



Dell PowerVault MD3260 15,000 Mailbox Resiliency Microsoft Exchange 2013 Storage Solution

Tested with ESRP – Storage Version 4.0
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1 Overview

This technical paper provides information on Dell's storage solution for Microsoft® Exchange Server. This solution is based on the *Microsoft Exchange Solution Reviewed Program (ESRP) – Storage program v4.0*. For any questions or comments regarding the contents of this document, see [Additional Information](#).

The ESRP – Storage program was developed by Microsoft Corporation to provide a common storage testing framework that enables vendors to provide information on their storage solutions for Microsoft Exchange Server software. For more details on the Microsoft ESRP – Storage program, see <http://technet.microsoft.com/en-us/exchange/ff182054.aspx>

1.1 Disclaimer

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2 Features

This technical paper describes a tested and validated resilient storage solution for a 15,000 mailbox Microsoft Exchange 2013 site, with Data Availability Group (DAG). A DAG is a high availability mechanism in Microsoft Exchange 2013.

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

The solution presented here is a Mailbox Resiliency solution with single DAG and three copies of each database spanning two sites: Local and Remote. The local site has two copies for each database: active and passive, while the remote site has a passive copy of each database. The tested environment simulates up to 15,000 users with 4 Gigabyte (GB) Mailbox size and 150 messages a day, or 0.121 IOPS for every user, including 20% headroom.

In this solution, Dell™ PowerEdge™ R620 servers attached to Dell PowerVault™ MD3260 enclosures are used as the Mailbox servers, with Dell PowerVault™ MD3260 configured as the storage array that hosts the Exchange mailbox databases. Each group of 4 PowerEdge R620 attached to a PowerVault™ MD3260 within the local site host one active copy of an Exchange 2013 database and transaction logs and one passive copy of a peer group of 4 servers. The secondary passive copies of the local site databases are hosted at the remote site.



3 Solution Components

The presented solution employs Dell PowerEdge™ R620 Servers and Dell PowerVault™ MD3260 storage, which are capable of meeting the high performance requirements of messaging deployments. The presented solution is for up to 15,000 mailboxes of 4 GB each. The following sub-sections describe the hardware components that are part of this Exchange solution.

3.1 Dell PowerEdge R620 Features

Dell PowerEdge™ R620 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
- External HBA
 - RAID – PERC H810
 - Non-RAID – 6 Gbps SAS HBA
- 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 R620 Server product page](#).

3.2 Dell PowerVault MD3260 Features

The PowerVault MD3260 high-density enclosure is designed to scale the needs of applications requiring large amounts of data storage. The MD3260 is a 60-drive, 4U standard rack enclosure. It can scale up to 180 hard drives in just 12U with two MD3060e enclosures that operate like a JBOD (just a bunch of disks). The MD3 dense array series is available in the Fibre Channel, SAS and iSCSI front-end interface. The solution described in this paper utilizes the SAS interface.

MD3260 supports SAS, near-line SAS (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 you create a virtual disk, 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 1](#) shows the view of disk groups, virtual disks, and the physical disks as displayed in PowerVault Modular Disk Storage Manager. [Figure 2](#) provides an overall summary view of the PowerVault MD3260. The features of Dell PowerVault MD3260 are detailed in [Table 1](#).



Figure 1 MDSM view of disk groups and virtual disks and physical disks

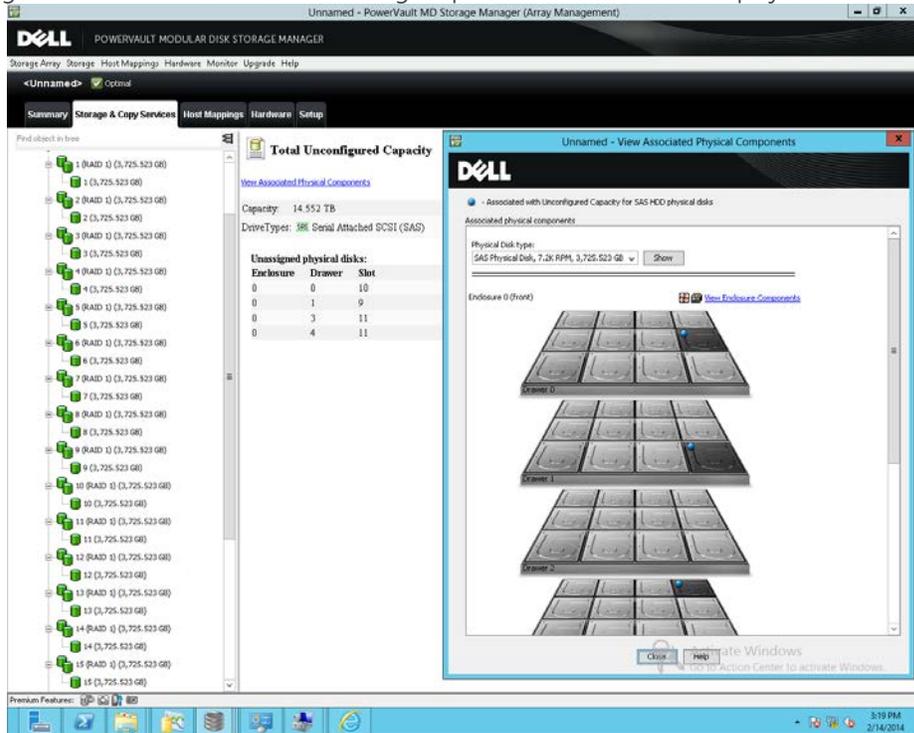


Figure 2 MDSM summary view

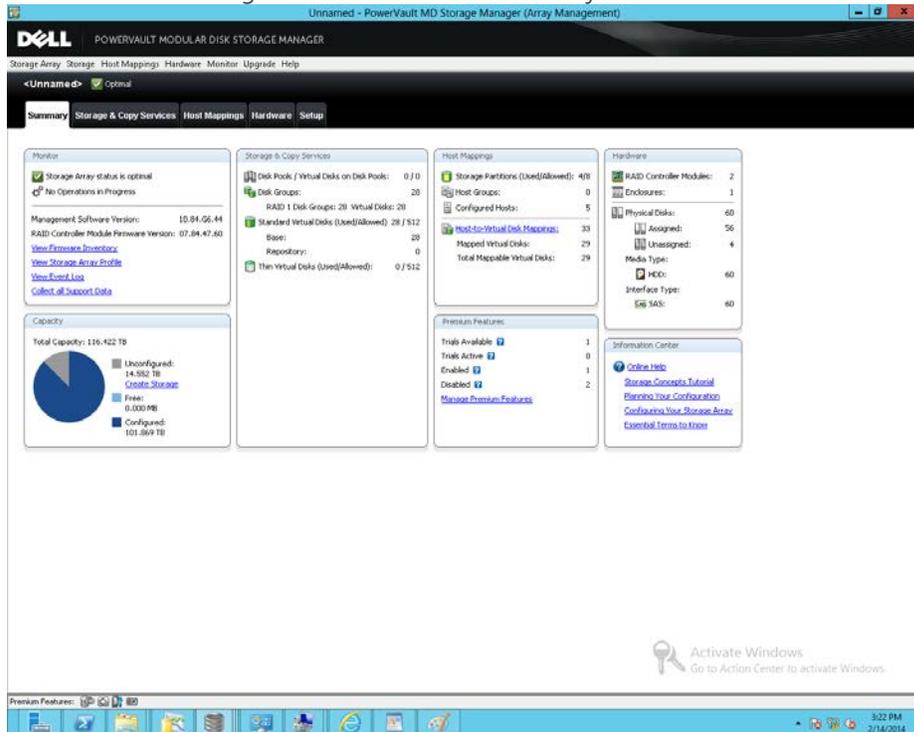


Table 1 Dell PowerVault MD3260 Features

Feature	Details
4U, 60 drive SAS high density enclosure	<ul style="list-style-type: none"> • Five horizontal drawers with 12 drives per drawer. • Designed to fit standard 1000mm cabinets (32" max depth).
6 Gb/s SAS-based storage system	Provides a high availability and high capacity storage offering when using 6 GB near-line SAS drives.
Ports	<ul style="list-style-type: none"> • Eight 6 GB/s SAS ports (4 per each controller) •
Scales to support up to 180 3.5-in or 2.5-in SAS drives (drive carriers required)	<ul style="list-style-type: none"> • 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 drives, NL-SAS drives, SEDs and SSDs (3.5"/10K or 15K drives not supported). • Configuration supports up to two additional MD3060e's.
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 software is part of the base features of this model	Increases system performance
SSD Cache- included as part of High Performance Tiering- HPT	Increases execution speed of applications by caching previously read data.
Thin Provisioning	<ul style="list-style-type: none"> • Allocate and consume physical storage capacity as needed. • Thin virtual disk can only be created from a disk pool. • Allows you to reduce the likelihood of having excess, unused capacity in the disk pool.
Support for self-encrypting drives (SED)	For securing data at rest.



