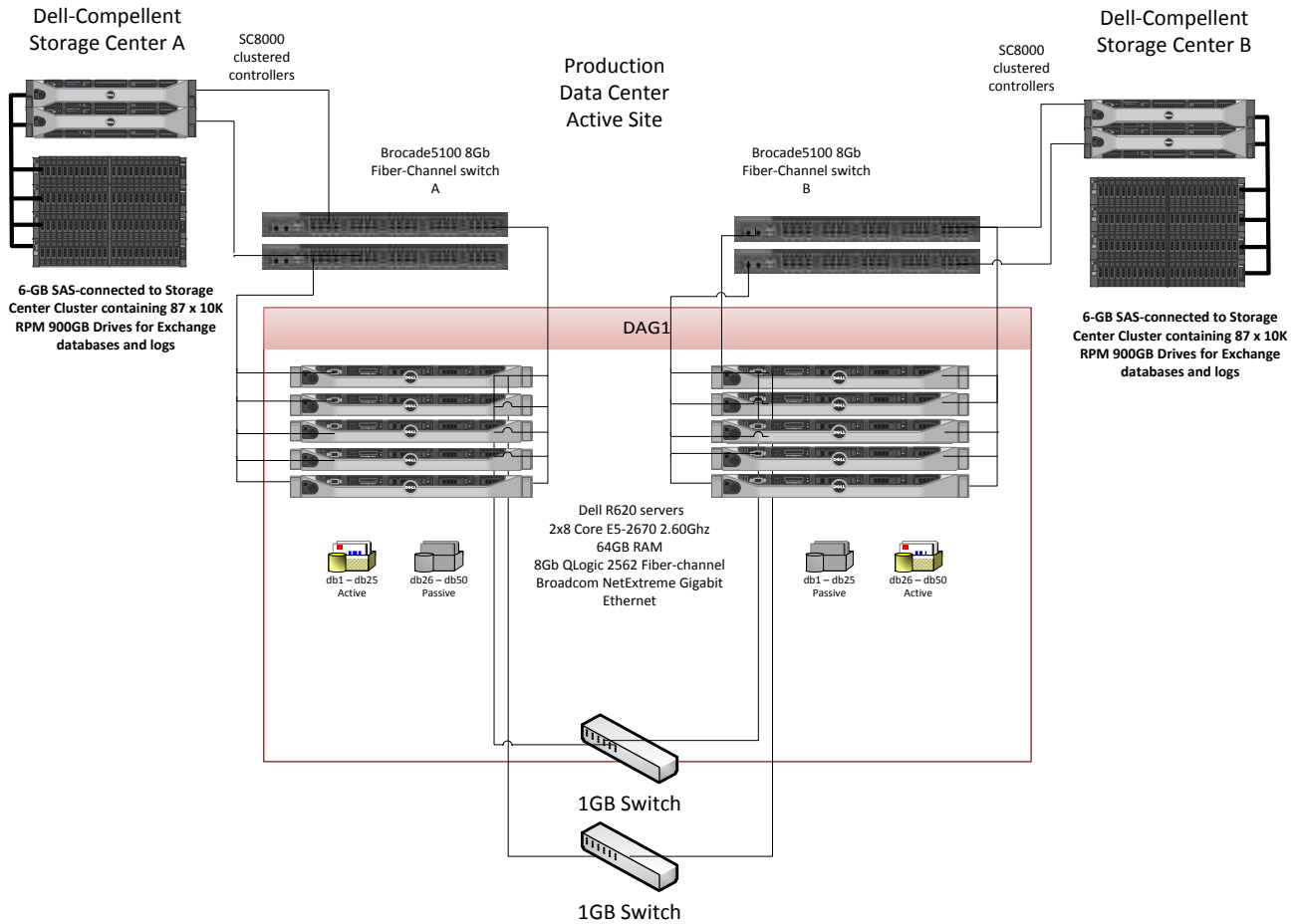


Figure 1 - Highly Available Data Center Design

The solution is designed around a highly available data center model (Figure 1). There are 2 disk arrays, for complete redundancy. The Exchange configuration is 1 DAG. The LAN ports are in a dedicated replication VLAN, for traffic isolation. There are 2 networks for redundancy.

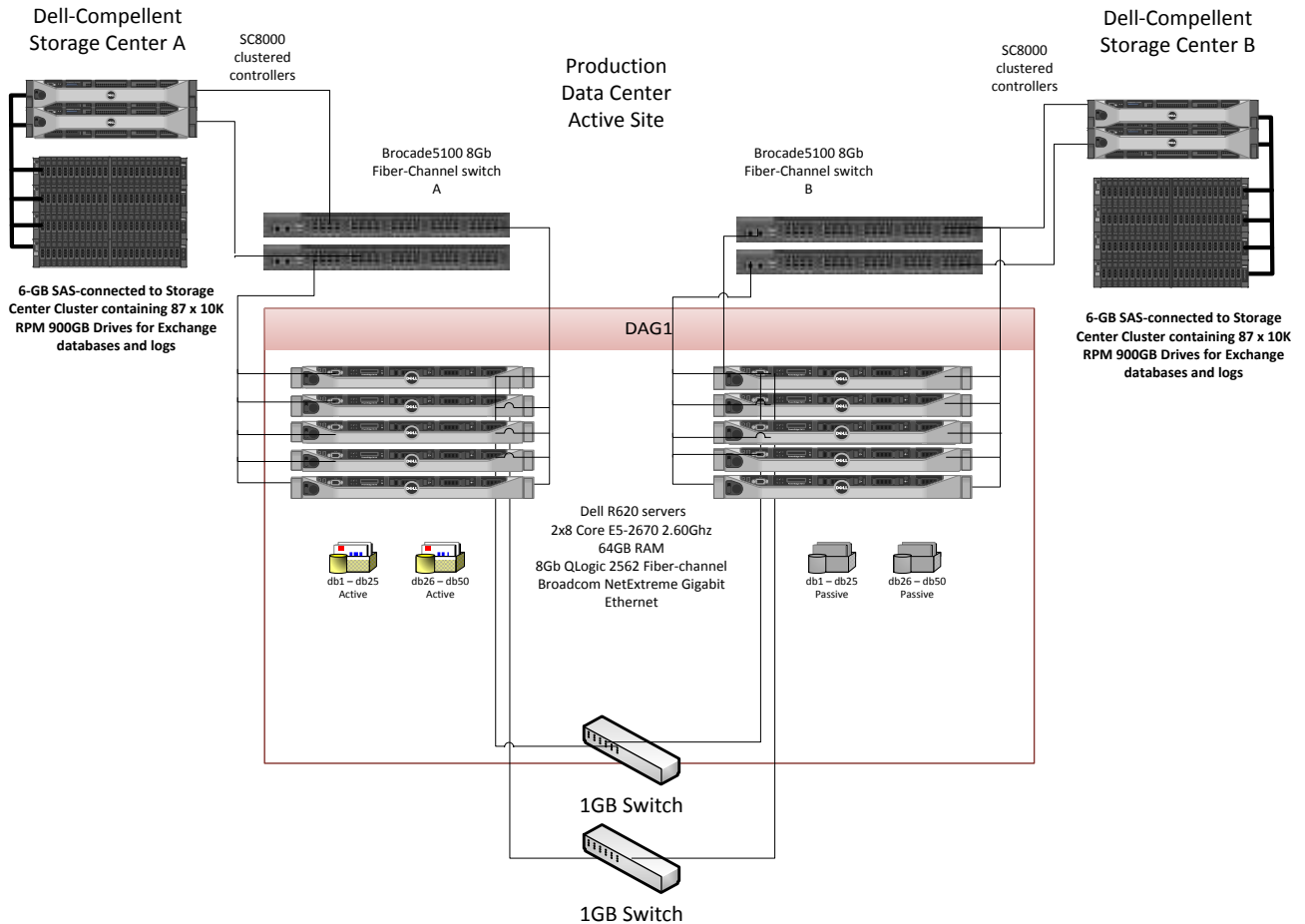


Figure 2 – Tested configuration with Storage Center A with Full user Load and Storage Center B offline

The tested configuration is a single Storage Center array (Figure 2), running with the full user load. This is to clearly show a single array can handle the user load in an array failure scenario. Under normal operating conditions the preferred activation scenario would be to run half of the mailbox databases active on each Storage Center array, while either array could handle the entire workload at any given time.

The ability to handle the entire workload on a single Storage Center array means no IO performance degradation will occur if an array or any volume(s) were to fail. All mailbox servers would have volumes mapped to both arrays, with 1 copy of each database on each array.

2 The Dell Compellent Storage Center (SC8000) solution

2.1 A modular hardware design

The hardware design consists of Dell 12G server-based clustered controllers providing automatic failover. Dell Compellent can seamlessly connect to any open-systems server without the need for server side agents. Organizations can mix and match Fiber Channel and iSCSI server connectivity, and disk enclosures support any external interface and disks based on Solid State, Fiber Channel, and/or Serial ATA. Next-generation SC8000 controllers combine the benefits of proven Dell™ Fluid Data™ architecture with resilient Dell hardware design to provide efficiency, quality and durability. Compared with previous generations of Compellent controllers, the SC8000 offers increased density, exceptional processing power, greater memory, and faster PCIe Gen3 I/O bus — making the SC8000 the scalability and performance platform choice for the future.

2.2 Powerful suite of software

Storage Center offers a powerful suite of enterprise capabilities to manage data differently. Building on Dell Compellent's Dynamic Block Architecture, Storage Center software intelligently optimizes data movement and access at the block-level to maximize utilization, automate tiered storage, simplify replication and speed data recovery.

2.3 Intuitive, unified interface

A centralized management interface streamlines administration and speeds common storage management tasks. The interface features a point-and-click wizard-based setup and management, comprehensive Phone Home capabilities, automatic notification when user-defined capacity thresholds are reached, and advanced storage consumption and chargeback reporting.

Dell Compellent's Enterprise Manager further simplifies storage management by providing comprehensive monitoring of all local and remote Storage Center environments.

Enterprise Manager allows you to gain better insight into your Storage Center deployments and reduces planning and configuration time for remote replications.

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

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



2.4 Targeted customer profile

This solution is targeted for users large and small. Capacity can be dynamically scaled from 1TB to over a Petabyte. This provides excellent growth potential with no downtime required for upgrades.

1. A Storage Center solution can be sized for any size organization
2. Unlimited number of hosts can be attached, via Fiber-Channel and iSCSI
3. User IO profile (.10 IOPS per user, .12 tested, giving 20% headroom).
4. User mailbox size (2 GB quota)
5. Backup strategy - VSS backup using SAN based snapshots, use Mailbox Resiliency as primary data protection mechanism.
6. Using SAN based snapshots, and boot from SAN, a complete server can be restored in minutes.
7. The tested RAID type was RAID 5 for database volumes and log volumes, while a mix of RAID10, RAID5, and RAID6 can be blended, with fully automated tiered storage providing the most efficient and best performing storage where needed.

2.5 Volume sizing

The volume size tested was just large enough to support the database size. Volumes on Dell Compellent storage can be grown dynamically, without affecting service. As database sizes approach volume sizes, any volume can be automatically increased on demand. This simplifies sizing, as capacity can be added as needed.

Using Dell Compellent Dynamic Capacity and hot upgrades additional disk capacity can be added as needed. If more spindles are required to accommodate growth they can simply be cabled and added to the disk pool to grow volume space. Since volumes are not tied to spindle boundaries adding spindles will increase performance and capacity as the system grows.

The testing environment was configured for 95% storage utilization. If the storage requirement grows beyond the design specified, additional spindles will provide additional capacity for any volume to be expanded.



3 Tested deployment

The following tables summarize the testing environment.

3.1 Simulated Exchange configuration

Table 1 Simulated Exchange configuration

Number of Exchange mailboxes simulated	25,000
Number of Database Availability Groups (DAGs)	1
Number of servers/DAG	10 (5 tested)
Number of active mailboxes/server	5000
Number of databases/host	5
Number of copies/database	2
Number of mailboxes/database	1000
Simulated profile: I/O's per second per mailbox (IOPS, include 20% headroom)	.10 (.12 tested)
Database/Log LUN size	2.2 TB
Total database size for performance testing	52.5 TB
% storage capacity used by Exchange database**	95%

* Note: Database size and capacity utilized may not match on a thin-provisioned system, as only used pages will consume space. Pages that are allocated, but contain blank data, may not use disk.



3.2 Primary storage hardware

Table 2 Primary storage hardware

Storage Connectivity (Fiber Channel, SAS, SATA, iSCSI)	SAS
Storage model and OS/firmware revision	Dell Compellent Storage Center (SC8000) v6.4 http://windowsservercatalog.com/item.aspx?idItem=106986ce-14ad-4910-9628-26af9bdd02f3&bCatID=1282
Storage cache	16 GB
Number of storage controllers	2
Number of storage ports	4 active ports per controller
Maximum bandwidth of storage connectivity to host	32 Gb/sec (4x8Gb GB HBA)
Switch type/model/firmware revision	Brocade Model 510 36- port 8Gb Fiber Channel Switch Firmware version 7.0.0b
HBA model and firmware	QLogic QMH2564 (Driver FW 5.04.04, Flash FW 4.04.02)
Number of HBA's/host	1 Dual-port QLogic 2562 8Gb HBA
Host server type	2x8 Core E5-2670 2.60Ghz 64GB RAM
Total number of disks tested in solution	82 Active for DB and log, 5 hot spares = 87 total spindles
Maximum number of spindles can be hosted in the storage	960



3.3 Primary storage software

Table 3 Primary storage software

Configuration	Detail
HBA driver	QLogic StorPort FC HBA Driver 9.1.9.27
HBA Queue Depth Setting	65535
Multi-Pathing	Microsoft Windows 2008 R2 MPIO Round-Robin(In-Box DSM)
Host OS	Microsoft Windows 2008 R2
ESE.dll file version	15.00.0712.008
Replication solution name/version	Microsoft Exchange Server 2013 DAG replication

3.4 Primary storage disk configuration (Mailbox store/Log disks)

Table 4 Primary storage disk configuration

Configuration	Detail
Disk type, speed and firmware revision	SAS 10k 900GB, XRC0
Raw capacity per disk (GB)	838.36 GB
Number of physical disks in test	82
Total raw storage capacity (GB)	68.74 TB
Raid level	RAID5
Total formatted capacity	55.00 TB
Storage capacity utilization	96.54 %
Database capacity utilization	95%



4 Best practices

Exchange Server 2013 has changed dramatically from previous versions. For a list of what has changed see the following: [http://technet.microsoft.com/en-us/library/jj150540\(v=exchg.150\).aspx](http://technet.microsoft.com/en-us/library/jj150540(v=exchg.150).aspx)

The best practices have also changed, based on the changes in behavior in Exchange 2013. Significant I/O reduction in Exchange 2013 has made it preferable to utilize RAID-5 volumes for both Database and logs. This provides overall storage savings due to the smaller capacity overhead vs. RAID-10.

Because processor performance has increased dramatically, and servers support much larger memory models, sizing requirements for servers have changed to reflect this. For server sizing please refer to the Microsoft Exchange Server Role Calculator.

For general sizing and requirements please visit the following link:

<http://technet.microsoft.com/en-us/library/aa996719.aspx>

One of the Microsoft best practices states that transaction logs and databases be separated from each other and dedicated to their own set of spindles. Dell Compellent virtualizes at the disk level within Storage Center, accelerating data access by spreading read/write operations across all disk drives in the SAN so multiple requests are processed in parallel. Dell Compellent virtualization allows the creation of high performance, highly efficient virtual volumes in just seconds without allocating drives to specific servers, without complicated capacity planning and without manual performance tuning. By managing disk drives as a single resource, Dell Compellent provides increased storage performance, availability and utilization.

Dell Compellent's storage virtualization is optimized to take advantage of all available spindles as part of a single disk folder, but is flexible enough to be configured allowing storage configurations where specific spindles are dedicated to a particular volume.

Another best practice in past versions of Exchange Server has been to align Exchange IO with disk page boundaries. With Windows Server 2008 this is no longer required, as Windows 2008 automatically aligns to a 1024k page boundary.

The volume on which transaction logs are stored is critical to a well performing Exchange environment. Since all transactions are first written to a transaction log before being committed to the information store database, it is important that this volume has the lowest possible write latency. Transaction logs should be placed on volumes with faster rotational speeds. For optimal transaction log performance, consider using drives with a rotational speed of 10,000 RPM or greater. Exchange 2013 no longer requires log files to be stored on a volume separate from the database volumes; The Dell Compellent Storage Center can be flexibly designed for separate disk folders or as a single disk folder configuration.



