Dell PowerVault MD3860f 10,000 user Mailbox Exchange 2013 Resiliency Storage Solution — Direct Attach FC using dual QLogic QLE2662 16Gb FC adapters

Microsoft ESRP 4.0

Dell MD3 Series storage solutions
September 2015

Revisions

Date	Description
Sept. 2015	Initial release

Disclaimer

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 this document. 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 one 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 Series storage. 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 databases in a DAG. There can be only one active copy of a given Exchange 2013 database at any given time. Secondary copies, including the copies located at remote sites, are periodi-cally 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 da-tabases 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.
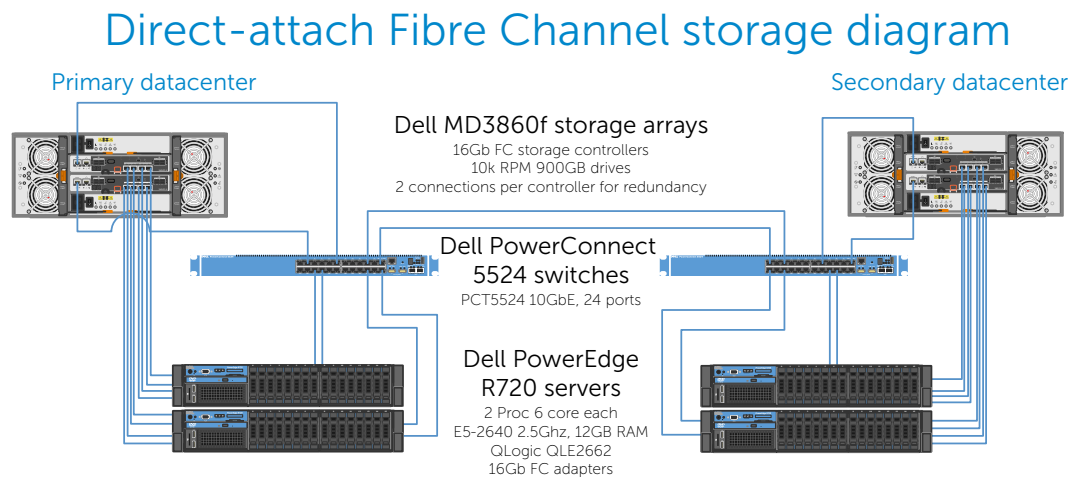
1.3 Solution description

Testing was performed on a Dell R720 server, dual QLogic QLE2662 16Gb FC HBAs, 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.

Direct-attach Fibre Channel storage diagram

Primary datacenter

Secondary datacenter

Dell MD3860f storage arrays
16Gb FC 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
QLogic QLE2662
16Gb FC 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 60-drive, 4U standard rack enclosure and can scale up to 180 drives using MD3060e 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 16Gb FC 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
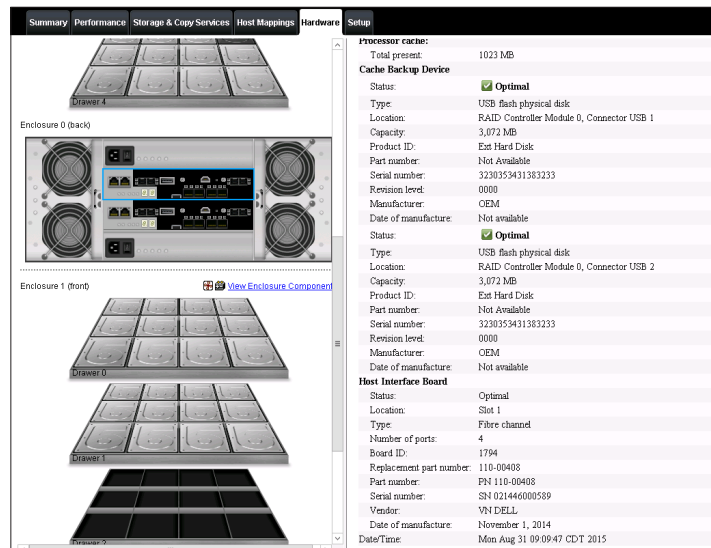
Figure 3 MDSM summary view
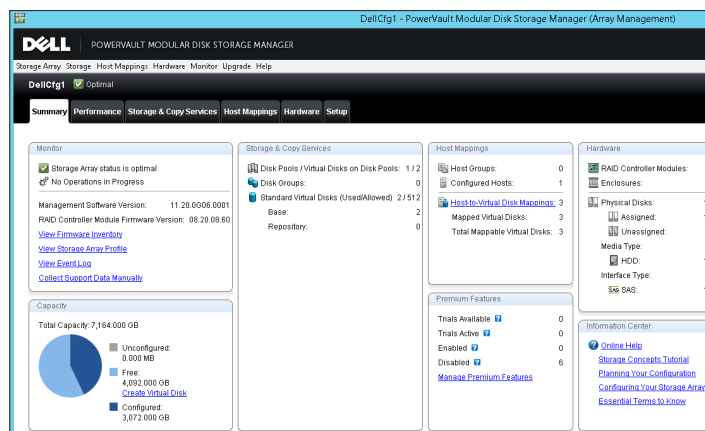
Table 1 Dell PowerVault MD3860f Features

Feature	Details
2U, 24 drive FC enclosure	Designed to fit standard 1,000mm 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	Eight 16Gb/s FC ports (4 per each controller) and four 12Gb/s SAS ports (2 per controller)
Scales to support up to 192 2.5-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 768 GB 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 QLogic QLE2662 FC adapter

The QLogic Fibre Channel adapters have the following design characteristics:

- 16Gbps per port maximum throughput for high bandwidth (SAN) traffic

- Over 1.2 million IOPS reduces latency in high transaction intensive applications and virtualized environments

- Optimization for virtualized environments: with increasing numbers of VMs on virtualized servers it is essential that the I/O performance scales as the VM count grows and doesn't become a bottleneck

- Decreased power and cooling costs by using the fewest PCI Express® lanes in PCIe® Gen 3 environments

- Overlapping protection domains (OPDs) to ensure a high level of reliability as data moves to and from the PCI bus and Fibre Channel network

- Complete investment protection for legacy 8Gb Fibre Channel infrastructure

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 5 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	5.77TB
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.

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3.2 Primary storage hardware

Configuration Item	Detail
Storage Connectivity (Fibre Channel, SAS, SATA, iSCSI)	FC
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 FC port per controller
Maximum bandwidth of storage connectivity to host	64Gb/s (4x16Gb HBA)
Switch type/model/firmware revision	N/A
HBA model and firmware	QLogic QLE2662 16Gb FC HBA: 02.00.84
Number of HBA's/host	2
Host server type	Dell PowerEdge R720 Dual E5-2640 6-core CPU, 32GB RAM
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

3.3 Primary storage software

Configuration Item	Detail
HBA driver	9.1.11.3
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	837.863 GB
Storage capacity utilization	99.41%
Database capacity utilization	86.82%

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 un-interruptible 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 de-fragmentation 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 reconstruction technology, DDP significantly reduces exposure to numerous cascading disk failures. Flexible disk pool sizing provides optimal utilization of any configuration for maximum 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 leverages 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 numerous 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 controller 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 available 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 described, 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 white-paper.

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	1251.404
Disks Writes/sec sum	556.108
Disk Read Latency (ms) average	14.127
Disk Write Latency (ms) average	2.299
Transaction Log I/O	
Log Disks Writes/sec sum	144.807
Log Disk Write Latency (ms) average	0.660

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 Volume Shadow Copy Service (VSS). The following table shows the average rate for a single database file.