Feature	Details
VMware VAAI support	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Dynamically rebalances 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)	Asymmetric Logical Unit Access (ALUA)

Figure 3 shows the MD3260 front and back view.

Figure 3 Dell PowerVault MD3260 front and back view



4 Solution Description

In this solution, Dell PowerEdge R620 servers and PowerVault MD3260 storage array using 3.5" NL-SAS hard drives are configured for the Mailbox Server Role. The Mailbox Server Role connects to the MD3260 through Dell 6 Gbps SAS HBAs in the R620 PCIe slots. The internal drives on the PowerEdge R620 are configured as RAID drives and are used to host the operating system, application bits, and Exchange Transport Database. A total of 12 PowerEdge R620 servers are in the DAG, with a group of four PowerEdge R620 systems connected to each MD3260. The presented solution utilizes 14 3.5" 7.2K RPM NL-SAS disks per DAG member, along with 2 of the 3.5" LFF 7.2KRPM NL-SAS disks for global hot spares and 2 for restore volumes shared among DAG members attached to PowerVault MD3260 storage arrays.

Details of the high-level solution design are as follows:

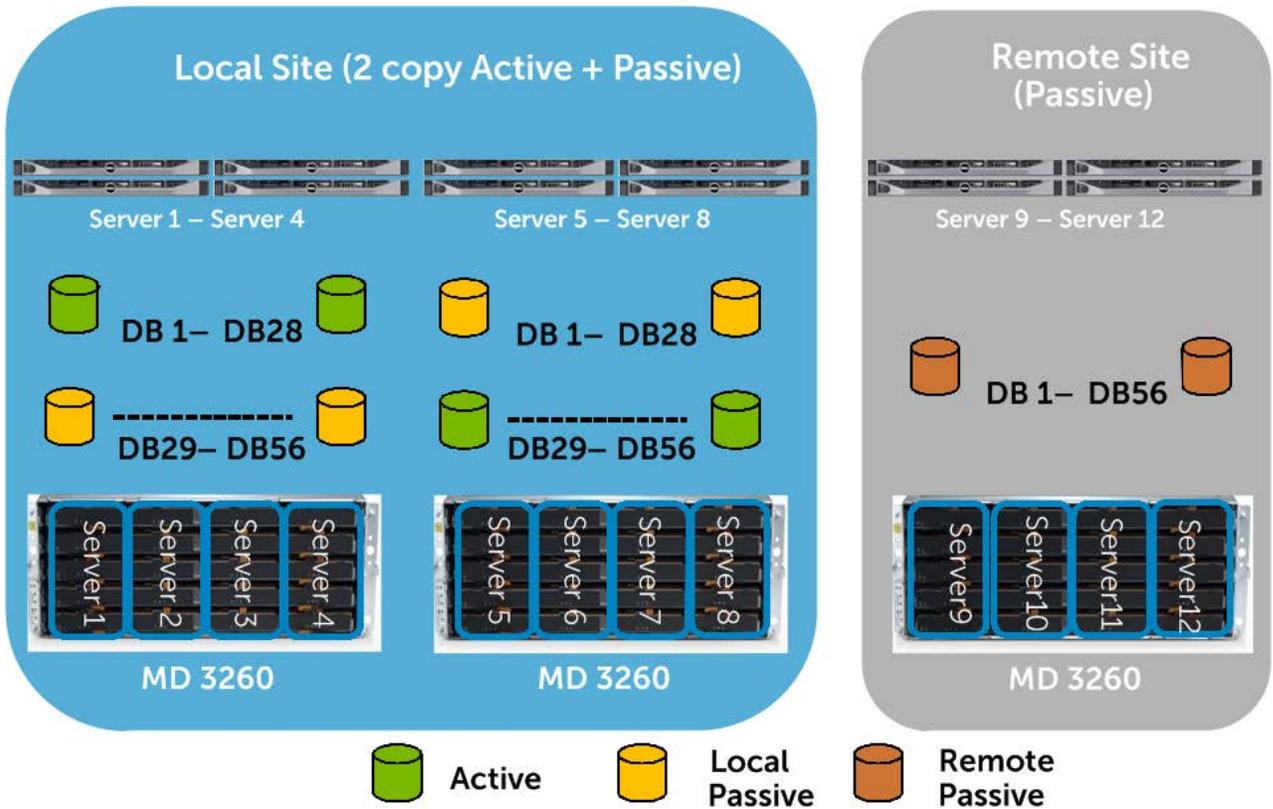
- 12-member DAG across two sites
- Site resilient DAG configuration with 2 local copies and 1 remote copy per database
- 8 DAG members configured at local site in active/active configuration
- 4 DAG members configured at remote site with passive copies
- 14 disk drives (in 7 RAID 1 virtual disks) for Exchange database and its transaction logs assigned to each DAG member(server)

This solution has a 3-copy DAG layout with Exchange Servers distributed between two sites: Local and Remote. Each server node has 7-RAID 1 LUNs hosting 7 active and 7 passive databases. Each of these databases hosts 268 users with a 4GB mailbox each. Thus, a single server can accommodate 1875 users during normal operating conditions. Eight such servers placed in the local site provide Exchange Mailbox Services for 15,000 users. The mailbox user profile tested was 150 messages a day, or 0.121 transactions per user, which included a 20% IO headroom.

Figure 4 represents the distribution of database copies across the DAG members. A 3-copy DAG site resiliency solution with Exchange servers hosted at both local and remote site as shown. The local site has two database copies of each of the databases, one active and other passive. The remote site holds one passive copy of each of the databases



Figure 4 Database Availability Group architectural diagram



4.1 Failure and Recovery Scenarios

Figure 4 shows the logical diagram of the solution on the local site and remote site. The local site has eight PowerEdge R620 servers. The remote site has four PowerEdge R620 servers. The first group of 4 PowerEdge R620 servers at the local site is Server1 thru Server4, and the second group of PowerEdge R620 at the local site are Server5 thru Server8. The Exchange database copies at the local site server are distributed in such a way that each database and its passive copy is on a separate server group and storage enclosure. In the event that the members of a PowerEdge R620 group or the PowerVault MD3260 storage enclosure they are attached to is brought down for maintenance at the local site, it is not necessary for the remote site passive database copies to be activated. Active database copies on the Server1 thru Server4 group have their local passive copies hosted on the Server5 thru Server8 group. Conversely, the Server5 thru Server8 group active database copies have their local passive copies hosted on the Server1 thru Server4 group. The remote site server group hosts the secondary passive copies of all local site databases.

Each of the hosts is designed in such a way that it can handle twice the normal server load of up to 3,750 users. Thus, the tested configuration simulated the failure case in which a local site is completely unavailable and all the databases are activated on the remote site.

Figure 5 describes the scenario where a local site is completely unavailable. In this case, the databases on the remote site are activated. These server hosts are designed so that each host is capable of handling 3750 users in this worst-case scenario. Thus, a total of 15,000 users could be handled by servers located in the remote site. This worst-case scenario is validated as part of the ESRP.