For issues related to performance and server health please see the following:
[http://technet.microsoft.com/en-us/library/jj150551\(v=exchg.150\).aspx](http://technet.microsoft.com/en-us/library/jj150551(v=exchg.150).aspx)

For more information on Exchange best practices when implemented with Dell Compellent Storage Center, visit the Dell Compellent Knowledge Center at <http://kc.compellent.com/>.



4.1 Using Dell Compellent Storage Center Data Progression

Industry studies show that as much of 80% of Exchange data is inactive. This means that a lot of fast, higher-cost storage is being unnecessarily utilized.

Storage Center's Data Progression is a complete hardware and software architecture that delivers fully automated tiered storage. This patented technology cuts administrative time and reduces overall storage costs by dynamically classifying and moving data at the block-level between tiers of storage based on frequency of access. This complete Automated Tiered Storage solution does not require time consuming data classification and the repetitive manual transfer of data between tiers.

Each volume is configured by default with a recommended storage profile that manages the RAID configuration and provides optimal operation and performance for Exchange on the Dell Compellent Storage Center. With this configuration all data written to each volume is written at RAID10 providing the best possible I/O performance for Exchange database and log operations.

Snapshots, known as Replays on the Dell Compellent Storage Center, are an integral part of the Data Progression solution. As data grows and usage patterns change, Data Progression can automatically move inactive blocks of data to a lower tier of storage (both disk class and RAID level) on-the-fly. With the recommended storage profile, active data is always written at RAID10, while any replays are initially stored at Tier 1 on RAID-5. This data eventually makes its way down the RAID levels and tiers.

The following chart is an example of how Data Progression moves data to the most appropriate tier:

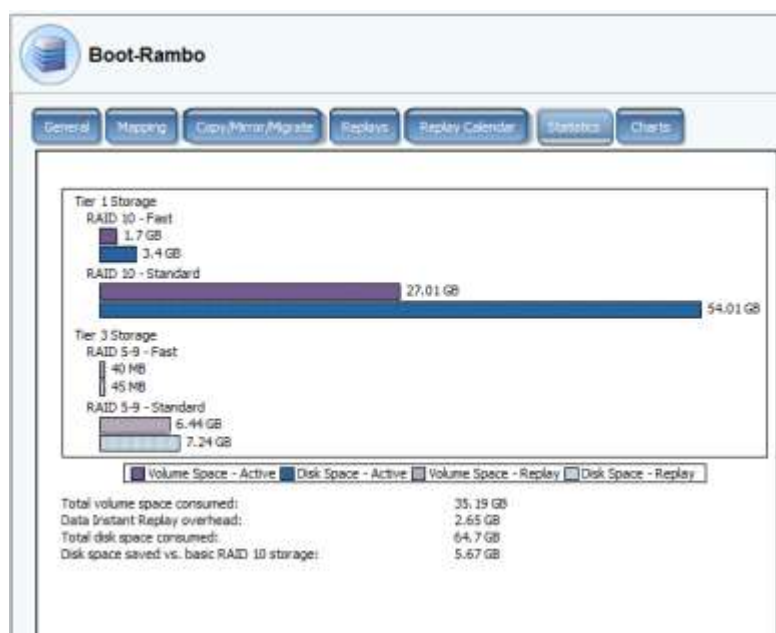


Figure 3 Volume Statistics showing Data Progression

4.2 Core storage

1. Dell Compellent storage by its nature does not need disk sector alignment to perform properly. Dell Compellent virtualizes all disk reads and writes, and applies them across system managed data pages, so by nature isolates disk IOs from sector boundaries. The page to sector alignment for all volumes and data pages is handled automatically by the system.
2. The Dell Compellent method of IO and disk capacity aggregation provides maximum IO to all hosted applications. All the IOPS for all of the assigned drives can be applied to all applications hosted on a Storage Center. If IOPS need to be dedicated to an application, such as Exchange, a dedicated disk pool can be created for each IO type, such as database or log files. As Exchange 2013 IO is mostly sequential, using a smaller number of database files will greatly improve the performance. This is due to the fact that the more sequential streams you have, the more random it looks. Minimizing the number of file streams while meeting business requirements will provide a more responsive solution. Isolating the log files can also provide a performance benefit in an IO constrained system. Using Dell Compellent Dynamic Storage, a small system can start with all volumes sharing spindles, and volumes can dynamically be moved to dedicated spindles and load increases.
3. Dell Compellent Storage Center is a true thin provisioned system. This means that volumes will truly only consume space when and where data is written. The volume sizes should be created to reflect the maximum size they will achieve. The volumes will only consume the space actually used by data, so the storage can be sized to host the actual storage requirement, rather than the volume sizes allocated. This allows the volumes to be sized properly to meet growth while requiring the minimum number of disks to meet the storage and IOP requirement.
4. Dell Compellent's Fluid Data architecture uses an IOP and storage aggregation model. This means that the IOPS and storage capacity of all available disks will be available to the entire disk pool. This provides a huge performance boost to all applications and all LUNs, as the combined IO performance of all spindles will apply to all configured storage. If dedicated spindles are desired, a disk pool can be created that will dedicate those spindles to the LUNs created in that pool. All disks in a disk pool will have multiple RAID types applied to them. This is done by virtualizing the RAID pools on the disks. For example, a write could come in on RAID 10, and would be mirrored at the block level, across a pair of disks. In essence each write could hit a different pair of disks, dramatically improving performance. The next write could be a RAID5 block, with the blocks striped across all the disks available to the pool. In this method a disk pool will balance the IO across all the available spindles.



5. Latency and IO load can be measured real-time, or logged historically for reporting purposes. This means if a volume is performing poorly, its IO can be reported over time, and compared to IO load on the server, for any length of time you wish to store. If you need to report on the last month of IO history, a report can be generated showing the IO graphically or as a summary chart. This provides the ability to trend and determine when IO performance changed. Volumes can also be summarized as a group, to determine if IO load is shifting, increasing, or disk performance is changing. Reporting can be done at any level, including at the disk device level. This allows reporting on the latency at the Server, LUN, or disk level to provide more accurate performance monitoring and diagnostics.
6. Because Storage Center manages block placement, defragmentation is not required. Dell Compellent Data Progression computes block placement and optimizes block placement based on access patterns. Because block placement is relative to other stored blocks Exchange On-line defragmentation is accounted for.
7. Dell Compellent Fluid Data also allows disks to be added to a pool to increase performance dynamically. This allows for accurate sizing on day one and disks to be added as performance requirements increase. If after one year IO requirements double, additional disks could simply be added (without any downtime), and RAID stripes rebalanced.
8. The most common cause of performance issues is low spindle count. To achieve a given IO level requires a spindle count equal to or greater than the IOP target. If the IO load exceeds the capabilities of the spindles poor performance will result. Dell Compellent, along with a business partner, will work with customers to determine the correct spindle count. As IO load grows the spindle count must increase to maintain performance. Using Dell Compellent Enterprise Manager, current IO loads can be tracked, and thresholds can be set for alerting, to warn of IO usage approaching or exceeding acceptable performance levels. Because IO patterns can be very diverse, creating a baseline and using historical reporting will be a key strategy for planning for and managing growth. With an accurate growth plan, disk can be added before it is needed, and performance as well as capacity can be increased with down time.

4.3 Backup Strategy

1. The Dell Compellent Storage Center has an integrated snapshot facility that provides basic volume-based snapshots called Replays. In order to provide VSS integration with a graphical management interface, Dell Compellent Replay Manager should be implemented. This provides a full interface for scheduling database backups. Using Replay Manager, Exchange Servers can be restored in minutes to any available restore point. It also provides detailed reporting on Replays. Because Dell Compellent Storage Center has the ability to manage thousands of Replays, a fine grained backup strategy can be defined to greatly reduce reliance on tape for historical data recovery. Combined with a lagged database copy, data can be recovered very quickly with minimal administrative effort.



2. Since Dell Compellent Replays take do not require page pre-allocation or disk allocation disk space requirements are much smaller for snapshots. Backup verification can also be passed to a secondary server to isolate the impact of backups on the production Exchange environment. By automating the creation and verification process using a secondary server, more frequent database backups and more frequent database scans can be implemented reducing exposure.
3. Replay restore points can also be replicated and tested in a remote environment without breaking replication. This allows Disaster Recovery testing of a production restore point without pausing replication, reducing exposure even further.

4.4 Additional Information

For more information on Dell Compellent Storage Center and other Dell Compellent solutions, visit our website at <http://www.compellent.com>.



5 Test results summary

This section provides a high level summary of the test data from ESRP. The detailed html reports which are generated by ESRP testing framework are shown in the Appendices later in this whitepaper.

5.1 Reliability

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

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

1. No errors were reported in either the application or system log
2. No errors were reported during the [database](#) and [log](#) checksum process
3. No errors were reported during either the backup or restore process

5.2 Storage performance results

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

Individual Server Metrics:

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



5.2.1 Server 1 – JS6

Database I/O	
Database Disks Transfers/sec	591.112
Database Disks Reads/sec	429.061
Database Disks Writes/sec	162.051
Average Database Disk Read Latency (ms)	10.863
Average Database Disk Write Latency (ms)	1.869
Transaction Log I/O	
Log Disks Writes/sec	38.444
Average Log Disk Write Latency (ms)	1.260

5.2.2 Server 2 – JS7

Database I/O	
Database Disks Transfers/sec	558.671
Database Disks Reads/sec	406.354
Database Disks Writes/sec	152.317
Average Database Disk Read Latency (ms)	11.470
Average Database Disk Write Latency (ms)	1.859
Transaction Log I/O	
Log Disks Writes/sec	36.08
Average Log Disk Write Latency (ms)	1.271



5.2.3 Server 3 – JS8

Database I/O	
Database Disks Transfers/sec	549.702
Database Disks Reads/sec	399.807
Database Disks Writes/sec	149.895
Average Database Disk Read Latency (ms)	11.178
Average Database Disk Write Latency (ms)	2.069
Transaction Log I/O	
Log Disks Writes/sec	35.549
Average Log Disk Write Latency (ms)	1.345

5.2.4 Server 4 – JS9

Database I/O	
Database Disks Transfers/sec	592.434
Database Disks Reads/sec	430.306
Database Disks Writes/sec	162.128
Average Database Disk Read Latency (ms)	10.994
Average Database Disk Write Latency (ms)	2.045
Transaction Log I/O	
Log Disks Writes/sec	38.395
Average Log Disk Write Latency (ms)	1.292



5.2.5 Server 5 – JS10

Database I/O	
Database Disks Transfers/sec	637.206
Database Disks Reads/sec	460.831
Database Disks Writes/sec	176.375
Average Database Disk Read Latency (ms)	11.547
Average Database Disk Write Latency (ms)	1.980
Transaction Log I/O	
Log Disks Writes/sec	38.395
Average Log Disk Write Latency (ms)	1.333



5.3 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).

5.3.1 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.

Performance item	Detail
MB read/sec per database	116.5
MB read/sec total per server	582.5

5.3.2 Transaction Log Recovery/Replay performance

The purpose of this 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.

Performance item	Detail
Average time to play one Log file (sec)	1.039



6 Conclusion

The testing shows the scalability and performance of the Dell Compellent Storage Center.

This document is developed by storage solution providers, 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 v4.0 test framework. Customers should not quote the data directly for his/her pre-deployment verification. It is still necessary to go through the exercises to validate the storage design for a specific customer environment.

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



7 Additional resources

7.1 Microsoft ESRP Program Website:
<http://technet.microsoft.com/en-us/exchange/ff182054.aspx>

7.2 Dell Compellent TechCenter Content:
<http://en.community.dell.com/techcenter/storage/w/wiki/5018.compellent-technical-content.aspx>

7.3 Dell Storage Website:
<http://www.dellstorage.com/compellent/>



A Performance testing

A.1 Server 1 – JS6

Table 5 Test Summary

Overall Test Result	Pass
Machine Name	JS6
Test Description	5000 users/server 5 servers 2GB mailboxes .10 IOPS/user .12 IOPS tested 5 dbs per server 2.2 TB db/log combined volumes 2 copies 7 threads/db
Test Start Time	11/21/2013 8:34:08 AM
Test End Time	11/21/2013 10:52:12 AM
Collection Start Time	11/21/2013 8:37:20 AM
Collection End Time	11/21/2013 10:37:07 AM
Jetstress Version	15.00.0658.004
ESE Version	15.00.0712.008
Operating System	Windows Server 2008 R2 Standard Service Pack 1 (6.1.7601.65536)
Performance Log	C:\Program Files\Exchange Jetstress\Performance_2013_11_21_8_34_19.blg



Table 6 Database sizing and throughput

Performance counter	Value
Achieved Transactional I/O per Second	546.592
Target Transactional I/O per Second	500
Initial Database Size (bytes)	10749888233472
Final Database Size (bytes)	10751314296832
Database Files (Count)	5

Table 7 Jetstress system parameters

Performance counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 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



Table 8 Database configuration

Performance counter	Value
Instance1048.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance1048.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance1048.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance1048.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance1048.5	Log path: C:\DB\DB5 Database: C:\DB\DB4\Jetstress005001.edb

Table 9 Transactional I/O performance

MSEExchange 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
Instance1048.1	10.966	2.128	76.931	32.410	32875.970	35740.830	0.000	1.005	0.000	7.724	0.000	20409.336
Instance1048.2	10.601	1.834	76.858	32.479	32873.116	35764.328	0.000	1.017	0.000	7.729	0.000	20331.338
Instance1048.3	11.165	2.021	76.870	32.087	32855.163	35723.069	0.000	1.001	0.000	7.575	0.000	20379.166
Instance1048.4	10.448	1.788	76.826	32.489	32863.741	35794.054	0.000	1.006	0.000	7.697	0.000	20558.742
Instance1048.5	11.136	1.572	77.055	32.586	32864.303	35756.243	0.000	1.010	0.000	7.719	0.000	20336.815



Table 10 Background Database Maintenance I/O performance

MSEExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance1048.1	8.863	261940.638
Instance1048.2	8.929	261961.444
Instance1048.3	8.885	261969.262
Instance1048.4	9.009	261971.882
Instance1048.5	8.836	261925.532

Table 11 Log replication I/O performance

MSEExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance1048.1	0.671	227213.829
Instance1048.2	0.672	227725.984
Instance1048.3	0.659	225264.677
Instance1048.4	0.676	225753.854
Instance1048.5	0.669	229575.803



Table 12 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
Instance1048.1	10.966	2.128	85.794	32.410	56539.416	35740.830	6.683	1.005	0.671	7.724	227213.829	20409.336
Instance1048.2	10.601	1.834	85.787	32.479	56716.901	35764.328	6.511	1.017	0.672	7.729	227725.984	20331.338
Instance1048.3	11.165	2.021	85.754	32.087	56592.447	35723.069	6.750	1.001	0.659	7.575	225264.677	20379.166
Instance1048.4	10.448	1.788	85.835	32.489	56909.900	35794.054	6.734	1.006	0.676	7.697	225753.854	20558.742
Instance1048.5	11.136	1.572	85.891	32.586	56430.020	35756.243	7.474	1.010	0.669	7.719	229575.803	20336.815

Table 13 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.449	0.000	2.254
Available MBytes	28861.937	28851.000	28943.000
Free System Page Table Entries	33555674.025	33555673.000	33555676.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	78166781.328	78147584.000	78225408.000
Pool Paged Bytes	156522962.038	156491776.000	156565504.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



A.2 Test Log

11/21/2013 8:34:08 AM -- Preparing for testing ...
11/21/2013 8:34:13 AM -- Attaching databases ...
11/21/2013 8:34:13 AM -- Preparations for testing are complete.
11/21/2013 8:34:13 AM -- Starting transaction dispatch ..
11/21/2013 8:34:13 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/21/2013 8:34:13 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/21/2013 8:34:19 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
11/21/2013 8:34:19 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
11/21/2013 8:34:25 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/21/2013 8:34:25 AM -- Performance logging started (interval: 15000 ms).
11/21/2013 8:34:25 AM -- Attaining prerequisites:
11/21/2013 8:37:20 AM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1210593000.0 (lower bound: 1207960000.0, upper bound: none)
11/21/2013 10:37:21 AM -- Performance logging has ended.
11/21/2013 10:52:11 AM -- JetInterop batch transaction stats: 20590, 20590, 20590, 20590 and 20589.
11/21/2013 10:52:11 AM -- Dispatching transactions ends.
11/21/2013 10:52:11 AM -- Shutting down databases ...
11/21/2013 10:52:12 AM -- Instance1048.1 (complete), Instance1048.2 (complete), Instance1048.3 (complete), Instance1048.4 (complete) and Instance1048.5 (complete)
11/21/2013 10:52:12 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_21_8_34_19.blg has 490 samples.
11/21/2013 10:52:12 AM -- Creating test report ...
11/21/2013 10:52:16 AM -- Instance1048.1 has 11.0 for I/O Database Reads Average Latency.
11/21/2013 10:52:16 AM -- Instance1048.1 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:16 AM -- Instance1048.1 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:16 AM -- Instance1048.2 has 10.6 for I/O Database Reads Average Latency.
11/21/2013 10:52:16 AM -- Instance1048.2 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:16 AM -- Instance1048.2 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:16 AM -- Instance1048.3 has 11.2 for I/O Database Reads Average Latency.
11/21/2013 10:52:16 AM -- Instance1048.3 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:16 AM -- Instance1048.3 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:16 AM -- Instance1048.4 has 10.4 for I/O Database Reads Average Latency.
11/21/2013 10:52:16 AM -- Instance1048.4 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:16 AM -- Instance1048.4 has 1.0 for I/O Log Reads Average Latency.



