Dell PowerVault MD3860f 10,000 user Mailbox Exchange 2013 Resiliency Storage Solution — Direct Attach SAS using dual LSI 9300-8e 12Gb SAS adapters

Microsoft ESRP 4.0

Dell MD3 Series storage solutions
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About Microsoft ESRP-Storage program

The Microsoft 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 this paper. Therefore, the number of mailboxes hosted per server as part of the tested configuration may not necessarily be viable for some customer deployments.

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

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1   Executive summary

1.1   Overview

This technical paper describes a tested and validated resilient storage solution for a 10,000 user mailbox Microsoft Exchange 2013 site, with Data Availability Group (DAG). A DAG is a high availability mechanism in Microsoft Exchange 2013.

The "Low Maintenance" concept of this configuration is based on the self-healing data protection capability of the Dell PowerVault MD3860f storage array using Dynamic Disk Pooling (DDP) technology. DDP enables the solution to withstand multiple drive failures over time without requiring drive maintenance actions by the customer. In addition to up to 8x faster rebuilds during a drive failure, DDP also provides higher levels of system per-formance during drive failures, delivering improved service to the infrastructure end-users. This capability can be used to design system solutions that require no drive maintenance for multiple years, significantly lowering the operational and therefore total cost of system ownership. Dynamic Disk Pooling is a standard (no-cost) feature of the PowerVault MD3 storage series. DDP requires a minimum of 11 drives in the pool, so to see the benefits of "low maintenance" it is recommended to add two additional drives to the pool. This will provide at least two years of predicted "no drive maintenance" based on standard drive failure rates.

This mailbox resiliency model supports multiple copies (up to 16) of Exchange database in a DAG. There can be only one active copy of a given Exchange 2013 database at any giv-en time. Secondary copies, including the copies located at remote sites, are periodically synched with the primary copy. Mail clients access the primary (active) copy, and database changes to the primary copy are copied to the secondary (passive) copies in the form of transaction logs. The copied log records are played on the secondary copy to keep the secondary database copies consistent with the primary copy. All hosts within a DAG are configured to be identical in terms of storage resources for Exchange 2013 databases and logs. The primary and secondary copies do not share any storage resources and reside on their own dedicated storage resources, as discussed later in this document.

This document provides information on a specific Dell MD3860f solution for Microsoft Exchange Server, based on the Microsoft Exchange Solution Reviewed Program (ESRP) Storage program.

The ESRP–Storage program was developed by Microsoft Corporation to provide a com-mon storage testing framework for vendors for information on its storage solutions with Microsoft Exchange Server software. Details about the Microsoft ESRP – Storage program are available at http://technet.microsoft.com/en-us/exchange/ff182054.aspx.

1.2   Simulated environment

This Mailbox Resiliency solution utilizes one Database Availability Group (DAG) and two copies of every database with (DDP) Dynamic Disk Pool technology. The tested environment simulates all users in this DAG running on a single MD3860f array. The tested environment simulates up to 10,000 users with 2GB Mailbox size and 200 messages a day, or 0.12 IOPS for every user, including 20% headroom.
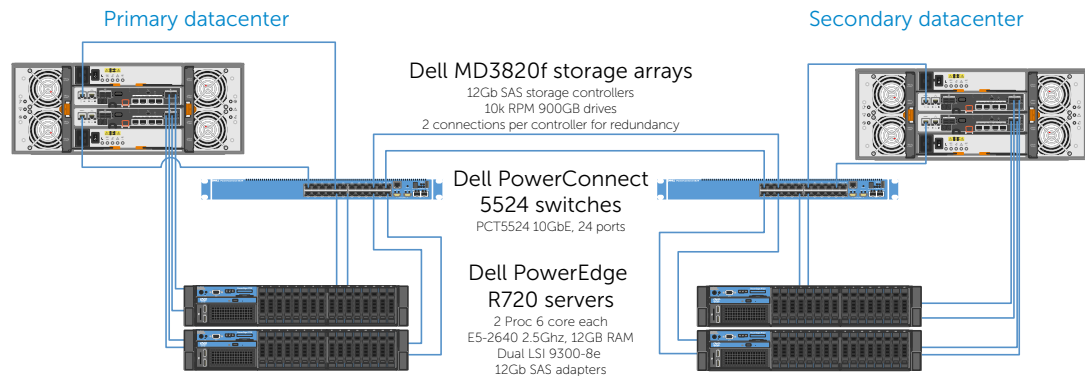
1.3   Solution description

Testing was performed on a Dell R720 server, dual LSI 9300-8e 12Gb SAS adapters and a Dell MD3860f storage array with redundant controller pair; front-end connections and back-end connections. Exchange is a critical application in most businesses today and the design of the system supporting Exchange should have redundant components and a design to support continued operation in case a single component fails. This solution was designed with the ability to support continuous operation during component failure.

The MD3860f is a 4U drive enclosure with 60 2.5" or 3.5" drive slots offering four 16Gb Fibre Channel and two 12Gb SAS host connections per controller. Thirty-nine 10k 900GB 6Gbps SAS drives were used in the dedicated dynamic disk pool (DDP). As a redundant solution, databases and logs were stored together on the same volumes using Microsoft best practices. Given the self healing benefits of DDP consideration should be given to add additional HDDs to provide for a long term "no drive replacement" scenario. Adding 5% drive overhead to the drive pool provides for a predicted two years, or more, of no drive maintenance, based on typical drive failure rates. The cost of two additional drives is very low when compared to a skilled professionals time to have to order a new drive and travel to a remote site to replace a single drive.

Information about compatibility is available at http://www.windowsservercatalog.com/item.aspx?idItem=467135f9-8f78-bfed-b511- f62d42b2d1cb&bCatID=1338.

This figure illustrates the architectural design of the solution showing both primary site and secondary site configurations. This solution was tested on the primary site. The secondary site illustrates what a typical configuration would look like if a redundant Exchange environment were implemented.

SAS direct-attach storage diagram

Primary datacenter   Secondary datacenter

Dell MD3820f storage arrays
12Gb SAS storage controllers
10k RPM 900GB drives
2 connections per controller for redundancy

Dell PowerConnect
5524 switches
PCT5524 10GbE, 24 ports

Dell PowerEdge
R720 servers
2 Proc 6 core each
E5-2640 2.5Ghz, 12GB RAM
Dual LSI 9300-8e
12Gb SAS adapters

2 The Dell MD3860f solution for Microsoft ESRP

2.1 A modular hardware design

The PowerVault MD3860f enclosure is designed to scale the needs of applications requiring large amounts of data storage. The MD3860f is a 24-drive, 2U standard rack enclosure and can scale up to 192 drives using MD1220 expansion enclosures. The MD3 Series is available in 16Gb Fibre Channel and 12Gb SAS host interfaces, 10Gb iSCSI and 12Gb SAS host interfaces or 12Gb SAS host interfaces. The MD3 Series also comes in a 2U 12-drive 3.5 inch drive module, 2U 24-drive 2.5 inch drive module or 4U 60-drive module supporting either 2.5 or 3.5 inch drives. The PowerVault MD3 Series supports simultaneous use of multiple host protocols making it highly adaptable to customer infrastructure environments. The solution described in this paper utilizes the 12Gb SAS interface.

Figure 1 Dell PowerVault MD3860f front and back view

The MD3860f supports SAS, SED SAS, near-line SAS (NL-SAS), SED NL-SAS and SSD drives. The ability to mix SAS, near-line SAS and SSD drives within the same enclosure enables the user to blend drives to best suit their application storage needs across three tiers of performance offerings. Non-disruptive and on-line firmware upgrades are designed to enable high availability.

The storage management software, PowerVault Modular Disk Storage Manager (MDSM), was used to configure the storage for this solution. The MD storage management software has three major components:

- Client management software
- Host-agent management software
- Multi-path driver software

The client management software contains the graphical user interface for managing the storage array. It also contains an optional monitor service that sends alerts when an event occurs in the storage array.

The host-agent management software is installed on one or more hosts that are connected to the storage arrays to enable in-band management. The host-agent management software, along with the Ethernet connection on the host, provides another network management connection to the storage array, rather than using the individual Ethernet connections on each RAID controller module in the storage array.

The multi-path driver is also referred to as the I/O path failover driver. With the redundant pair of active RAID controller modules in a storage array, when a virtual disk is created, one of the RAID controller modules is automatically or manually chosen to "own" the virtual disk. The I/O between the virtual disk and the application host along the I/O path is controlled by the RAID controller "owning" virtual disk. When a component along the I/O path to a RAID controller module or the RAID controller module itself fails, ownership of the virtual disks that had been assigned to that RAID controller module automatically transfer to the other RAID controller module. The multi-path driver manages this failover process.

Figure 2 shows the view of disk groups, virtual disks, and the physical disks as displayed in PowerVault Modular Disk Storage Manager. Figure 3 provides an overall summary view of the PowerVault MD3860f. The features of Dell PowerVault MD3860f are detailed in Table 1.

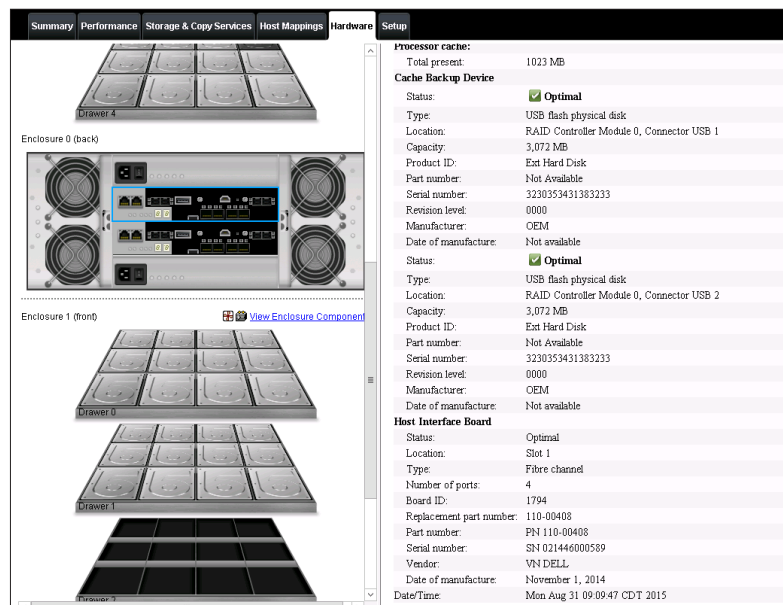*Figure 2 MDSM view of disk groups, virtual disks and physical disks*
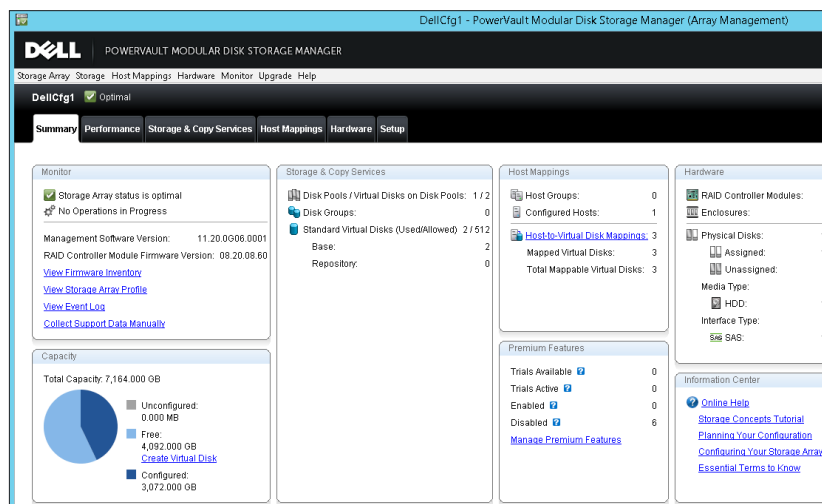
Figure 3 MDSM summary view