Figure 5 With all eight servers unavailable at the Local Site

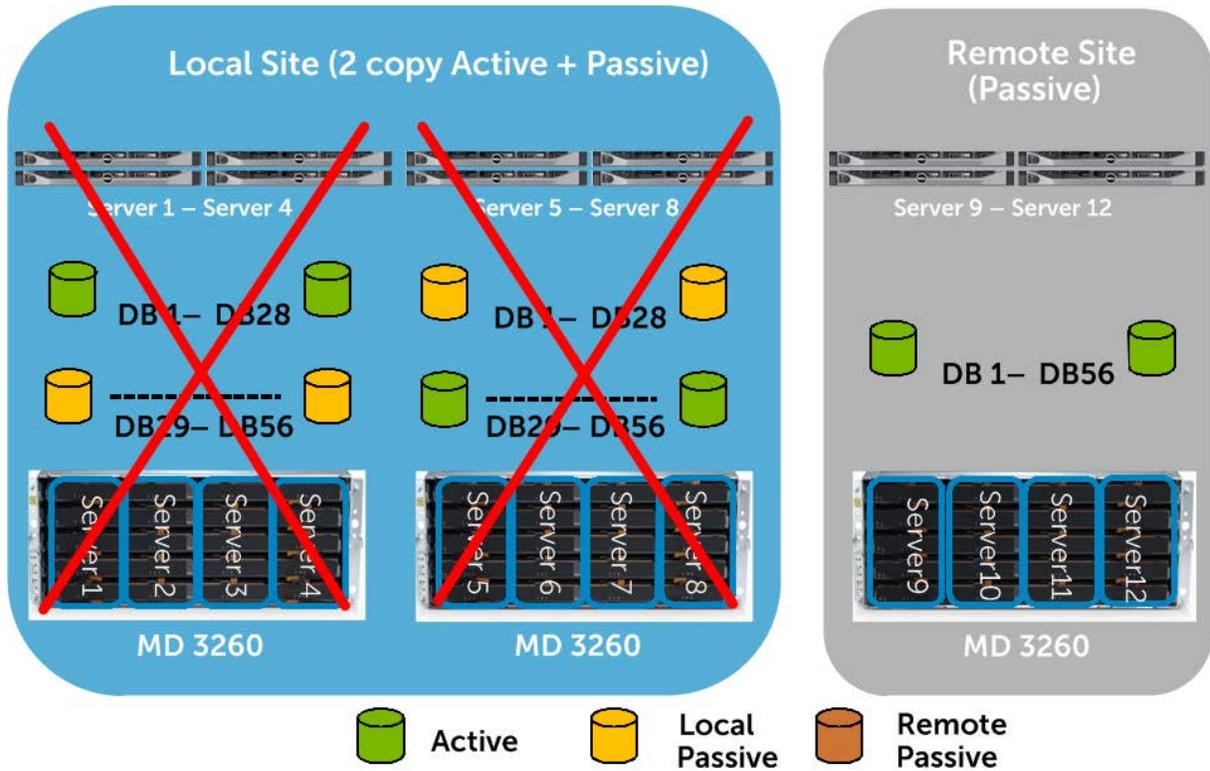


Table 2 shows the database layout across all 12 server hosts. Each server hosts 14 Databases, with 7 active and 7 passive databases on the eight servers in the local site and all passive databases on the remote site.



Table 2 Database/Transaction Log layout across servers in DAG

Database Name	Active Server	Local Enclosure1				Local Enclosure2				Remote Enclosure			
		Server1	Server2	Server3	Server4	Server5	Server6	Server7	Server8	Server9	Server10	Server11	Server12
DB1	Server1	1				2				3			
DB2	Server2		1				2				3		
DB3	Server3			1				2				3	
DB4	Server4				1				2				3
DB5	Server5	2				1				3			
DB6	Server6		2				1				3		
DB7	Server7			2				1				3	
DB8	Server8				2				1				3
DB9	Server1	1					2			3			
DB10	Server2		1					2			3		
DB11	Server3			1					2			3	
DB12	Server4				1	2							3
DB13	Server5		2			1				3			
DB14	Server6			2			1				3		
DB15	Server7				2			1				3	
DB16	Server8	2							1				3
DB17	Server1	1						2		3			
DB18	Server2		1						2				
DB19	Server3			1		2					3		
DB20	Server4				1		2						3
DB21	Server5			2		1				3			
DB22	Server6				2		1				3		
DB23	Server7	2						1				3	
DB24	Server8		2						1				3
DB25	Server1	1							2	3			
DB26	Server2		1			2					3		
DB27	Server3			1			2					3	
DB28	Server4				1			2					3
DB29	Server5				2	1				3			
DB30	Server6	2					1				3		
DB31	Server7		2					1				3	
DB32	Server8			2					1				3
DB33	Server1	1				2				3			
DB34	Server2		1				2				3		
DB35	Server3			1				2				3	
DB36	Server4				1				2				3
DB37	Server5	2				1				3			
DB38	Server6		2				1				3		
DB39	Server7			2				1				3	
DB40	Server8				2				1				3
DB41	Server1	1					2			3			
DB42	Server2		1					2			3		
DB43	Server3			1					2			3	
DB44	Server4				1	2							3
DB45	Server5		2			1				3			
DB46	Server6			2			1				3		
DB47	Server7				2			1				3	
DB48	Server8	2							1				3
DB49	Server1	1						2		3			
DB50	Server2		1						2		3		
DB51	Server3			1		2						3	
DB52	Server4				1		2						3
DB53	Server5			2		1				3			
DB54	Server6				2		1				3		
DB55	Server7	2						1				3	
DB56	Server8		2						1				3



Active Copy



Local Passive Copy



Remote Passive Copy



4.2 Storage Sizing

Storage sizing typically involves the type of RAID, 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 15,000 users with 150 messages/day profile. The recommended IOPS per server is 452. 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 6 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		10446	73125	585000	585000
Average Move Mailbox Transaction Logs Generated / Day		1717	12021	96171	96171
Average Transaction Logs Generated / Day		12164	85146	681171	681171
Disk Space Requirements		/ Database	/ Server	/ DAG	/ Environment
Transport Database Space Required		--	429 GB	5150 GB	5150 GB
Database Space Required		1174 GB	16436 GB	197227 GB	197227 GB
Log Space Required		42 GB	593 GB	7114 GB	7114 GB
Database+Log Volume Space Required		1775 GB	24845 GB	298138 GB	298138 GB
Log Volume Space Required		0 GB	0 GB	0 GB	0 GB
Restore Volume Space Required		--	1280 GB	15364 GB	15364 GB
Host IO and Throughput Requirements		/ Database	/ Server	/ DAG	/ Environment
Total Database Required IOPS		32	452	5427	5427
Total Log Required IOPS		7	96	1155	1155
Database Read I/O Percentage		60%	--	--	--
Background Database Maintenance Throughput Requirements		1.0 MB/s	14 MB/s	168 MB/s	168 MB/s

4.3 Recommended Hardware Configuration

Based on the solution requirements as detailed in the previous sections, [Table 3](#) and [Table 4](#) provide the detailed server and storage configuration. Additionally, the firmware and driver versions are provided for the tested solution.

Table 3 Exchange Server Configuration

Microsoft Exchange Server System	Dell PowerEdge R620 server
CPU	2x2.5GHz Intel 10-core Intel® Xeon® processor E5-2670 V2
Memory	Up to 160 GB DDR3
Networking	Broadcom 5720 1 GbE QP



Form Factor	1 U
RAID Controller	Dell PowerEdge RAID Controller H710P (Firmware version: Firmware 6.2.0-00007) Driver version 6.600.21.08
Internal Disks	2 x 1.2 TB SAS 2.5-inch 10K RPM disk drives (Operating System)
Systems Management	iDRAC7 Express or iDRAC7 Enterprise
Host Bust Controller (HBA) connecting to PoweVault MD3260	Dell 6 Gbps SAS HBA

Table 4 Storage Subsystem configuration (per storage enclosure)

Storage System	Dell PowerVault MD3260
Disks	60 x 4 TB 7.2K RPM NL-SAS 3.5" disk: <ul style="list-style-type: none"> • 56 x 4 TB 7.2K RPM NL-SAS 3.5" drive in RAID 1 (for DB and Log) • 2 x 4 TB 7.2K RPM NL-SAS 3.5-inch drive (for Restore LUN) • 2 x 4 TB 7.2K RPM NL-SAS 3.5-inch drive (for Global Hot-spare)
Storage Controller	Dual, active/active SAS controllers in a 4U, 60 drive enclosure; High Performance Tiering standard on base



5 Targeted Customer Profile

This solution is intended for mid-size to large organizations hosting up to 15,000 Exchange 2013 mailboxes. The configuration used for testing was as follows:

- Number of mailboxes: 15,000
- Number of Sites : 2 (Local and Remote)
- Number of Servers in each site : 8 in local and 4 in remote
- Number of hosts attached to each storage system: 4
- User IO profile: 150 messages sent and received or 0.121 I/O operations per second per mailbox (This includes 20% IO headroom factor)
- 4 GB Mailbox quota per mailbox
- 24x7 Background Database Maintenance enabled
- Data Availability Group (DAG) for Mailbox Resiliency (3 copies simulated)

5.1 Tested User Profile

The tested user profile was 0.121 IOPS per user with a 4 GB mailbox size. This IO profile for Exchange 2013 represents about 150 messages (sent/received) per mailbox per day and accounts for additional 20% IO headroom. Sometimes additional applications, such as certain mobile messaging applications, can raise the IOPS profile of a user as high as three or four times that of normal.

5.2 Tested Deployment

The tested deployment simulated a failure scenario where up to eight of the Exchange Server 2013 DAG members go offline and the passive copies on the surviving DAG members at the remote site are activated to provide mailbox service continuity. Therefore, the IOPs simulated mimicked that of 3750 active mailboxes on the same Exchange 2013 Server. The target IOPs per server for the given profile was 452. The achieved IOPs were 633--which is much higher than the target--and the solution still maintained read and write latencies well within the recommended thresholds. The following tables summarize the testing environment.