11/21/2013 10:52:16 AM -- Instance1048.5 has 11.1 for I/O Database Reads Average Latency.
11/21/2013 10:52:16 AM -- Instance1048.5 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:16 AM -- Instance1048.5 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:16 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/21/2013 10:52:16 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/21/2013 10:52:16 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_21_8_34_19.xml has 478 samples queried.



A.3 Server 2 – JS7

Table 14 Test summary

Overall Test Result	Pass
Machine Name	JS7
Test Description	5000 users/server 5 servers 2GB mailboxes .10 IOPS/user .12 IOPS tested 5 dbs per server 2.2 TB db/log combined volumes 2 copies 7 threads/db
Test Start Time	11/21/2013 8:34:01 AM
Test End Time	11/21/2013 10:52:33 AM
Collection Start Time	11/21/2013 8:37:19 AM
Collection End Time	11/21/2013 10:37:15 AM
Jetstress Version	15.00.0658.004
ESE Version	15.00.0712.008
Operating System	Windows Server 2008 R2 Standard Service Pack 1 (6.1.7601.65536)
Performance Log	C:\Program Files\Exchange Jetstress\Performance_2013_11_21_8_34_13.blg



Table 15 Database sizing and throughput

Performance counter	Value
Achieved Transactional I/O per Second	514.326
Target Transactional I/O per Second	500
Initial Database Size (bytes)	10750894866432
Final Database Size (bytes)	10752245432320
Database Files (Count)	5

Table 16 Jetstress system parameters

Performance counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 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



Table 17 Database configuration

Performance counter	Value
Instance3144.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance3144.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance3144.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance3144.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance3144.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb

Table 18 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
Instance3144.1	11.536	1.933	72.338	30.488	32859.400	35728.901	0.000	1.010	0.000	7.242	0.000	20411.639
Instance3144.2	11.313	2.024	72.262	30.290	32871.745	35774.387	0.000	1.021	0.000	7.183	0.000	20592.779
Instance3144.3	11.082	1.829	72.739	30.767	32862.821	35709.245	0.000	1.016	0.000	7.218	0.000	20363.729
Instance3144.4	11.502	1.909	72.275	30.299	32873.010	35776.330	0.000	1.010	0.000	7.206	0.000	20585.550
Instance3144.5	11.918	1.599	72.395	30.473	32865.533	35756.624	0.000	1.025	0.000	7.231	0.000	20468.698



Table 19 Background Database Maintenance I/O performance

MSEExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3144.1	8.896	261999.082
Instance3144.2	8.854	261953.662
Instance3144.3	8.918	261973.703
Instance3144.4	8.851	261964.369
Instance3144.5	8.823	261978.389

Table 20 Log Replication I/O performance

MSEExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3144.1	0.630	223201.424
Instance3144.2	0.630	221835.205
Instance3144.3	0.628	221860.293
Instance3144.4	0.633	222369.119
Instance3144.5	0.630	223317.690



Table 21 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
Instance3144.1	11.536	1.933	81.235	30.488	57952.921	35728.901	7.066	1.010	0.630	7.242	223201.424	20411.639
Instance3144.2	11.313	2.024	81.117	30.290	57876.637	35774.387	7.316	1.021	0.630	7.183	221835.205	20592.779
Instance3144.3	11.082	1.829	81.657	30.767	57885.792	35709.245	6.731	1.016	0.628	7.218	221860.293	20363.729
Instance3144.4	11.502	1.909	81.127	30.299	57867.595	35776.330	6.731	1.010	0.633	7.206	222369.119	20585.550
Instance3144.5	11.918	1.599	81.218	30.473	57756.075	35756.624	6.999	1.025	0.630	7.231	223317.690	20468.698

Table 22 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.444	0.000	2.388
Available MBytes	28767.355	28755.000	28820.000
Free System Page Table Entries	33555673.040	33555672.000	33555675.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	82186291.307	82149376.000	82231296.000
Pool Paged Bytes	166704207.098	166674432.000	166830080.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



A.4 Test log

11/21/2013 8:34:01 AM -- Preparing for testing ...
11/21/2013 8:34:07 AM -- Attaching databases ...
11/21/2013 8:34:07 AM -- Preparations for testing are complete.
11/21/2013 8:34:07 AM -- Starting transaction dispatch ..
11/21/2013 8:34:07 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/21/2013 8:34:07 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/21/2013 8:34:13 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
11/21/2013 8:34:13 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
11/21/2013 8:34:19 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/21/2013 8:34:19 AM -- Performance logging started (interval: 15000 ms).
11/21/2013 8:34:19 AM -- Attaining prerequisites:
11/21/2013 8:37:19 AM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1209672000.0 (lower bound: 1207960000.0, upper bound: none)
11/21/2013 10:37:20 AM -- Performance logging has ended.
11/21/2013 10:52:31 AM -- JetInterop batch transaction stats: 19536, 19536, 19536, 19535 and 19535.
11/21/2013 10:52:31 AM -- Dispatching transactions ends.
11/21/2013 10:52:32 AM -- Shutting down databases ...
11/21/2013 10:52:33 AM -- Instance3144.1 (complete), Instance3144.2 (complete), Instance3144.3 (complete), Instance3144.4 (complete) and Instance3144.5 (complete)
11/21/2013 10:52:33 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_21_8_34_13.blg has 491 samples.
11/21/2013 10:52:33 AM -- Creating test report ...
11/21/2013 10:52:36 AM -- Instance3144.1 has 11.5 for I/O Database Reads Average Latency.
11/21/2013 10:52:36 AM -- Instance3144.1 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:36 AM -- Instance3144.1 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:36 AM -- Instance3144.2 has 11.3 for I/O Database Reads Average Latency.
11/21/2013 10:52:36 AM -- Instance3144.2 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:36 AM -- Instance3144.2 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:36 AM -- Instance3144.3 has 11.1 for I/O Database Reads Average Latency.
11/21/2013 10:52:36 AM -- Instance3144.3 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:36 AM -- Instance3144.3 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:36 AM -- Instance3144.4 has 11.5 for I/O Database Reads Average Latency.
11/21/2013 10:52:36 AM -- Instance3144.4 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:36 AM -- Instance3144.4 has 1.0 for I/O Log Reads Average Latency.



11/21/2013 10:52:36 AM -- Instance3144.5 has 11.9 for I/O Database Reads Average Latency.
11/21/2013 10:52:36 AM -- Instance3144.5 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:36 AM -- Instance3144.5 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:36 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/21/2013 10:52:36 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/21/2013 10:52:36 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_21_8_34_13.xml has 478 samples queried.



A.5 Server 3 – JS8

Table 23 Test summary

Overall Test Result	Pass
Machine Name	JS8
Test Description	5000 users/server 5 servers 2GB mailboxes .10 IOPS/user .12 IOPS tested 5 dbs per server 2.2 TB db/log combined volumes 2 copies 7 threads/db
Test Start Time	11/21/2013 8:33:56 AM
Test End Time	11/21/2013 10:52:37 AM
Collection Start Time	11/21/2013 8:37:16 AM
Collection End Time	11/21/2013 10:37:09 AM
Jetstress Version	15.00.0658.004
ESE Version	15.00.0712.008
Operating System	Windows Server 2008 R2 Standard Service Pack 1 (6.1.7601.65536)
Performance Log	C:\Program Files\Exchange Jetstress\Performance_2013_11_21_8_34_7.blg



Table 24 Database sizing and throughput

Performance counter	Value
Achieved Transactional I/O per Second	504.673
Target Transactional I/O per Second	500
Initial Database Size (bytes)	10750651596800
Final Database Size (bytes)	10751985385472
Database Files (Count)	5

Table 25 Jetstress system parameters

Performance counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 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



Table 26 Database configuration

Performance counter	Value
Instance3108.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance3108.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance3108.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance3108.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance3108.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb

Table 27 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
Instance3108.1	10.843	1.522	70.898	29.802	32888.081	35673.846	0.000	1.075	0.000	7.047	0.000	20479.329
Instance3108.2	10.885	1.629	71.053	30.322	32870.381	35734.743	0.000	1.068	0.000	7.203	0.000	20424.736
Instance3108.3	11.694	2.004	70.990	30.029	32877.862	35763.355	0.000	1.086	0.000	7.182	0.000	20248.652
Instance3108.4	10.691	2.390	70.995	29.971	32880.854	35740.162	0.000	1.082	0.000	7.052	0.000	20521.349
Instance3108.5	11.775	2.801	70.841	29.771	32876.657	35777.569	0.000	1.068	0.000	7.065	0.000	20437.130



Table 28 Background Database Maintenance I/O performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3108.1	9.118	261926.426
Instance3108.2	9.115	262000.083
Instance3108.3	8.868	261931.182
Instance3108.4	9.117	261964.697
Instance3108.5	8.812	261928.714

Table 29 Log Replication I/O performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3108.1	0.614	219974.385
Instance3108.2	0.627	221373.762
Instance3108.3	0.620	221858.098
Instance3108.4	0.617	220398.505
Instance3108.5	0.617	221864.144



Table 30 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
Instance3108.1	10.843	1.522	80.016	29.802	58987.417	35673.846	6.976	1.075	0.614	7.047	219974.385	20479.329
Instance3108.2	10.885	1.629	80.168	30.322	58922.152	35734.743	6.682	1.068	0.627	7.203	221373.762	20424.736
Instance3108.3	11.694	2.004	79.858	30.029	58314.478	35763.355	6.911	1.086	0.620	7.182	221858.098	20248.652
Instance3108.4	10.691	2.390	80.112	29.971	58951.435	35740.162	6.657	1.082	0.617	7.052	220398.505	20521.349
Instance3108.5	11.775	2.801	79.653	29.771	58215.465	35777.569	7.272	1.068	0.617	7.065	221864.144	20437.130

Table 31 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.351	0.000	1.882
Available MBytes	28833.639	28824.000	28875.000
Free System Page Table Entries	33555674.056	33555673.000	33555676.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	78290413.829	78249984.000	78331904.000
Pool Paged Bytes	154152763.324	154136576.000	154218496.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



A.6 Test log

11/21/2013 8:33:56 AM -- Preparing for testing ...
11/21/2013 8:34:02 AM -- Attaching databases ...
11/21/2013 8:34:02 AM -- Preparations for testing are complete.
11/21/2013 8:34:02 AM -- Starting transaction dispatch ..
11/21/2013 8:34:02 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/21/2013 8:34:02 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/21/2013 8:34:07 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
11/21/2013 8:34:07 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
11/21/2013 8:34:13 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/21/2013 8:34:13 AM -- Performance logging started (interval: 15000 ms).
11/21/2013 8:34:13 AM -- Attaining prerequisites:
11/21/2013 8:37:16 AM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1215062000.0 (lower bound: 1207960000.0, upper bound: none)
11/21/2013 10:37:17 AM -- Performance logging has ended.
11/21/2013 10:52:35 AM -- JetInterop batch transaction stats: 19109, 19109, 19109, 19109 and 19109.
11/21/2013 10:52:35 AM -- Dispatching transactions ends.
11/21/2013 10:52:35 AM -- Shutting down databases ...
11/21/2013 10:52:37 AM -- Instance3108.1 (complete), Instance3108.2 (complete), Instance3108.3 (complete), Instance3108.4 (complete) and Instance3108.5 (complete)
11/21/2013 10:52:37 AM -- <C:\Program Files\Exchange Jetstress\Performance 2013 11 21 8 34 7.blg> has 491 samples.
11/21/2013 10:52:37 AM -- Creating test report ...
11/21/2013 10:52:40 AM -- Instance3108.1 has 10.8 for I/O Database Reads Average Latency.
11/21/2013 10:52:40 AM -- Instance3108.1 has 1.1 for I/O Log Writes Average Latency.
11/21/2013 10:52:40 AM -- Instance3108.1 has 1.1 for I/O Log Reads Average Latency.
11/21/2013 10:52:40 AM -- Instance3108.2 has 10.9 for I/O Database Reads Average Latency.
11/21/2013 10:52:40 AM -- Instance3108.2 has 1.1 for I/O Log Writes Average Latency.
11/21/2013 10:52:40 AM -- Instance3108.2 has 1.1 for I/O Log Reads Average Latency.
11/21/2013 10:52:40 AM -- Instance3108.3 has 11.7 for I/O Database Reads Average Latency.
11/21/2013 10:52:40 AM -- Instance3108.3 has 1.1 for I/O Log Writes Average Latency.
11/21/2013 10:52:40 AM -- Instance3108.3 has 1.1 for I/O Log Reads Average Latency.
11/21/2013 10:52:40 AM -- Instance3108.4 has 10.7 for I/O Database Reads Average Latency.
11/21/2013 10:52:40 AM -- Instance3108.4 has 1.1 for I/O Log Writes Average Latency.
11/21/2013 10:52:40 AM -- Instance3108.4 has 1.1 for I/O Log Reads Average Latency.



11/21/2013 10:52:40 AM -- Instance3108.5 has 11.8 for I/O Database Reads Average Latency.
11/21/2013 10:52:40 AM -- Instance3108.5 has 1.1 for I/O Log Writes Average Latency.
11/21/2013 10:52:40 AM -- Instance3108.5 has 1.1 for I/O Log Reads Average Latency.
11/21/2013 10:52:40 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/21/2013 10:52:40 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/21/2013 10:52:40 AM -- <C:\Program Files\Exchange Jetstress\Performance 2013 11 21 8 34 7.xml> has 478 samples queried.