Performance item	Detail
MB read/sec per database	110.775
MB read/sec total per server	886.185

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)	0.961

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 QLogic QLE2662 16Gb FC HBAs per server
	FC-Direct
Test Start Time	7/29/2015 8:11:36 AM
Test End Time	7/29/2015 10:15:00 AM
Collection Start Time	7/29/2015 8:14:48 AM
Collection End Time	7/29/2015 10:14:47 AM
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_7_29_8_11_54.blg

---Database Sizing and Throughput---

Achieved Transactional I/O per Second	909.36
Target Transactional I/O per Second	600
Initial Database Size (bytes)	10723056943104
Final Database Size (bytes)	10725523193856
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

Instance4424.1 Log path: C:\Users\Administrator\Desktop\Volume 4\Log 1
Database: C:\Users\Administrator\Desktop\Volume 3\DB 1\Jetstress001001.edb

Instance4424.2 Log path: C:\Users\Administrator\Desktop\Volume 4\Log 2
Database: C:\Users\Administrator\Desktop\Volume 3\DB 2\Jetstress002001.edb

Instance4424.3 Log path: C:\Users\Administrator\Desktop\Volume 4\Log 3
Database: C:\Users\Administrator\Desktop\Volume 3\DB 3\Jetstress003001.edb

Instance4424.4 Log path: C:\Users\Administrator\Desktop\Volume 4\Log 4
Database: C:\Users\Administrator\Desktop\Volume 3\DB 4\Jetstress004001.edb

Instance4424.5 Log path: C:\Users\Administrator\Desktop\Volume 3\Log 5
Database: C:\Users\Administrator\Desktop\Volume 4\DB 5\Jetstress005001.edb

Instance4424.6 Log path: C:\Users\Administrator\Desktop\Volume 3\Log 6
Database: C:\Users\Administrator\Desktop\Volume 4\DB 6\Jetstress006001.edb

Instance4424.7 Log path: C:\Users\Administrator\Desktop\Volume 3\Log 7
Database: C:\Users\Administrator\Desktop\Volume 4\DB 7\Jetstress007001.edb

Instance4424.8 Log path: C:\Users\Administrator\Desktop\Volume 3\Log 8
Database: C:\Users\Administrator\Desktop\Volume 4\DB 8\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
Instance4424.1	15.544	2.426	78.548	34.784	32868.606	36533.824	0.000	0.754	0.000	9.094	0.000	20502.800
Instance4424.2	14.292	2.361	78.880	35.007	32877.116	36485.338	0.000	0.753	0.000	9.131	0.000	20332.902
Instance4424.3	14.241	2.389	78.755	34.854	32881.080	36567.223	0.000	0.754	0.000	9.140	0.000	20235.952
Instance4424.4	14.262	2.423	78.702	34.946	32883.917	36429.613	0.000	0.752	0.000	9.140	0.000	20388.099
Instance4424.5	13.368	1.965	79.055	35.077	32870.555	36451.625	0.000	0.772	0.000	9.112	0.000	20194.602
Instance4424.6	13.372	2.032	78.930	35.190	32877.555	36376.852	0.000	0.759	0.000	9.049	0.000	20409.441
Instance4424.7	13.317	2.004	78.793	34.698	32868.247	36524.999	0.000	0.760	0.000	9.056	0.000	20317.126
Instance4424.8	13.282	2.015	78.362	34.778	32879.092	36511.329	0.000	0.761	0.000	9.137	0.000	20415.196

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance4424.1	9.336	261867.463
Instance4424.2	9.341	261814.072
Instance4424.3	9.339	261866.404
Instance4424.4	9.339	261872.519
Instance4424.5	9.339	261874.778
Instance4424.6	9.339	261835.848
Instance4424.7	9.339	261828.412
Instance4424.8	9.341	261796.866

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance4424.1	0.797	232075.247
Instance4424.2	0.793	231588.716
Instance4424.3	0.790	232075.247
Instance4424.4	0.793	232561.778
Instance4424.5	0.786	232549.957
Instance4424.6	0.788	231590.029
Instance4424.7	0.785	232075.247
Instance4424.8	0.796	232565.051

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
Instance4424.1	15.544	2.426	87.885	34.784	57196.073	36533.824	0.750	0.754	0.797	9.094	232075.247	20502.800
Instance4424.2	14.292	2.361	88.220	35.007	57116.303	36485.338	0.788	0.753	0.793	9.131	231588.716	20332.902
Instance4424.3	14.241	2.389	88.094	34.854	57155.111	36567.223	0.761	0.754	0.790	9.140	232075.247	20235.952
Instance4424.4	14.262	2.423	88.041	34.946	57173.300	36429.613	0.793	0.752	0.793	9.140	232561.778	20388.099
Instance4424.5	13.368	1.965	88.394	35.077	57065.392	36451.625	0.776	0.772	0.786	9.112	232549.957	20194.602
Instance4424.6	13.372	2.032	88.270	35.190	57102.193	36376.852	0.743	0.759	0.788	9.049	231590.029	20409.441
Instance4424.7	13.317	2.004	88.132	34.698	57130.569	36524.999	0.750	0.760	0.785	9.056	232075.247	20317.126
Instance4424.8	13.282	2.015	87.702	34.778	57259.369	36511.329	0.795	0.761	0.796	9.137	232565.051	20415.196

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.961	0.636	2.257
Available MBytes	27943.551	27918.000	28053.000
Free System Page Table Entries	16600102.088	16599554.000	16600307.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	177244797.061	175132672.000	177975296.000
Pool Paged Bytes	147955831.716	141647872.000	154238976.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

```
7/29/2015 8:11:36 AM -- Preparing for testing ...
7/29/2015 8:11:45 AM -- Attaching databases ...
7/29/2015 8:11:45 AM -- Preparations for testing are complete.
7/29/2015 8:11:45 AM -- Starting transaction dispatch ..
7/29/2015 8:11:45 AM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)
7/29/2015 8:11:45 AM -- Database flush thresholds: (start: 20.5 MB, stop: 40.9 MB)
7/29/2015 8:11:54 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
7/29/2015 8:11:54 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
7/29/2015 8:11:55 AM -- Operation mix: Sessions 20, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
7/29/2015 8:11:55 AM -- Performance logging started (interval: 15000 ms).
7/29/2015 8:11:55 AM -- Attaining prerequisites:
7/29/2015 8:14:48 AM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1942692000.0 (lower bound: 1932735000.0, upper bound: none)
7/29/2015 10:14:49 AM -- Performance logging has ended.
7/29/2015 10:14:49 AM -- JetInterop batch transaction stats: 21961, 21961, 21961, 21961, 21961, 21961, 21961 and 21960.
7/29/2015 10:14:49 AM -- Dispatching transactions ends.
7/29/2015 10:14:51 AM -- Shutting down databases ...
7/29/2015 10:15:00 AM -- Instance4424.1 (complete), Instance4424.2 (complete), Instance4424.3 (complete), Instance4424.4 (complete), Instance4424.5 (complete),
Instance4424.6 (complete), Instance4424.7 (complete) and Instance4424.8 (complete)
7/29/2015 10:15:00 AM -- C:\Program Files\Exchange Jetstress\Performance_2015_7_29_8_11_54.blg has 490 samples.
7/29/2015 10:15:00 AM -- Creating test report ...
7/29/2015 10:15:03 AM -- Instance4424.1 has 15.5 for I/O Database Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.1 has 0.8 for I/O Log Writes Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.1 has 0.8 for I/O Log Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.2 has 14.3 for I/O Database Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.2 has 0.8 for I/O Log Writes Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.2 has 0.8 for I/O Log Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.3 has 14.2 for I/O Database Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.3 has 0.8 for I/O Log Writes Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.3 has 0.8 for I/O Log Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.4 has 14.3 for I/O Database Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.4 has 0.8 for I/O Log Writes Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.4 has 0.8 for I/O Log Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.5 has 13.4 for I/O Database Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.5 has 0.8 for I/O Log Writes Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.5 has 0.8 for I/O Log Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.6 has 13.4 for I/O Database Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.6 has 0.8 for I/O Log Writes Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.6 has 0.8 for I/O Log Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.7 has 13.3 for I/O Database Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.7 has 0.8 for I/O Log Writes Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.7 has 0.8 for I/O Log Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.8 has 13.3 for I/O Database Reads Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.8 has 0.8 for I/O Log Writes Average Latency.
7/29/2015 10:15:03 AM -- Instance4424.8 has 0.8 for I/O Log Reads Average Latency.
7/29/2015 10:15:03 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
7/29/2015 10:15:03 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
7/29/2015 10:15:03 AM -- C:\Program Files\Exchange Jetstress\Performance_2015_7_29_8_11_54.xml has 478 samples queried.
```