Table 5 Simulated Exchange Configuration

Feature	Specification
Number of Exchange mailboxes simulated	15,000 (at 4GB mailbox size each)
Number of Database Availability Groups (DAGs)	1



Feature	Specification
Number of Sites	2 (Local and Remote)
Number of servers/DAG	12 (4 Tested) (8 Local and 4 Remote)
Number of active mailboxes/server	1,875 (during normal operations) & 3750 (during site failure)
Number of databases/server	14 (7 active, 7 passive)
Number of copies/database	3 (2 in Local and 1 in remote site)
Number of mailboxes/database	268
Simulated profile: IOPS/mailbox	0.121 (150 messages/day) This includes 20% IO headroom factor
Database/Log LUN size	3725.4 GB
Number of LUNs per server	7
Number of DBs per LUN	2 (one active, one passive)
Background database maintenance (BDM)	Tested with BDM enabled
Total database size for performance testing	1076 GB per DB 58.86 TB total



Feature	Specification
% storage capacity used by Exchange database	58.86TB/101.87 57.78%

Table 6 Storage and Server Hardware

Feature	Specification
Storage Connectivity	SAS
Storage model and OS/firmware revision	Dell PowerVault MD3260 Firmware Version 7.84.47.60
Storage cache	4 GB per controller
Number of storage controllers	2
Number of storage ports	8 (four per controller)
Maximum bandwidth of storage connectivity to host	6 Gb/s per port
Switch type/model/firmware revision	NA
HBA model and firmware	Dell 6GB-SAS-HBA 2.0.35.10, A03
Number of HBA's/host	1 dual port SAS HBA
Host server type	2 CPU 10-core Intel® Xeon® processor E5-2670 V2
Total number of disks tested in solution	56 (14 per server)
Maximum number of spindles can be hosted in the storage	60 x 3.5" HDD



Table 7 Storage and Server Software

Feature	Specification
HBA driver	2.0.55.84
HBA QueueTarget Setting	N/A
HBA QueueDepth Setting	N/A
Multi-Pathing	Windows Server™ 2012 MPIO
Host OS	Windows Server™ 2012 datacenter X64 Edition
ESE.dll file version	15.00.0775.028
Replication solution name/version	N/A

Table 8 Storage Disk Configuration (Mailbox Store Disks)

Feature	Specification
Disk type, speed and firmware revision	DELL 7.2K 3.5" RPM 4 TB NL-SAS Model – ST4000NM0023
Raw capacity per disk (GB)	4 TB
Number of physical disks in test	56 (14 per Server)
Total raw storage capacity (TB)	56 TB per Server 224 TB Total
Number of disks per LUN	2
Raid level	RAID 1 pairs
Total formatted capacity	3725 GB / LUN 101.86 TB Total/ array
Storage capacity utilization	101.86 TB/224 TB = 45.5% Formatted Capacity / Total raw capacity
Database capacity utilization	56*(1.05)TB/101.86TB=57.75% Total Database size / Total formatted capacity



5.3 Best Practices

Exchange Server 2007, 2010 and 2013 overcome the memory limitations of previous Exchange versions by providing support as a 64-bit application capable of running on supported x64 platforms. On Windows Server 2012 Datacenter Edition, about 4TB of addressable memory is available for the kernel mode and the user mode applications. Both the application and kernel have sufficient memory for operations, allowing the Extensible Storage Engine (ESE) in Exchange Server 2013 to utilize more memory to buffer data pages. The result is a reduction in the number of I/O, specifically the read operations required to the disk subsystem. The total number of database disk I/O operations for a given user load depends on the available system memory. For a given load, the total database disk I/O operations required per second (IOPS) decreases over a period with increases in system memory. This decrease in database IOPS is primarily caused by a decrease in database reads.

Even with the decrease in database IOPS, it is essential to size the Exchange Storage subsystem accurately to ensure that there are no I/O bottlenecks, both from an IOPs and disk latency perspective. The disk subsystem should be capable of supporting both the capacity and I/O throughput demands of the application. Based on testing using the ESRP framework, we recommend the following best practices to help improve the I/O subsystem performance:

- Sharing Exchange 2013 storage resources with other applications may negatively affect the performance of Exchange 2013 deployment and, therefore, we do not recommend sharing the spindles hosting the Exchange Database and log with any other application or operating system.
- During testing, the database and log folders shared the same physical disk. Other testing indicated that separating the database folders from log folders onto different set of disks does not provide a noticeable performance advantage. In an Exchange Server 2013 resiliency solution, separating the database and log folders is no longer a required best practice. For standalone Exchange 2013 solutions that do not deploy a DAG, it is a best practice to separate the database and log onto separate physical disks.
- For Exchange 2013 database, it is recommended that the size of elements within a RAID stripe be set to 512K for best performance.
- Windows NTFS allocation unit size for Exchange 2013 database partitions should be set to 64K for best performance. For log partitions, if separated from the database, the default allocation unit size should be used. When formatting the windows partitions, GUID partition table (GPT) should be used.
- Exchange Server 2013 storage latencies are most often related to the number of disks available for a given workload. Windows Performance Monitor may be used to monitor Exchange Server 2013 database counters. Average database read latencies (Avg. Disk sec/Read) should not exceed 20ms.

For Exchange 2013 best practices on storage design, see [http://technet.microsoft.com/en-us/library/ee832792\(v=exchg.150\).aspx](http://technet.microsoft.com/en-us/library/ee832792(v=exchg.150).aspx)



5.4 Backup Strategy

To protect e-mail data from potential disasters, having a well designed and implemented backup solution is critical. Depending on environment requirements, different backup strategies may be implemented, such as backup to tape or LAN/SAN based backup. In this solution, DAG is used to maintain a passive database copy on a separate storage system.

For the purposes of this solution, the backup test simulated Exchange VSS backup, and measured the streaming read performance of the database disks.



6 Test Result Summary

This section provides a high-level summary of the test data from Microsoft Exchange Jetstress--as part of the ESRP requirements--and the link to the detailed html reports, which are generated by the ESRP testing framework. Click on the underlined headings below to view the html report for each test.

6.1 Reliability

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

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

- Any errors reported in the saved event log file? No
- Any errors reported in during the database and log checksum process? No

6.2 [Storage Performance Test Result Report](#)

The Storage performance test is designed to exercise the storage with maximum sustainable Exchange IO for 2 hours. The test shows how long it takes the storage to respond to an IO under load. The data below is the sum of all of the logical disk I/O's and average of all the logical disks I/O latency in the 2-hour test. The achieved IOPs were around 642.

As part of the ESRP framework, the Stress Test was also performed. The duration of the test was 24 hours, with a target IOPS of 0.121 , or 452, IOPs per server. The achieved IOPs were around 0.169 IOPs, or 633 IOPs, per server, s well above the target IOPs. The [Stress Test Result Report](#) is also provided for reference.

6.3 Individual Server Metrics

The sum of I/O's across Storage Groups and the average latency across all Storage Groups on a per server basis is detailed in [Table 9](#).

Table 9 Individual Server Metrics
Server1:

Database I/O	
Target Database Disk Transfers/sec	452
Achieved Database Disks Transfers/sec	642
Database Disks Reads/sec	441.1



Database Disks Writes/sec	200.9
Average Database Disk Read Latency (ms)	15.4
Average Database Disk Write Latency (ms)	7.4
Transaction Log I/O	
Log Disks Writes/sec	47.3
Average Log Disk Write Latency (ms)	2.4

Server 2 :

Database I/O	
Target Database Disk Transfers/sec	452
Database Disks Transfers/sec	632
Database Disks Reads/sec	436
Database Disks Writes/sec	196
Average Database Disk Read Latency (ms)	16.3
Average Database Disk Write Latency (ms)	12.8
Transaction Log I/O	
Log Disks Writes/sec	44
Average Log Disk Write Latency (ms)	2.9

Server 3 :

Database I/O	
Target Database Disk Transfers/sec	452
Database Disks Transfers/sec	630.7
Database Disks Reads/sec	433.6
Database Disks Writes/sec	197.1
Average Database Disk Read Latency (ms)	16.0
Average Database Disk Write Latency (ms)	8.7
Transaction Log I/O	



Log Disks Writes/sec	46.4
Average Log Disk Write Latency (ms)	1.4

Server 4 :

Database I/O	
Target Database Disk Transfers/sec	452
Database Disks Transfers/sec	633.1
Database Disks Reads/sec	435.2
Database Disks Writes/sec	197.9
Average Database Disk Read Latency (ms)	15.9
Average Database Disk Write Latency (ms)	8.9
Transaction Log I/O	
Log Disks Writes/sec	46.6
Average Log Disk Write Latency (ms)	2.5

6.3.1 Aggregate Performance across all servers/DAGs Metrics

Table 10 shows the aggregated results of the I/Os across the four servers in the solution and the average latency across all servers in solution.