A.7 Server 4 – JS9

Table 32 Test summary

Overall Test Result	Pass
Machine Name	JS9
Test Description	5000 users/server 5 servers 2GB mailboxes .10 IOPS/user .12 IOPS tested 5 dbs per server 2.2 TB db/log combined volumes 2 copies 7 threads/db
Test Start Time	11/21/2013 8:33:51 AM
Test End Time	11/21/2013 10:52:45 AM
Collection Start Time	11/21/2013 8:36:55 AM
Collection End Time	11/21/2013 10:36:49 AM
Jetstress Version	15.00.0658.004
ESE Version	15.00.0712.008
Operating System	Windows Server 2008 R2 Standard Service Pack 1 (6.1.7601.65536)
Performance Log	C:\Program Files\Exchange Jetstress\Performance_2013_11_21_8_34_2.blg



Table 33 Database sizing and throughput

Performance counter	Value
Achieved Transactional I/O per Second	548.1
Target Transactional I/O per Second	500
Initial Database Size (bytes)	10749829513216
Final Database Size (bytes)	10751289131008
Database Files (Count)	5

Table 34 Jetstress system parameters

Performance counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 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



Table 35 Database configuration

Performance counter	Value
Instance3160.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance3160.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance3160.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance3160.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance3160.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb

Table 36 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
Instance3160.1	10.939	1.317	77.653	32.834	32856.365	35675.770	0.000	1.027	0.000	7.726	0.000	20248.210
Instance3160.2	10.942	1.593	77.130	32.455	32862.616	35721.573	0.000	1.033	0.000	7.693	0.000	20350.230
Instance3160.3	11.027	1.996	77.396	32.409	32860.519	35786.612	0.000	1.032	0.000	7.646	0.000	20286.429
Instance3160.4	11.078	2.434	76.912	32.208	32857.048	35807.866	0.000	1.035	0.000	7.676	0.000	20442.512
Instance3160.5	10.986	2.887	76.882	32.222	32864.707	35789.564	0.000	1.040	0.000	7.654	0.000	20552.476



Table 37 Background Database Maintenance I/O performance

MSEExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3160.1	8.914	261968.709
Instance3160.2	8.883	261935.893
Instance3160.3	8.842	262009.567
Instance3160.4	8.871	262001.330
Instance3160.5	8.825	261933.541

Table 38 Log Replication I/O performance

MSEExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3160.1	0.669	224296.627
Instance3160.2	0.668	230117.303
Instance3160.3	0.661	226723.407
Instance3160.4	0.671	228669.530
Instance3160.5	0.672	226229.367



Table 39 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
Instance3160.1	10.939	1.317	86.567	32.834	56448.859	35675.770	6.871	1.027	0.669	7.726	224296.627	20248.210
Instance3160.2	10.942	1.593	86.013	32.455	56520.746	35721.573	6.959	1.033	0.668	7.693	230117.303	20350.230
Instance3160.3	11.027	1.996	86.238	32.409	56355.308	35786.612	6.443	1.032	0.661	7.646	226723.407	20286.429
Instance3160.4	11.078	2.434	85.782	32.208	56552.668	35807.866	6.858	1.035	0.671	7.676	228669.530	20442.512
Instance3160.5	10.986	2.887	85.706	32.222	56450.374	35789.564	7.210	1.040	0.672	7.654	226229.367	20552.476

Table 40 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.451	0.000	2.710
Available MBytes	28750.244	28740.000	28792.000
Free System Page Table Entries	33555674.006	33555672.000	33555676.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	73392435.841	73383936.000	73420800.000
Pool Paged Bytes	167195196.927	167182336.000	167256064.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



A.8 Test log

11/21/2013 8:33:51 AM -- Preparing for testing ...
11/21/2013 8:33:56 AM -- Attaching databases ...
11/21/2013 8:33:56 AM -- Preparations for testing are complete.
11/21/2013 8:33:56 AM -- Starting transaction dispatch ..
11/21/2013 8:33:56 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/21/2013 8:33:56 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/21/2013 8:34:02 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
11/21/2013 8:34:02 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
11/21/2013 8:34:07 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/21/2013 8:34:07 AM -- Performance logging started (interval: 15000 ms).
11/21/2013 8:34:07 AM -- Attaining prerequisites:
11/21/2013 8:36:55 AM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1214009000.0 (lower bound: 1207960000.0, upper bound: none)
11/21/2013 10:36:55 AM -- Performance logging has ended.
11/21/2013 10:52:44 AM -- JetInterop batch transaction stats: 20810, 20810, 20810, 20809 and 20809.
11/21/2013 10:52:44 AM -- Dispatching transactions ends.
11/21/2013 10:52:44 AM -- Shutting down databases ...
11/21/2013 10:52:45 AM -- Instance3160.1 (complete), Instance3160.2 (complete), Instance3160.3 (complete), Instance3160.4 (complete) and Instance3160.5 (complete)
11/21/2013 10:52:45 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_21_8_34_2.blg has 490 samples.
11/21/2013 10:52:45 AM -- Creating test report ...
11/21/2013 10:52:49 AM -- Instance3160.1 has 10.9 for I/O Database Reads Average Latency.
11/21/2013 10:52:49 AM -- Instance3160.1 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:49 AM -- Instance3160.1 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:49 AM -- Instance3160.2 has 10.9 for I/O Database Reads Average Latency.
11/21/2013 10:52:49 AM -- Instance3160.2 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:49 AM -- Instance3160.2 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:49 AM -- Instance3160.3 has 11.0 for I/O Database Reads Average Latency.
11/21/2013 10:52:49 AM -- Instance3160.3 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:49 AM -- Instance3160.3 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:49 AM -- Instance3160.4 has 11.1 for I/O Database Reads Average Latency.
11/21/2013 10:52:49 AM -- Instance3160.4 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:49 AM -- Instance3160.4 has 1.0 for I/O Log Reads Average Latency.



11/21/2013 10:52:49 AM -- Instance3160.5 has 11.0 for I/O Database Reads Average Latency.
11/21/2013 10:52:49 AM -- Instance3160.5 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:49 AM -- Instance3160.5 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:49 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/21/2013 10:52:49 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/21/2013 10:52:49 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_21_8_34_2.xml has 478 samples queried.



A.9 Server 5 – JS10

Table 41 Test summary

Overall Test Result	Pass
Machine Name	JS10
Test Description	5000 users/server 5 servers 2GB mailboxes .10 IOPS/user .12 IOPS tested 5 dbs per server 2.2 TB db/log combined volumes 2 copies 7 threads/db
Test Start Time	11/21/2013 8:33:46 AM
Test End Time	11/21/2013 10:52:50 AM
Collection Start Time	11/21/2013 8:36:53 AM
Collection End Time	11/21/2013 10:36:46 AM
Jetstress Version	15.00.0658.004
ESE Version	15.00.0712.008
Operating System	Windows Server 2008 R2 Enterprise Service Pack 1 (6.1.7601.65536)
Performance Log	C:\Program Files\Exchange Jetstress\Performance_2013_11_21_8_33_57.blg



Table 42 Database sizing and throughput

Performance counter	Value
Achieved Transactional I/O per Second	524.088
Target Transactional I/O per Second	500
Initial Database Size (bytes)	10751071027200
Final Database Size (bytes)	10752455147520
Database Files (Count)	5

Table 43 Jetstress system parameters

Performance counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 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



Table 44 Database configuration

Performance counter	Value
Instance3620.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance3620.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance3620.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance3620.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance3620.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb

Table 45 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
Instance3620.1	11.271	1.966	73.768	31.020	32866.395	35726.930	0.000	1.017	0.000	7.353	0.000	20283.644
Instance3620.2	11.224	1.702	73.939	31.336	32862.955	35688.783	0.000	1.006	0.000	7.340	0.000	20427.143
Instance3620.3	10.952	1.900	73.705	31.078	32867.582	35713.543	0.000	1.014	0.000	7.359	0.000	20391.368
Instance3620.4	10.948	1.694	73.679	30.836	32860.578	35693.455	0.000	1.009	0.000	7.271	0.000	20437.706
Instance3620.5	11.703	1.519	73.750	30.976	32879.966	35736.279	0.000	1.009	0.000	7.308	0.000	20423.428



Table 46 Background Database Maintenance I/O performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3620.1	8.896	261990.710
Instance3620.2	8.893	261903.503
Instance3620.3	8.962	261907.226
Instance3620.4	9.013	261961.669
Instance3620.5	8.774	261929.066

Table 47 Log Replication I/O performance

Instance3620.1	0.637	224843.483
Instance3620.2	0.640	225568.312
Instance3620.3	0.639	225221.240
Instance3620.4	0.633	224718.252
Instance3620.5	0.637	227714.430
Instance3620.1	0.637	224843.483



Table 48 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
Instance3620.1	11.271	1.966	82.664	31.020	57523.660	35726.930	7.010	1.017	0.637	7.353	224843.483	20283.644
Instance3620.2	11.224	1.702	82.832	31.336	57451.942	35688.783	6.866	1.006	0.640	7.340	225568.312	20427.143
Instance3620.3	10.952	1.900	82.666	31.078	57697.084	35713.543	6.695	1.014	0.639	7.359	225221.240	20391.368
Instance3620.4	10.948	1.694	82.692	30.836	57831.001	35693.455	6.680	1.009	0.633	7.271	224718.252	20437.706
Instance3620.5	11.703	1.519	82.525	30.976	57233.023	35736.279	6.727	1.009	0.637	7.308	227714.430	20423.428

Table 49 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.450	0.000	2.406
Available MBytes	59939.731	59929.000	59998.000
Free System Page Table Entries	33555668.017	33555668.000	33555670.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	65809927.482	65798144.000	65843200.000
Pool Paged Bytes	170110274.806	170094592.000	170147840.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



A.10 Test log

11/21/2013 8:33:46 AM -- Preparing for testing ...
11/21/2013 8:33:51 AM -- Attaching databases ...
11/21/2013 8:33:51 AM -- Preparations for testing are complete.
11/21/2013 8:33:51 AM -- Starting transaction dispatch ..
11/21/2013 8:33:51 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/21/2013 8:33:51 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/21/2013 8:33:57 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
11/21/2013 8:33:57 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
11/21/2013 8:34:03 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/21/2013 8:34:03 AM -- Performance logging started (interval: 15000 ms).
11/21/2013 8:34:03 AM -- Attaining prerequisites:
11/21/2013 8:36:53 AM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1217704000.0 (lower bound: 1207960000.0, upper bound: none)
11/21/2013 10:36:53 AM -- Performance logging has ended.
11/21/2013 10:52:48 AM -- JetInterop batch transaction stats: 19908, 19908, 19907, 19907 and 19907.
11/21/2013 10:52:48 AM -- Dispatching transactions ends.
11/21/2013 10:52:48 AM -- Shutting down databases ...
11/21/2013 10:52:50 AM -- Instance3620.1 (complete), Instance3620.2 (complete), Instance3620.3 (complete), Instance3620.4 (complete) and Instance3620.5 (complete)
11/21/2013 10:52:50 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_21_8_33_57.blg has 490 samples.
11/21/2013 10:52:50 AM -- Creating test report ...
11/21/2013 10:52:53 AM -- Instance3620.1 has 11.3 for I/O Database Reads Average Latency.
11/21/2013 10:52:53 AM -- Instance3620.1 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:53 AM -- Instance3620.1 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:53 AM -- Instance3620.2 has 11.2 for I/O Database Reads Average Latency.
11/21/2013 10:52:53 AM -- Instance3620.2 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:53 AM -- Instance3620.2 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:53 AM -- Instance3620.3 has 11.0 for I/O Database Reads Average Latency.
11/21/2013 10:52:53 AM -- Instance3620.3 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:53 AM -- Instance3620.3 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:53 AM -- Instance3620.4 has 10.9 for I/O Database Reads Average Latency.
11/21/2013 10:52:53 AM -- Instance3620.4 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:53 AM -- Instance3620.4 has 1.0 for I/O Log Reads Average Latency.



11/21/2013 10:52:53 AM -- Instance3620.5 has 11.7 for I/O Database Reads Average Latency.
11/21/2013 10:52:53 AM -- Instance3620.5 has 1.0 for I/O Log Writes Average Latency.
11/21/2013 10:52:53 AM -- Instance3620.5 has 1.0 for I/O Log Reads Average Latency.
11/21/2013 10:52:53 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/21/2013 10:52:53 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/21/2013 10:52:53 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_21_8_33_57.xml has 478 samples queried.



B Stress testing

B.1 Server 1 – JS6

Table 50 Test summary

Overall Test Result	Pass
Machine Name	JS6
Test Description	5000 users/server 5 servers 2GB mailboxes .10 IOPS/user .12 IOPS tested 5 dbs per server 2.2 TB db/log combined volumes 2 copies 7 threads/db
Test Start Time	11/22/2013 8:53:13 AM
Test End Time	11/23/2013 4:50:01 PM
Collection Start Time	11/22/2013 8:56:22 AM
Collection End Time	11/23/2013 8:56:14 AM
Jetstress Version	15.00.0658.004
ESE Version	15.00.0712.008
Operating System	Windows Server 2008 R2 Standard Service Pack 1 (6.1.7601.65536)
Performance Log	C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_25.blg



Table 51 Database sizing and throughput

Performance Counter	Value
Achieved Transactional I/O per Second	545.561
Target Transactional I/O per Second	500
Initial Database Size (bytes)	10751314296832
Final Database Size (bytes)	10771178520576
Database Files (Count)	5

Table 52 Jetstress system parameters

Performance Counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 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



Table 53 Database configuration

Performance Counter	Value
Instance1048.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance1048.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance1048.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance1048.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance1048.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb

Table 54 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
Instance1048.1	11.169	2.128	76.737	32.444	32862.190	35478.995	0.000	0.993	0.000	7.605	0.000	20422.581
Instance1048.2	10.911	1.840	76.587	32.341	32861.207	35504.126	0.000	1.003	0.000	7.611	0.000	20421.462
Instance1048.3	11.351	2.044	76.707	32.453	32858.319	35478.127	0.000	0.989	0.000	7.622	0.000	20397.019
Instance1048.4	11.098	1.787	76.741	32.454	32861.357	35468.275	0.000	0.988	0.000	7.631	0.000	20352.076
Instance1048.5	11.174	1.571	76.694	32.404	32859.983	35482.605	0.000	0.998	0.000	7.612	0.000	20378.209



Table 55 Background Database Maintenance I/O performance

MSEExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance1048.1	8.792	261944.314
Instance1048.2	8.850	261944.829
Instance1048.3	8.819	261945.120
Instance1048.4	8.834	261947.502
Instance1048.5	8.830	261973.180

Table 56 Log replication I/O performance

MSEExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance1048.1	0.663	226972.012
Instance1048.2	0.664	226209.282
Instance1048.3	0.664	225739.383
Instance1048.4	0.663	226815.592
Instance1048.5	0.663	225900.248



Table 57 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
Instance1048.1	11.169	2.128	85.530	32.444	56411.814	35478.995	6.717	0.993	0.663	7.605	226972.012	20422.581
Instance1048.2	10.911	1.840	85.437	32.341	56589.725	35504.126	6.484	1.003	0.664	7.611	226209.282	20421.462
Instance1048.3	11.351	2.044	85.527	32.453	56481.243	35478.127	6.531	0.989	0.664	7.622	225739.383	20397.019
Instance1048.4	11.098	1.787	85.575	32.454	56510.484	35468.275	6.777	0.988	0.663	7.631	226815.592	20352.076
Instance1048.5	11.174	1.571	85.524	32.404	56515.735	35482.605	7.248	0.998	0.663	7.612	225900.248	20378.209

Table 58 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.423	0.000	2.690
Available MBytes	28787.678	28771.000	28858.000
Free System Page Table Entries	33555674.045	33555671.000	33555676.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	80063456.484	80039936.000	80121856.000
Pool Paged Bytes	170529282.938	169652224.000	171302912.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



B.2 Test log

11/22/2013 8:53:13 AM -- Preparing for testing ...
11/22/2013 8:53:19 AM -- Attaching databases ...
11/22/2013 8:53:19 AM -- Preparations for testing are complete.
11/22/2013 8:53:19 AM -- Starting transaction dispatch ..
11/22/2013 8:53:19 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/22/2013 8:53:19 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/22/2013 8:53:25 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
11/22/2013 8:53:25 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
11/22/2013 8:53:31 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/22/2013 8:53:31 AM -- Performance logging started (interval: 15000 ms).
11/22/2013 8:53:31 AM -- Attaining prerequisites:
11/22/2013 8:56:22 AM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1212330000.0 (lower bound: 1207960000.0, upper bound: none)
11/23/2013 8:56:23 AM -- Performance logging has ended.
11/23/2013 4:50:00 PM -- JetInterop batch transaction stats: 284111, 284111, 284110, 284110 and 284110.
11/23/2013 4:50:00 PM -- Dispatching transactions ends.
11/23/2013 4:50:00 PM -- Shutting down databases ...
11/23/2013 4:50:01 PM -- Instance1048.1 (complete), Instance1048.2 (complete), Instance1048.3 (complete), Instance1048.4 (complete) and Instance1048.5 (complete)
11/23/2013 4:50:01 PM -- C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_25.blg has 5762 samples.
11/23/2013 4:50:01 PM -- Creating test report ...
11/23/2013 4:50:31 PM -- Instance1048.1 has 11.2 for I/O Database Reads Average Latency.
11/23/2013 4:50:31 PM -- Instance1048.1 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:31 PM -- Instance1048.1 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:50:31 PM -- Instance1048.2 has 10.9 for I/O Database Reads Average Latency.
11/23/2013 4:50:31 PM -- Instance1048.2 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:31 PM -- Instance1048.2 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:50:31 PM -- Instance1048.3 has 11.4 for I/O Database Reads Average Latency.
11/23/2013 4:50:31 PM -- Instance1048.3 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:31 PM -- Instance1048.3 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:50:31 PM -- Instance1048.4 has 11.1 for I/O Database Reads Average Latency.
11/23/2013 4:50:31 PM -- Instance1048.4 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:31 PM -- Instance1048.4 has 1.0 for I/O Log Reads Average Latency.