Table 1 Dell PowerVault MD3860f Features

Feature	Details
4U, 60 drive FC enclosure	Designed to fit standard 1000mm cabinets (32" max depth).
6Gb/s SAS-based storage system	Provides a high availability and high capacity storage offering when using 6Gb near-line SAS drives.
Ports	Four 12Gb/s SAS ports (2 per each controller)
Scales to support up to 180 2.5-in or 3.5-in. SAS drives	• Up to 120 drive slots are supported as part of the base; moving from 121-180 drive slots requires purchase of the Premium Feature Key (PFK) for firmware • High performance SAS, NL-SAS, SEDs and SSDs drives • Configuration supports up to eight additional MD1220 expansion modules.
Support for SAS, near-line SAS and Solid State Disk drives	The ability to mix SAS, near-line SAS and SSD drives within the same enclosure supports a user's ability to blend drives to best suit their applications' storage needs across three tiers of performance offerings.
Non-disruptive, on-line firmware upgrades	Improved data availability
High Performance Tiering (HPT)	Increases system performance
SSD Cache (included as part of HPT)	Increases execution speed of applications by caching previously read data.
Thin provisioning	• Allocate and consume physical storage capacity as needed • Thin virtual disk can only be created from a disk pool • Reduces the likelihood of having excess, unused capacity in the disk pool
Support for self-encrypting drives (SED)	Secures data at rest.
VMware VAAI support	• The ability to integrate array commands with VMware, allowing for an increased number of VM's. • Reduces SAN traffic as functions are executed in the array.
Dynamic Disk Pools	• Dynamically rebalances data in the event of a drive failure • Allows for the creation of pools without the complexity of RAID • Enables Thin Provisioning
Asymmetric Logical Unit Access (ALUA)	Enables the array to service I/O requests through either RAID controller module

2.2 Dell PowerEdge R720 Features

Dell PowerEdge™ R720 is a 2-socket CPU, 1U, multi-purpose server, offering an excellent balance of redundancy and value in a compact form factor. It is a most suitable hardware building block for any mid-size or large business. It delivers enormous performance in a dense 1U form-factor, enabling larger and more efficient databases and mail servers. Major features of the server/storage system include:

- Intel® Xeon® processor E5-2600 or E5-2600 v2 product family
- Dual processor sockets
- Up to 768GB of Memory with 24 DIMMs
- Integrated RAID support through PERC H310, PERC H710, PERC H710P
- Up to three PCIe 3.0 expansion slots
- Choice of NIC technologies
- Dell OpenManage™ Essentials and Dell Management Console, Dell OpenManage Power Center and Dell OpenManage Connections

For more information, see Dell PowerEdge R720 Server product page.

2.3 LSI 12Gb SAS adapter

The LSI SAS 9300 8 and 4-port, 12Gb/s SAS host bus adapter family provides increased connectivity and maximum performance for high-end servers and appliances within internal storage, or connecting to large scale storage enclosures.

- Four/eight ports of 12Gb/s SAS + SATA ports
- Eight lanes of PCI Express 3.0
- Low-profile form factor
- Mini-SAS HD connectors
- SAS 3008 12Gb/s SAS+SATA controller
- Supports SSDs, HDDs, and tape drives

2.4 Storage Sizing

Storage sizing typically involves the type of data protection chosen, type of disks and the number of disks, both from a capacity and IOPS perspective. Selecting the right storage is crucial to achieve the balance between cost and performance. Jetstress tools provide a way of capturing the storage subsystem IOPS. Storage design also depends on the actual size of the mailbox on the disk, content indexing space and Log space required. Microsoft Exchange 2013 Server Role Requirements Calculator can be used to derive the required IOPS for a particular user profile. Figure 4 shows the Mailbox Calculator output for 10,000 users with 200 messages/day profile. The recommended IOPS per server is 1,200. This will be the target IOPs that will be verified and tested as part of ESRP Jetstress verification. More details on this are provided in Section 6.

Figure 4 Recommended IOPS from the Microsoft Exchange 2013 Server Role Requirements Calculator

Role Requirements Results Pane - Log, Disk Space, and IO Requirements				
Transaction Log Requirements	**/ Database**	**/ Server**	**/ DAG**	**/ Environment**
User Transaction Logs Generated / Day	5000	5000	10000	20000
Average Move Mailbox Transaction Logs Generated / Day	1945	1945	3889	7779
Average Transaction Logs Generated / Day	6945	6945	13889	27779
Disk Space Requirements	**/ Database**	**/ Server**	**/ DAG**	**/ Environment**
Transport Database Space Required	--	64 GB	257 GB	515 GB
Database Space Required	1329 GB	1329 GB	10635 GB	21270 GB
Log Space Required	47 GB	47 GB	380 GB	760 GB
Database+Log Volume Space Required	2009 GB	2009 GB	16072 GB	32144 GB
Log Volume Space Required	0 GB	0 GB	0 GB	0 GB
Restore Volume Space Required	--	1449 GB	5797 GB	11594 GB
Host IO and Throughput Requirements	**/ Database**	**/ Server**	**/ DAG**	**/ Environment**
Total Database Required IOPS	20	20	80	161
Total Log Required IOPS	4	4	18	35
Database Read I/O Percentage	60%	--	--	--
Background Database Maintenance Throughput Requirements	1.0 MB/s	1 MB/s	4 MB/s	8 MB/s

2.5 Targeted customer profile

This solution is targeted for a medium-sized organization. Capacity can be dynamically scaled from 600GB to over a petabyte.

1. A Dell MD3 Series storage solution can be sized for any organization

2. Up to four servers can be directly connected to the storage array in a fully redundant configuration via Fibre Channel or iSCSI, two via SAS

3. User I/O profile (0.09 IOPs per user, 0.12 tested, giving 20% headroom).

4. User mailbox size (2GB quota)

5. Dynamic Disk Pooling was chosen for data protection of the database volumes and log volumes.

2.6 Volume sizing

The volume size tested was just large enough to support the database size. Volumes on Dell MD3 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 Dynamic Volume Expansion and hot upgrades, additional disk capacity can be added as needed. If more spindles are required to accommodate growth, they can simply be 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 88% 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

Configuration Item	Detail
Number of Exchange mailboxes simulated	10,000
Number of DAG	1
Number of servers/DAG	2
Number of active mailboxes/server	5,000
Number of databases/host	8
Number of copies/database	2
Number of mailboxes/database	625
Simulated profile: I/O per second per mailbox (IOPS, include 20% headroom)	0.12
Database/Log LUN size	5.774TB
Total database size for performance testing	23.096TB
% storage capacity used by Exchange database*	97.08%

* 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 no data, will consume no disk space.

3.2 Primary storage hardware

Configuration Item	Detail
Storage Connectivity (Fibre Channel, SAS, SATA, iSCSI)	SAS
Storage Model and OS/firmware revision	Dell MD3860f: 08.20.08.60
Storage Cache	16GB
Number of storage controllers	2
Number of storage ports	4 active SAS port per controller
Maximum bandwidth of storage connectivity to host	192Gb/s (4x48Gb HBA) *
Switch type/model/firmware revision	N/A
HBA model and firmware	LSI 9300-8e 12Gb SAS HBA: 3.00.08.00
Number of HBA's/host	2
Host server type	Dell PowerEdge R720
Total number of disks tested in solution	39
Maximum number of spindles that can be hosted in the storage	60 drive bay + dual controllers in a 4U chassis Scalable to 192 drives via modular expansion enclosures

* - Each 12Gb SAS port has 4 lanes that each support 12Gb. Therefore a single 12Gb port can support up to 48Gb of throughput.

3.3 Primary storage software

Configuration Item	Detail
HBA driver	2.50.96.0
Multi-Pathing (MPI/O)	Microsoft Windows Server 2012 R2 MPI/O Round-Robin (InBox DSM)
Host OS	Windows Server 2012 R2 Datacenter (6.3.9600)
ESE.dll file version	15.00.0847.030
Replication solution name/version	Microsoft Exchange Server 2013 DAG replication

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

Configuration Item	Detail
Disk Type, speed and firmware revision	SAS 10k 900GB, B556
Raw capacity per disk (GB)	838,363GB
Number of physical disks in test	39
Total raw storage capacity (TB)	23.232TB
Data protection	DDP
Total formatted capacity	837.363GB
Storage capacity utilization	99.41%
Database capacity utilization	87.05%

4 Best practices

- Ensure Multipath I/O is installed and configured on the server before installing MS Exchange. This feature provides alternate paths between storage devices and hosts in case the primary path fails. This feature also provides load balancing between paths.

- Configure the page file size to be 10MB larger than the physical RAM installed in the server.

- Assign an allocation unit size of 64KB when creating volumes in Windows Server 2012. This option increases the block size of the volume being created. This setting can result in increased performance because it uses the most efficient block size for data transfer on the system bus.

- Set the start demand cache flushing value to 80% in the Dell Modular Disk Storage Manager.

- When creating volumes in the Modular Disk Storage Manager, make sure read and write cache are both enabled. Also confirm that dynamic cache read pre-fetch is enabled. These three settings increase the performance of the storage system.

- Adjust IOPs per user to 0.12 to allow for 20% headroom.

- From a controller resource allocation perspective, there are two user-modifiable reconstruction priorities within DDP. It is recommended to set these as Low or Medium priority settings for NL-SAS drives, this will increase the drive reconstruction time but will also lessen the impact of I/O performance during rebuild.

- Degraded reconstruction priority is assigned for instances where only a single D-Piece needs to be rebuilt for affected D-Stripes. The default is 'high' 1.
- Critical reconstruction priority is assigned for instances where a D-Stripe has two missing D-Pieces which need to be rebuilt. The default is 'highest'.