Table 10 Aggregated Performance Metrics across all Servers

Database I/O	
Database Disks Transfers/sec	2537.8
Database Disks Reads/sec	1745.9
Database Disks Writes/sec	791.9
Average Database Disk Read Latency (ms)	15.9
Average Database Disk Write Latency (ms)	9.45
Transaction Log I/O	
Log Disks Writes/sec	184.3
Average Log Disk Write Latency (ms)	2.3



6.4 Database Backup/Recovery Performance

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

6.5 Database Backup Test Result Report

The test is to measure the maximum rate at which databases could be backed up via VSS. The following table shows the average rate for a single database file.

Table 11 Database Backup Test Metrics

Average MB read/sec per database	65.1
Average MB read/sec total per server	911.4

6.6 SoftRecovery Test Result Report

The test is to measure the maximum rate at which the log files can be played against the databases. The following table shows the average rate for 508 log files played in a single storage group. Each log file is 1 MB in size.

Table 12 SoftRecovery Test metrics

Average number of Log files played	506
Average time to play one Log file (sec)	3.5



7 Conclusion

This ESRP document presents a tested and validated Exchange solution for 15,000 mailboxes with 4GB mailbox size supporting up to 150 messages/day in a 3 copy DAG. The solution uses groups of 4 Dell PowerEdge R620 servers attached to a PowerVault MD3260 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 15,000 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.



8 Additional Information

1. **Support.dell.com** is focused on meeting customer requirements with proven services.
2. **DellTechCenter.com** is an IT Community where you can connect with Dell Customers and Dell employees for sharing knowledge, best practices and information about Dell products and installations.
3. Referenced or recommended Dell publications:
 - a. [Dell PowerVault MD 3260](#)
 - b. [Dell Unified Communication and Collaboration website](#)



A Performance Test Result Report

A.1 Server 1

Microsoft Exchange Jetstress 2013

Performance Test Result Report

Test Summary

Overall Test Result	Pass
Machine Name	HOST- 1
Test Description	Server 1 3 Copy DAG (2 Local Site + 1 Remote Site) 12 Servers (8 Local Site + 4 Remote Site) 3750 Mailboxes/Server 4 GB Mailbox Size 150 Messages a Day 0.121 IOPs tested 14 DBs per Server
Test Start Time	2/9/2014 4:20:54 PM
Test End Time	2/9/2014 6:51:11 PM
Collection Start Time	2/9/2014 4:27:59 PM
Collection End Time	2/9/2014 6:27:58 PM
Jetstress Version	15.00.0775.000
ESE Version	15.00.0712.008
Operating System	Windows Server 2012 Datacenter (6.2.9200.0)
Performance Log	C:\Program Files\Exchange Jetstress\ESRP-Final\Performance_2014_2_9_16_21_27.blog

Database Sizing and Throughput

Achieved Transactional I/O per Second	633.738
Target Transactional I/O per Second	453.75
Initial Database Size (bytes)	16174214414336
Final Database Size (bytes)	16176110239744
Database Files (Count)	14

Jetstress System Parameters

Thread Count	16
Minimum Database Cache	448.0 MB
Maximum Database Cache	3584.0 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	3



- Database Configuration

Instance3068.1 Log path: C:\databases\DB1
Database: C:\databases\DB1\Jetstress001001.edb

Instance3068.2 Log path: C:\databases\DB2
Database: C:\databases\DB2\Jetstress002001.edb

Instance3068.3 Log path: C:\databases\DB3
Database: C:\databases\DB3\Jetstress003001.edb

Instance3068.4 Log path: C:\databases\DB4
Database: C:\databases\DB4\Jetstress004001.edb

Instance3068.5 Log path: C:\databases\DB5
Database: C:\databases\DB5\Jetstress005001.edb

Instance3068.6 Log path: C:\databases\DB6
Database: C:\databases\DB6\Jetstress006001.edb

Instance3068.7 Log path: C:\databases\DB7
Database: C:\databases\DB7\Jetstress007001.edb

Instance3068.8 Log path: C:\databases\DB8
Database: C:\databases\DB8\Jetstress008001.edb

Instance3068.9 Log path: C:\databases\DB9
Database: C:\databases\DB9\Jetstress009001.edb

Instance3068.10 Log path: C:\databases\DB10
Database: C:\databases\DB10\Jetstress010001.edb

Instance3068.11 Log path: C:\databases\DB11
Database: C:\databases\DB11\Jetstress011001.edb

Instance3068.12 Log path: C:\databases\DB12
Database: C:\databases\DB12\Jetstress012001.edb

Instance3068.13 Log path: C:\databases\DB13
Database: C:\databases\DB13\Jetstress013001.edb

Instance3068.14 Log path: C:\databases\DB14
Database: C:\databases\DB14\Jetstress014001.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
Instance3068.1	15.142	7.448	31.074	14.019	33595.779	35540.736	0.000	2.445	0.000	3.304	0.000	20701.929
Instance3068.2	16.005	6.763	31.269	14.306	33590.911	35514.125	0.000	2.308	0.000	3.382	0.000	20441.493
Instance3068.3	15.527	8.742	31.201	14.166	33666.816	35504.983	0.000	2.143	0.000	3.298	0.000	20635.165
Instance3068.4	16.151	7.947	30.946	14.078	33633.900	35570.269	0.000	2.257	0.000	3.327	0.000	20780.654
Instance3068.5	14.946	7.713	30.991	14.148	33584.153	35575.991	0.000	1.989	0.000	3.348	0.000	20807.165
Instance3068.6	15.774	7.682	31.152	14.143	33607.308	35502.129	0.000	2.116	0.000	3.298	0.000	20780.405
Instance3068.7	15.428	7.771	31.131	14.055	33491.375	35556.006	0.000	2.353	0.000	3.328	0.000	20480.650
Instance3068.8	15.927	6.960	31.400	14.516	33606.668	35476.606	0.000	2.296	0.000	3.391	0.000	20494.094
Instance3068.9	15.478	7.504	31.042	14.055	33691.175	35509.987	0.000	2.973	0.000	3.307	0.000	21016.451
Instance3068.10	16.090	7.368	31.153	14.133	33563.261	35541.001	0.000	2.423	0.000	3.315	0.000	20586.655
Instance3068.11	15.639	6.631	30.945	13.950	33606.950	35525.347	0.000	2.292	0.000	3.307	0.000	20764.851
Instance3068.12	16.173	6.942	31.255	14.372	33704.239	35577.947	0.000	2.429	0.000	3.394	0.000	20689.612
Instance3068.13	15.442	7.747	31.048	13.998	33608.464	35610.454	0.000	2.639	0.000	3.254	0.000	21050.449
Instance3068.14	16.006	8.367	31.031	14.164	33574.780	35523.275	0.000	2.399	0.000	3.374	0.000	20562.015



Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3068.1	9.050	261851.560
Instance3068.2	8.952	261775.965
Instance3068.3	9.013	261811.641
Instance3068.4	8.982	261834.130
Instance3068.5	9.084	261810.532
Instance3068.6	9.011	261797.074
Instance3068.7	9.008	261720.619
Instance3068.8	8.958	261750.979
Instance3068.9	8.981	261718.300
Instance3068.10	8.939	261742.078
Instance3068.11	8.977	261887.308
Instance3068.12	8.998	261788.191
Instance3068.13	9.036	261765.933
Instance3068.14	9.024	261827.000

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3068.1	0.580	113743.842
Instance3068.2	0.583	113361.703
Instance3068.3	0.575	111902.111
Instance3068.4	0.588	114863.971
Instance3068.5	0.588	114769.100
Instance3068.6	0.580	112875.172
Instance3068.7	0.578	112822.976
Instance3068.8	0.588	114334.765
Instance3068.9	0.583	114764.128
Instance3068.10	0.578	112822.976
Instance3068.11	0.583	113361.703
Instance3068.12	0.588	114857.271
Instance3068.13	0.578	112388.642
Instance3068.14	0.585	114282.569

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
Instance3068.1	15.142	7.448	40.124	14.019	85080.083	35540.736	0.843	2.445	0.580	3.304	113743.842	20701.929
Instance3068.2	16.005	6.763	40.221	14.306	84378.330	35514.125	0.886	2.308	0.583	3.382	113361.703	20441.493
Instance3068.3	15.527	8.742	40.214	14.166	84798.528	35504.983	0.847	2.143	0.575	3.298	111902.111	20635.165
Instance3068.4	16.151	7.947	39.927	14.078	84967.111	35570.269	0.784	2.257	0.588	3.327	114863.971	20780.654
Instance3068.5	14.946	7.713	40.075	14.148	85317.132	35575.991	1.176	1.989	0.588	3.348	114769.100	20807.165
Instance3068.6	15.774	7.682	40.163	14.143	84806.654	35502.129	0.671	2.116	0.580	3.298	112875.172	20780.405
Instance3068.7	15.428	7.771	40.140	14.055	84711.860	35556.006	0.937	2.353	0.578	3.328	112822.976	20480.650
Instance3068.8	15.927	6.960	40.358	14.516	84246.640	35476.606	0.849	2.296	0.588	3.391	114334.765	20494.094
Instance3068.9	15.478	7.504	40.023	14.055	84860.798	35509.987	1.135	2.973	0.583	3.307	114764.128	21016.451
Instance3068.10	16.090	7.368	40.093	14.133	84438.228	35541.001	0.943	2.423	0.578	3.315	112822.976	20586.655
Instance3068.11	15.639	6.631	39.922	13.950	84938.789	35525.347	0.736	2.292	0.583	3.307	113361.703	20764.851
Instance3068.12	16.173	6.942	40.253	14.372	84690.546	35577.947	1.010	2.429	0.588	3.394	114857.271	20689.612
Instance3068.13	15.442	7.747	40.084	13.998	85041.499	35610.454	0.729	2.639	0.578	3.254	112388.642	21050.449
Instance3068.14	16.006	8.367	40.055	14.164	84999.296	35523.275	0.800	2.399	0.585	3.374	114282.569	20562.015