11/23/2013 4:50:31 PM -- Instance1048.5 has 11.2 for I/O Database Reads Average Latency.
11/23/2013 4:50:31 PM -- Instance1048.5 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:31 PM -- Instance1048.5 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:50:31 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/23/2013 4:50:31 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/23/2013 4:50:31 PM -- C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_25.xml has 5750 samples queried.



B.3 Server 2 – JS7

Table 59 Test Summary

Overall Test Result	Pass
Machine Name	JS7
Test Description	5000 users/server 5 servers 2GB mailboxes .10 IOPS/user .12 IOPS tested 5 dbs per server 2.2 TB db/log combined volumes 2 copies 7 threads/db
Test Start Time	11/22/2013 8:53:09 AM
Test End Time	11/23/2013 4:49:53 PM
Collection Start Time	11/22/2013 8:56:27 AM
Collection End Time	11/23/2013 8:56:25 AM
Jetstress Version	15.00.0658.004
ESE Version	15.00.0712.008
Operating System	Windows Server 2008 R2 Standard Service Pack 1 (6.1.7601.65536)
Performance Log	C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_20.blg



Table 60 Database Sizing and Throughput

Performance Counter	Value
Achieved Transactional I/O per Second	512.345
Target Transactional I/O per Second	500
Initial Database Size (bytes)	10752245432320
Final Database Size (bytes)	10770859753472
Database Files (Count)	5

Table 61 Jetstress System Parameters

Performance Counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 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



Table 62 Database configuration

Performance Counter	Value
Instance3144.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance3144.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance3144.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance3144.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance3144.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb

Table 63 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
Instance3144.1	11.878	1.935	72.032	30.439	32869.286	35474.460	0.000	0.995	0.000	7.135	0.000	20398.103
Instance3144.2	11.664	2.053	72.040	30.482	32874.006	35466.522	0.000	1.002	0.000	7.151	0.000	20376.599
Instance3144.3	11.586	1.828	72.041	30.467	32871.485	35458.825	0.000	0.993	0.000	7.125	0.000	20436.392
Instance3144.4	11.843	1.914	72.118	30.538	32870.883	35460.828	0.000	1.000	0.000	7.152	0.000	20360.188
Instance3144.5	11.943	1.601	71.856	30.333	32867.405	35492.961	0.000	1.009	0.000	7.118	0.000	20486.633



Table 64 Background Database Maintenance I/O performance

MSEExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3144.1	8.789	261951.572
Instance3144.2	8.759	261955.135
Instance3144.3	8.771	261959.043
Instance3144.4	8.756	261934.585
Instance3144.5	8.831	261943.486

Table 65 Log Replication I/O performance

MSEExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3144.1	0.621	221796.013
Instance3144.2	0.622	220811.693
Instance3144.3	0.621	222323.542
Instance3144.4	0.621	221476.307
Instance3144.5	0.623	221850.638



Table 66 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
Instance3144.1	11.878	1.935	80.821	30.439	57780.587	35474.460	6.981	0.995	0.621	7.135	221796.013	20398.103
Instance3144.2	11.664	2.053	80.799	30.482	57706.929	35466.522	7.006	1.002	0.622	7.151	220811.693	20376.599
Instance3144.3	11.586	1.828	80.812	30.467	57736.422	35458.825	6.551	0.993	0.621	7.125	222323.542	20436.392
Instance3144.4	11.843	1.914	80.874	30.538	57671.937	35460.828	6.774	1.000	0.621	7.152	221476.307	20360.188
Instance3144.5	11.943	1.601	80.687	30.333	57938.899	35492.961	7.255	1.009	0.623	7.118	221850.638	20486.633

Table 67 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.456	0.000	2.859
Available MBytes	28754.887	28739.000	28792.000
Free System Page Table Entries	33555673.047	33555671.000	33555675.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	82215435.485	82161664.000	82280448.000
Pool Paged Bytes	167024659.586	166432768.000	167776256.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



B.4 Test log

11/22/2013 8:53:09 AM -- Preparing for testing ...
11/22/2013 8:53:14 AM -- Attaching databases ...
11/22/2013 8:53:14 AM -- Preparations for testing are complete.
11/22/2013 8:53:14 AM -- Starting transaction dispatch ..
11/22/2013 8:53:14 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/22/2013 8:53:14 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/22/2013 8:53:20 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
11/22/2013 8:53:20 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
11/22/2013 8:53:26 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/22/2013 8:53:26 AM -- Performance logging started (interval: 15000 ms).
11/22/2013 8:53:26 AM -- Attaining prerequisites:
11/22/2013 8:56:27 AM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1209831000.0 (lower bound: 1207960000.0, upper bound: none)
11/23/2013 8:56:28 AM -- Performance logging has ended.
11/23/2013 4:49:52 PM -- JetInterop batch transaction stats: 266750, 266750, 266750, 266750 and 266750.
11/23/2013 4:49:52 PM -- Dispatching transactions ends.
11/23/2013 4:49:52 PM -- Shutting down databases ...
11/23/2013 4:49:53 PM -- Instance3144.1 (complete), Instance3144.2 (complete), Instance3144.3 (complete), Instance3144.4 (complete) and Instance3144.5 (complete)
11/23/2013 4:49:53 PM -- C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_20.blg has 5763 samples.
11/23/2013 4:49:53 PM -- Creating test report ...
11/23/2013 4:50:22 PM -- Instance3144.1 has 11.9 for I/O Database Reads Average Latency.
11/23/2013 4:50:22 PM -- Instance3144.1 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:22 PM -- Instance3144.1 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:50:22 PM -- Instance3144.2 has 11.7 for I/O Database Reads Average Latency.
11/23/2013 4:50:22 PM -- Instance3144.2 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:22 PM -- Instance3144.2 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:50:22 PM -- Instance3144.3 has 11.6 for I/O Database Reads Average Latency.
11/23/2013 4:50:22 PM -- Instance3144.3 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:22 PM -- Instance3144.3 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:50:22 PM -- Instance3144.4 has 11.8 for I/O Database Reads Average Latency.
11/23/2013 4:50:22 PM -- Instance3144.4 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:22 PM -- Instance3144.4 has 1.0 for I/O Log Reads Average Latency.



11/23/2013 4:50:22 PM -- Instance3144.5 has 11.9 for I/O Database Reads Average Latency.
11/23/2013 4:50:22 PM -- Instance3144.5 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:22 PM -- Instance3144.5 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:50:22 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/23/2013 4:50:22 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/23/2013 4:50:22 PM -- [C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_20.xml](#) has 5750 samples queried.



B.5 Server 3 – JS8

Test Summary

Overall Test Result	Pass
Machine Name	JS8
Test Description	5000 users/server 5 servers 2GB mailboxes .10 IOPS/user .12 IOPS tested 5 dbs per server 2.2 TB db/log combined volumes 2 copies 7 threads/db
Test Start Time	11/22/2013 8:53:00 AM
Test End Time	11/23/2013 4:49:46 PM
Collection Start Time	11/22/2013 8:56:19 AM
Collection End Time	11/23/2013 8:56:16 AM
Jetstress Version	15.00.0658.004
ESE Version	15.00.0712.008
Operating System	Windows Server 2008 R2 Standard Service Pack 1 (6.1.7601.65536)
Performance Log	C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_11.blg



Table 68 Database sizing and throughput

Performance Counter	Value
Achieved Transactional I/O per Second	504.205
Target Transactional I/O per Second	500
Initial Database Size (bytes)	10751985385472
Final Database Size (bytes)	10770297716736
Database Files (Count)	5

Table 69 Jetstress system parameters

Performance Counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 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



Table 70 Database configuration

Performance Counter	Value
Instance3108.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance3108.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance3108.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance3108.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance3108.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb

Table 71 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
Instance3108.1	11.804	1.485	70.814	29.887	32872.259	35481.227	0.000	1.059	0.000	7.009	0.000	20416.768
Instance3108.2	11.981	1.604	70.912	29.960	32871.283	35479.071	0.000	1.044	0.000	7.024	0.000	20367.252
Instance3108.3	11.953	1.965	70.869	29.978	32870.341	35482.498	0.000	1.055	0.000	7.028	0.000	20400.321
Instance3108.4	11.847	2.370	70.916	30.058	32871.055	35475.824	0.000	1.061	0.000	7.041	0.000	20356.708
Instance3108.5	11.813	2.774	70.855	29.956	32871.616	35488.355	0.000	1.044	0.000	7.013	0.000	20424.995



Table 72 Background Database Maintenance I/O performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3108.1	8.821	261952.236
Instance3108.2	8.785	261965.282
Instance3108.3	8.787	261951.282
Instance3108.4	8.747	261949.052
Instance3108.5	8.798	261968.116

Table 73 Log Replication I/O performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3108.1	0.610	220667.436
Instance3108.2	0.610	221055.103
Instance3108.3	0.612	219575.503
Instance3108.4	0.612	221032.222
Instance3108.5	0.611	220396.312



Table 74 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
Instance3108.1	11.804	1.485	79.635	29.887	58247.452	35481.227	6.644	1.059	0.610	7.009	220667.436	20416.768
Instance3108.2	11.981	1.604	79.697	29.960	58123.646	35479.071	6.851	1.044	0.610	7.024	221055.103	20367.252
Instance3108.3	11.953	1.965	79.656	29.978	58140.746	35482.498	6.574	1.055	0.612	7.028	219575.503	20400.321
Instance3108.4	11.847	2.370	79.663	30.058	58024.383	35475.824	6.613	1.061	0.612	7.041	221032.222	20356.708
Instance3108.5	11.813	2.774	79.654	29.956	58177.161	35488.355	7.062	1.044	0.611	7.013	220396.312	20424.995

Table 75 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.382	0.000	2.320
Available MBytes	28819.823	28802.000	28862.000
Free System Page Table Entries	33555674.046	33555671.000	33555676.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	78310790.121	78229504.000	78417920.000
Pool Paged Bytes	154523421.157	154034176.000	155123712.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



B.6 Test log

11/22/2013 8:53:00 AM -- Preparing for testing ...
11/22/2013 8:53:05 AM -- Attaching databases ...
11/22/2013 8:53:05 AM -- Preparations for testing are complete.
11/22/2013 8:53:05 AM -- Starting transaction dispatch ..
11/22/2013 8:53:05 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/22/2013 8:53:05 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/22/2013 8:53:11 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
11/22/2013 8:53:11 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
11/22/2013 8:53:18 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/22/2013 8:53:18 AM -- Performance logging started (interval: 15000 ms).
11/22/2013 8:53:18 AM -- Attaining prerequisites:
11/22/2013 8:56:19 AM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1219088000.0 (lower bound: 1207960000.0, upper bound: none)
11/23/2013 8:56:20 AM -- Performance logging has ended.
11/23/2013 4:49:44 PM -- JetInterop batch transaction stats: 262663, 262663, 262663, 262663 and 262663.
11/23/2013 4:49:44 PM -- Dispatching transactions ends.
11/23/2013 4:49:44 PM -- Shutting down databases ...
11/23/2013 4:49:46 PM -- Instance3108.1 (complete), Instance3108.2 (complete), Instance3108.3 (complete), Instance3108.4 (complete) and Instance3108.5 (complete)
11/23/2013 4:49:46 PM -- C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_11.blg has 5763 samples.
11/23/2013 4:49:46 PM -- Creating test report ...
11/23/2013 4:50:16 PM -- Instance3108.1 has 11.8 for I/O Database Reads Average Latency.
11/23/2013 4:50:16 PM -- Instance3108.1 has 1.1 for I/O Log Writes Average Latency.
11/23/2013 4:50:16 PM -- Instance3108.1 has 1.1 for I/O Log Reads Average Latency.
11/23/2013 4:50:16 PM -- Instance3108.2 has 12.0 for I/O Database Reads Average Latency.
11/23/2013 4:50:16 PM -- Instance3108.2 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:16 PM -- Instance3108.2 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:50:16 PM -- Instance3108.3 has 12.0 for I/O Database Reads Average Latency.
11/23/2013 4:50:16 PM -- Instance3108.3 has 1.1 for I/O Log Writes Average Latency.
11/23/2013 4:50:16 PM -- Instance3108.3 has 1.1 for I/O Log Reads Average Latency.
11/23/2013 4:50:16 PM -- Instance3108.4 has 11.8 for I/O Database Reads Average Latency.
11/23/2013 4:50:16 PM -- Instance3108.4 has 1.1 for I/O Log Writes Average Latency.
11/23/2013 4:50:16 PM -- Instance3108.4 has 1.1 for I/O Log Reads Average Latency.



11/23/2013 4:50:16 PM -- Instance3108.5 has 11.8 for I/O Database Reads Average Latency.
11/23/2013 4:50:16 PM -- Instance3108.5 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:16 PM -- Instance3108.5 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:50:16 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/23/2013 4:50:16 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/23/2013 4:50:16 PM -- [C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_11.xml](#) has 5750 samples queried.



B.7 Server 4 – JS9

Table 76 Test summary

Overall Test Result	Pass
Machine Name	JS9
Test Description	5000 users/server 5 servers 2GB mailboxes .10 IOPS/user .12 IOPS tested 5 dbs per server 2.2 TB db/log combined volumes 2 copies 7 threads/db
Test Start Time	11/22/2013 8:52:56 AM
Test End Time	11/23/2013 4:49:40 PM
Collection Start Time	11/22/2013 8:56:02 AM
Collection End Time	11/23/2013 8:55:57 AM
Jetstress Version	15.00.0658.004
ESE Version	15.00.0712.008
Operating System	Windows Server 2008 R2 Standard Service Pack 1 (6.1.7601.65536)
Performance Log	C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_7.blg



Table 77 Database sizing and throughput

Performance Counter	Value
Achieved Transactional I/O per Second	547.664
Target Transactional I/O per Second	500
Initial Database Size (bytes)	10751289131008
Final Database Size (bytes)	10771161743360
Database Files (Count)	5

Table 78 Jetstress system parameters

Performance Counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 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



Table 79 Database configuration

Performance Counter	Value
Instance3160.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance3160.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance3160.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance3160.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance3160.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb

Table 80 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
Instance3160.1	11.221	1.375	76.976	32.486	32857.015	35472.411	0.000	1.011	0.000	7.627	0.000	20390.455
Instance3160.2	11.014	1.594	76.994	32.503	32860.763	35469.626	0.000	1.020	0.000	7.629	0.000	20407.034
Instance3160.3	10.942	2.006	77.052	32.537	32857.131	35477.933	0.000	1.008	0.000	7.639	0.000	20349.569
Instance3160.4	11.247	2.462	77.057	32.544	32860.065	35470.875	0.000	1.007	0.000	7.639	0.000	20342.817
Instance3160.5	10.997	2.927	77.035	32.479	32860.638	35474.362	0.000	1.021	0.000	7.616	0.000	20390.528



Table 81 Background Database Maintenance I/O performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3160.1	8.804	261955.884
Instance3160.2	8.859	261959.805
Instance3160.3	8.863	261970.864
Instance3160.4	8.808	261953.552
Instance3160.5	8.815	261951.521

Table 82 Log Replication I/O performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3160.1	8.804	261955.884
Instance3160.2	8.859	261959.805
Instance3160.3	8.863	261970.864
Instance3160.4	8.808	261953.552
Instance3160.5	8.815	261951.521



Table 83 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
Instance3160.1	11.221	1.375	85.781	32.486	56371.316	35472.411	6.641	1.011	0.664	7.627	226634.094	20390.455
Instance3160.2	11.014	1.594	85.853	32.503	56500.013	35469.626	6.970	1.020	0.664	7.629	227285.957	20407.034
Instance3160.3	10.942	2.006	85.915	32.537	56492.898	35477.933	6.367	1.008	0.664	7.639	226542.947	20349.569
Instance3160.4	11.247	2.462	85.864	32.544	56359.730	35470.875	6.366	1.007	0.664	7.639	227001.172	20342.817
Instance3160.5	10.997	2.927	85.850	32.479	56382.932	35474.362	6.802	1.021	0.663	7.616	226653.389	20390.528

Table 84 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.456	0.000	2.690
Available MBytes	28732.548	28719.000	28775.000
Free System Page Table Entries	33555674.039	33555642.000	33555676.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	73402232.321	73355264.000	73490432.000
Pool Paged Bytes	167413680.587	166834176.000	168116224.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



B.8 Test log

11/22/2013 8:52:56 AM -- Preparing for testing ...
11/22/2013 8:53:01 AM -- Attaching databases ...
11/22/2013 8:53:01 AM -- Preparations for testing are complete.
11/22/2013 8:53:01 AM -- Starting transaction dispatch ..
11/22/2013 8:53:01 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/22/2013 8:53:01 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/22/2013 8:53:07 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
11/22/2013 8:53:07 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
11/22/2013 8:53:14 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/22/2013 8:53:14 AM -- Performance logging started (interval: 15000 ms).
11/22/2013 8:53:14 AM -- Attaining prerequisites:
11/22/2013 8:56:02 AM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1209942000.0 (lower bound: 1207960000.0, upper bound: none)
11/23/2013 8:56:03 AM -- Performance logging has ended.
11/23/2013 4:49:38 PM -- JetInterop batch transaction stats: 285207, 285207, 285206, 285206 and 285206.
11/23/2013 4:49:38 PM -- Dispatching transactions ends.
11/23/2013 4:49:38 PM -- Shutting down databases ...
11/23/2013 4:49:40 PM -- Instance3160.1 (complete), Instance3160.2 (complete), Instance3160.3 (complete), Instance3160.4 (complete) and Instance3160.5 (complete)
11/23/2013 4:49:40 PM -- C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_7.blg has 5762 samples.
11/23/2013 4:49:40 PM -- Creating test report ...
11/23/2013 4:50:08 PM -- Instance3160.1 has 11.2 for I/O Database Reads Average Latency.
11/23/2013 4:50:08 PM -- Instance3160.1 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:08 PM -- Instance3160.1 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:50:08 PM -- Instance3160.2 has 11.0 for I/O Database Reads Average Latency.
11/23/2013 4:50:08 PM -- Instance3160.2 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:08 PM -- Instance3160.2 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:50:08 PM -- Instance3160.3 has 10.9 for I/O Database Reads Average Latency.
11/23/2013 4:50:08 PM -- Instance3160.3 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:08 PM -- Instance3160.3 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:50:08 PM -- Instance3160.4 has 11.2 for I/O Database Reads Average Latency.
11/23/2013 4:50:08 PM -- Instance3160.4 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:08 PM -- Instance3160.4 has 1.0 for I/O Log Reads Average Latency.