Server2

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 QLogic QLE2662 16Gb FC HBAs per server
	FC-Direct
Test Start Time	7/29/2015 8:11:36 AM
Test End Time	7/29/2015 10:15:00 AM
Collection Start Time	7/29/2015 8:14:48 AM
Collection End Time	7/29/2015 10:14:47 AM
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_7_29_8_11_54.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second	898.153
Target Transactional I/O per Second	600
Initial Database Size (bytes)	10738793971712
Final Database Size (bytes)	10741201502208
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

Instance4360.1 Log path: C:\Users\Administrator\Desktop\Volume2\Log 1
Database: C:\Users\Administrator\Desktop\Volume1\DB 1\Jetstress001001.edb

Instance4360.2 Log path: C:\Users\Administrator\Desktop\Volume2\Log 2
Database: C:\Users\Administrator\Desktop\Volume1\DB 2\Jetstress002001.edb

Instance4360.3 Log path: C:\Users\Administrator\Desktop\Volume2\Log 3
Database: C:\Users\Administrator\Desktop\Volume1\DB 3\Jetstress003001.edb

Instance4360.4 Log path: C:\Users\Administrator\Desktop\Volume2\Log 4
Database: C:\Users\Administrator\Desktop\Volume1\DB 4\Jetstress004001.edb

Instance4360.5 Log path: C:\Users\Administrator\Desktop\Volume1\Log 5
Database: C:\Users\Administrator\Desktop\Volume2\DB 5\Jetstress005001.edb

Instance4360.6 Log path: C:\Users\Administrator\Desktop\Volume1\Log 6
Database: C:\Users\Administrator\Desktop\Volume2\DB 6\Jetstress006001.edb

Instance4360.7 Log path: C:\Users\Administrator\Desktop\Volume1\Log 7
Database: C:\Users\Administrator\Desktop\Volume2\DB 7\Jetstress007001.edb

Instance4360.8 Log path: C:\Users\Administrator\Desktop\Volume1\Log 8
Database: C:\Users\Administrator\Desktop\Volume2\DB 8\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
Instance4360.1	13.039	2.190	77.909	34.825	32898.131	36929.917	0.000	0.554	0.000	8.944	0.000	20345.987
Instance4360.2	13.136	2.227	77.767	34.776	32873.980	36944.064	0.000	0.557	0.000	9.095	0.000	20074.483
Instance4360.3	13.257	2.259	77.589	34.381	32884.149	36940.134	0.000	0.554	0.000	8.923	0.000	20251.652
Instance4360.4	13.490	2.214	77.402	34.552	32895.123	36983.669	0.000	0.555	0.000	9.061	0.000	20313.146
Instance4360.5	14.190	2.564	77.649	34.732	32882.976	36955.857	0.000	0.557	0.000	8.997	0.000	20229.727
Instance4360.6	14.754	2.580	77.398	34.421	32896.145	36959.756	0.000	0.547	0.000	8.944	0.000	20408.454
Instance4360.7	15.616	2.551	78.035	34.742	32869.485	36897.805	0.000	0.545	0.000	9.032	0.000	20006.686
Instance4360.8	16.869	2.571	77.630	34.345	32883.463	36897.858	0.000	0.562	0.000	8.916	0.000	20189.411

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance4360.1	9.738	261817.306
Instance4360.2	9.739	261801.820
Instance4360.3	9.740	261804.910
Instance4360.4	9.738	261832.096
Instance4360.5	9.740	261749.880
Instance4360.6	9.738	261834.740
Instance4360.7	9.739	261792.500
Instance4360.8	9.736	261889.502

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance4360.1	0.776	232078.520
Instance4360.2	0.781	231588.716
Instance4360.3	0.771	231082.504
Instance4360.4	0.787	231588.716
Instance4360.5	0.778	232561.778
Instance4360.6	0.780	231102.774
Instance4360.7	0.772	232561.778
Instance4360.8	0.770	232561.778

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
Instance4360.1	13.039	2.190	87.647	34.825	58331.682	36929.917	0.824	0.554	0.776	8.944	232078.520	20345.987
Instance4360.2	13.136	2.227	87.506	34.776	58353.069	36944.064	0.822	0.557	0.781	9.095	231588.716	20074.483
Instance4360.3	13.257	2.259	87.329	34.381	58415.815	36940.134	0.804	0.554	0.771	8.923	231082.504	20251.652
Instance4360.4	13.490	2.214	87.140	34.552	58479.710	36983.669	0.843	0.555	0.787	9.061	231588.716	20313.146
Instance4360.5	14.190	2.564	87.389	34.732	58392.644	36955.857	1.615	0.557	0.778	8.997	232561.778	20229.727
Instance4360.6	14.754	2.580	87.135	34.421	58480.395	36959.756	1.674	0.547	0.780	8.944	231102.774	20408.454
Instance4360.7	15.616	2.551	87.774	34.742	58269.149	36897.805	1.678	0.545	0.772	9.032	232561.778	20006.686
Instance4360.8	16.869	2.571	87.366	34.345	58403.349	36897.858	1.583	0.562	0.770	8.916	232561.778	20189.411

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.300	0.131	1.507
Available MBytes	28246.455	28204.000	28371.000
Free System Page Table Entries	16605927.334	16604567.000	16606435.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	136796412.259	135643136.000	137003008.000
Pool Paged Bytes	92488928.468	91852800.000	92852224.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