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	1.571	0.754	3.382
Available MBytes	26599.630	26577.000	26911.000
Free System Page Table Entries	33555853.985	33555861.000	33555856.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	234305249.537	234237952.000	234586112.000
Pool Paged Bytes	117272387.875	117264384.000	117346304.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



A.2 Server 2

Microsoft Exchange Jetstress 2013

Performance Test Result Report

Test Summary

Overall Test Result	Pass
Machine Name	HOST- 2
Test Description	Server 2 3 Copy DAG (2 Local Site + 1 Remote Site) 12 Servers (8 Local Site + 4 Remote Site) 3750 Mailboxes/Server 4 GB Mailbox Size 150 Messages a Day 0.121 IOPs tested 14 DBs per Server
Test Start Time	2/9/2014 4:20:26 PM
Test End Time	2/9/2014 6:50:47 PM
Collection Start Time	2/9/2014 4:27:23 PM
Collection End Time	2/9/2014 6:27:17 PM
Jetstress Version	15.00.0775.000
ESE Version	15.00.0712.008
Operating System	Windows Server 2012 Datacenter (6.2.9200.0)
Performance Log	C:\Program Files\Exchange Jetstress\ESRP-Final\Performance_2014_2_9_16_20_59.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second	623.702
Target Transactional I/O per Second	453.75
Initial Database Size (bytes)	16173711097856
Final Database Size (bytes)	16175590146048
Database Files (Count)	14

Jetstress System Parameters

Thread Count	16
Minimum Database Cache	448.0 MB
Maximum Database Cache	3584.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%
Run Background Database Maintenance	True



Database Configuration

Instance2300.1 Log path: C:\databases\DB1
Database: C:\databases\DB1\Jetstress001001.edb

Instance2300.2 Log path: C:\databases\DB2
Database: C:\databases\DB2\Jetstress002001.edb

Instance2300.3 Log path: C:\databases\DB3
Database: C:\databases\DB3\Jetstress003001.edb

Instance2300.4 Log path: C:\databases\DB4
Database: C:\databases\DB4\Jetstress004001.edb

Instance2300.5 Log path: C:\databases\DB5
Database: C:\databases\DB5\Jetstress005001.edb

Instance2300.6 Log path: C:\databases\DB6
Database: C:\databases\DB6\Jetstress006001.edb

Instance2300.7 Log path: C:\databases\DB7
Database: C:\databases\DB7\Jetstress007001.edb

Instance2300.8 Log path: C:\databases\DB8
Database: C:\databases\DB8\Jetstress008001.edb

Instance2300.9 Log path: C:\databases\DB9
Database: C:\databases\DB9\Jetstress009001.edb

Instance2300.10 Log path: C:\databases\DB10
Database: C:\databases\DB10\Jetstress010001.edb

Instance2300.11 Log path: C:\databases\DB11
Database: C:\databases\DB11\Jetstress011001.edb

Instance2300.12 Log path: C:\databases\DB12
Database: C:\databases\DB12\Jetstress012001.edb

Instance2300.13 Log path: C:\databases\DB13
Database: C:\databases\DB13\Jetstress013001.edb

Instance2300.14 Log path: C:\databases\DB14
Database: C:\databases\DB14\Jetstress014001.edb



Transactional I/O Performance

MSExchange Database => Instance	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
Instance2300.1	13.378	9.222	10.478	13.387	33600.978	33522.709	0.000	2.925	0.000	3.218	0.000	20819.340
Instance2300.2	16.165	9.103	10.361	13.699	33569.382	33568.176	0.000	2.747	0.000	3.276	0.000	21301.395
Instance2300.3	15.802	9.470	10.659	13.903	33641.664	33620.875	0.000	3.005	0.000	3.248	0.000	20908.596
Instance2300.4	16.579	9.979	10.655	13.998	33619.721	33513.427	0.000	2.324	0.000	3.308	0.000	21098.717
Instance2300.5	15.644	9.227	10.657	14.057	33570.313	33541.760	0.000	2.655	0.000	3.330	0.000	20841.616
Instance2300.6	16.195	9.207	10.433	13.798	33640.398	33297.607	0.000	2.346	0.000	3.298	0.000	20895.602
Instance2300.7	13.848	8.308	10.887	14.037	33624.820	33520.808	0.000	2.436	0.000	3.291	0.000	20263.722
Instance2300.8	16.691	7.928	10.650	13.767	33629.615	33511.951	0.000	2.215	0.000	3.250	0.000	20642.649
Instance2300.9	16.162	9.171	10.757	14.043	33604.534	33502.216	0.000	2.603	0.000	3.321	0.000	20520.800
Instance2300.10	16.693	9.487	10.877	13.812	33694.482	33648.260	0.000	2.662	0.000	3.288	0.000	20826.802
Instance2300.11	15.700	9.316	10.822	13.794	33594.602	33606.007	0.000	2.953	0.000	3.214	0.000	20616.057
Instance2300.12	16.337	9.519	10.950	14.050	33672.587	33441.842	0.000	3.165	0.000	3.298	0.000	20329.075
Instance2300.13	15.822	9.070	10.625	13.738	33645.276	33450.027	0.000	2.837	0.000	3.246	0.000	20501.467
Instance2300.14	16.413	9.081	10.777	14.111	33737.305	33524.049	0.000	2.235	0.000	3.341	0.000	20844.462

Background Database Maintenance I/O Performance

MSExchange Database => Instance	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance2300.1	8.547	261810.339
Instance2300.2	8.499	261796.838
Instance2300.3	8.309	261738.214
Instance2300.4	8.459	261797.820
Instance2300.5	8.528	261751.514
Instance2300.6	8.515	261640.233
Instance2300.7	8.306	261773.476
Instance2300.8	8.463	261814.966
Instance2300.9	8.302	261841.913
Instance2300.10	8.477	261770.736
Instance2300.11	8.529	261782.354
Instance2300.12	8.497	261812.048
Instance2300.13	8.563	261746.682
Instance2300.14	8.507	261764.239

Log Replication I/O Performance

MSExchange Database => Instance	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance2300.1	0.566	110106.503
Instance2300.2	0.581	113982.298
Instance2300.3	0.574	111649.125
Instance2300.4	0.589	114574.461
Instance2300.5	0.591	115585.613
Instance2300.6	0.586	114086.910
Instance2300.7	0.566	110695.713
Instance2300.8	0.571	111633.611
Instance2300.9	0.579	112624.257
Instance2300.10	0.579	112624.257
Instance2300.11	0.564	110196.503
Instance2300.12	0.571	111161.604
Instance2300.13	0.564	110643.407
Instance2300.14	0.589	114574.461



Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.959	0.519	1.280
Available MBytes	26055.400	26049.000	27120.000
Free System Page Table Entries	33530833.502	33530800.000	33530854.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	234006742.762	233938944.000	234639360.000
Pool Paged Bytes	11711101.054	117059864.000	117116928.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