11/23/2013 4:50:08 PM -- Instance3160.5 has 11.0 for I/O Database Reads Average Latency.
11/23/2013 4:50:08 PM -- Instance3160.5 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:50:08 PM -- Instance3160.5 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:50:08 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/23/2013 4:50:08 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/23/2013 4:50:08 PM -- [C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_7.xml](#) has 5750 samples queried.



B.9 Server 5 – JS10

Table 85 Test summary

Overall Test Result	Pass
Machine Name	JS10
Test Description	5000 users/server 5 servers 2GB mailboxes .10 IOPS/user .12 IOPS tested 5 dbs per server 2.2 TB db/log combined volumes 2 copies 7 threads/db
Test Start Time	11/22/2013 8:52:52 AM
Test End Time	11/23/2013 4:49:33 PM
Collection Start Time	11/22/2013 8:55:57 AM
Collection End Time	11/23/2013 8:55:49 AM
Jetstress Version	15.00.0658.004
ESE Version	15.00.0712.008
Operating System	Windows Server 2008 R2 Enterprise Service Pack 1 (6.1.7601.65536)
Performance Log	C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_3.blg



Table 86 Database sizing and throughput

Performance Counter	Value
Achieved Transactional I/O per Second	523.033
Target Transactional I/O per Second	500
Initial Database Size (bytes)	10752455147520
Final Database Size (bytes)	10771455344640
Database Files (Count)	5

Table 87 Jetstress system parameters

Performance Counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 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



Table 88 Database configuration

Performance Counter	Value
Instance3620.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance3620.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance3620.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance3620.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance3620.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb

Table 89 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
Instance3620.1	11.561	1.908	73.525	31.088	32868.549	35463.021	0.000	1.004	0.000	7.286	0.000	20385.000
Instance3620.2	11.387	1.636	73.490	31.109	32867.821	35454.607	0.000	0.991	0.000	7.295	0.000	20397.039
Instance3620.3	11.338	1.838	73.567	31.108	32868.242	35440.925	0.000	1.002	0.000	7.284	0.000	20363.499
Instance3620.4	11.735	1.607	73.507	31.053	32865.732	35461.258	0.000	1.008	0.000	7.285	0.000	20365.326
Instance3620.5	11.654	1.452	73.492	31.094	32867.533	35465.310	0.000	0.995	0.000	7.299	0.000	20399.156



Table 90 Background Database Maintenance I/O performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3620.1	8.807	261961.823
Instance3620.2	8.857	261959.113
Instance3620.3	8.856	261961.984
Instance3620.4	8.787	261944.192
Instance3620.5	8.810	261951.619

Table 91 Log Replication I/O performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3620.1	0.634	223626.891
Instance3620.2	0.636	223674.869
Instance3620.3	0.633	224208.099
Instance3620.4	0.633	223661.740
Instance3620.5	0.635	223108.026



Table 92 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
Instance3620.1	11.561	1.908	82.332	31.088	57374.055	35463.021	6.723	1.004	0.634	7.286	223626.891	20385.000
Instance3620.2	11.387	1.636	82.347	31.109	57509.349	35454.607	7.311	0.991	0.636	7.295	223674.869	20397.039
Instance3620.3	11.338	1.838	82.423	31.108	57483.798	35440.925	6.552	1.002	0.633	7.284	224208.099	20363.499
Instance3620.4	11.735	1.607	82.295	31.053	57326.364	35461.258	6.772	1.008	0.633	7.285	223661.740	20365.326
Instance3620.5	11.654	1.452	82.301	31.094	57389.266	35465.310	6.715	0.995	0.635	7.299	223108.026	20399.156

Table 93 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.466	0.000	2.860
Available MBytes	59929.958	59916.000	59975.000
Free System Page Table Entries	33555668.047	33555636.000	33555670.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	65817353.171	65798144.000	65875968.000
Pool Paged Bytes	170876258.393	170074112.000	171466752.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



B.10 Test log

11/22/2013 8:52:52 AM -- Preparing for testing ...
11/22/2013 8:52:57 AM -- Attaching databases ...
11/22/2013 8:52:57 AM -- Preparations for testing are complete.
11/22/2013 8:52:57 AM -- Starting transaction dispatch ..
11/22/2013 8:52:57 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/22/2013 8:52:57 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/22/2013 8:53:03 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
11/22/2013 8:53:03 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
11/22/2013 8:53:09 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/22/2013 8:53:09 AM -- Performance logging started (interval: 15000 ms).
11/22/2013 8:53:09 AM -- Attaining prerequisites:
11/22/2013 8:55:57 AM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 1220018000.0 (lower bound: 1207960000.0, upper bound: none)
11/23/2013 8:55:57 AM -- Performance logging has ended.
11/23/2013 4:49:31 PM -- JetInterop batch transaction stats: 272254, 272254, 272253, 272253 and 272253.
11/23/2013 4:49:31 PM -- Dispatching transactions ends.
11/23/2013 4:49:31 PM -- Shutting down databases ...
11/23/2013 4:49:33 PM -- Instance3620.1 (complete), Instance3620.2 (complete), Instance3620.3 (complete), Instance3620.4 (complete) and Instance3620.5 (complete)
11/23/2013 4:49:33 PM -- C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_3.blg has 5761 samples.
11/23/2013 4:49:33 PM -- Creating test report ...
11/23/2013 4:49:59 PM -- Instance3620.1 has 11.6 for I/O Database Reads Average Latency.
11/23/2013 4:49:59 PM -- Instance3620.1 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:49:59 PM -- Instance3620.1 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:49:59 PM -- Instance3620.2 has 11.4 for I/O Database Reads Average Latency.
11/23/2013 4:49:59 PM -- Instance3620.2 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:49:59 PM -- Instance3620.2 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:49:59 PM -- Instance3620.3 has 11.3 for I/O Database Reads Average Latency.
11/23/2013 4:49:59 PM -- Instance3620.3 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:49:59 PM -- Instance3620.3 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:49:59 PM -- Instance3620.4 has 11.7 for I/O Database Reads Average Latency.
11/23/2013 4:49:59 PM -- Instance3620.4 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:49:59 PM -- Instance3620.4 has 1.0 for I/O Log Reads Average Latency.



11/23/2013 4:49:59 PM -- Instance3620.5 has 11.7 for I/O Database Reads Average Latency.
11/23/2013 4:49:59 PM -- Instance3620.5 has 1.0 for I/O Log Writes Average Latency.
11/23/2013 4:49:59 PM -- Instance3620.5 has 1.0 for I/O Log Reads Average Latency.
11/23/2013 4:49:59 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/23/2013 4:49:59 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/23/2013 4:49:59 PM -- [C:\Program Files\Exchange Jetstress\Stress_2013_11_22_8_53_3.xml](#) has 5749 samples queried.



C Backup testing

C.1 Server 1 – JS6

Table 94 Database backup statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance3996.1	2054428.09	04:51:03	117.64
Instance3996.2	2054444.09	04:52:44	116.96
Instance3996.3	2054436.09	04:50:14	117.98
Instance3996.4	2054420.09	04:54:12	116.38
Instance3996.5	2054428.09	05:01:32	113.55
Avg			116.50
Sum			582.52



Table 95 Jetstress system parameters

Performance Counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%

Table 96 Database configuration

Performance Counter	Value
Instance3996.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance3996.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance3996.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance3996.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance3996.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb



Table 97 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
Instance3996.1	3.176	0.000	470.590	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3996.2	3.050	0.000	467.709	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3996.3	3.300	0.000	472.008	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3996.4	3.354	0.000	465.436	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3996.5	3.453	0.000	454.204	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000



Table 98 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.736	0.000	1.808
Available MBytes	30245.507	30228.000	30250.000
Free System Page Table Entries	33555674.113	33555674.000	33555676.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	80181118.724	80158720.000	80216064.000
Pool Paged Bytes	173879282.392	173826048.000	174030848.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

C.2 Test log

11/25/2013 11:08:30 AM -- Preparing for testing ...
 11/25/2013 11:08:36 AM -- Attaching databases ...
 11/25/2013 11:08:36 AM -- Preparations for testing are complete.
 11/25/2013 11:08:44 AM -- Performance logging started (interval: 30000 ms).
 11/25/2013 11:08:44 AM -- Backing up databases ...
 11/25/2013 4:10:17 PM -- Performance logging has ended.
 11/25/2013 4:10:17 PM -- Instance3996.1 (100% processed), Instance3996.2 (100% processed), Instance3996.3 (100% processed), Instance3996.4 (100% processed) and Instance3996.5 (100% processed)
 11/25/2013 4:10:17 PM -- C:\Program Files\Exchange Jetstress\DatabaseBackup_2013_11_25_11_8_36.blg has 602 samples.
 11/25/2013 4:10:17 PM -- Creating test report ...



C.3 Server 2 – JS7

Table 99 Database backup statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance3688.1	2054364.09	04:49:52	118.12
Instance3688.2	2054380.09	04:46:40	119.44
Instance3688.3	2054372.09	04:39:07	122.67
Instance3688.4	2054364.09	04:53:34	116.63
Instance3688.5	2054372.09	05:00:00	114.13
Avg			118.20
Sum			590.98

Table 100 Jetstress system parameters

Performance Counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%



Table 101 Database configuration

Performance Counter	Value
Instance3688.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance3688.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance3688.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance3688.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance3688.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb

Table 102 Transactional I/O performance

MSEExchange 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
Instance3688.1	3.160	0.000	472.397	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3688.2	3.228	0.000	477.841	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3688.3	3.037	0.000	490.747	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3688.4	3.187	0.000	466.393	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3688.5	3.363	0.000	456.443	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000



Table 103 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	1.140	0.000	1.706
Available MBytes	30169.511	30152.000	30176.000
Free System Page Table Entries	33555673.077	33555673.000	33555675.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	82210679.239	82198528.000	82251776.000
Pool Paged Bytes	170473188.220	170446848.000	170528768.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

C.4 Test log

11/25/2013 11:08:27 AM -- Preparing for testing ...
 11/25/2013 11:08:33 AM -- Attaching databases ...
 11/25/2013 11:08:33 AM -- Preparations for testing are complete.
 11/25/2013 11:08:41 AM -- Performance logging started (interval: 30000 ms).
 11/25/2013 11:08:41 AM -- Backing up databases ...
 11/25/2013 4:08:42 PM -- Performance logging has ended.
 11/25/2013 4:08:42 PM -- Instance3688.1 (100% processed), Instance3688.2 (100% processed), Instance3688.3 (100% processed), Instance3688.4 (100% processed) and Instance3688.5 (100% processed)
 11/25/2013 4:08:42 PM -- C:\Program Files\Exchange Jetstress\DatabaseBackup_2013_11_25_11_8_33.blg has 599 samples.
 11/25/2013 4:08:42 PM -- Creating test report ...



C.5 Server 3 – JS8

Table 104 Database backup statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance2384.1	2054268.09	05:08:31	110.97
Instance2384.2	2054252.09	05:02:00	113.36
Instance2384.3	2054284.09	05:04:15	112.53
Instance2384.4	2054268.09	05:03:14	112.90
Instance2384.5	2054244.09	04:58:35	114.66
Avg			112.89
Sum			564.43

Table 105 Jetstress system parameters

Performance Counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%



Table 106 Database configuration

Performance Counter	Value
Instance2384.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance2384.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance2384.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance2384.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance2384.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb

Table 107 Transactional I/O performance

MSEExchange 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
Instance2384.1	3.359	0.000	443.623	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2384.2	3.459	0.000	453.252	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2384.3	3.350	0.000	449.802	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2384.4	3.479	0.000	451.351	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2384.5	3.410	0.000	458.465	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000



Table 108 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.727	0.000	1.679
Available MBytes	30224.956	30210.000	30232.000
Free System Page Table Entries	33555674.068	33555674.000	33555676.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	78409747.948	78385152.000	78454784.000
Pool Paged Bytes	158407620.156	158150656.000	158736384.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

C.6 Test log

11/25/2013 11:08:25 AM -- Preparing for testing ...
 11/25/2013 11:08:30 AM -- Attaching databases ...
 11/25/2013 11:08:30 AM -- Preparations for testing are complete.
 11/25/2013 11:08:38 AM -- Performance logging started (interval: 30000 ms).
 11/25/2013 11:08:38 AM -- Backing up databases ...
 11/25/2013 4:17:10 PM -- Performance logging has ended.
 11/25/2013 4:17:10 PM -- Instance2384.1 (100% processed), Instance2384.2 (100% processed), Instance2384.3 (100% processed), Instance2384.4 (100% processed) and Instance2384.5 (100% processed)
 11/25/2013 4:17:10 PM -- C:\Program Files\Exchange Jetstress\DatabaseBackup_2013_11_25_11_8_30.blg has 616 samples.
 11/25/2013 4:17:10 PM -- Creating test report ...



C.7 Server 4 – JS9

Table 109 Database backup statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance4064.1	2054436.09	05:06:29	111.72
Instance4064.2	2054436.09	05:04:32	112.43
Instance4064.3	2054420.09	05:02:12	113.30
Instance4064.4	2054436.09	05:03:43	112.74
Instance4064.5	2054412.09	05:05:28	112.09
Avg			112.45
Sum			562.27

Table 110 Jetstress system parameters

Performance Counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%



Table 111 Database configuration

Performance Counter	Value
Instance4064.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance4064.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance4064.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance4064.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance4064.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb

Table 112 Transactional I/O performance

MSEExchange 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
Instance4064.1	3.513	0.000	446.602	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4064.2	3.415	0.000	449.523	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4064.3	3.483	0.000	453.039	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4064.4	3.386	0.000	450.458	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4064.5	3.441	0.000	448.233	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000



Table 113 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.741	0.000	1.953
Available MBytes	30136.982	30123.000	30145.000
Free System Page Table Entries	33555674.065	33555674.000	33555676.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	73488491.085	73486336.000	73515008.000
Pool Paged Bytes	171147685.647	168050688.000	171552768.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

C.8 Test log

11/25/2013 11:08:22 AM -- Preparing for testing ...
 11/25/2013 11:08:27 AM -- Attaching databases ...
 11/25/2013 11:08:27 AM -- Preparations for testing are complete.
 11/25/2013 11:08:35 AM -- Performance logging started (interval: 30000 ms).
 11/25/2013 11:08:35 AM -- Backing up databases ...
 11/25/2013 4:15:05 PM -- Performance logging has ended.
 11/25/2013 4:15:05 PM -- Instance4064.1 (100% processed), Instance4064.2 (100% processed), Instance4064.3 (100% processed), Instance4064.4 (100% processed) and Instance4064.5 (100% processed)
 11/25/2013 4:15:05 PM -- C:\Program Files\Exchange Jetstress\DatabaseBackup_2013_11_25_11_8_27.blg has 612 samples.
 11/25/2013 4:15:05 PM -- Creating test report ...