- Given the self healing benefits of DDP consideration should be given to add additional HDDs to provide for a long term "no drive replacement" scenario. Adding 5% drive overhead to the drive pool provides for a predicted two years, or more, of no drive maintenance, based on typical drive failure rates.

- It is best to use SAS drives with Exchange 2013 when a moderate amount of storage capacity is needed with high performance and balanced power consumption. It is also important to disable physical disk-write caching when the drives are used without an uninterruptible power supply (UPS). The 900GB 10k RPM SAS drives used in the testing were chosen for their average storage capacity, excellent random I/O performance, and great sequential I/O performance and power utilization.

Best Practice Exchange 2013 storage configuration options

https://technet.microsoft.com/en-us/library/ee832792(v=exchg.150).aspx

Planning for high availability and site resilience, see https://technet.microsoft.com/library/dd638104(EXCHG.150)#StoreReq

Exchange Server 2013 has changed dramatically from previous versions, see http://technet.microsoft.com/en-us/library/jj150540(v=exchg.150).aspx

Exchange 2013 requirements that you need to know before you install Exchange 2013, see https://technet.microsoft.com/en-us/library/aa996719.aspx

Exchange 2013 Sizing and Configuration Recommendations, see https://technet.microsoft.com/en-us/library/dn879075.aspx

Drive Best Practices

When initializing disks in Windows Server 2012, the disks should be initialized as Basic Disks. Initializing a disk as dynamic increases processor overhead as the server also becomes responsible for managing volumes. This is the recommended disk configuration by Microsoft. When formatting drives, use the GUID partition table (GPT) scheme as opposed to MBR. GPT allows volumes to reach 256TB in size.

It is also important to disable automatic disk optimization and defragmentation on Windows Server 2012. When this feature is enabled, additional processor overhead will be incurred because the system will monitor and move data around to prevent fragmentation. Confirm that NTFS compression is not enabled. Do not use NTFS encrypting file system (EFS) or resilient file system (ReFS) as these will also increase processor overhead.

Dynamic Disk Pools

Dell MD3 Series Dynamic Disk Pools (DDP) is a data protection technology designed to deliver consistent storage system performance, data protection, and efficiency throughout the lifecycle of the system. DDP simplifies the setup process and reduces the ongoing maintenance requirements of data protection. With DDP, customers do not have to define RAID array sizes, hot spares, and drive maintenance schedules. DDP distributes data, parity

information, and spare capacity across a pool of drives. Its intelligent algorithm defines which drives are used for segment placement, making sure data is fully protected.

DDP is able to utilize every drive in the pool for the intensive process of rebuilding a failed drive. This dynamic rebuild technology is the key to its exceptional performance under failure and returns the system to optimal conditions up to eight times more quickly than traditional RAID technology. With shorter rebuild times and patented prioritization recon-struction technology, DDP significantly reduces exposure to numerous cascading disk failures. Flexible disk pool sizing provides optimal utilization of any configuration for maxi-mum performance, protection, and efficiency. DDP can easily be grown by adding up to 12 additional disk drives at one time.

In addition to superior data protection, Dynamic Disk Pools enable customers to structure their storage infrastructure in a way that can greatly reduce drive maintenance schedules. Designing a disk pool with additional drive capacity for growth at system installation lever-ages the technology's automatic self-healing capability and can extend drive maintenance schedules by years, driving operational costs down.

Configuration flexibility enables DDP to address wide-ranging requirements. Drives can be configured into one large disk pool to maximize simplicity and protection or into numer-ous smaller pools to maximize sequential performance. Different drive types can be used to create storage tiers, such as performance pools and capacity pools, and disk pools can reside in the same system with traditional RAID groups.

The following are the four key benefits of DDP technology:

- Reduce performance degradation following a drive (or multiple-drive) failure
- Eliminate complex RAID management without sacrificing data protection
- Eliminate deployment and management of idle hot spare drives
- Expand or contract the disk pool without reconfiguring RAID

Backup strategy

Other features of the MD3 Series that protect data include mirroring and backing up con-troller cache. If power is lost to the system during operation, onboard batteries are used to destage the data from cache memory to internal controller flash so that it will be avail-able when power is restored. The DDP algorithms allow the system to recreate any lost data in the rare case of drive failure. Users also have the option of confirming data with RAID parity at all times and even continuing a rebuild when hitting an unreadable sector.

Behind the scenes, the system performs other tasks that protect data at all times. The optional media scan feature looks for inconsistencies even on sectors not currently being accessed by any host. All types of diagnostic data are constantly collected for later use by support if necessary.

Not only does the MD3 Series offer the detailed reliability and availability features already de-scribed, but using the MDSM software features allows the possibility to maximize availability.

Additional information

For more information Dell MD3 Series storage solutions, visit our website at http://www.dell.com/storage.

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 Appendix later in this whitepaper.

5.1 Reliability

Tests in this framework to check storage reliability are run over a 24 hour period. The goal of these "Stress tests" is to verify that the storage can handle high I/O load for a long period of time. Both log and database files were analyzed for integrity after the stress test to ensure no database/log corruption.

The following list provides an overview of reliability results:

- No errors were reported in either the application or system log
- No errors were reported during the database and log checksum process
- 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 I/O for 2 hours. The test illustrates how long it takes for the storage to respond to a specific mailbox profile I/O load. The data below is the sum of all the logical disk I/O and average of all the logical disks I/O latency in the 2-hour test duration. Each server is listed separately and the aggregate numbers across all servers is listed as well.

Multiple Server Metrics:

The sum of all transactional I/O performance across all mailbox databases and the average latency across all databases on a per server basis.

Database I/O	Value
Disks Reads/sec sum	1234.407
Disks Writes/sec sum	555.867
Disk Read Latency (ms) average	14.355
Disk Write Latency (ms) average	1.561
Transaction Log I/O	
Log Disks Writes/sec sum	131.600
Log Disk Write Latency (ms) average	0.425

5.3 Database backup/recovery performance

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

5.3.1 Database read-only performance

The test measures 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	104.02
MB read/sec total per server	832.145

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 10,000 log files played in a single database. Each log file is 1MB in size.

Performance item	Detail
Average time to play one Log file (sec)	1.318

6 Conclusion

This ESRP document presents a tested and validated Exchange solution for 10,000 mailboxes with 2GB mailbox size supporting up to 200 messages/day in a single DAG. The solution uses two Dell PowerEdge R720 servers attached to a PowerVault MD3860f storage array for Exchange mailbox databases and transactional logs.

Testing was carried out as part of the ESRP test framework using Microsoft Exchange Server 2013 Jetstress. The test results show that the proposed solution is more than capable of delivering the IOPs and meeting the capacity requirements to support 10,000 mailboxes with the set mailbox profile.

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 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, and the tests are not designed to deliver the maximum throughput for a given solution. Rather, the tests are focused on producing recommendations from vendors for Exchange application. The data presented in this document should not be used for direct comparisons among solutions.

7   Additional resources

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

Dell Storage Website: http://www.dell.com/storage/

Dell TechCenter storage page: http://en.community.dell.com/techcenter/storage/

8 Appendix

Test results for each particular mailbox size, users and connection

A Performance testing

Server 1

Test Summary

Overall Test Result	**Pass**
Machine Name	Servers
Test Description	Machine Name: Dell Poweredge R720 (non-virtual)
	10000 users Microsoft Exchange 2013
	2 Dell Poweredge R720 servers with Microsoft Server 2012 r2 installed
	2GB Mailboxes, 5000 users per server, 0.12 IOPs
	16 DB and LOG on 4 LUNs (combined)
	Dell MD3860f using Dynamic Disk Pool (39 drives) technology for data protection
	Dual LSI 9300-8e 12Gb SAS HBAs per server
	SAS-Direct Attach
Test Start Time	8/3/2015 12:49:17 PM
Test End Time	8/3/2015 2:52:50 PM
Collection Start Time	8/3/2015 12:52:43 PM
Collection End Time	8/3/2015 2:52:40 PM
Jetstress Version	15.00.0995.000
ESE Version	15.00.0847.030
Operating System	Windows Server 2012 R2 Datacenter (6.2.9200.0)
Performance Log	C:\Program Files\Exchange Jetstress\Performance_2015_8_3_12_49_34.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second	913.829
Target Transactional I/O per Second	600
Initial Database Size (bytes)	10767583674368
Final Database Size (bytes)	10769840209920
Database Files (Count)	8

Jetstress System Parameters

Thread Count	20
Minimum Database Cache	256.0 MB
Maximum Database Cache	2048.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%
Run Background Database Maintenance	True
Number of Copies per Database	2

Database Configuration

Instance4256.1 Log path: C:\Users\Administrator\Documents\Vol2\Log1
Database: C:\Users\Administrator\Documents\Vol1\DB1\Jetstress001001.edb

Instance4256.2 Log path: C:\Users\Administrator\Documents\Vol2\Log2
Database: C:\Users\Administrator\Documents\Vol1\DB2\Jetstress002001.edb

Instance4256.3 Log path: C:\Users\Administrator\Documents\Vol2\Log3
Database: C:\Users\Administrator\Documents\Vol1\DB3\Jetstress003001.edb

Instance4256.4 Log path: C:\Users\Administrator\Documents\Vol2\Log4
Database: C:\Users\Administrator\Documents\Vol1\DB4\Jetstress004001.edb

Instance4256.5 Log path: C:\Users\Administrator\Documents\Vol1\log5
Database: C:\Users\Administrator\Documents\Vol2\DB5\Jetstress005001.edb

Instance4256.6 Log path: C:\Users\Administrator\Documents\Vol1\log6
Database: C:\Users\Administrator\Documents\Vol2\DB6\Jetstress006001.edb

Instance4256.7 Log path: C:\Users\Administrator\Documents\Vol1\log7
Database: C:\Users\Administrator\Documents\Vol2\DB7\Jetstress007001.edb

Instance4256.8 Log path: C:\Users\Administrator\Documents\Vol1\log8
Database: C:\Users\Administrator\Documents\Vol2\DB8\Jetstress008001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance4256.1	15.801	2.079	78.816	35.500	32934.108	34627.591	0.000	0.437	0.000	8.376	0.000	20200.995
Instance4256.2	15.160	2.090	78.895	35.612	32920.959	34655.048	0.000	0.447	0.000	8.441	0.000	20086.999
Instance4256.3	14.616	2.078	78.436	35.457	32931.215	34704.866	0.000	0.445	0.000	8.390	0.000	20459.032
Instance4256.4	13.978	2.074	78.912	35.658	32932.391	34647.647	0.000	0.437	0.000	8.368	0.000	20320.170
Instance4256.5	13.540	1.275	78.520	35.310	32927.048	34685.368	0.000	0.484	0.000	8.333	0.000	20514.347
Instance4256.6	13.346	1.255	78.700	35.391	32941.403	34661.490	0.000	0.459	0.000	8.307	0.000	20391.163
Instance4256.7	13.221	1.253	78.683	35.420	32943.102	34668.844	0.000	0.465	0.000	8.375	0.000	20316.854
Instance4256.8	13.110	1.254	78.716	35.803	32931.013	34677.970	0.000	0.475	0.000	8.489	0.000	20312.608