2/9/2014 4:20:26 PM -- Preparing for testing ...
 2/9/2014 4:20:41 PM -- Attaching databases ...
 2/9/2014 4:20:41 PM -- Preparations for testing are complete.
 2/9/2014 4:20:41 PM -- Starting transaction display.
 2/9/2014 4:20:41 PM -- Database cache settings: (minimum: 448.0 MB, maximum: 3.5 GB)
 2/9/2014 4:20:41 PM -- Database flush thresholds: (start: 35.8 MB, stop: 71.7 MB)
 2/9/2014 4:20:59 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
 2/9/2014 4:20:59 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
 2/9/2014 4:21:01 PM -- Operation mix: Sessions 16, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
 2/9/2014 4:21:01 PM -- Performance logging started (interval: 15000 ms).
 2/9/2014 4:21:01 PM -- Attaining prerequisites:
 2/9/2014 4:27:23 PM -- VMExchange Database(JetstressWin)\Database Cache Size, Last: 3384381000.0 (lower bound: 3382287000.0, upper bound: none)
 2/9/2014 4:27:24 PM -- Performance logging has ended.
 2/9/2014 6:50:19 PM -- JetInterop batch transaction status: 9648, 9648, 9648, 9648, 9648, 9648, 9648, 9648, 9648, 9648, 9647 and 9647.
 2/9/2014 6:50:19 PM -- Dispatching transactions ends.
 2/9/2014 6:50:21 PM -- Shutting down databases.
 2/9/2014 6:50:47 PM -- Instance2300.1 (complete), Instance2300.2 (complete), Instance2300.3 (complete), Instance2300.4 (complete), Instance2300.5 (complete), Instance2300.6 (complete), Instance2300.7 (complete), Instance2300.8 (complete), Instance2300.9 (complete), Instance2300.10 (complete), Instance2300.11 (complete), Instance2300.12 (complete), Instance2300.13 (complete) and Instance2300.14 (complete).
 2/9/2014 6:50:47 PM -- C:\Program Files\Exchange\Jetstress\667-Final\Performance 2014_2_9_16_20_89.xls has 503 samples.
 2/9/2014 6:50:47 PM -- Creating test report ...
 2/9/2014 6:50:53 PM -- Instance2300.1 has 15.6 for I/O Database Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.1 has 2.0 for I/O Log Writes Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.1 has 2.9 for I/O Log Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.2 has 16.2 for I/O Database Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.2 has 2.2 for I/O Log Writes Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.2 has 2.2 for I/O Log Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.3 has 15.8 for I/O Database Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.3 has 3.0 for I/O Log Writes Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.3 has 3.0 for I/O Log Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.4 has 16.6 for I/O Database Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.4 has 2.3 for I/O Log Writes Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.4 has 2.3 for I/O Log Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.5 has 15.6 for I/O Database Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.5 has 2.7 for I/O Log Writes Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.5 has 2.7 for I/O Log Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.6 has 16.2 for I/O Database Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.6 has 2.3 for I/O Log Writes Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.6 has 2.9 for I/O Log Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.7 has 15.8 for I/O Database Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.7 has 2.4 for I/O Log Writes Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.7 has 2.4 for I/O Log Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.8 has 16.7 for I/O Database Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.8 has 2.2 for I/O Log Writes Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.8 has 2.2 for I/O Log Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.9 has 16.2 for I/O Database Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.9 has 2.6 for I/O Log Writes Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.9 has 2.6 for I/O Log Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.10 has 16.7 for I/O Database Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.10 has 2.7 for I/O Log Writes Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.10 has 2.7 for I/O Log Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.11 has 15.9 for I/O Database Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.11 has 3.0 for I/O Log Writes Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.11 has 3.0 for I/O Log Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.12 has 16.2 for I/O Database Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.12 has 3.2 for I/O Log Writes Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.12 has 3.2 for I/O Log Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.13 has 15.0 for I/O Database Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.13 has 2.8 for I/O Log Writes Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.13 has 2.8 for I/O Log Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.14 has 16.4 for I/O Database Reads Average Latency.
 2/9/2014 6:50:53 PM -- Instance2300.14 has 2.2 for I/O Log Writes Average Latency.



A.3 Server 3

Microsoft Exchange Jetstress 2013

Performance Test Result Report

Test Summary

Overall Test Result	Pass
Machine Name	HOST-3
Test Description	Server 3 3 Copy DAG (2 Local Site + 1 Remote Site) 12 Servers (8 Local Site + 4 Remote Site) 3750 Mailboxes/Server 4 GB Mailbox Size 150 Messages a Day 0.121 IOPs tested 14 DBs per Server
Test Start Time	2/9/2014 4:20:39 PM
Test End Time	2/9/2014 6:50:15 PM
Collection Start Time	2/9/2014 4:28:34 PM
Collection End Time	2/9/2014 6:28:29 PM
Jetstress Version	15.00.0775.000
ESE Version	15.00.0712.008
Operating System	Windows Server 2012 Datacenter (6.2.9200.0)
Performance Log	C:\Program Files\Exchange Jetstress\ESRP-Final\Performance_2014_2_9_16_21_11.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second	609.888
Target Transactional I/O per Second	453.75
Initial Database Size (bytes)	16175355265024
Final Database Size (bytes)	16177158815744
Database Files (Count)	14

Jetstress System Parameters

Thread Count	16
Minimum Database Cache	448.0 MB
Maximum Database Cache	3584.0 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	3



Database Configuration

Instance880.1 Log path: C:\databases\DB1
Database: C:\databases\DB1\Uetstress001001.edb

Instance880.2 Log path: C:\databases\DB2
Database: C:\databases\DB2\Uetstress002001.edb

Instance880.3 Log path: C:\databases\DB3
Database: C:\databases\DB3\Uetstress003001.edb

Instance880.4 Log path: C:\databases\DB4
Database: C:\databases\DB4\Uetstress004001.edb

Instance880.5 Log path: C:\databases\DB5
Database: C:\databases\DB5\Uetstress005001.edb

Instance880.6 Log path: C:\databases\DB6
Database: C:\databases\DB6\Uetstress006001.edb

Instance880.7 Log path: C:\databases\DB7
Database: C:\databases\DB7\Uetstress007001.edb

Instance880.8 Log path: C:\databases\DB8
Database: C:\databases\DB8\Uetstress008001.edb

Instance880.9 Log path: C:\databases\DB9
Database: C:\databases\DB9\Uetstress009001.edb

Instance880.10 Log path: C:\databases\DB10
Database: C:\databases\DB10\Uetstress010001.edb

Instance880.11 Log path: C:\databases\DB11
Database: C:\databases\DB11\Uetstress011001.edb

Instance880.12 Log path: C:\databases\DB12
Database: C:\databases\DB12\Uetstress012001.edb

Instance880.13 Log path: C:\databases\DB13
Database: C:\databases\DB13\Uetstress013001.edb

Instance880.14 Log path: C:\databases\DB14
Database: C:\databases\DB14\Uetstress014001.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
Instance880.1	13.454	7.379	29.720	13.492	33844.917	33533.016	0.000	2.159	0.000	3.156	0.000	21230.167
Instance880.2	16.016	8.039	29.808	13.407	33667.8769	33073.935	0.000	2.315	0.000	3.130	0.000	21332.390
Instance880.3	15.609	7.985	30.006	13.490	32842.116	3547.422	0.000	2.532	0.000	3.215	0.000	20596.459
Instance880.4	15.991	7.924	29.952	13.782	33830.374	35473.531	0.000	2.760	0.000	3.235	0.000	20940.091
Instance880.5	15.259	8.705	30.064	13.689	33740.153	35433.192	0.000	2.682	0.000	3.204	0.000	20844.920
Instance880.6	16.082	8.928	30.033	13.679	33823.110	35508.227	0.000	2.529	0.000	3.232	0.000	20677.854
Instance880.7	10.600	10.400	29.990	13.507	33733.441	35496.332	0.000	4.005	0.000	3.130	0.000	20779.516
Instance880.8	19.589	10.061	30.048	13.608	33721.259	35478.110	0.000	3.633	0.000	3.199	0.000	20645.539
Instance880.9	15.449	9.712	29.866	13.653	33834.901	35530.070	0.000	2.873	0.000	3.215	0.000	20959.252
Instance880.10	16.069	8.961	30.273	13.846	33759.763	35511.809	0.000	2.454	0.000	3.288	0.000	20240.570
Instance880.11	13.946	8.621	29.945	13.342	33823.174	35337.635	0.000	2.785	0.000	3.174	0.000	20395.215
Instance880.12	16.316	9.132	30.197	13.034	33750.500	35482.361	0.000	2.651	0.000	3.214	0.000	20864.060
Instance880.13	15.356	7.223	29.876	13.485	33867.552	35545.020	0.000	2.846	0.000	3.167	0.000	21078.527
Instance880.14	15.885	7.316	29.732	13.359	33772.204	35617.421	0.000	2.682	0.000	3.179	0.000	20862.260



Background Database Maintenance I/O Performance

MSExchange Database => Instance	Database Maintenance I/O Reads/sec	Database Maintenance I/O Reads Average Bytes
Instance880.1	8.597	261778.726
Instance880.2	8.517	261751.437
Instance880.3	8.561	261770.438
Instance880.4	8.546	261747.625
Instance880.5	8.562	261771.932
Instance880.6	8.510	261759.072
Instance880.7	8.410	261628.669
Instance880.8	8.313	261628.739
Instance880.9	8.600	261877.326
Instance880.10	8.525	261739.896
Instance880.11	8.568	261782.200
Instance880.12	8.497	261837.909
Instance880.13	8.582	261629.717
Instance880.14	8.500	261024.009