7/29/2015 6:11:38 AM -- Preparing for testing ...
7/29/2015 6:11:46 AM -- Attaching databases ...
7/29/2015 6:11:46 AM -- Preparations for testing are complete.
7/29/2015 6:11:47 AM -- Starting transaction dispatch ..
7/29/2015 6:11:47 AM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)
7/29/2015 6:11:47 AM -- Database flush thresholds: (start: 20.5 MB, stop: 40.9 MB)
7/29/2015 6:11:55 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
7/29/2015 6:11:55 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
7/29/2015 6:11:56 AM -- Operation mix: Sessions 20, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
7/29/2015 6:11:56 AM -- Performance logging started (interval: 15000 ms).
7/29/2015 6:11:56 AM -- Attaining prerequisites:
7/29/2015 6:14:49 AM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1944904000.0 (lower bound: 1932735000.0, upper bound: none)
7/29/2015 8:14:49 AM -- Performance logging has ended.
7/29/2015 8:14:49 AM -- JetInterop batch transaction stats: 21628, 21628, 21628, 21628, 21628, 21628, 21628 and 21628.
7/29/2015 8:14:49 AM -- Dispatching transactions ends.
7/29/2015 8:14:49 AM -- Shutting down databases ...
7/29/2015 8:14:55 AM -- Instance4360.1 (complete), Instance4360.2 (complete), Instance4360.3 (complete), Instance4360.4 (complete), Instance4360.5 (complete), Instance4360.6 (complete), Instance4360.7 (complete) and Instance4360.8 (complete)
7/29/2015 8:14:55 AM -- C:\Program Files\Exchange Jetstress\Performance_2015_7_29_6_11_55.blg has 490 samples.
7/29/2015 8:14:55 AM -- Creating test report ...
7/29/2015 8:14:57 AM -- Instance4360.1 has 13.0 for I/O Database Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.1 has 0.6 for I/O Log Writes Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.1 has 0.6 for I/O Log Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.2 has 13.1 for I/O Database Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.2 has 0.6 for I/O Log Writes Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.2 has 0.6 for I/O Log Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.3 has 13.3 for I/O Database Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.3 has 0.6 for I/O Log Writes Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.3 has 0.6 for I/O Log Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.4 has 13.5 for I/O Database Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.4 has 0.6 for I/O Log Writes Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.4 has 0.6 for I/O Log Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.5 has 14.2 for I/O Database Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.5 has 0.6 for I/O Log Writes Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.5 has 0.6 for I/O Log Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.6 has 14.8 for I/O Database Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.6 has 0.5 for I/O Log Writes Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.6 has 0.5 for I/O Log Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.7 has 15.6 for I/O Database Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.7 has 0.5 for I/O Log Writes Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.7 has 0.5 for I/O Log Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.8 has 16.9 for I/O Database Reads Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.8 has 0.6 for I/O Log Writes Average Latency.
7/29/2015 8:14:57 AM -- Instance4360.8 has 0.6 for I/O Log Reads Average Latency.
7/29/2015 8:14:57 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
7/29/2015 8:14:57 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
7/29/2015 8:14:57 AM -- C:\Program Files\Exchange Jetstress\Performance_2015_7_29_6_11_55.xml has 478 samples queried.

B   Stress testing

Server 1

Database Sizing and Throughput	
Achieved Transactional I/O per Second	919.47
Target Transactional I/O per Second	600
Initial Database Size (bytes)	10740513636352
Final Database Size (bytes)	10767558508544
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

Instance4248.1 Log path: C:\Users\Administrator\Documents\Vol2\Log1
Database: C:\Users\Administrator\Documents\Vol1\DB1\Jetstress001001.edb

Instance4248.2 Log path: C:\Users\Administrator\Documents\Vol2\Log2
Database: C:\Users\Administrator\Documents\Vol1\DB2\Jetstress002001.edb

Instance4248.3 Log path: C:\Users\Administrator\Documents\Vol2\Log3
Database: C:\Users\Administrator\Documents\Vol1\DB3\Jetstress003001.edb

Instance4248.4 Log path: C:\Users\Administrator\Documents\Vol2\Log4
Database: C:\Users\Administrator\Documents\Vol1\DB4\Jetstress004001.edb

Instance4248.5 Log path: C:\Users\Administrator\Documents\Vol1\log5
Database: C:\Users\Administrator\Documents\Vol2\DB5\Jetstress005001.edb

Instance4248.6 Log path: C:\Users\Administrator\Documents\Vol1\log6
Database: C:\Users\Administrator\Documents\Vol2\DB6\Jetstress006001.edb

Instance4248.7 Log path: C:\Users\Administrator\Documents\Vol1\log7
Database: C:\Users\Administrator\Documents\Vol2\DB7\Jetstress007001.edb

Instance4248.8 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
Instance4248.1	15.653	1.967	79.407	35.631	32886.872	35298.453	0.000	0.627	0.000	8.609	0.000	20215.537
Instance4248.2	14.982	1.965	79.316	35.546	32886.357	35317.152	0.000	0.627	0.000	8.579	0.000	20294.208
Instance4248.3	14.487	1.979	79.391	35.624	32883.225	35320.420	0.000	0.627	0.000	8.590	0.000	20237.229
Instance4248.4	13.975	1.974	79.335	35.534	32889.021	35315.692	0.000	0.628	0.000	8.581	0.000	20282.663
Instance4248.5	13.438	1.500	79.347	35.655	32889.586	35335.444	0.000	0.653	0.000	8.612	0.000	20292.119
Instance4248.6	13.277	1.488	79.348	35.698	32891.066	35322.571	0.000	0.651	0.000	8.638	0.000	20275.605
Instance4248.7	13.182	1.494	79.164	35.410	32886.801	35326.744	0.000	0.653	0.000	8.581	0.000	20336.761
Instance4248.8	13.125	1.500	79.394	35.669	32888.813	35311.785	0.000	0.649	0.000	8.630	0.000	20283.145

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance4248.1	9.802	261808.476
Instance4248.2	9.802	261812.819
Instance4248.3	9.796	261829.789
Instance4248.4	9.792	261840.661
Instance4248.5	9.801	261823.379
Instance4248.6	9.800	261835.686
Instance4248.7	9.801	261817.637
Instance4248.8	9.800	261842.575

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance4248.1	0.744	230780.294
Instance4248.2	0.744	230779.332
Instance4248.3	0.743	230333.524
Instance4248.4	0.743	231303.792
Instance4248.5	0.746	231021.029
Instance4248.6	0.748	230947.291
Instance4248.7	0.745	230170.972
Instance4248.8	0.748	230901.512

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
Instance4248.1	15.653	1.967	89.209	35.631	58039.723	35298.453	0.975	0.627	0.744	8.609	230780.294	20215.537
Instance4248.2	14.982	1.965	89.117	35.546	58064.798	35317.152	0.996	0.627	0.744	8.579	230779.332	20294.208
Instance4248.3	14.487	1.979	89.188	35.624	58030.653	35320.420	0.978	0.627	0.743	8.590	230333.524	20237.229
Instance4248.4	13.975	1.974	89.127	35.534	58043.343	35315.692	0.989	0.628	0.743	8.581	231303.792	20282.663
Instance4248.5	13.438	1.500	89.148	35.655	58057.813	35335.444	1.000	0.653	0.746	8.612	231021.029	20292.119
Instance4248.6	13.277	1.488	89.149	35.698	58058.863	35322.571	0.986	0.651	0.748	8.638	230947.291	20275.605
Instance4248.7	13.182	1.494	88.965	35.410	58106.532	35326.744	1.000	0.653	0.745	8.581	230170.972	20336.761
Instance4248.8	13.125	1.500	89.194	35.669	58044.045	35311.785	1.013	0.649	0.748	8.630	230901.512	20283.145