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance4256.1	9.880	261720.663
Instance4256.2	9.876	261845.650
Instance4256.3	9.875	261854.921
Instance4256.4	9.876	261824.982
Instance4256.5	9.875	261887.657
Instance4256.6	9.878	261801.531
Instance4256.7	9.878	261778.103
Instance4256.8	9.877	261832.606

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance4256.1	0.724	230615.654
Instance4256.2	0.725	230129.123
Instance4256.3	0.732	230615.654
Instance4256.4	0.726	230129.123
Instance4256.5	0.731	230615.654
Instance4256.6	0.724	230615.654
Instance4256.7	0.726	231102.185
Instance4256.8	0.736	228669.530

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
Instance4256.1	15.801	2.079	88.696	35.500	58418.037	34627.591	0.599	0.437	0.724	8.376	230615.654	20200.995
Instance4256.2	15.160	2.090	88.770	35.612	58388.373	34655.048	0.603	0.447	0.725	8.441	230129.123	20086.999
Instance4256.3	14.616	2.078	88.311	35.457	58529.652	34704.866	0.711	0.445	0.732	8.390	230615.654	20459.032
Instance4256.4	13.978	2.074	88.787	35.658	58392.440	34647.647	0.621	0.437	0.726	8.368	230129.123	20320.170
Instance4256.5	13.540	1.275	88.394	35.310	58504.644	34685.368	0.520	0.484	0.731	8.333	230615.654	20514.347
Instance4256.6	13.346	1.255	88.579	35.391	58464.348	34661.490	0.461	0.459	0.724	8.307	230615.654	20391.163
Instance4256.7	13.221	1.253	88.561	35.420	58467.109	34668.844	0.508	0.465	0.726	8.375	231102.185	20316.854
Instance4256.8	13.110	1.254	88.594	35.803	58450.982	34677.970	0.516	0.475	0.736	8.489	228669.530	20312.608

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.824	0.481	1.871
Available MBytes	27999.217	27970.000	28105.000
Free System Page Table Entries	16600257.188	16599780.000	16600532.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	166220434.438	165384192.000	166481920.000
Pool Paged Bytes	106795974.280	106651648.000	106901504.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

```
8/3/2015 12:49:17 PM -- Preparing for testing ...
8/3/2015 12:49:25 PM -- Attaching databases ...
8/3/2015 12:49:25 PM -- Preparations for testing are complete.
8/3/2015 12:49:25 PM -- Starting transaction dispatch ..
8/3/2015 12:49:26 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)
8/3/2015 12:49:26 PM -- Database flush thresholds: (start: 20.5 MB, stop: 40.9 MB)
8/3/2015 12:49:34 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
8/3/2015 12:49:34 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
8/3/2015 12:49:36 PM -- Operation mix: Sessions 20, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
8/3/2015 12:49:36 PM -- Performance logging started (interval: 15000 ms).
8/3/2015 12:49:36 PM -- Attaining prerequisites:
8/3/2015 12:52:43 PM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1945313000.0 (lower bound: 1932735000.0, upper bound: none)
8/3/2015 2:52:44 PM -- Performance logging has ended.
8/3/2015 2:52:44 PM -- JetInterop batch transaction stats: 20224, 20224, 20224, 20224, 20223, 20223, 20223 and 20223.
8/3/2015 2:52:44 PM -- Dispatching transactions ends.
8/3/2015 2:52:44 PM -- Shutting down databases ...
8/3/2015 2:52:50 PM -- Instance4256.1 (complete), Instance4256.2 (complete), Instance4256.3 (complete), Instance4256.4 (complete), Instance4256.5 (complete), Instance4256.6 (complete), Instance4256.7 (complete) and Instance4256.8 (complete)
8/3/2015 2:52:50 PM -- C:\Program Files\Exchange Jetstress\Performance_2015_8_3_12_49_34.blg has 491 samples.
8/3/2015 2:52:51 PM -- Creating test report ...
8/3/2015 2:52:54 PM -- Instance4256.1 has 15.8 for I/O Database Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.1 has 0.4 for I/O Log Writes Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.1 has 0.4 for I/O Log Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.2 has 15.2 for I/O Database Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.2 has 0.4 for I/O Log Writes Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.2 has 0.4 for I/O Log Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.3 has 14.6 for I/O Database Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.3 has 0.4 for I/O Log Writes Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.3 has 0.4 for I/O Log Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.4 has 14.0 for I/O Database Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.4 has 0.4 for I/O Log Writes Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.4 has 0.4 for I/O Log Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.5 has 13.5 for I/O Database Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.5 has 0.5 for I/O Log Writes Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.5 has 0.5 for I/O Log Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.6 has 13.3 for I/O Database Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.6 has 0.5 for I/O Log Writes Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.6 has 0.5 for I/O Log Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.7 has 13.2 for I/O Database Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.7 has 0.5 for I/O Log Writes Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.7 has 0.5 for I/O Log Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.8 has 13.1 for I/O Database Reads Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.8 has 0.5 for I/O Log Writes Average Latency.
8/3/2015 2:52:54 PM -- Instance4256.8 has 0.5 for I/O Log Reads Average Latency.
8/3/2015 2:52:54 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
8/3/2015 2:52:54 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
8/3/2015 2:52:54 PM -- C:\Program Files\Exchange Jetstress\Performance_2015_8_3_12_49_34.xml has 478 samples queried.
```

Server 2

Overall Test Result	**Pass**
Machine Name	Servers
Test Description	Machine Name: Dell Poweredge R720 (non-virtual)
	10000 users Microsoft Exchange 2013
	2 Dell Poweredge R720 servers with Microsoft Server 2012 r2 installed
	2GB Mailboxes, 5000 users per server, 0.12 IOPs
	16 DB and LOG on 4 LUNs (combined)
	Dell MD3860f using Dynamic Disk Pool (39 drives) technology for data protection
	Dual LSI 9300-8e 12Gb SAS HBAs per server
	SAS-Direct Attach
Test Start Time	8/3/2015 12:49:17 PM
Test End Time	8/3/2015 2:52:50 PM
Collection Start Time	8/3/2015 12:52:43 PM
Collection End Time	8/3/2015 2:52:40 PM
Jetstress Version	15.00.0995.000
ESE Version	15.00.0847.030
Operating System	Windows Server 2012 R2 Datacenter (6.2.9200.0)
Performance Log	C:\Program Files\Exchange Jetstress\Performance_2015_8_3_12_49_34.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second	876.508
Target Transactional I/O per Second	600
Initial Database Size (bytes)	10763045437440
Final Database Size (bytes)	10765226475520
Database Files (Count)	8

Jetstress System Parameters

Thread Count	20
Minimum Database Cache	256.0 MB
Maximum Database Cache	2048.0 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

Dell MD3860f 10,000 user Mailbox Exchange 2013 Resiliency Storage Solution — Direct Attach SAS using dual LSI 9300-8e 12Gb SAS adapters

Instance3124.1 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log1
Database: C:\Users\Administrator\Documents\VolumeStary1\DB1\Jetstress001001.edb

Instance3124.2 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log2
Database: C:\Users\Administrator\Documents\VolumeStary1\DB2\Jetstress002001.edb

Instance3124.3 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log3
Database: C:\Users\Administrator\Documents\VolumeStary1\DB3\Jetstress003001.edb

Instance3124.4 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log4
Database: C:\Users\Administrator\Documents\VolumeStary1\DB4\Jetstress004001.edb

Instance3124.5 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log5
Database: C:\Users\Administrator\Documents\VolumeStary2\DB5\Jetstress005001.edb

Instance3124.6 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log6
Database: C:\Users\Administrator\Documents\VolumeStary2\DB6\Jetstress006001.edb

Instance3124.7 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log7
Database: C:\Users\Administrator\Documents\VolumeStary2\DB7\Jetstress007001.edb

Instance3124.8 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log8
Database: C:\Users\Administrator\Documents\VolumeStary2\DB8\Jetstress008001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance3124.1	14.890	1.455	75.547	33.735	32866.209	34794.843	0.000	0.403	0.000	8.036	0.000	20237.022
Instance3124.2	15.326	1.433	75.720	34.229	32875.321	34770.524	0.000	0.397	0.000	8.091	0.000	20361.714
Instance3124.3	16.093	1.460	75.711	33.865	32871.576	34769.047	0.000	0.398	0.000	8.007	0.000	20248.192
Instance3124.4	16.917	1.433	75.393	34.002	32877.691	34766.185	0.000	0.412	0.000	8.074	0.000	20380.409
Instance3124.5	13.228	1.472	75.682	34.005	32875.996	34773.364	0.000	0.381	0.000	8.104	0.000	20183.165
Instance3124.6	13.337	1.474	75.543	33.882	32882.936	34791.097	0.000	0.388	0.000	8.075	0.000	20274.115
Instance3124.7	13.485	1.448	75.114	33.401	32874.334	34824.446	0.000	0.385	0.000	7.998	0.000	20513.759
Instance3124.8	13.744	1.443	76.082	34.597	32892.224	34767.174	0.000	0.378	0.000	8.135	0.000	20288.375

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3124.1	9.773	261855.615
Instance3124.2	9.775	261821.692
Instance3124.3	9.776	261793.287
Instance3124.4	9.774	261855.812
Instance3124.5	9.773	261871.788
Instance3124.6	9.775	261812.272
Instance3124.7	9.775	261798.715
Instance3124.8	9.775	261776.296

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3124.1	0.694	227696.469
Instance3124.2	0.704	231102.185
Instance3124.3	0.692	230127.517
Instance3124.4	0.702	229156.061
Instance3124.5	0.699	229678.568
Instance3124.6	0.699	229642.592
Instance3124.7	0.699	226723.407
Instance3124.8	0.705	229620.108