C.9 Server 4 – JS10

Table 114 Database backup statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance4976.1	2054476.09	05:14:29	108.88
Instance4976.2	2054508.09	05:08:10	111.11
Instance4976.3	2054476.09	05:12:24	109.61
Instance4976.4	2054476.09	05:16:50	108.07
Instance4976.5	2054484.09	05:12:00	109.74
Avg			109.48
Sum			547.41

Table 115 Jetstress system parameters

Performance Counter	Value
Thread Count	7
Minimum Database Cache	160.0 MB
Maximum Database Cache	1280.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%



Table 116 Database configuration

Performance Counter	Value
Instance4976.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance4976.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance4976.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance4976.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance4976.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb

Table 117 Transactional I/O performance

MSEExchange 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
Instance4976.1	3.632	0.000	435.125	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4976.2	3.256	0.000	443.985	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4976.3	3.640	0.000	438.189	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4976.4	3.781	0.000	432.163	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4976.5	3.654	0.000	438.584	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000



Table 118 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.832	0.000	2.043
Available MBytes	61322.368	61307.000	61324.000
Free System Page Table Entries	33555668.041	33555668.000	33555670.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	66051778.932	66027520.000	66105344.000
Pool Paged Bytes	174661334.344	174637056.000	174768128.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

C.10 Test log

11/25/2013 11:08:19 AM -- Preparing for testing ...
 11/25/2013 11:08:25 AM -- Attaching databases ...
 11/25/2013 11:08:25 AM -- Preparations for testing are complete.
 11/25/2013 11:08:33 AM -- Performance logging started (interval: 30000 ms).
 11/25/2013 11:08:33 AM -- Backing up databases ...
 11/25/2013 4:25:24 PM -- Performance logging has ended.
 11/25/2013 4:25:24 PM -- Instance4976.1 (100% processed), Instance4976.2 (100% processed), Instance4976.3 (100% processed), Instance4976.4 (100% processed) and Instance4976.5 (100% processed)
 11/25/2013 4:25:24 PM -- C:\Program Files\Exchange Jetstress\DatabaseBackup_2013_11_25_11_8_25.blg has 633 samples.
 11/25/2013 4:25:24 PM -- Creating test report ...



D Recovery testing

D.1 Server 1 – JS6

Table 119 Soft Recovery statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance3996.1	501	586.3765588
Instance3996.2	504	590.0893826
Instance3996.3	505	629.3392342
Instance3996.4	507	600.4322489
Instance3996.5	508	605.4710812
Avg	505	602.342
Sum	2525	3011.7085057

Table 120 Database configuration

Performance Counter	Value
Instance3996.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance3996.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance3996.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb



Instance3996.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance3996.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb

Table 121 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
Instance3996.1	9.314	0.923	581.481	3.409	40149.619	32768.000	13.936	0.000	4.262	0.000	209703.231	0.000
Instance3996.2	9.238	0.918	586.650	3.427	40167.240	32768.000	15.088	0.000	4.284	0.000	209673.358	0.000
Instance3996.3	9.738	0.987	540.764	3.219	40223.731	32768.000	16.262	0.000	4.024	0.000	209697.216	0.000
Instance3996.4	9.400	0.942	564.942	3.384	40309.403	32768.000	15.356	0.000	4.231	0.000	209697.517	0.000
Instance3996.5	9.414	0.905	565.214	3.362	40123.426	32768.000	15.242	0.000	4.202	0.000	209688.596	0.000

Table 122 Background Database Maintenance I/O performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3996.1	8.648	262072.291
Instance3996.2	8.636	261748.350
Instance3996.3	8.515	262024.874
Instance3996.4	8.552	261968.178
Instance3996.5	8.576	262081.166



Table 123 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
Instance3996.1	9.314	0.923	590.129	3.409	43401.735	32768.000	13.936	0.000	4.262	0.000	209703.231	0.000
Instance3996.2	9.238	0.918	595.286	3.427	43381.876	32768.000	15.088	0.000	4.284	0.000	209673.358	0.000
Instance3996.3	9.738	0.987	549.279	3.219	43662.159	32768.000	16.262	0.000	4.024	0.000	209697.216	0.000
Instance3996.4	9.400	0.942	573.494	3.384	43614.740	32768.000	15.356	0.000	4.231	0.000	209697.517	0.000
Instance3996.5	9.414	0.905	573.791	3.362	43440.918	32768.000	15.242	0.000	4.202	0.000	209688.596	0.000

Table 124 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	1.505	0.000	8.200
Available MBytes	28892.808	28839.000	30049.000
Free System Page Table Entries	33555674.167	33555674.000	33555676.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	80045843.692	79990784.000	80089088.000
Pool Paged Bytes	174325917.538	174301184.000	174370816.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



D.2 Test log

11/26/2013 9:40:55 AM -- Preparing for testing ...
11/26/2013 9:41:00 AM -- Attaching databases ...
11/26/2013 9:41:00 AM -- Preparations for testing are complete.
11/26/2013 9:41:00 AM -- Starting transaction dispatch ..
11/26/2013 9:41:00 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/26/2013 9:41:00 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/26/2013 9:41:06 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
11/26/2013 9:41:06 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
11/26/2013 9:41:10 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/26/2013 9:41:10 AM -- Performance logging started (interval: 15000 ms).
11/26/2013 9:41:10 AM -- Generating log files ...
11/26/2013 11:34:50 AM -- C:\DB\DB1 (100.2% generated), C:\DB\DB2 (100.8% generated), C:\DB\DB3 (101.0% generated), C:\DB\DB4 (101.4% generated) and C:\DB\DB5 (101.6% generated)
11/26/2013 11:34:50 AM -- Performance logging has ended.
11/26/2013 11:34:50 AM -- JetInterop batch transaction stats: 16991, 16990, 16990, 16990 and 16990.
11/26/2013 11:34:50 AM -- Dispatching transactions ends.
11/26/2013 11:34:50 AM -- Shutting down databases ...
11/26/2013 11:34:51 AM -- Instance3996.1 (complete), Instance3996.2 (complete), Instance3996.3 (complete), Instance3996.4 (complete) and Instance3996.5 (complete)
11/26/2013 11:34:51 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_6.blg has 453 samples.
11/26/2013 11:34:51 AM -- Creating test report ...
11/26/2013 11:34:54 AM -- Instance3996.1 has 11.1 for I/O Database Reads Average Latency.
11/26/2013 11:34:54 AM -- Instance3996.1 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:34:54 AM -- Instance3996.1 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:34:54 AM -- Instance3996.2 has 10.9 for I/O Database Reads Average Latency.
11/26/2013 11:34:54 AM -- Instance3996.2 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:34:54 AM -- Instance3996.2 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:34:54 AM -- Instance3996.3 has 11.3 for I/O Database Reads Average Latency.
11/26/2013 11:34:54 AM -- Instance3996.3 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:34:54 AM -- Instance3996.3 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:34:54 AM -- Instance3996.4 has 11.1 for I/O Database Reads Average Latency.
11/26/2013 11:34:54 AM -- Instance3996.4 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:34:54 AM -- Instance3996.4 has 1.0 for I/O Log Reads Average Latency.



11/26/2013 11:34:54 AM -- Instance3996.5 has 11.1 for I/O Database Reads Average Latency.
11/26/2013 11:34:54 AM -- Instance3996.5 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:34:54 AM -- Instance3996.5 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:34:54 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/26/2013 11:34:54 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/26/2013 11:34:54 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_6.xml has 452 samples queried.
11/26/2013 11:34:54 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_6.html was saved.
11/26/2013 11:48:08 AM -- Performance logging started (interval: 4000 ms).
11/26/2013 11:48:08 AM -- Recovering databases ...
11/26/2013 11:58:38 AM -- Performance logging has ended.
11/26/2013 11:58:38 AM -- Instance3996.1 (586.3765588), Instance3996.2 (590.0893826), Instance3996.3 (629.3392342), Instance3996.4 (600.4322489) and Instance3996.5 (605.4710812)
11/26/2013 11:58:38 AM -- C:\Program Files\Exchange Jetstress\SoftRecovery_2013_11_26_11_48_5.blg has 156 samples.
11/26/2013 11:58:38 AM -- Creating test report ...
.



D.3 Server 2 – JS7

Table 125 Soft Recovery statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance3688.1	501	669.1038891
Instance3688.2	502	657.9654177
Instance3688.3	502	644.7053327
Instance3688.4	502	656.1090058
Instance3688.5	502	669.1038891
Avg	501	659.398
Sum	2509	3296.9875344

Table 126 Database configuration

Performance Counter	Value
Instance3688.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance3688.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance3688.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance3688.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance3688.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb



Table 127 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
Instance3688.1	10.349	0.894	498.493	2.988	40172.703	32768.000	15.340	0.000	3.734	0.000	209691.045	0.000
Instance3688.2	10.080	0.900	517.201	3.055	40218.728	32768.000	17.719	0.000	3.819	0.000	209693.312	0.000
Instance3688.3	10.075	0.925	517.536	3.119	40046.471	32768.000	16.579	0.000	3.899	0.000	209729.941	0.000
Instance3688.4	10.190	0.900	511.587	3.067	40161.422	32768.000	16.862	0.000	3.848	0.000	209762.914	0.000
Instance3688.5	10.392	0.921	502.215	3.003	40177.806	32768.000	17.958	0.000	3.753	0.000	209680.754	0.000

Table 128 Background Database Maintenance I/O performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3688.1	8.624	262144.000
Instance3688.2	8.397	261884.097
Instance3688.3	8.329	262081.354
Instance3688.4	8.391	261917.902
Instance3688.5	8.583	261840.742



Table 129 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
Instance3688.1	10.349	0.894	507.117	2.988	43947.484	32768.000	15.340	0.000	3.734	0.000	209691.045	0.000
Instance3688.2	10.080	0.900	525.598	3.055	43760.109	32768.000	17.719	0.000	3.819	0.000	209693.312	0.000
Instance3688.3	10.075	0.925	525.864	3.119	43563.187	32768.000	16.579	0.000	3.899	0.000	209729.941	0.000
Instance3688.4	10.190	0.900	519.978	3.067	43739.938	32768.000	16.862	0.000	3.848	0.000	209762.914	0.000
Instance3688.5	10.392	0.921	510.799	3.003	43902.529	32768.000	17.958	0.000	3.753	0.000	209680.754	0.000

Table 130 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	1.361	0.000	4.542
Available MBytes	28812.946	28758.000	29983.000
Free System Page Table Entries	33555673.319	33555670.000	33555675.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	82395876.241	82350080.000	82493440.000
Pool Paged Bytes	171364080.578	171331584.000	171405312.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



D.4 Test log

11/26/2013 9:41:00 AM -- Preparing for testing ...
11/26/2013 9:41:06 AM -- Attaching databases ...
11/26/2013 9:41:06 AM -- Preparations for testing are complete.
11/26/2013 9:41:06 AM -- Starting transaction dispatch ..
11/26/2013 9:41:06 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/26/2013 9:41:06 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/26/2013 9:41:12 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
11/26/2013 9:41:12 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
11/26/2013 9:41:16 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/26/2013 9:41:16 AM -- Performance logging started (interval: 15000 ms).
11/26/2013 9:41:16 AM -- Generating log files ...
11/26/2013 11:40:06 AM -- C:\DB\DB1 (100.2% generated), C:\DB\DB2 (100.4% generated), C:\DB\DB3 (100.4% generated), C:\DB\DB4 (100.4% generated) and C:\DB\DB5 (100.4% generated)
11/26/2013 11:40:06 AM -- Performance logging has ended.
11/26/2013 11:40:06 AM -- JetInterop batch transaction stats: 16774, 16774, 16774, 16774 and 16773.
11/26/2013 11:40:06 AM -- Dispatching transactions ends.
11/26/2013 11:40:07 AM -- Shutting down databases ...
11/26/2013 11:40:08 AM -- Instance3688.1 (complete), Instance3688.2 (complete), Instance3688.3 (complete), Instance3688.4 (complete) and Instance3688.5 (complete)
11/26/2013 11:40:08 AM -- [C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_12.blg](#) has 474 samples.
11/26/2013 11:40:08 AM -- Creating test report ...
11/26/2013 11:40:11 AM -- Instance3688.1 has 11.8 for I/O Database Reads Average Latency.
11/26/2013 11:40:11 AM -- Instance3688.1 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:40:11 AM -- Instance3688.1 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:40:11 AM -- Instance3688.2 has 11.5 for I/O Database Reads Average Latency.
11/26/2013 11:40:11 AM -- Instance3688.2 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:40:11 AM -- Instance3688.2 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:40:11 AM -- Instance3688.3 has 11.5 for I/O Database Reads Average Latency.
11/26/2013 11:40:11 AM -- Instance3688.3 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:40:11 AM -- Instance3688.3 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:40:11 AM -- Instance3688.4 has 11.7 for I/O Database Reads Average Latency.
11/26/2013 11:40:11 AM -- Instance3688.4 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:40:11 AM -- Instance3688.4 has 1.0 for I/O Log Reads Average Latency.



11/26/2013 11:40:11 AM -- Instance3688.5 has 12.0 for I/O Database Reads Average Latency.
11/26/2013 11:40:11 AM -- Instance3688.5 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:40:11 AM -- Instance3688.5 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:40:11 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/26/2013 11:40:11 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/26/2013 11:40:11 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_12.xml has 473 samples queried.
11/26/2013 11:40:11 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_12.html was saved.
11/26/2013 11:48:12 AM -- Performance logging started (interval: 4000 ms).
11/26/2013 11:48:12 AM -- Recovering databases ...
11/26/2013 11:59:21 AM -- Performance logging has ended.
11/26/2013 11:59:21 AM -- Instance3688.1 (669.1038891), Instance3688.2 (657.9654177), Instance3688.3 (644.7053327), Instance3688.4 (656.1090058) and Instance3688.5 (669.1038891)
11/26/2013 11:59:21 AM -- C:\Program Files\Exchange Jetstress\SoftRecovery_2013_11_26_11_48_8.blg has 166 samples.