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	1.107	0.679	2.745
Available MBytes	27802.470	27750.000	27888.000
Free System Page Table Entries	16600114.739	16599517.000	16600435.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	180526557.867	179638272.000	181387264.000
Pool Paged Bytes	106795389.438	106622976.000	107016192.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

```
8/1/2015 4:06:44 PM -- Preparing for testing ...
8/1/2015 4:06:52 PM -- Attaching databases ...
8/1/2015 4:06:52 PM -- Preparations for testing are complete.
8/1/2015 4:06:52 PM -- Starting transaction dispatch ..
8/1/2015 4:06:53 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)
8/1/2015 4:06:53 PM -- Database flush thresholds: (start: 20.5 MB, stop: 40.9 MB)
8/1/2015 4:07:01 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
8/1/2015 4:07:01 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
8/1/2015 4:07:03 PM -- Operation mix: Sessions 20, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
8/1/2015 4:07:03 PM -- Performance logging started (interval: 15000 ms).
8/1/2015 4:07:03 PM -- Attaining prerequisites:
8/1/2015 4:09:53 PM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1937633000.0 (lower bound: 1932735000.0, upper bound: none)
8/2/2015 4:09:54 PM -- Performance logging has ended.
8/2/2015 4:09:54 PM -- JetInterop batch transaction stats: 242525, 242524, 242524, 242524, 242524, 242524, 242524 and 242524.
8/2/2015 4:09:54 PM -- Dispatching transactions ends.
8/2/2015 4:09:54 PM -- Shutting down databases ...
8/2/2015 4:10:01 PM -- Instance4248.1 (complete), Instance4248.2 (complete), Instance4248.3 (complete), Instance4248.4 (complete), Instance4248.5 (complete),
Instance4248.6 (complete), Instance4248.7 (complete) and Instance4248.8 (complete)
8/2/2015 4:10:01 PM -- C:\Program Files\Exchange Jetstress\Stress_2015_8_1_16_7_1.blg has 5756 samples.
8/2/2015 4:10:01 PM -- Creating test report ...
8/2/2015 4:10:33 PM -- Instance4248.1 has 15.7 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.1 has 0.6 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.1 has 0.6 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.2 has 15.0 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.2 has 0.6 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.2 has 0.6 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.3 has 14.5 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.3 has 0.6 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.3 has 0.6 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.4 has 14.0 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.4 has 0.6 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.4 has 0.6 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.5 has 13.4 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.5 has 0.7 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.5 has 0.7 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.6 has 13.3 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.6 has 0.7 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.6 has 0.7 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.7 has 13.2 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.7 has 0.7 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.7 has 0.7 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.8 has 13.1 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.8 has 0.6 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.8 has 0.6 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
8/2/2015 4:10:33 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
8/2/2015 4:10:33 PM -- C:\Program Files\Exchange Jetstress\Stress_2015_8_1_16_7_1.xml has 5744 samples queried.
```

Server 2

Database Sizing and Throughput

Achieved Transactional I/O per Second	919.47
Target Transactional I/O per Second	600
Initial Database Size (bytes)	10740513636352
Final Database Size (bytes)	10767558508544
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

Instance4248.1 Log path: C:\Users\Administrator\Documents\Vol2\Log1
Database: C:\Users\Administrator\Documents\Vol1\DB1\Jetstress001001.edb

Instance4248.2 Log path: C:\Users\Administrator\Documents\Vol2\Log2
Database: C:\Users\Administrator\Documents\Vol1\DB2\Jetstress002001.edb

Instance4248.3 Log path: C:\Users\Administrator\Documents\Vol2\Log3
Database: C:\Users\Administrator\Documents\Vol1\DB3\Jetstress003001.edb

Instance4248.4 Log path: C:\Users\Administrator\Documents\Vol2\Log4
Database: C:\Users\Administrator\Documents\Vol1\DB4\Jetstress004001.edb

Instance4248.5 Log path: C:\Users\Administrator\Documents\Vol1\log5
Database: C:\Users\Administrator\Documents\Vol2\DB5\Jetstress005001.edb

Instance4248.6 Log path: C:\Users\Administrator\Documents\Vol1\log6
Database: C:\Users\Administrator\Documents\Vol2\DB6\Jetstress006001.edb

Instance4248.7 Log path: C:\Users\Administrator\Documents\Vol1\log7
Database: C:\Users\Administrator\Documents\Vol2\DB7\Jetstress007001.edb

Instance4248.8 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
Instance4248.1	15.653	1.967	79.407	35.631	32886.872	35298.453	0.000	0.627	0.000	8.609	0.000	20215.537
Instance4248.2	14.982	1.965	79.316	35.546	32886.357	35317.152	0.000	0.627	0.000	8.579	0.000	20294.208
Instance4248.3	14.487	1.979	79.391	35.624	32883.225	35320.420	0.000	0.627	0.000	8.590	0.000	20237.229
Instance4248.4	13.975	1.974	79.335	35.534	32889.021	35315.692	0.000	0.628	0.000	8.581	0.000	20282.663
Instance4248.5	13.438	1.500	79.347	35.655	32889.586	35335.444	0.000	0.653	0.000	8.612	0.000	20292.119
Instance4248.6	13.277	1.488	79.348	35.698	32891.066	35322.571	0.000	0.651	0.000	8.638	0.000	20275.605
Instance4248.7	13.182	1.494	79.164	35.410	32886.801	35326.744	0.000	0.653	0.000	8.581	0.000	20336.761
Instance4248.8	13.125	1.500	79.394	35.669	32888.813	35311.785	0.000	0.649	0.000	8.630	0.000	20283.145

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance4248.1	9.802	261808.476
Instance4248.2	9.802	261812.819
Instance4248.3	9.796	261829.789
Instance4248.4	9.792	261840.661
Instance4248.5	9.801	261823.379
Instance4248.6	9.800	261835.686
Instance4248.7	9.801	261817.637
Instance4248.8	9.800	261842.575

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance4248.1	0.744	230780.294
Instance4248.2	0.744	230779.332
Instance4248.3	0.743	230333.524
Instance4248.4	0.743	231303.792
Instance4248.5	0.746	231021.029
Instance4248.6	0.748	230947.291
Instance4248.7	0.745	230170.972
Instance4248.8	0.748	230901.512

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
Instance4248.1	15.653	1.967	89.209	35.631	58039.723	35298.453	0.975	0.627	0.744	8.609	230780.294	20215.537
Instance4248.2	14.982	1.965	89.117	35.546	58064.798	35317.152	0.996	0.627	0.744	8.579	230779.332	20294.208
Instance4248.3	14.487	1.979	89.188	35.624	58030.653	35320.420	0.978	0.627	0.743	8.590	230333.524	20237.229
Instance4248.4	13.975	1.974	89.127	35.534	58043.343	35315.692	0.989	0.628	0.743	8.581	231303.792	20282.663
Instance4248.5	13.438	1.500	89.148	35.655	58057.813	35335.444	1.000	0.653	0.746	8.612	231021.029	20292.119
Instance4248.6	13.277	1.488	89.149	35.698	58058.863	35322.571	0.986	0.651	0.748	8.638	230947.291	20275.605
Instance4248.7	13.182	1.494	88.965	35.410	58106.532	35326.744	1.000	0.653	0.745	8.581	230170.972	20336.761
Instance4248.8	13.125	1.500	89.194	35.669	58044.045	35311.785	1.013	0.649	0.748	8.630	230901.512	20283.145