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
Instance3124.1	14.890	1.455	85.320	33.735	59095.340	34794.843	0.605	0.403	0.694	8.036	227696.469	20237.022
Instance3124.2	15.326	1.433	85.496	34.229	59052.655	34770.524	0.759	0.397	0.704	8.091	231102.185	20361.714
Instance3124.3	16.093	1.460	85.488	33.865	59051.144	34769.047	0.651	0.398	0.692	8.007	230127.517	20248.192
Instance3124.4	16.917	1.433	85.167	34.002	59155.978	34766.185	0.712	0.412	0.702	8.074	229156.061	20380.409
Instance3124.5	13.228	1.472	85.454	34.005	59063.832	34773.364	1.727	0.381	0.699	8.104	229678.568	20183.165
Instance3124.6	13.337	1.474	85.318	33.882	59111.447	34791.097	1.639	0.388	0.699	8.075	229642.592	20274.115
Instance3124.7	13.485	1.448	84.889	33.401	59235.223	34824.446	1.529	0.385	0.699	7.998	226723.407	20513.759
Instance3124.8	13.744	1.443	85.857	34.597	58951.935	34767.174	1.494	0.378	0.705	8.135	229620.108	20288.375

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.278	0.124	0.701
Available MBytes	28335.704	28307.000	28462.000
Free System Page Table Entries	16601890.361	16601457.000	16602052.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	150298487.182	149270528.000	150601728.000
Pool Paged Bytes	87297261.294	86781952.000	87482368.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

```
8/3/2015 10:48:47 AM -- Preparing for testing ...
8/3/2015 10:48:56 AM -- Attaching databases ...
8/3/2015 10:48:56 AM -- Preparations for testing are complete.
8/3/2015 10:48:56 AM -- Starting transaction dispatch ..
8/3/2015 10:48:56 AM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)
8/3/2015 10:48:56 AM -- Database flush thresholds: (start: 20.5 MB, stop: 40.9 MB)
8/3/2015 10:49:05 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
8/3/2015 10:49:05 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
8/3/2015 10:49:06 AM -- Operation mix: Sessions 20, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
8/3/2015 10:49:06 AM -- Performance logging started (interval: 15000 ms).
8/3/2015 10:49:06 AM -- Attaining prerequisites:
8/3/2015 10:52:00 AM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1943196000.0 (lower bound: 1932735000.0, upper bound: none)
8/3/2015 12:52:01 PM -- Performance logging has ended.
8/3/2015 12:52:01 PM -- JetInterop batch transaction stats: 19403, 19403, 19403, 19403, 19403, 19403, 19403 and 19402.
8/3/2015 12:52:01 PM -- Dispatching transactions ends.
8/3/2015 12:52:01 PM -- Shutting down databases ...
8/3/2015 12:52:06 PM -- Instance3124.1 (complete), Instance3124.2 (complete), Instance3124.3 (complete), Instance3124.4 (complete), Instance3124.5 (complete), Instance3124.6 (complete), Instance3124.7 (complete) and Instance3124.8 (complete)
8/3/2015 12:52:06 PM -- C:\Program Files\Exchange Jetstress\Performance_2015_8_3_10_49_5.blg has 490 samples.
8/3/2015 12:52:06 PM -- Creating test report ...
8/3/2015 12:52:08 PM -- Instance3124.1 has 14.9 for I/O Database Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.1 has 0.4 for I/O Log Writes Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.1 has 0.4 for I/O Log Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.2 has 15.3 for I/O Database Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.2 has 0.4 for I/O Log Writes Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.2 has 0.4 for I/O Log Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.3 has 16.1 for I/O Database Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.3 has 0.4 for I/O Log Writes Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.3 has 0.4 for I/O Log Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.4 has 16.9 for I/O Database Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.4 has 0.4 for I/O Log Writes Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.4 has 0.4 for I/O Log Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.5 has 13.2 for I/O Database Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.5 has 0.4 for I/O Log Writes Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.5 has 0.4 for I/O Log Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.6 has 13.3 for I/O Database Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.6 has 0.4 for I/O Log Writes Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.6 has 0.4 for I/O Log Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.7 has 13.5 for I/O Database Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.7 has 0.4 for I/O Log Writes Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.7 has 0.4 for I/O Log Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.8 has 13.7 for I/O Database Reads Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.8 has 0.4 for I/O Log Writes Average Latency.
8/3/2015 12:52:08 PM -- Instance3124.8 has 0.4 for I/O Log Reads Average Latency.
8/3/2015 12:52:08 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
8/3/2015 12:52:08 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
8/3/2015 12:52:08 PM -- C:\Program Files\Exchange Jetstress\Performance_2015_8_3_10_49_5.xml has 478 samples queried.
```

B   Stress testing

Server 1

Database Sizing and Throughput

Achieved Transactional I/O per Second	917.833
Target Transactional I/O per Second	600
Initial Database Size (bytes)	10769840209920
Final Database Size (bytes)	10796289490944
Database Files (Count)	8

Jetstress System Parameters

Thread Count	20
Minimum Database Cache	256.0 MB
Maximum Database Cache	2048.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%
Run Background Database Maintenance	True
Number of Copies per Database	2

Database Configuration

Instance3812.1 Log path: C:\Users\Administrator\Documents\Vol2\Log1
Database: C:\Users\Administrator\Documents\Vol1\DB1\Jetstress001001.edb

Instance3812.2 Log path: C:\Users\Administrator\Documents\Vol2\Log2
Database: C:\Users\Administrator\Documents\Vol1\DB2\Jetstress002001.edb

Instance3812.3 Log path: C:\Users\Administrator\Documents\Vol2\Log3
Database: C:\Users\Administrator\Documents\Vol1\DB3\Jetstress003001.edb

Instance3812.4 Log path: C:\Users\Administrator\Documents\Vol2\Log4
Database: C:\Users\Administrator\Documents\Vol1\DB4\Jetstress004001.edb

Instance3812.5 Log path: C:\Users\Administrator\Documents\Vol1\log5
Database: C:\Users\Administrator\Documents\Vol2\DB5\Jetstress005001.edb

Instance3812.6 Log path: C:\Users\Administrator\Documents\Vol1\log6
Database: C:\Users\Administrator\Documents\Vol2\DB6\Jetstress006001.edb

Instance3812.7 Log path: C:\Users\Administrator\Documents\Vol1\log7
Database: C:\Users\Administrator\Documents\Vol2\DB7\Jetstress007001.edb

Instance3812.8 Log path: C:\Users\Administrator\Documents\Vol1\log8
Database: C:\Users\Administrator\Documents\Vol2\DB8\Jetstress008001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance3812.1	15.717	2.166	78.966	35.717	32882.040	34477.052	0.000	0.441	0.000	8.365	0.000	20284.314
Instance3812.2	15.056	2.153	78.981	35.709	32880.727	34474.628	0.000	0.439	0.000	8.364	0.000	20273.548
Instance3812.3	14.542	2.160	78.956	35.668	32884.126	34474.447	0.000	0.441	0.000	8.359	0.000	20282.067
Instance3812.4	13.901	2.151	78.999	35.722	32882.474	34466.114	0.000	0.439	0.000	8.378	0.000	20256.206
Instance3812.5	13.463	1.269	79.074	35.806	32882.175	34471.291	0.000	0.459	0.000	8.383	0.000	20250.096
Instance3812.6	13.297	1.280	79.038	35.778	32884.363	34469.074	0.000	0.454	0.000	8.379	0.000	20283.202
Instance3812.7	13.168	1.284	78.980	35.700	32883.193	34471.222	0.000	0.459	0.000	8.366	0.000	20288.004
Instance3812.8	13.040	1.274	79.068	35.673	32883.357	34463.873	0.000	0.459	0.000	8.350	0.000	20231.788

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3812.1	9.891	261836.671
Instance3812.2	9.892	261820.791
Instance3812.3	9.891	261824.237
Instance3812.4	9.893	261804.076
Instance3812.5	9.890	261833.380
Instance3812.6	9.892	261816.791
Instance3812.7	9.891	261823.989
Instance3812.8	9.891	261828.322

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3812.1	0.725	230702.626
Instance3812.2	0.724	230253.532
Instance3812.3	0.724	230213.487
Instance3812.4	0.725	230739.694
Instance3812.5	0.725	230580.871
Instance3812.6	0.726	230658.852
Instance3812.7	0.725	230176.823
Instance3812.8	0.722	230092.024

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
Instance3812.1	15.717	2.166	88.857	35.717	58368.543	34477.052	0.487	0.441	0.725	8.365	230702.626	20284.314
Instance3812.2	15.056	2.153	88.874	35.709	58363.629	34474.628	0.477	0.439	0.724	8.364	230253.532	20273.548
Instance3812.3	14.542	2.160	88.847	35.668	58371.896	34474.447	0.482	0.441	0.724	8.359	230213.487	20282.067
Instance3812.4	13.901	2.151	88.892	35.722	58358.841	34466.114	0.495	0.439	0.725	8.378	230739.694	20256.206
Instance3812.5	13.463	1.269	88.964	35.806	58335.369	34471.291	0.489	0.459	0.725	8.383	230580.871	20250.096
Instance3812.6	13.297	1.280	88.930	35.778	58348.832	34469.074	0.511	0.454	0.726	8.379	230658.852	20283.202
Instance3812.7	13.168	1.284	88.870	35.700	58363.159	34471.222	0.489	0.459	0.725	8.366	230176.823	20288.004
Instance3812.8	13.040	1.274	88.959	35.673	58338.131	34463.873	0.502	0.459	0.722	8.350	230092.024	20231.788

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.837	0.520	2.763
Available MBytes	27929.508	27814.000	28098.000
Free System Page Table Entries	16600233.854	16599343.000	16600554.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	170007153.629	167694336.000	173432832.000
Pool Paged Bytes	110631048.533	108310528.000	111624192.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

8/3/2015 8:52:00 PM -- Preparing for testing ...
8/3/2015 8:52:09 PM -- Attaching databases ...
8/3/2015 8:52:09 PM -- Preparations for testing are complete.
8/3/2015 8:52:09 PM -- Starting transaction dispatch ..
8/3/2015 8:52:09 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)
8/3/2015 8:52:09 PM -- Database flush thresholds: (start: 20.5 MB, stop: 40.9 MB)
8/3/2015 8:52:17 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
8/3/2015 8:52:17 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
8/3/2015 8:52:19 PM -- Operation mix: Sessions 20, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
8/3/2015 8:52:19 PM -- Performance logging started (interval: 15000 ms).
8/3/2015 8:52:19 PM -- Attaining prerequisites:
8/3/2015 8:55:18 PM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1947935000.0 (lower bound: 1932735000.0, upper bound: none)
8/4/2015 8:55:18 PM -- Performance logging has ended.
8/4/2015 8:55:18 PM -- JetInterop batch transaction stats: 236271, 236271, 236271, 236270, 236270, 236270, 236270 and 236270.
8/4/2015 8:55:18 PM -- Dispatching transactions ends.
8/4/2015 8:55:20 PM -- Shutting down databases ...
8/4/2015 8:55:32 PM -- Instance3812.1 (complete), Instance3812.2 (complete), Instance3812.3 (complete), Instance3812.4 (complete), Instance3812.5 (complete), Instance3812.6 (complete), Instance3812.7 (complete) and Instance3812.8 (complete)
8/4/2015 8:55:32 PM -- C:\Program Files\Exchange Jetstress\Stress_2015_8_3_20_52_17.blg has 5756 samples.
8/4/2015 8:55:32 PM -- Creating test report ...
8/4/2015 8:56:05 PM -- Instance3812.1 has 15.7 for I/O Database Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.1 has 0.4 for I/O Log Writes Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.1 has 0.4 for I/O Log Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.2 has 15.1 for I/O Database Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.2 has 0.4 for I/O Log Writes Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.2 has 0.4 for I/O Log Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.3 has 14.5 for I/O Database Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.3 has 0.4 for I/O Log Writes Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.3 has 0.4 for I/O Log Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.4 has 13.9 for I/O Database Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.4 has 0.4 for I/O Log Writes Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.4 has 0.4 for I/O Log Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.5 has 13.5 for I/O Database Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.5 has 0.5 for I/O Log Writes Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.5 has 0.5 for I/O Log Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.6 has 13.3 for I/O Database Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.6 has 0.5 for I/O Log Writes Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.6 has 0.5 for I/O Log Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.7 has 13.2 for I/O Database Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.7 has 0.5 for I/O Log Writes Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.7 has 0.5 for I/O Log Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.8 has 13.0 for I/O Database Reads Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.8 has 0.5 for I/O Log Writes Average Latency.
8/4/2015 8:56:05 PM -- Instance3812.8 has 0.5 for I/O Log Reads Average Latency.
8/4/2015 8:56:05 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
8/4/2015 8:56:05 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
8/4/2015 8:56:05 PM -- C:\Program Files\Exchange Jetstress\Stress_2015_8_3_20_52_17.xml has 5744 samples queried.