D.5 Server 3 – JS8

Table 131 Soft Recovery statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance2384.1	502	662.7390483
Instance2384.2	502	659.5566279
Instance2384.3	501	662.2086449
Instance2384.4	510	659.2914262
Instance2384.5	504	652.1309803
Avg	503	659.185
Sum	2519	3295.9267276

Table 132 Database configuration

Performance Counter	Value
Instance2384.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance2384.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance2384.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance2384.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance2384.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb



Table 133 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
Instance2384.1	10.161	0.890	514.916	3.030	40100.675	32768.000	17.410	0.000	3.788	0.000	209722.776	0.000
Instance2384.2	10.227	0.926	508.063	3.043	40167.969	32768.000	15.939	0.000	3.804	0.000	209736.186	0.000
Instance2384.3	10.197	0.869	513.062	3.018	40201.865	32768.000	16.190	0.000	3.773	0.000	209762.002	0.000
Instance2384.4	10.147	0.927	518.734	3.092	40215.075	32768.000	15.382	0.000	3.865	0.000	209722.218	0.000
Instance2384.5	10.129	0.874	521.039	3.093	40245.896	32768.000	15.444	0.000	3.867	0.000	209708.442	0.000

Table 134 Background Database Maintenance I/O performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance2384.1	8.562	261987.483
Instance2384.2	8.483	262045.598
Instance2384.3	8.512	261933.077
Instance2384.4	8.380	262083.203
Instance2384.5	8.526	262137.832



Table 135 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
Instance2384.1	10.161	0.890	523.478	3.030	43729.833	32768.000	17.410	0.000	3.788	0.000	209722.776	0.000
Instance2384.2	10.227	0.926	516.546	3.043	43811.728	32768.000	15.939	0.000	3.804	0.000	209736.186	0.000
Instance2384.3	10.197	0.869	521.574	3.018	43820.334	32768.000	16.190	0.000	3.773	0.000	209762.002	0.000
Instance2384.4	10.147	0.927	527.115	3.092	43742.369	32768.000	15.382	0.000	3.865	0.000	209722.218	0.000
Instance2384.5	10.129	0.874	529.565	3.093	43818.496	32768.000	15.444	0.000	3.867	0.000	209708.442	0.000

Table 136 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	1.529	0.000	8.757
Available MBytes	28867.415	28811.000	30078.000
Free System Page Table Entries	33555674.317	33555674.000	33555676.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	79267690.146	79208448.000	79446016.000
Pool Paged Bytes	158383778.341	158351360.000	158429184.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



D.6 Test log

11/26/2013 9:41:05 AM -- Preparing for testing ...
11/26/2013 9:41:11 AM -- Attaching databases ...
11/26/2013 9:41:11 AM -- Preparations for testing are complete.
11/26/2013 9:41:11 AM -- Starting transaction dispatch ..
11/26/2013 9:41:11 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/26/2013 9:41:11 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/26/2013 9:41:17 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
11/26/2013 9:41:17 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
11/26/2013 9:41:21 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/26/2013 9:41:21 AM -- Performance logging started (interval: 15000 ms).
11/26/2013 9:41:21 AM -- Generating log files ...
11/26/2013 11:40:38 AM -- C:\DB\DB1 (100.4% generated), C:\DB\DB2 (100.4% generated), C:\DB\DB3 (100.2% generated), C:\DB\DB4 (101.8% generated) and C:\DB\DB5 (100.8% generated)
11/26/2013 11:40:38 AM -- Performance logging has ended.
11/26/2013 11:40:38 AM -- JetInterop batch transaction stats: 16842, 16842, 16841, 16841 and 16841.
11/26/2013 11:40:38 AM -- Dispatching transactions ends.
11/26/2013 11:40:38 AM -- Shutting down databases ...
11/26/2013 11:40:39 AM -- Instance2384.1 (complete), Instance2384.2 (complete), Instance2384.3 (complete), Instance2384.4 (complete) and Instance2384.5 (complete)
11/26/2013 11:40:39 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_17.blg has 476 samples.
11/26/2013 11:40:39 AM -- Creating test report ...
11/26/2013 11:40:41 AM -- Instance2384.1 has 11.7 for I/O Database Reads Average Latency.
11/26/2013 11:40:41 AM -- Instance2384.1 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:40:41 AM -- Instance2384.1 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:40:41 AM -- Instance2384.2 has 11.7 for I/O Database Reads Average Latency.
11/26/2013 11:40:41 AM -- Instance2384.2 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:40:41 AM -- Instance2384.2 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:40:41 AM -- Instance2384.3 has 11.7 for I/O Database Reads Average Latency.
11/26/2013 11:40:41 AM -- Instance2384.3 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:40:41 AM -- Instance2384.3 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:40:41 AM -- Instance2384.4 has 11.7 for I/O Database Reads Average Latency.
11/26/2013 11:40:41 AM -- Instance2384.4 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:40:41 AM -- Instance2384.4 has 1.0 for I/O Log Reads Average Latency.



11/26/2013 11:40:41 AM -- Instance2384.5 has 11.6 for I/O Database Reads Average Latency.
11/26/2013 11:40:41 AM -- Instance2384.5 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:40:41 AM -- Instance2384.5 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:40:42 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/26/2013 11:40:42 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/26/2013 11:40:42 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_17.xml has 475 samples queried.
11/26/2013 11:40:42 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_17.html was saved.
11/26/2013 11:48:15 AM -- Performance logging started (interval: 4000 ms).
11/26/2013 11:48:15 AM -- Recovering databases ...
11/26/2013 11:59:17 AM -- Performance logging has ended.
11/26/2013 11:59:17 AM -- Instance2384.1 (662.7390483), Instance2384.2 (659.5566279), Instance2384.3 (662.2086449), Instance2384.4 (659.2914262) and Instance2384.5 (652.1309803)
11/26/2013 11:59:18 AM -- C:\Program Files\Exchange Jetstress\SoftRecovery_2013_11_26_11_48_11.blg has 164 samples.
11/26/2013 11:59:18 AM -- Creating test report ...
.



D.7 Server 4 – JS9

Table 137 Soft Recovery statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance4064.1	511	616.8591542
Instance4064.2	516	622.9587933
Instance4064.3	506	615.267944
Instance4064.4	509	621.3675831
Instance4064.5	501	593.5214046
Avg	508	613.995
Sum	2543	3069.9748792

Table 138 Database configuration

Performance Counter	Value
Instance4064.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance4064.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance4064.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance4064.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance4064.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb



Table 139 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
Instance4064.1	9.528	0.886	560.512	3.322	40279.869	32768.000	12.960	0.000	4.152	0.000	209688.073	0.000
Instance4064.2	9.444	0.953	556.128	3.319	40164.647	32768.000	16.045	0.000	4.149	0.000	209716.037	0.000
Instance4064.3	9.390	0.933	566.386	3.297	40144.192	32768.000	16.144	0.000	4.122	0.000	209675.286	0.000
Instance4064.4	9.516	1.011	560.956	3.287	40225.695	32768.000	14.902	0.000	4.109	0.000	209645.934	0.000
Instance4064.5	9.415	1.016	571.218	3.383	40242.029	32768.000	14.569	0.000	4.229	0.000	209702.983	0.000

Table 140 Background Database Maintenance I/O performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance4064.1	8.637	261931.334
Instance4064.2	8.586	261981.360
Instance4064.3	8.525	261803.162
Instance4064.4	8.498	261814.755
Instance4064.5	8.485	261903.239



Table 141 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
Instance4064.1	9.528	0.886	569.149	3.322	43643.637	32768.000	12.960	0.000	4.152	0.000	209688.073	0.000
Instance4064.2	9.444	0.953	564.714	3.319	43537.097	32768.000	16.045	0.000	4.149	0.000	209716.037	0.000
Instance4064.3	9.390	0.933	574.911	3.297	43431.067	32768.000	16.144	0.000	4.122	0.000	209675.286	0.000
Instance4064.4	9.516	1.011	569.454	3.287	43532.518	32768.000	14.902	0.000	4.109	0.000	209645.934	0.000
Instance4064.5	9.415	1.016	579.703	3.383	43486.512	32768.000	14.569	0.000	4.229	0.000	209702.983	0.000

Table 142 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	1.535	0.000	7.219
Available MBytes	28789.104	28731.000	30003.000
Free System Page Table Entries	33555674.065	33555674.000	33555676.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	73926416.623	73842688.000	74207232.000
Pool Paged Bytes	171370948.156	171347968.000	171405312.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



D.8 Test log

11/26/2013 9:41:10 AM -- Preparing for testing ...
11/26/2013 9:41:15 AM -- Attaching databases ...
11/26/2013 9:41:15 AM -- Preparations for testing are complete.
11/26/2013 9:41:15 AM -- Starting transaction dispatch ..
11/26/2013 9:41:15 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/26/2013 9:41:15 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/26/2013 9:41:21 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
11/26/2013 9:41:21 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
11/26/2013 9:41:25 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/26/2013 9:41:25 AM -- Performance logging started (interval: 15000 ms).
11/26/2013 9:41:25 AM -- Generating log files ...
11/26/2013 11:35:07 AM -- C:\DB\DB1 (102.2% generated), C:\DB\DB2 (103.2% generated), C:\DB\DB3 (101.0% generated), C:\DB\DB4 (101.8% generated) and C:\DB\DB5 (100.2% generated)
11/26/2013 11:35:07 AM -- Performance logging has ended.
11/26/2013 11:35:07 AM -- JetInterop batch transaction stats: 17043, 17043, 17042, 17042 and 17042.
11/26/2013 11:35:07 AM -- Dispatching transactions ends.
11/26/2013 11:35:07 AM -- Shutting down databases ...
11/26/2013 11:35:08 AM -- Instance4064.1 (complete), Instance4064.2 (complete), Instance4064.3 (complete), Instance4064.4 (complete) and Instance4064.5 (complete)
11/26/2013 11:35:08 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_21.blg has 454 samples.
11/26/2013 11:35:08 AM -- Creating test report ...
11/26/2013 11:35:11 AM -- Instance4064.1 has 11.2 for I/O Database Reads Average Latency.
11/26/2013 11:35:11 AM -- Instance4064.1 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:35:11 AM -- Instance4064.1 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:35:11 AM -- Instance4064.2 has 11.0 for I/O Database Reads Average Latency.
11/26/2013 11:35:11 AM -- Instance4064.2 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:35:11 AM -- Instance4064.2 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:35:11 AM -- Instance4064.3 has 11.0 for I/O Database Reads Average Latency.
11/26/2013 11:35:11 AM -- Instance4064.3 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:35:11 AM -- Instance4064.3 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:35:11 AM -- Instance4064.4 has 11.2 for I/O Database Reads Average Latency.
11/26/2013 11:35:11 AM -- Instance4064.4 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:35:11 AM -- Instance4064.4 has 1.0 for I/O Log Reads Average Latency.



11/26/2013 11:35:11 AM -- Instance4064.5 has 11.0 for I/O Database Reads Average Latency.
11/26/2013 11:35:11 AM -- Instance4064.5 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:35:11 AM -- Instance4064.5 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:35:11 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/26/2013 11:35:11 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/26/2013 11:35:11 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_21.xml has 453 samples queried.
11/26/2013 11:35:11 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_21.html was saved.
11/26/2013 11:48:18 AM -- Performance logging started (interval: 4000 ms).
11/26/2013 11:48:18 AM -- Recovering databases ...
11/26/2013 11:58:41 AM -- Performance logging has ended.
11/26/2013 11:58:41 AM -- Instance4064.1 (616.8591542), Instance4064.2 (622.9587933), Instance4064.3 (615.267944), Instance4064.4 (621.3675831) and Instance4064.5 (593.5214046)
11/26/2013 11:58:42 AM -- C:\Program Files\Exchange Jetstress\SoftRecovery_2013_11_26_11_48_15.blg has 154 samples.
11/26/2013 11:58:42 AM -- Creating test report ...



D.9 Server 5 – JS10

Table 143 Soft Recovery statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance4976.1	506	645.7744185
Instance4976.2	511	649.752495
Instance4976.3	501	634.3705992
Instance4976.4	504	651.6089307
Instance4976.5	512	654.2609817
Avg	506	647.153
Sum	2534	3235.7674251

Table 144 Database configuration

Performance Counter	Value
Instance4976.1	Log path: C:\DB\DB1 Database: C:\DB\DB1\Jetstress001001.edb
Instance4976.2	Log path: C:\DB\DB2 Database: C:\DB\DB2\Jetstress002001.edb
Instance4976.3	Log path: C:\DB\DB3 Database: C:\DB\DB3\Jetstress003001.edb
Instance4976.4	Log path: C:\DB\DB4 Database: C:\DB\DB4\Jetstress004001.edb
Instance4976.5	Log path: C:\DB\DB5 Database: C:\DB\DB5\Jetstress005001.edb



Table 145 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
Instance4976.1	9.922	0.927	534.768	3.138	40163.454	32768.000	15.212	0.000	3.922	0.000	209696.560	0.000
Instance4976.2	9.850	0.866	539.864	3.149	40123.738	32768.000	16.203	0.000	3.937	0.000	209728.885	0.000
Instance4976.3	9.781	0.903	534.635	3.160	40295.824	32768.000	17.120	0.000	3.950	0.000	209653.559	0.000
Instance4976.4	10.048	0.879	532.975	3.093	40135.437	32768.000	14.728	0.000	3.867	0.000	209683.657	0.000
Instance4976.5	10.019	0.925	520.521	3.130	40260.752	32768.000	15.014	0.000	3.912	0.000	209646.711	0.000

Table 146 Background Database Maintenance I/O performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance4976.1	8.656	261878.871
Instance4976.2	8.639	262077.741
Instance4976.3	8.518	262027.305
Instance4976.4	8.441	261804.005
Instance4976.5	8.414	262035.117



Table 147 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
Instance4976.1	9.922	0.927	543.423	3.138	43694.881	32768.000	15.212	0.000	3.922	0.000	209696.560	0.000
Instance4976.2	9.850	0.866	548.503	3.149	43619.417	32768.000	16.203	0.000	3.937	0.000	209728.885	0.000
Instance4976.3	9.781	0.903	543.153	3.160	43773.027	32768.000	17.120	0.000	3.950	0.000	209653.559	0.000
Instance4976.4	10.048	0.879	541.416	3.093	43591.570	32768.000	14.728	0.000	3.867	0.000	209683.657	0.000
Instance4976.5	10.019	0.925	528.934	3.130	43788.501	32768.000	15.014	0.000	3.912	0.000	209646.711	0.000

Table 148 Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	1.618	0.000	8.201
Available MBytes	59975.444	59916.000	61210.000
Free System Page Table Entries	33555668.025	33555668.000	33555670.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	66569784.889	66428928.000	66863104.000
Pool Paged Bytes	175339191.309	175308800.000	175448064.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



D.10 Test log

11/26/2013 9:41:14 AM -- Preparing for testing ...
11/26/2013 9:41:20 AM -- Attaching databases ...
11/26/2013 9:41:20 AM -- Preparations for testing are complete.
11/26/2013 9:41:20 AM -- Starting transaction dispatch ..
11/26/2013 9:41:20 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)
11/26/2013 9:41:20 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)
11/26/2013 9:41:26 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
11/26/2013 9:41:26 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
11/26/2013 9:41:29 AM -- Operation mix: Sessions 7, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
11/26/2013 9:41:29 AM -- Performance logging started (interval: 15000 ms).
11/26/2013 9:41:29 AM -- Generating log files ...
11/26/2013 11:39:35 AM -- C:\DB\DB1 (101.2% generated), C:\DB\DB2 (102.2% generated), C:\DB\DB3 (100.2% generated), C:\DB\DB4 (100.8% generated) and C:\DB\DB5 (102.4% generated)
11/26/2013 11:39:35 AM -- Performance logging has ended.
11/26/2013 11:39:35 AM -- JetInterop batch transaction stats: 17101, 17100, 17100, 17100 and 17100.
11/26/2013 11:39:35 AM -- Dispatching transactions ends.
11/26/2013 11:39:36 AM -- Shutting down databases ...
11/26/2013 11:39:37 AM -- Instance4976.1 (complete), Instance4976.2 (complete), Instance4976.3 (complete), Instance4976.4 (complete) and Instance4976.5 (complete)
11/26/2013 11:39:37 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_26.blg has 471 samples.
11/26/2013 11:39:37 AM -- Creating test report ...
11/26/2013 11:39:39 AM -- Instance4976.1 has 11.5 for I/O Database Reads Average Latency.
11/26/2013 11:39:39 AM -- Instance4976.1 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:39:39 AM -- Instance4976.1 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:39:39 AM -- Instance4976.2 has 11.5 for I/O Database Reads Average Latency.
11/26/2013 11:39:39 AM -- Instance4976.2 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:39:39 AM -- Instance4976.2 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:39:39 AM -- Instance4976.3 has 11.2 for I/O Database Reads Average Latency.
11/26/2013 11:39:39 AM -- Instance4976.3 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:39:39 AM -- Instance4976.3 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:39:39 AM -- Instance4976.4 has 11.5 for I/O Database Reads Average Latency.
11/26/2013 11:39:39 AM -- Instance4976.4 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:39:39 AM -- Instance4976.4 has 1.0 for I/O Log Reads Average Latency.



11/26/2013 11:39:39 AM -- Instance4976.5 has 11.3 for I/O Database Reads Average Latency.
11/26/2013 11:39:39 AM -- Instance4976.5 has 1.0 for I/O Log Writes Average Latency.
11/26/2013 11:39:39 AM -- Instance4976.5 has 1.0 for I/O Log Reads Average Latency.
11/26/2013 11:39:39 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
11/26/2013 11:39:39 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
11/26/2013 11:39:39 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_26.xml has 470 samples queried.
11/26/2013 11:39:39 AM -- C:\Program Files\Exchange Jetstress\Performance_2013_11_26_9_41_26.html was saved.
11/26/2013 11:48:23 AM -- Performance logging started (interval: 4000 ms).
11/26/2013 11:48:23 AM -- Recovering databases ...
11/26/2013 11:59:17 AM -- Performance logging has ended.
11/26/2013 11:59:17 AM -- Instance4976.1 (645.7744185), Instance4976.2 (649.752495), Instance4976.3 (634.3705992), Instance4976.4 (651.6089307) and Instance4976.5 (654.2609817)
11/26/2013 11:59:18 AM -- C:\Program Files\Exchange Jetstress\SoftRecovery_2013_11_26_11_48_19.blg has 162 samples.
11/26/2013 11:59:18 AM -- Creating test report ...