Counter	Average	Minimum	Maximum
% Processor Time	1.107	0.679	2.745
Available MBytes	27802.470	27750.000	27888.000
Free System Page Table Entries	16600114.739	16599517.000	16600435.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	180526557.867	179638272.000	181387264.000
Pool Paged Bytes	106795389.438	106622976.000	107016192.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

```
8/1/2015 4:06:44 PM -- Preparing for testing ...
8/1/2015 4:06:52 PM -- Attaching databases ...
8/1/2015 4:06:52 PM -- Preparations for testing are complete.
8/1/2015 4:06:52 PM -- Starting transaction dispatch ..
8/1/2015 4:06:53 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)
8/1/2015 4:06:53 PM -- Database flush thresholds: (start: 20.5 MB, stop: 40.9 MB)
8/1/2015 4:07:01 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
8/1/2015 4:07:01 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
8/1/2015 4:07:03 PM -- Operation mix: Sessions 20, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
8/1/2015 4:07:03 PM -- Performance logging started (interval: 15000 ms).
8/1/2015 4:07:03 PM -- Attaining prerequisites:
8/1/2015 4:09:53 PM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 1937633000.0 (lower bound: 1932735000.0, upper bound: none)
8/2/2015 4:09:54 PM -- Performance logging has ended.
8/2/2015 4:09:54 PM -- JetInterop batch transaction stats: 242525, 242524, 242524, 242524, 242524, 242524, 242524 and 242524.
8/2/2015 4:09:54 PM -- Dispatching transactions ends.
8/2/2015 4:09:54 PM -- Shutting down databases ...
8/2/2015 4:10:01 PM -- Instance4248.1 (complete), Instance4248.2 (complete), Instance4248.3 (complete), Instance4248.4 (complete), Instance4248.5 (complete),
Instance4248.6 (complete), Instance4248.7 (complete) and Instance4248.8 (complete)
8/2/2015 4:10:01 PM -- C:\Program Files\Exchange Jetstress\Stress_2015_8_1_16_7_1.blg has 5756 samples.
8/2/2015 4:10:01 PM -- Creating test report ...
8/2/2015 4:10:33 PM -- Instance4248.1 has 15.7 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.1 has 0.6 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.1 has 0.6 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.2 has 15.0 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.2 has 0.6 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.2 has 0.6 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.3 has 14.5 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.3 has 0.6 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.3 has 0.6 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.4 has 14.0 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.4 has 0.6 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.4 has 0.6 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.5 has 13.4 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.5 has 0.7 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.5 has 0.7 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.6 has 13.3 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.6 has 0.7 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.6 has 0.7 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.7 has 13.2 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.7 has 0.7 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.7 has 0.7 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.8 has 13.1 for I/O Database Reads Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.8 has 0.6 for I/O Log Writes Average Latency.
8/2/2015 4:10:33 PM -- Instance4248.8 has 0.6 for I/O Log Reads Average Latency.
8/2/2015 4:10:33 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
8/2/2015 4:10:33 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
8/2/2015 4:10:33 PM -- C:\Program Files\Exchange Jetstress\Stress_2015_8_1_16_7_1.xml has 5744 samples queried.
```

C   Backup testing

Server 1

Database Backup Statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance2448.1	1280368.03	03:51:12	92.30
Instance2448.2	1280360.03	03:40:45	96.66
Instance2448.3	1280360.03	03:40:36	96.73
Instance2448.4	1280360.03	03:35:53	98.85
Instance2448.5	1280352.03	02:26:47	145.36
Instance2448.6	1280360.03	02:19:35	152.88
Instance2448.7	1280360.03	02:15:35	157.39
Instance2448.8	1280368.03	02:18:57	153.57
Avg			124.22
Sum			993.74

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

Instance2448.1 Log path: C:\Users\Administrator\Documents\Vol2\Log1
Database: C:\Users\Administrator\Documents\Vol1\DB1\Jetstress001001.edb

Instance2448.2 Log path: C:\Users\Administrator\Documents\Vol2\Log2
Database: C:\Users\Administrator\Documents\Vol1\DB2\Jetstress002001.edb

Instance2448.3 Log path: C:\Users\Administrator\Documents\Vol2\Log3
Database: C:\Users\Administrator\Documents\Vol1\DB3\Jetstress003001.edb

Instance2448.4 Log path: C:\Users\Administrator\Documents\Vol2\Log4
Database: C:\Users\Administrator\Documents\Vol1\DB4\Jetstress004001.edb

Instance2448.5 Log path: C:\Users\Administrator\Documents\Vol1\log5
Database: C:\Users\Administrator\Documents\Vol2\DB5\Jetstress005001.edb

Instance2448.6 Log path: C:\Users\Administrator\Documents\Vol1\log6
Database: C:\Users\Administrator\Documents\Vol2\DB6\Jetstress006001.edb

Instance2448.7 Log path: C:\Users\Administrator\Documents\Vol1\log7
Database: C:\Users\Administrator\Documents\Vol2\DB7\Jetstress007001.edb

Instance2448.8 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
Instance2448.1	3.380	0.000	368.658	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2448.2	3.237	0.000	386.464	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2448.3	3.306	0.000	387.257	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2448.4	3.129	0.000	394.890	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2448.5	3.220	0.000	581.338	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2448.6	2.902	0.000	612.140	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2448.7	3.041	0.000	630.048	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2448.8	3.124	0.000	614.126	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

DELL

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	1.742	0.271	3.488
Available MBytes	29949.494	29918.000	29967.000
Free System Page Table Entries	16600316.292	16599946.000	16600563.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	179438055.619	179101696.000	179929088.000
Pool Paged Bytes	106939130.459	106778624.000	107085824.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

8/1/2015 12:08:12 PM -- Preparing for testing ...
8/1/2015 12:08:20 PM -- Attaching databases ...
8/1/2015 12:08:20 PM -- Preparations for testing are complete.
8/1/2015 12:08:29 PM -- Performance logging started (interval: 30000 ms).
8/1/2015 12:08:29 PM -- Backing up databases ...
8/1/2015 3:59:42 PM -- Performance logging has ended.
8/1/2015 3:59:42 PM -- Instance2448.1 (100% processed), Instance2448.2 (100% processed), Instance2448.3 (100% processed), Instance2448.4 (100% processed), Instance2448.5 (100% processed), Instance2448.6 (100% processed), Instance2448.7 (100% processed) and Instance2448.8 (100% processed)
8/1/2015 3:59:42 PM -- C:\Program Files\Exchange Jetstress\DatabaseBackup_2015_8_1_12_8_20.blg has 462 samples.
8/1/2015 3:59:42 PM -- Creating test report ...

Server 2

Database Backup Statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance2820.1	1280000.03	03:41:03	96.51
Instance2820.2	1280000.03	03:47:38	93.71
Instance2820.3	1280000.03	03:50:59	92.35
Instance2820.4	1280000.03	03:54:36	90.93
Instance2820.5	1280000.03	03:25:03	104.03
Instance2820.6	1280000.03	03:27:09	102.98
Instance2820.7	1280000.03	03:32:32	100.37
Instance2820.8	1280000.03	03:38:15	97.74
Avg			97.33
Sum			778.63

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

Instance2820.1 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log1
Database: C:\Users\Administrator\Documents\VolumeStary1\DB1\Jetstress001001.edb

Instance2820.2 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log2
Database: C:\Users\Administrator\Documents\VolumeStary1\DB2\Jetstress002001.edb

Instance2820.3 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log3
Database: C:\Users\Administrator\Documents\VolumeStary1\DB3\Jetstress003001.edb

Instance2820.4 Log path: C:\Users\Administrator\Documents\VolumeStary2\Log4
Database: C:\Users\Administrator\Documents\VolumeStary1\DB4\Jetstress004001.edb

Instance2820.5 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log5
Database: C:\Users\Administrator\Documents\VolumeStary2\DB5\Jetstress005001.edb

Instance2820.6 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log6
Database: C:\Users\Administrator\Documents\VolumeStary2\DB6\Jetstress006001.edb

Instance2820.7 Log path: C:\Users\Administrator\Documents\VolumeStary1\Log7
Database: C:\Users\Administrator\Documents\VolumeStary2\DB7\Jetstress007001.edb

Instance2820.8 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
Instance2820.1	3.481	0.000	385.891	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2820.2	3.634	0.000	374.701	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2820.3	3.922	0.000	367.821	0.000	262144.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2820.4	4.010	0.000	360.366	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2820.5	4.597	0.000	416.368	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2820.6	4.939	0.000	411.433	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2820.7	5.265	0.000	400.717	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2820.8	5.478	0.000	390.677	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	0.718	0.404	1.083
Available MBytes	30497.426	30407.000	30544.000
Free System Page Table Entries	16606752.932	16606226.000	16606984.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	132534368.068	132177920.000	133038080.000
Pool Paged Bytes	92007015.710	91906048.000	92221440.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

8/1/2015 10:08:34 AM -- Preparing for testing ...
8/1/2015 10:08:42 AM -- Attaching databases ...
8/1/2015 10:08:42 AM -- Preparations for testing are complete.
8/1/2015 10:08:51 AM -- Performance logging started (interval: 30000 ms).
8/1/2015 10:08:51 AM -- Backing up databases ...
8/1/2015 2:03:29 PM -- Performance logging has ended.
8/1/2015 2:03:29 PM -- Instance2820.1 (100% processed), Instance2820.2 (100% processed), Instance2820.3 (100% processed), Instance2820.4 (100% processed), Instance2820.5 (100% processed), Instance2820.6 (100% processed), Instance2820.7 (100% processed) and Instance2820.8 (100% processed)
8/1/2015 2:03:29 PM -- C:\Program Files\Exchange Jetstress\DatabaseBackup_2015_8_1_10_8_42.blg has 469 samples.
8/1/2015 2:03:29 PM -- Creating test report ...