Server 2

Achieved Transactional I/O per Second	879.186
Target Transactional I/O per Second	600
Initial Database Size (bytes)	10765226475520
Final Database Size (bytes)	10790744621056
Database Files (Count)	8

Jetstress System Parameters

Thread Count	20
Minimum Database Cache	256.0 MB
Maximum Database Cache	2048.0 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

Instance3044.1 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log1
Database: C:\Users\Administrator\Documents\VolumeStary1\DB1\Jetstress001001.edb

Instance3044.2 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log2
Database: C:\Users\Administrator\Documents\VolumeStary1\DB2\Jetstress002001.edb

Instance3044.3 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log3
Database: C:\Users\Administrator\Documents\VolumeStary1\DB3\Jetstress003001.edb

Instance3044.4 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log4
Database: C:\Users\Administrator\Documents\VolumeStary1\DB4\Jetstress004001.edb

Instance3044.5 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log5
Database: C:\Users\Administrator\Documents\VolumeStary2\DB5\Jetstress005001.edb

Instance3044.6 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log6
Database: C:\Users\Administrator\Documents\VolumeStary2\DB6\Jetstress006001.edb

Instance3044.7 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log7
Database: C:\Users\Administrator\Documents\VolumeStary2\DB7\Jetstress007001.edb

Instance3044.8 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log8
Database: C:\Users\Administrator\Documents\VolumeStary2\DB8\Jetstress008001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance3044.1	14.784	1.488	75.848	34.252	32877.363	34542.805	0.000	0.415	0.000	8.046	0.000	20259.922
Instance3044.2	15.286	1.503	75.756	34.143	32876.965	34547.866	0.000	0.414	0.000	8.013	0.000	20331.553
Instance3044.3	15.998	1.515	75.716	34.093	32878.898	34549.482	0.000	0.416	0.000	8.009	0.000	20340.714
Instance3044.4	16.854	1.492	75.740	34.102	32875.003	34544.659	0.000	0.414	0.000	8.016	0.000	20330.133
Instance3044.5	13.262	1.530	75.786	34.247	32880.096	34541.298	0.000	0.388	0.000	8.057	0.000	20335.668
Instance3044.6	13.340	1.517	75.749	34.074	32877.040	34546.736	0.000	0.388	0.000	7.999	0.000	20363.487
Instance3044.7	13.482	1.533	75.681	34.144	32878.194	34555.261	0.000	0.387	0.000	8.031	0.000	20419.441
Instance3044.8	13.702	1.516	75.717	34.138	32881.993	34553.710	0.000	0.389	0.000	8.025	0.000	20363.091

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3044.1	9.689	261836.333
Instance3044.2	9.690	261823.487
Instance3044.3	9.690	261808.170
Instance3044.4	9.690	261811.827
Instance3044.5	9.689	261825.422
Instance3044.6	9.689	261827.284
Instance3044.7	9.689	261804.314
Instance3044.8	9.689	261803.572

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3044.1	0.696	229442.040
Instance3044.2	0.696	228946.063
Instance3044.3	0.695	229326.431
Instance3044.4	0.696	228839.676
Instance3044.5	0.700	229569.062
Instance3044.6	0.695	228357.091
Instance3044.7	0.700	229244.705
Instance3044.8	0.698	228762.591

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
Instance3044.1	14.784	1.488	85.537	34.252	58813.113	34542.805	0.604	0.415	0.696	8.046	229442.040	20259.922
Instance3044.2	15.286	1.503	85.446	34.143	58840.631	34547.866	0.595	0.414	0.696	8.013	228946.063	20331.553
Instance3044.3	15.998	1.515	85.406	34.093	58853.243	34549.482	0.596	0.416	0.695	8.009	229326.431	20340.714
Instance3044.4	16.854	1.492	85.430	34.102	58842.630	34544.659	0.612	0.414	0.696	8.016	228839.676	20330.133
Instance3044.5	13.262	1.530	85.475	34.247	58831.393	34541.298	1.638	0.388	0.700	8.057	229569.062	20335.668
Instance3044.6	13.340	1.517	85.438	34.074	58840.052	34546.736	1.544	0.388	0.695	7.999	228357.091	20363.487
Instance3044.7	13.482	1.533	85.371	34.144	58860.950	34555.261	1.575	0.387	0.700	8.031	229244.705	20419.441
Instance3044.8	13.702	1.516	85.406	34.138	58853.286	34553.710	1.551	0.389	0.698	8.025	228762.591	20363.091

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.269	0.000	1.603
Available MBytes	28298.897	28225.000	28498.000
Free System Page Table Entries	16601727.977	16600904.000	16602024.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	155611751.967	153792512.000	157286400.000
Pool Paged Bytes	91453018.437	90460160.000	92135424.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

8/3/2015 6:51:58 PM -- Preparing for testing ...
8/3/2015 6:52:07 PM -- Attaching databases ...
8/3/2015 6:52:07 PM -- Preparations for testing are complete.
8/3/2015 6:52:07 PM -- Starting transaction dispatch ..
8/3/2015 6:52:07 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)
8/3/2015 6:52:07 PM -- Database flush thresholds: (start: 20.5 MB, stop: 40.9 MB)
8/3/2015 6:52:15 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
8/3/2015 6:52:15 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
8/3/2015 6:52:16 PM -- Operation mix: Sessions 20, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
8/3/2015 6:52:16 PM -- Performance logging started (interval: 15000 ms).
8/3/2015 6:52:16 PM -- Attaining prerequisites:
8/3/2015 6:55:15 PM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1934143000.0 (lower bound: 1932735000.0, upper bound: none)
8/4/2015 6:55:16 PM -- Performance logging has ended.
8/4/2015 6:55:16 PM -- JetInterop batch transaction stats: 226557, 226557, 226557, 226557, 226557, 226556, 226556 and 226556.
8/4/2015 6:55:16 PM -- Dispatching transactions ends.
8/4/2015 6:55:16 PM -- Shutting down databases ...
8/4/2015 6:55:21 PM -- Instance3044.1 (complete), Instance3044.2 (complete), Instance3044.3 (complete), Instance3044.4 (complete), Instance3044.5 (complete), Instance3044.6 (complete), Instance3044.7 (complete) and Instance3044.8 (complete)
8/4/2015 6:55:21 PM -- C:\Program Files\Exchange Jetstress\Stress_2015_8_3_18_52_15.blg has 5763 samples.
8/4/2015 6:55:21 PM -- Creating test report ...
8/4/2015 6:55:49 PM -- Instance3044.1 has 14.8 for I/O Database Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.1 has 0.4 for I/O Log Writes Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.1 has 0.4 for I/O Log Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.2 has 15.3 for I/O Database Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.2 has 0.4 for I/O Log Writes Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.2 has 0.4 for I/O Log Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.3 has 16.0 for I/O Database Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.3 has 0.4 for I/O Log Writes Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.3 has 0.4 for I/O Log Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.4 has 16.9 for I/O Database Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.4 has 0.4 for I/O Log Writes Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.4 has 0.4 for I/O Log Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.5 has 13.3 for I/O Database Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.5 has 0.4 for I/O Log Writes Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.5 has 0.4 for I/O Log Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.6 has 13.3 for I/O Database Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.6 has 0.4 for I/O Log Writes Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.6 has 0.4 for I/O Log Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.7 has 13.5 for I/O Database Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.7 has 0.4 for I/O Log Writes Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.7 has 0.4 for I/O Log Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.8 has 13.7 for I/O Database Reads Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.8 has 0.4 for I/O Log Writes Average Latency.
8/4/2015 6:55:49 PM -- Instance3044.8 has 0.4 for I/O Log Reads Average Latency.
8/4/2015 6:55:49 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
8/4/2015 6:55:49 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
8/4/2015 6:55:49 PM -- C:\Program Files\Exchange Jetstress\Stress_2015_8_3_18_52_15.xml has 5751 samples queried.