D   Recovery testing

Server 1

Database Sizing and Throughput

Achieved Transactional I/O per Second	940.191
Target Transactional I/O per Second	600
Initial Database Size (bytes)	10725523193856
Final Database Size (bytes)	10727402242048
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

Instance1844.1 Log path: C:\Users\Administrator\Desktop\Volume 4\Log 1
Database: C:\Users\Administrator\Desktop\Volume 3\DB 1\Jetstress001001.edb

Instance1844.2 Log path: C:\Users\Administrator\Desktop\Volume 4\Log 2
Database: C:\Users\Administrator\Desktop\Volume 3\DB 2\Jetstress002001.edb

Instance1844.3 Log path: C:\Users\Administrator\Desktop\Volume 4\Log 3
Database: C:\Users\Administrator\Desktop\Volume 3\DB 3\Jetstress003001.edb

Instance1844.4 Log path: C:\Users\Administrator\Desktop\Volume 4\Log 4
Database: C:\Users\Administrator\Desktop\Volume 3\DB 4\Jetstress004001.edb

Instance1844.5 Log path: C:\Users\Administrator\Desktop\Volume 3\Log 5
Database: C:\Users\Administrator\Desktop\Volume 4\DB 5\Jetstress005001.edb

Instance1844.6 Log path: C:\Users\Administrator\Desktop\Volume 3\Log 6
Database: C:\Users\Administrator\Desktop\Volume 4\DB 6\Jetstress006001.edb

Instance1844.7 Log path: C:\Users\Administrator\Desktop\Volume 3\Log 7
Database: C:\Users\Administrator\Desktop\Volume 4\DB 7\Jetstress007001.edb

Instance1844.8 Log path: C:\Users\Administrator\Desktop\Volume 3\Log 8
Database: C:\Users\Administrator\Desktop\Volume 4\DB 8\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
Instance1844.1	16.745	3.423	81.834	35.660	32768.000	36508.033	0.000	0.701	0.000	9.100	0.000	20381.069
Instance1844.2	15.310	3.487	81.628	35.656	32768.000	36515.835	0.000	0.703	0.000	9.155	0.000	20379.080
Instance1844.3	15.317	3.626	82.034	35.898	32768.000	36497.419	0.000	0.701	0.000	9.207	0.000	20348.991
Instance1844.4	15.328	3.584	81.637	35.503	32768.000	36544.810	0.000	0.703	0.000	9.181	0.000	20290.566
Instance1844.5	14.350	2.683	81.637	35.647	32768.000	36528.499	0.000	0.700	0.000	9.193	0.000	20360.685
Instance1844.6	14.346	2.833	81.778	35.824	32768.000	36523.770	0.000	0.705	0.000	9.282	0.000	20140.360
Instance1844.7	14.320	2.529	81.856	35.873	32768.000	36555.028	0.000	0.699	0.000	9.191	0.000	20251.306
Instance1844.8	14.266	2.767	82.050	35.676	32768.000	36494.331	0.000	0.701	0.000	9.153	0.000	20187.067

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	1.072	0.615	9.020
Available MBytes	27494.587	27342.000	29631.000
Free System Page Table Entries	16599642.296	16598900.000	16599925.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	185487034.921	181719040.000	186290176.000
Pool Paged Bytes	159085865.989	156893184.000	160612352.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

7/29/2015 4:20:05 PM -- Preparing for testing ...
7/29/2015 4:20:14 PM -- Attaching databases ...
7/29/2015 4:20:14 PM -- Preparations for testing are complete.
7/29/2015 4:20:14 PM -- Starting transaction dispatch ..
7/29/2015 4:20:14 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)
7/29/2015 4:20:14 PM -- Database flush thresholds: (start: 20.5 MB, stop: 40.9 MB)
7/29/2015 4:20:23 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
7/29/2015 4:20:23 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
7/29/2015 4:20:24 PM -- Operation mix: Sessions 20, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
7/29/2015 4:20:24 PM -- Performance logging started (interval: 15000 ms).
7/29/2015 4:20:24 PM -- Generating log files ...
7/29/2015 5:55:17 PM -- C:\Users\Administrator\Desktop\Volume 4\Log 1 (100.2% generated), C:\Users\Administrator\Desktop\Volume 4\Log 2 (101.0% generated),
C:\Users\Administrator\Desktop\Volume 4\Log 3 (101.6% generated), C:\Users\Administrator\Desktop\Volume 4\Log 4 (100.8% generated),
C:\Users\Administrator\Desktop\Volume 3\Log 5 (101.6% generated), C:\Users\Administrator\Desktop\Volume 3\Log 6 (101.4% generated),
C:\Users\Administrator\Desktop\Volume 3\Log 7 (100.6% generated) and C:\Users\Administrator\Desktop\Volume 3\Log 8 (100.2% generated)
7/29/2015 5:55:17 PM -- Performance logging has ended.
7/29/2015 5:55:17 PM -- JetInterop batch transaction stats: 17013, 17013, 17013, 17013, 17013, 17013, 17013 and 17013.
7/29/2015 5:55:17 PM -- Dispatching transactions ends.
7/29/2015 5:55:17 PM -- Shutting down databases ...
7/29/2015 5:55:24 PM -- Instance1844.1 (complete), Instance1844.2 (complete), Instance1844.3 (complete), Instance1844.4 (complete), Instance1844.5 (complete),
Instance1844.6 (complete), Instance1844.7 (complete) and Instance1844.8 (complete)
7/29/2015 5:55:24 PM -- C:\Program Files\Exchange Jetstress\Performance_2015_7_29_16_20_23.blg has 378 samples.
7/29/2015 5:55:24 PM -- Creating test report ...
7/29/2015 5:55:25 PM -- Instance1844.1 has 16.7 for I/O Database Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.1 has 0.7 for I/O Log Writes Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.1 has 0.7 for I/O Log Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.2 has 15.3 for I/O Database Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.2 has 0.7 for I/O Log Writes Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.2 has 0.7 for I/O Log Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.3 has 15.3 for I/O Database Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.3 has 0.7 for I/O Log Writes Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.3 has 0.7 for I/O Log Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.4 has 15.3 for I/O Database Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.4 has 0.7 for I/O Log Writes Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.4 has 0.7 for I/O Log Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.5 has 14.4 for I/O Database Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.5 has 0.7 for I/O Log Writes Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.5 has 0.7 for I/O Log Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.6 has 14.3 for I/O Database Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.6 has 0.7 for I/O Log Writes Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.6 has 0.7 for I/O Log Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.7 has 14.3 for I/O Database Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.7 has 0.7 for I/O Log Writes Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.7 has 0.7 for I/O Log Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.8 has 14.3 for I/O Database Reads Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.8 has 0.7 for I/O Log Writes Average Latency.
7/29/2015 5:55:25 PM -- Instance1844.8 has 0.7 for I/O Log Reads Average Latency.
7/29/2015 5:55:26 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
7/29/2015 5:55:26 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
7/29/2015 5:55:26 PM -- C:\Program Files\Exchange Jetstress\Performance_2015_7_29_16_20_23.xml has 377 samples queried.