Dell MD3860f 10,000 user Mailbox Exchange 2013 Resiliency Storage Solution — Direct Attach SAS using dual LSI 9300-8e 12Gb SAS adapters

C Backup testing

Server 1

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance4084.1	1287016.03	03:40:29	97.28
Instance4084.2	1287000.03	03:32:48	100.80
Instance4084.3	1287008.03	03:30:58	101.67
Instance4084.4	1287016.03	03:16:46	109.01
Instance4084.5	1287000.03	03:26:58	103.64
Instance4084.6	1287016.03	03:17:21	108.69
Instance4084.7	1287016.03	03:18:00	108.33
Instance4084.8	1287008.03	03:14:25	110.33
Avg			104.97
Sum			839.74

Jetstress System Parameters

Thread Count	20
Minimum Database Cache	256.0 MB
Maximum Database Cache	2048.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%

Database Configuration

Instance4084.1 Log path: C:\Users\Administrator\Documents\Vol2\Log1
Database: C:\Users\Administrator\Documents\Vol1\DB1\Jetstress001001.edb

Instance4084.2 Log path: C:\Users\Administrator\Documents\Vol2\Log2
Database: C:\Users\Administrator\Documents\Vol1\DB2\Jetstress002001.edb

Instance4084.3 Log path: C:\Users\Administrator\Documents\Vol2\Log3
Database: C:\Users\Administrator\Documents\Vol1\DB3\Jetstress003001.edb

Instance4084.4 Log path: C:\Users\Administrator\Documents\Vol2\Log4
Database: C:\Users\Administrator\Documents\Vol1\DB4\Jetstress004001.edb

Instance4084.5 Log path: C:\Users\Administrator\Documents\Vol1\log5
Database: C:\Users\Administrator\Documents\Vol2\DB5\Jetstress005001.edb

Instance4084.6 Log path: C:\Users\Administrator\Documents\Vol1\log6
Database: C:\Users\Administrator\Documents\Vol2\DB6\Jetstress006001.edb

Instance4084.7 Log path: C:\Users\Administrator\Documents\Vol1\log7
Database: C:\Users\Administrator\Documents\Vol2\DB7\Jetstress007001.edb

Instance4084.8 Log path: C:\Users\Administrator\Documents\Vol1\log8
Database: C:\Users\Administrator\Documents\Vol2\DB8\Jetstress008001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance4084.1	3.084	0.000	388.374	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4084.2	3.183	0.000	402.826	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4084.3	3.182	0.000	406.305	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4084.4	2.620	0.000	435.807	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4084.5	4.750	0.000	414.478	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4084.6	4.616	0.000	434.565	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4084.7	4.811	0.000	433.112	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4084.8	4.446	0.000	441.406	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	1.881	0.157	3.721
Available MBytes	30094.311	30073.000	30102.000
Free System Page Table Entries	16600533.066	16600191.000	16600796.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	173782332.509	173645824.000	178089984.000
Pool Paged Bytes	115772834.909	115642368.000	115871744.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

8/5/2015 2:09:10 AM -- Preparing for testing ...
8/5/2015 2:09:19 AM -- Attaching databases ...
8/5/2015 2:09:19 AM -- Preparations for testing are complete.
8/5/2015 2:09:29 AM -- Performance logging started (interval: 30000 ms).
8/5/2015 2:09:29 AM -- Backing up databases ...
8/5/2015 5:49:59 AM -- Performance logging has ended.
8/5/2015 5:49:59 AM -- Instance4084.1 (100% processed), Instance4084.2 (100% processed), Instance4084.3 (100% processed), Instance4084.4 (100% processed), Instance4084.5 (100% processed), Instance4084.6 (100% processed), Instance4084.7 (100% processed) and Instance4084.8 (100% processed)
8/5/2015 5:49:59 AM -- C:\Program Files\Exchange Jetstress\DatabaseBackup_2015_8_5_2_9_19.blg has 440 samples.
8/5/2015 5:49:59 AM -- Creating test report ...

Server 2

Database Backup Statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance3736.1	1286336.03	03:32:43	100.78
Instance3736.2	1286352.03	03:35:19	99.57
Instance3736.3	1286336.03	03:41:32	96.77
Instance3736.4	1286352.03	03:42:47	96.23
Instance3736.5	1286368.03	03:12:32	111.35
Instance3736.6	1286328.03	03:16:51	108.91
Instance3736.7	1286376.03	03:16:51	108.91
Instance3736.8	1286344.03	03:30:07	102.03
Avg			103.07
Sum			824.55

Jetstress System Parameters

Thread Count	20
Minimum Database Cache	256.0 MB
Maximum Database Cache	2048.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%

Database Configuration

Instance3736.1 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log1
Database: C:\Users\Administrator\Documents\VolumeStary1\DB1\Jetstress001001.edb

Instance3736.2 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log2
Database: C:\Users\Administrator\Documents\VolumeStary1\DB2\Jetstress002001.edb

Instance3736.3 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log3
Database: C:\Users\Administrator\Documents\VolumeStary1\DB3\Jetstress003001.edb

Instance3736.4 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log4
Database: C:\Users\Administrator\Documents\VolumeStary1\DB4\Jetstress004001.edb

Instance3736.5 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log5
Database: C:\Users\Administrator\Documents\VolumeStary2\DB5\Jetstress005001.edb

Instance3736.6 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log6
Database: C:\Users\Administrator\Documents\VolumeStary2\DB6\Jetstress006001.edb

Instance3736.7 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log7
Database: C:\Users\Administrator\Documents\VolumeStary2\DB7\Jetstress007001.edb

Instance3736.8 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log8
Database: C:\Users\Administrator\Documents\VolumeStary2\DB8\Jetstress008001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance3736.1	3.042	0.000	403.738	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3736.2	2.962	0.000	398.144	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3736.3	3.195	0.000	387.684	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3736.4	3.559	0.000	384.818	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3736.5	4.391	0.000	446.395	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3736.6	5.100	0.000	435.441	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3736.7	5.009	0.000	435.568	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3736.8	4.978	0.000	407.854	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.629	0.365	0.856
Available MBytes	30468.476	30455.000	30473.000
Free System Page Table Entries	16601996.587	16601778.000	16602219.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	157625668.458	157585408.000	157704192.000
Pool Paged Bytes	92390692.243	92311552.000	92745728.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

8/5/2015 12:09:37 AM -- Preparing for testing ...
8/5/2015 12:09:45 AM -- Attaching databases ...
8/5/2015 12:09:45 AM -- Preparations for testing are complete.
8/5/2015 12:09:54 AM -- Performance logging started (interval: 30000 ms).
8/5/2015 12:09:54 AM -- Backing up databases ...
8/5/2015 3:52:41 AM -- Performance logging has ended.
8/5/2015 3:52:41 AM -- Instance3736.1 (100% processed), Instance3736.2 (100% processed), Instance3736.3 (100% processed), Instance3736.4 (100% processed), Instance3736.5 (100% processed), Instance3736.6 (100% processed), Instance3736.7 (100% processed) and Instance3736.8 (100% processed)
8/5/2015 3:52:41 AM -- C:\Program Files\Exchange Jetstress\DatabaseBackup_2015_8_5_0_9_45.blg has 445 samples.
8/5/2015 3:52:41 AM -- Creating test report ...

D   Recovery testing

Server 1

Database Sizing and Throughput

Achieved Transactional I/O per Second	924.262
Target Transactional I/O per Second	600
Initial Database Size (bytes)	10737485348864
Final Database Size (bytes)	10739347619840
Database Files (Count)	8

Jetstress System Parameters

Thread Count	20
Minimum Database Cache	256.0 MB
Maximum Database Cache	2048.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%

Database Configuration

Instance3464.1 Log path: C:\Users\Administrator\Desktop\Volume_2\log1
Database: C:\Users\Administrator\Desktop\Volume_1\DB1\Jetstress001001.edb

Instance3464.2 Log path: C:\Users\Administrator\Desktop\Volume_2\log2
Database: C:\Users\Administrator\Desktop\Volume_1\DB2\Jetstress002001.edb

Instance3464.3 Log path: C:\Users\Administrator\Desktop\Volume_2\log3
Database: C:\Users\Administrator\Desktop\Volume_1\DB3\Jetstress003001.edb

Instance3464.4 Log path: C:\Users\Administrator\Desktop\Volume_2\log4
Database: C:\Users\Administrator\Desktop\Volume_1\DB4\Jetstress004001.edb

Instance3464.5 Log path: C:\Users\Administrator\Desktop\Volume_1\log5
Database: C:\Users\Administrator\Desktop\Volume_2\DB5\Jetstress005001.edb

Instance3464.6 Log path: C:\Users\Administrator\Desktop\Volume_1\log6
Database: C:\Users\Administrator\Desktop\Volume_2\DB6\Jetstress006001.edb

Instance3464.7 Log path: C:\Users\Administrator\Desktop\Volume_1\log7
Database: C:\Users\Administrator\Desktop\Volume_2\DB7\Jetstress007001.edb

Instance3464.8 Log path: C:\Users\Administrator\Desktop\Volume_1\log8
Database: C:\Users\Administrator\Desktop\Volume_2\DB8\Jetstress008001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance3464.1	17.048	3.059	80.242	35.261	32768.000	36177.698	0.000	0.405	0.000	9.503	0.000	20364.712
Instance3464.2	16.209	2.984	80.054	35.081	32768.000	36147.381	0.000	0.384	0.000	9.447	0.000	20408.811
Instance3464.3	15.472	3.059	80.558	35.389	32768.078	36097.223	0.000	0.387	0.000	9.531	0.000	20169.693
Instance3464.4	15.168	3.011	80.233	35.462	32768.000	36159.883	0.000	0.392	0.000	9.595	0.000	20359.649
Instance3464.5	14.827	3.481	80.132	34.932	32768.000	36167.370	0.000	0.405	0.000	9.366	0.000	20473.005
Instance3464.6	14.615	3.479	80.576	35.279	32768.000	36127.750	0.000	0.393	0.000	9.480	0.000	20201.946
Instance3464.7	14.464	3.450	80.531	35.273	32768.000	36046.401	0.000	0.390	0.000	9.473	0.000	20199.190
Instance3464.8	14.541	3.408	80.228	35.033	32768.000	36173.908	0.000	0.394	0.000	9.394	0.000	20520.432

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.428	0.178	1.032
Available MBytes	28248.522	28080.000	29977.000
Free System Page Table Entries	16603845.620	16603436.000	16604068.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	164225572.372	163246080.000	164429824.000
Pool Paged Bytes	93584322.448	93405184.000	93671424.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