Dell PowerVault MD3860f 10,000 user Mailbox Exchange 2013 Resiliency Storage Solution — Direct Attach FC
using dual QLogic QLE2662 16Gb FC adapters

Server 2

Database Sizing and Throughput

Achieved Transactional I/O per Second	945.863
Target Transactional I/O per Second	600
Initial Database Size (bytes)	10741528657920
Final Database Size (bytes)	10743416094720
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

Instance3600.1 Log path: C:\Users\Administrator\Desktop\Volume2\Log 1
Database: C:\Users\Administrator\Desktop\Volume1\DB 1\Jetstress001001.edb

Instance3600.2 Log path: C:\Users\Administrator\Desktop\Volume2\Log 2
Database: C:\Users\Administrator\Desktop\Volume1\DB 2\Jetstress002001.edb

Instance3600.3 Log path: C:\Users\Administrator\Desktop\Volume2\Log 3
Database: C:\Users\Administrator\Desktop\Volume1\DB 3\Jetstress003001.edb

Instance3600.4 Log path: C:\Users\Administrator\Desktop\Volume2\Log 4
Database: C:\Users\Administrator\Desktop\Volume1\DB 4\Jetstress004001.edb

Instance3600.5 Log path: C:\Users\Administrator\Desktop\Volume1\Log 5
Database: C:\Users\Administrator\Desktop\Volume2\DB 5\Jetstress005001.edb

Instance3600.6 Log path: C:\Users\Administrator\Desktop\Volume1\Log 6
Database: C:\Users\Administrator\Desktop\Volume2\DB 6\Jetstress006001.edb

Instance3600.7 Log path: C:\Users\Administrator\Desktop\Volume1\Log 7
Database: C:\Users\Administrator\Desktop\Volume2\DB 7\Jetstress007001.edb

Instance3600.8 Log path: C:\Users\Administrator\Desktop\Volume1\Log 8
Database: C:\Users\Administrator\Desktop\Volume2\DB 8\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
Instance3600.1	14.068	3.004	82.068	35.752	32768.000	36596.259	0.000	0.537	0.000	9.130	0.000	20218.218
Instance3600.2	14.155	3.129	82.530	36.731	32768.000	36586.040	0.000	0.533	0.000	9.323	0.000	20250.636
Instance3600.3	14.298	3.231	82.076	36.210	32768.000	36630.133	0.000	0.534	0.000	9.300	0.000	20142.618
Instance3600.4	14.484	3.157	82.093	36.120	32768.000	36578.306	0.000	0.534	0.000	9.242	0.000	20250.174
Instance3600.5	15.193	3.435	82.193	36.125	32768.000	36553.837	0.000	0.535	0.000	9.168	0.000	20222.336
Instance3600.6	15.775	3.545	81.742	35.660	32768.000	36670.649	0.000	0.535	0.000	9.145	0.000	20410.920
Instance3600.7	16.734	3.599	82.124	36.340	32768.000	36617.325	0.000	0.534	0.000	9.342	0.000	20147.531
Instance3600.8	18.086	3.517	82.081	36.018	32768.000	36638.741	0.000	0.531	0.000	9.187	0.000	20186.145

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.372	0.236	0.808
Available MBytes	28082.850	28011.000	29937.000
Free System Page Table Entries	16605772.414	16605112.000	16606024.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	144408597.615	144277504.000	144531456.000
Pool Paged Bytes	93854598.417	93704192.000	94023680.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Dell PowerVault MD3860f 10,000 user Mailbox Exchange 2013 Resiliency Storage Solution — Direct Attach FC using dual QLogic QLE2662 16Gb FC adapters

Test Log

7/29/2015 2:37:46 PM -- Preparing for testing ...
7/29/2015 2:37:54 PM -- Attaching databases ...
7/29/2015 2:37:54 PM -- Preparations for testing are complete.
7/29/2015 2:37:54 PM -- Starting transaction dispatch ..
7/29/2015 2:37:54 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)
7/29/2015 2:37:54 PM -- Database flush thresholds: (start: 20.5 MB, stop: 40.9 MB)
7/29/2015 2:38:03 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
7/29/2015 2:38:03 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
7/29/2015 2:38:03 PM -- Operation mix: Sessions 20, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
7/29/2015 2:38:03 PM -- Performance logging started (interval: 15000 ms).
7/29/2015 2:38:03 PM -- Generating log files ...
7/29/2015 4:12:55 PM -- C:\Users\Administrator\Desktop\Volume2\Log 1 (100.2% generated), C:\Users\Administrator\Desktop\Volume2\Log 2 (102.4% generated),
C:\Users\Administrator\Desktop\Volume2\Log 3 (101.6% generated), C:\Users\Administrator\Desktop\Volume2\Log 4 (101.4% generated),
C:\Users\Administrator\Desktop\Volume1\Log 5 (100.4% generated), C:\Users\Administrator\Desktop\Volume1\Log 6 (101.0% generated),
C:\Users\Administrator\Desktop\Volume1\Log 7 (102.0% generated) and C:\Users\Administrator\Desktop\Volume1\Log 8 (100.6% generated)
7/29/2015 4:12:55 PM -- Performance logging has ended.
7/29/2015 4:12:55 PM -- JetInterop batch transaction stats: 17078, 17078, 17078, 17078, 17078, 17078, 17078 and 17078.
7/29/2015 4:12:55 PM -- Dispatching transactions ends.
7/29/2015 4:12:56 PM -- Shutting down databases ...
7/29/2015 4:13:00 PM -- Instance3600.1 (complete), Instance3600.2 (complete), Instance3600.3 (complete), Instance3600.4 (complete), Instance3600.5 (complete),
Instance3600.6 (complete), Instance3600.7 (complete) and Instance3600.8 (complete)
7/29/2015 4:13:00 PM -- C:\Program Files\Exchange Jetstress\Performance_2015_7_29_14_38_3.blg has 379 samples.
7/29/2015 4:13:00 PM -- Creating test report ...
7/29/2015 4:13:01 PM -- Instance3600.1 has 14.1 for I/O Database Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.1 has 0.5 for I/O Log Writes Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.1 has 0.5 for I/O Log Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.2 has 14.2 for I/O Database Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.2 has 0.5 for I/O Log Writes Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.2 has 0.5 for I/O Log Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.3 has 14.3 for I/O Database Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.3 has 0.5 for I/O Log Writes Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.3 has 0.5 for I/O Log Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.4 has 14.5 for I/O Database Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.4 has 0.5 for I/O Log Writes Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.4 has 0.5 for I/O Log Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.5 has 15.2 for I/O Database Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.5 has 0.5 for I/O Log Writes Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.5 has 0.5 for I/O Log Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.6 has 15.8 for I/O Database Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.6 has 0.5 for I/O Log Writes Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.6 has 0.5 for I/O Log Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.7 has 16.7 for I/O Database Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.7 has 0.5 for I/O Log Writes Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.7 has 0.5 for I/O Log Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.8 has 18.1 for I/O Database Reads Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.8 has 0.5 for I/O Log Writes Average Latency.
7/29/2015 4:13:01 PM -- Instance3600.8 has 0.5 for I/O Log Reads Average Latency.
7/29/2015 4:13:01 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
7/29/2015 4:13:01 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
7/29/2015 4:13:01 PM -- C:\Program Files\Exchange Jetstress\Performance_2015_7_29_14_38_3.xml has 378 samples queried.