8/4/2015 10:30:40 PM -- Preparing for testing ...
8/4/2015 10:30:40 PM -- Creating C:\Users\Administrator\Desktop\Volume_1\DB1\Jetstress001001.edb.
8/4/2015 10:30:40 PM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)
8/4/2015 10:30:40 PM -- Database flush thresholds: (start: 2.5 MB, stop: 5.1 MB)
8/5/2015 1:26:58 AM -- 100.0% of 1.2 TB complete (427197519 records inserted).
8/5/2015 1:26:59 AM -- 100.0% of 1.2 TB complete (427198384 records inserted).
8/5/2015 1:26:59 AM -- Duplicating 7 databases:
8/5/2015 5:24:23 AM -- 100.0% of 8.5 TB complete (8.5 TB duplicated).
8/5/2015 5:24:31 AM -- Attaching databases ...
8/5/2015 5:24:31 AM -- Preparations for testing are complete.
8/5/2015 5:24:31 AM -- Starting transaction dispatch ..
8/5/2015 5:24:31 AM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)
8/5/2015 5:24:31 AM -- Database flush thresholds: (start: 20.5 MB, stop: 40.9 MB)
8/5/2015 5:24:40 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
8/5/2015 5:24:40 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
8/5/2015 5:24:41 AM -- Operation mix: Sessions 20, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
8/5/2015 5:24:41 AM -- Performance logging started (interval: 15000 ms).
8/5/2015 5:24:41 AM -- Generating log files ...
8/5/2015 6:56:24 AM -- C:\Users\Administrator\Desktop\Volume_2\log1 (101.4% generated), C:\Users\Administrator\Desktop\Volume_2\log2 (101.0% generated), C:\Users\Administrator\Desktop\Volume_2\log3 (100.8% generated), C:\Users\Administrator\Desktop\Volume_2\log4 (102.4% generated), C:\Users\Administrator\Desktop\Volume_1\log5 (100.4% generated), C:\Users\Administrator\Desktop\Volume_1\log6 (100.2% generated), C:\Users\Administrator\Desktop\Volume_1\log7 (100.2% generated) and C:\Users\Administrator\Desktop\Volume_1\log8 (100.8% generated)
8/5/2015 6:56:24 AM -- Performance logging has ended.
8/5/2015 6:56:24 AM -- JetInterop batch transaction stats: 16995, 16995, 16994, 16994, 16994, 16994, 16994 and 16994.
8/5/2015 6:56:24 AM -- Dispatching transactions ends.
8/5/2015 6:56:24 AM -- Shutting down databases ...
8/5/2015 6:56:29 AM -- Instance3464.1 (complete), Instance3464.2 (complete), Instance3464.3 (complete), Instance3464.4 (complete), Instance3464.5 (complete), Instance3464.6 (complete), Instance3464.7 (complete) and Instance3464.8 (complete)
8/5/2015 6:56:29 AM -- C:\Program Files\Exchange Jetstress\Performance_2015_8_5_5_24_40.blg has 366 samples.
8/5/2015 6:56:29 AM -- Creating test report ...
8/5/2015 6:56:30 AM -- Instance3464.1 has 17.0 for I/O Database Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.1 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.1 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.2 has 16.2 for I/O Database Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.2 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.2 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.3 has 15.5 for I/O Database Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.3 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.3 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.4 has 15.2 for I/O Database Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.4 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.4 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.5 has 14.8 for I/O Database Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.5 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.5 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.6 has 14.6 for I/O Database Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.6 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.6 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.7 has 14.5 for I/O Database Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.7 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.7 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.8 has 14.5 for I/O Database Reads Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.8 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 6:56:30 AM -- Instance3464.8 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 6:56:30 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
8/5/2015 6:56:30 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
8/5/2015 6:56:30 AM -- C:\Program Files\Exchange Jetstress\Performance_2015_8_5_5_24_40.xml has 365 samples queried.

Server 2

Database Sizing and Throughput

Achieved Transactional I/O per Second	940.996
Target Transactional I/O per Second	600
Initial Database Size (bytes)	10737418240000
Final Database Size (bytes)	10739322454016
Database Files (Count)	8

Jetstress System Parameters

Thread Count	20
Minimum Database Cache	256.0 MB
Maximum Database Cache	2048.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%

Database Configuration

Instance3432.1 Log path: C:\Users\Administrator\Desktop\VolDort1\log1
Database: C:\Users\Administrator\Desktop\VolDort1\DB1\Jetstress001001.edb

Instance3432.2 Log path: C:\Users\Administrator\Desktop\VolDort1\log2
Database: C:\Users\Administrator\Desktop\VolDort1\DB2\Jetstress002001.edb

Instance3432.3 Log path: C:\Users\Administrator\Desktop\VolDort1\log3
Database: C:\Users\Administrator\Desktop\VolDort1\DB3\Jetstress003001.edb

Instance3432.4 Log path: C:\Users\Administrator\Desktop\VolDort1\log4
Database: C:\Users\Administrator\Desktop\VolDort1\DB4\Jetstress004001.edb

Instance3432.5 Log path: C:\Users\Administrator\Desktop\VolDort2\log5
Database: C:\Users\Administrator\Desktop\VolDort2\DB5\Jetstress005001.edb

Instance3432.6 Log path: C:\Users\Administrator\Desktop\VolDort2\log6
Database: C:\Users\Administrator\Desktop\VolDort2\DB6\Jetstress006001.edb

Instance3432.7 Log path: C:\Users\Administrator\Desktop\VolDort2\log7
Database: C:\Users\Administrator\Desktop\VolDort2\DB7\Jetstress007001.edb

Instance3432.8 Log path: C:\Users\Administrator\Desktop\VolDort2\log8
Database: C:\Users\Administrator\Desktop\VolDort2\DB8\Jetstress008001.edb

Transactional I/O Performance

MSExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance3432.1	13.794	3.345	81.669	35.754	32768.000	36025.058	0.000	0.411	0.000	9.625	0.000	20352.110
Instance3432.2	13.759	3.275	81.796	35.890	32768.000	36000.629	0.000	0.408	0.000	9.633	0.000	20441.180
Instance3432.3	13.968	3.236	81.727	35.825	32768.000	35985.738	0.000	0.402	0.000	9.635	0.000	20452.813
Instance3432.4	14.275	3.242	82.009	36.064	32768.000	36005.258	0.000	0.410	0.000	9.734	0.000	20417.279
Instance3432.5	14.906	2.781	81.880	35.768	32768.000	35983.554	0.000	0.401	0.000	9.593	0.000	20468.192
Instance3432.6	15.447	2.954	81.629	35.887	32768.000	36103.232	0.000	0.387	0.000	9.736	0.000	20435.098
Instance3432.7	16.266	3.122	81.639	36.087	32768.083	36034.208	0.000	0.398	0.000	9.703	0.000	20484.840
Instance3432.8	17.481	2.937	81.490	35.883	32768.000	36091.333	0.000	0.393	0.000	9.757	0.000	20256.807

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.348	0.167	0.942
Available MBytes	28357.992	28250.000	30119.000
Free System Page Table Entries	16603842.350	16603507.000	16604049.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	173195298.420	171696128.000	173481984.000
Pool Paged Bytes	92131832.829	91947008.000	92246016.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

8/4/2015 10:30:42 PM -- Preparing for testing ...
8/4/2015 10:30:42 PM -- Creating C:\Users\Administrator\Desktop\VolDort1\DB1\Jetstress001001.edb.
8/4/2015 10:30:42 PM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)
8/4/2015 10:30:42 PM -- Database flush thresholds: (start: 2.5 MB, stop: 5.1 MB)
8/5/2015 1:27:28 AM -- 100.0% of 1.2 TB complete (427196373 records inserted).
8/5/2015 1:27:29 AM -- 100.0% of 1.2 TB complete (427198080 records inserted).
8/5/2015 1:27:30 AM -- Duplicating 7 databases:
8/5/2015 5:36:01 AM -- 100.0% of 8.5 TB complete (8.5 TB duplicated).
8/5/2015 5:36:09 AM -- Attaching databases ...
8/5/2015 5:36:09 AM -- Preparations for testing are complete.
8/5/2015 5:36:09 AM -- Starting transaction dispatch ..
8/5/2015 5:36:09 AM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)
8/5/2015 5:36:09 AM -- Database flush thresholds: (start: 20.5 MB, stop: 40.9 MB)
8/5/2015 5:36:18 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
8/5/2015 5:36:18 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
8/5/2015 5:36:18 AM -- Operation mix: Sessions 20, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
8/5/2015 5:36:18 AM -- Performance logging started (interval: 15000 ms).
8/5/2015 5:36:18 AM -- Generating log files ...
8/5/2015 7:05:42 AM -- C:\Users\Administrator\Desktop\VolDort1\log1 (100.2% generated), C:\Users\Administrator\Desktop\VolDort1\log2 (100.6% generated),
C:\Users\Administrator\Desktop\VolDort1\log3 (100.6% generated), C:\Users\Administrator\Desktop\VolDort1\log4 (101.2% generated),
C:\Users\Administrator\Desktop\VolDort2\log5 (100.2% generated), C:\Users\Administrator\Desktop\VolDort2\log6 (101.4% generated),
C:\Users\Administrator\Desktop\VolDort2\log7 (101.8% generated) and C:\Users\Administrator\Desktop\VolDort2\log8 (101.2% generated)
8/5/2015 7:05:42 AM -- Performance logging has ended.
8/5/2015 7:05:42 AM -- JetInterop batch transaction stats: 16883, 16883, 16883, 16883, 16883, 16883, 16883 and 16882.
8/5/2015 7:05:42 AM -- Dispatching transactions ends.
8/5/2015 7:05:42 AM -- Shutting down databases ...
8/5/2015 7:05:47 AM -- Instance3432.1 (complete), Instance3432.2 (complete), Instance3432.3 (complete), Instance3432.4 (complete), Instance3432.5 (complete),
Instance3432.6 (complete), Instance3432.7 (complete) and Instance3432.8 (complete)
8/5/2015 7:05:47 AM -- C:\Program Files\Exchange Jetstress\Performance_2015_8_5_5_36_18.blg has 357 samples.
8/5/2015 7:05:47 AM -- Creating test report ...
8/5/2015 7:05:47 AM -- Instance3432.1 has 13.8 for I/O Database Reads Average Latency.
8/5/2015 7:05:47 AM -- Instance3432.1 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 7:05:47 AM -- Instance3432.1 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 7:05:47 AM -- Instance3432.2 has 13.8 for I/O Database Reads Average Latency.
8/5/2015 7:05:47 AM -- Instance3432.2 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 7:05:47 AM -- Instance3432.2 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 7:05:47 AM -- Instance3432.3 has 14.0 for I/O Database Reads Average Latency.
8/5/2015 7:05:47 AM -- Instance3432.3 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 7:05:47 AM -- Instance3432.3 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 7:05:47 AM -- Instance3432.4 has 14.3 for I/O Database Reads Average Latency.
8/5/2015 7:05:47 AM -- Instance3432.4 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 7:05:47 AM -- Instance3432.4 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 7:05:48 AM -- Instance3432.5 has 14.9 for I/O Database Reads Average Latency.
8/5/2015 7:05:48 AM -- Instance3432.5 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 7:05:48 AM -- Instance3432.5 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 7:05:48 AM -- Instance3432.6 has 15.4 for I/O Database Reads Average Latency.
8/5/2015 7:05:48 AM -- Instance3432.6 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 7:05:48 AM -- Instance3432.6 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 7:05:48 AM -- Instance3432.7 has 16.3 for I/O Database Reads Average Latency.
8/5/2015 7:05:48 AM -- Instance3432.7 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 7:05:48 AM -- Instance3432.7 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 7:05:48 AM -- Instance3432.8 has 17.5 for I/O Database Reads Average Latency.
8/5/2015 7:05:48 AM -- Instance3432.8 has 0.4 for I/O Log Writes Average Latency.
8/5/2015 7:05:48 AM -- Instance3432.8 has 0.4 for I/O Log Reads Average Latency.
8/5/2015 7:05:48 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
8/5/2015 7:05:48 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
8/5/2015 7:05:48 AM -- C:\Program Files\Exchange Jetstress\Performance_2015_8_5_5_36_18.xml has 356 samples queried.