Log Replication I/O Performance

MSExchange Database => Instance	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance880.1	0.569	111109.299
Instance880.2	0.561	109211.401
Instance880.3	0.556	108226.299
Instance880.4	0.569	110674.054
Instance880.5	0.564	110229.267
Instance880.6	0.564	110134.197
Instance880.7	0.551	107696.442
Instance880.8	0.556	108273.060
Instance880.9	0.569	110979.190
Instance880.10	0.566	110659.265
Instance880.11	0.556	108226.299
Instance880.12	0.564	109735.713
Instance880.13	0.564	109698.932
Instance880.14	0.561	109646.646

Total I/O Performance

MSExchange Database => Instance	I/O Database Reads Average Latency (msec)	I/O Database Reads Average	I/O Database Writes Average Latency (msec)	I/O Database Writes Average	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Reads Average	I/O Log Writes Average Latency (msec)	I/O Log Writes Average	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance880.1	15.454	7.579	38.317	13.492	84985.103	35533.016	1.159	2.159	0.569	3.156	111109.299	21250.167
Instance880.2	16.016	8.259	38.323	13.407	84362.980	33973.935	0.696	2.313	0.561	3.130	109211.401	21352.390
Instance880.3	15.609	7.885	38.567	13.490	84436.000	35547.422	0.837	2.532	0.556	3.215	108226.299	20596.459
Instance880.4	15.991	7.924	38.497	13.782	84423.405	35473.531	0.936	2.260	0.569	3.235	110674.054	20940.091
Instance880.5	13.239	8.702	38.626	13.689	84286.097	35433.192	0.913	2.682	0.564	3.204	110229.267	20844.920
Instance880.6	16.082	8.928	38.942	13.679	84148.164	35508.227	0.759	2.529	0.564	3.232	110134.197	20677.854
Instance880.7	18.600	10.403	38.404	13.507	83641.477	35496.332	0.793	4.000	0.551	3.139	107696.442	20979.016
Instance880.8	19.589	10.061	38.361	13.608	83153.026	35478.110	0.909	3.633	0.556	3.199	108273.060	20645.539
Instance880.9	15.449	9.212	38.465	13.653	84820.242	35530.070	0.812	2.873	0.569	3.215	110979.190	20959.252
Instance880.10	16.089	8.961	38.798	13.846	83833.144	35511.809	0.822	2.454	0.566	3.288	110659.265	20240.970
Instance880.11	15.546	8.621	38.514	13.542	84538.834	35537.635	1.078	2.785	0.556	3.174	108226.299	20595.215
Instance880.12	16.316	8.132	38.695	13.834	83844.769	35482.361	0.842	2.651	0.564	3.214	109735.713	20864.060
Instance880.13	15.356	7.323	38.458	13.483	84693.214	35545.020	0.797	2.546	0.564	3.167	109698.932	21078.027
Instance880.14	15.885	7.316	38.312	13.359	84845.058	35617.421	0.796	2.682	0.561	3.179	109646.646	20862.260

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.942	0.468	1.322
Available MBytes	26917.199	26911.000	27037.000
Free System Page Table Entries	33553853.971	33553852.000	33553854.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	232844931.548	232648704.000	23312256.000
Pool Paged Bytes	117716409.303	117623204.000	117824208.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



Test Log

2/9/2014 4:20:39 PM -- Preparing for testing ...

2/9/2014 4:20:53 PM -- Attaching databases ...

2/9/2014 4:20:53 PM -- Preparations for testing are complete.

2/9/2014 4:20:53 PM -- Starting transaction dispatch

2/9/2014 4:20:53 PM -- Database cache settings: (minimum: 448.0 MB, maximum: 3.3 GB)

2/9/2014 4:20:53 PM -- Database flush thresholds: (start: 35.8 MB, step: 71.7 MB)

2/9/2014 4:21:11 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).

2/9/2014 4:21:11 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).

2/9/2014 4:21:12 PM -- Operation mix: Sessions 10, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.

2/9/2014 4:21:12 PM -- Performance logging started (interval: 15000 ms).

2/9/2014 4:21:12 PM -- Attaining prerequisites:

2/9/2014 4:28:04 PM -- (MSExchangeDatabaseJetstressWin)\Database Cache Size. Last: 3400081000.0 (lower bound: 3382287000.0, upper bound: none)

2/9/2014 4:28:04 PM -- Performance logging has ended.

2/9/2014 4:49:01 PM -- Jetstress batch transaction stats: 9300, 9300, 9300, 9300, 9300, 9300, 9300, 9300, 9300, 9300, 9300 and 9299.

2/9/2014 4:49:01 PM -- Dispatching transactions ends.

2/9/2014 4:49:02 PM -- Shutting down databases ...

2/9/2014 6:50:15 PM -- Instance880.1 (complete), Instance880.2 (complete), Instance880.3 (complete), Instance880.4 (complete), Instance880.5 (complete), Instance880.6 (complete), Instance880.7 (complete), Instance880.8 (complete), Instance880.9 (complete), Instance880.10 (complete), Instance880.11 (complete), Instance880.12 (complete), Instance880.13 (complete) and Instance880.14 (complete)

2/9/2014 6:50:15 PM -- C:\Program Files\Exchange Jetstress\ESKP-Final\Performance_2014_2_9_16_21_11.blg has 507 samples.

2/9/2014 6:50:15 PM -- Creating test report ...

2/9/2014 6:50:22 PM -- Instance880.1 has 15.5 for I/O Database Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.1 has 2.2 for I/O Log Writes Average Latency.

2/9/2014 6:50:22 PM -- Instance880.1 has 2.2 for I/O Log Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.2 has 15.0 for I/O Database Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.2 has 2.3 for I/O Log Writes Average Latency.

2/9/2014 6:50:22 PM -- Instance880.2 has 2.3 for I/O Log Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.3 has 15.6 for I/O Database Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.3 has 2.3 for I/O Log Writes Average Latency.

2/9/2014 6:50:22 PM -- Instance880.3 has 2.3 for I/O Log Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.4 has 16.0 for I/O Database Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.4 has 2.3 for I/O Log Writes Average Latency.

2/9/2014 6:50:22 PM -- Instance880.4 has 2.3 for I/O Log Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.5 has 15.3 for I/O Database Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.5 has 2.7 for I/O Log Writes Average Latency.

2/9/2014 6:50:22 PM -- Instance880.5 has 2.7 for I/O Log Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.6 has 16.1 for I/O Database Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.6 has 2.5 for I/O Log Writes Average Latency.

2/9/2014 6:50:22 PM -- Instance880.6 has 2.5 for I/O Log Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.7 has 10.6 for I/O Database Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.7 has 4.0 for I/O Log Writes Average Latency.

2/9/2014 6:50:22 PM -- Instance880.7 has 4.0 for I/O Log Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.8 has 19.6 for I/O Database Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.8 has 3.6 for I/O Log Writes Average Latency.

2/9/2014 6:50:22 PM -- Instance880.8 has 3.6 for I/O Log Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.9 has 15.4 for I/O Database Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.9 has 2.9 for I/O Log Writes Average Latency.

2/9/2014 6:50:22 PM -- Instance880.9 has 2.9 for I/O Log Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.10 has 16.1 for I/O Database Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.10 has 2.3 for I/O Log Writes Average Latency.

2/9/2014 6:50:22 PM -- Instance880.10 has 2.3 for I/O Log Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.11 has 15.5 for I/O Database Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.11 has 2.8 for I/O Log Writes Average Latency.

2/9/2014 6:50:22 PM -- Instance880.11 has 2.8 for I/O Log Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.12 has 16.3 for I/O Database Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.12 has 2.7 for I/O Log Writes Average Latency.

2/9/2014 6:50:22 PM -- Instance880.12 has 2.7 for I/O Log Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.13 has 15.4 for I/O Database Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.13 has 2.5 for I/O Log Writes Average Latency.

2/9/2014 6:50:22 PM -- Instance880.13 has 2.5 for I/O Log Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.14 has 15.9 for I/O Database Reads Average Latency.

2/9/2014 6:50:22 PM -- Instance880.14 has 2.7 for I/O Log Writes Average Latency.

2/9/2014 6:50:22 PM -- Instance880.14 has 2.7 for I/O Log Reads Average Latency.

2/9/2014 6:50:22 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.

2/9/2014 6:50:22 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.

2/9/2014 6:50:22 PM -- C:\Program Files\Exchange Jetstress\ESKP-Final\Performance_2014_2_9_16_21_11.xml has 477 samples queued.



A.4 Server 4

Microsoft Exchange Jetstress 2013

Performance Test Result Report

Test Summary

Overall Test Result	Pass
Machine Name	HOST- 4
Test Description	Server 4 3 Copy DAG (2 Local Site + 1 Remote Site) 12 Servers (8 Local Site + 4 Remote Site) 3750 Mailboxes/Server 4 GB Mailbox Size 150 Messages a Day 0.121 IOPs tested 14 DBs per Server
Test Start Time	2/9/2014 4:20:39 PM
Test End Time	2/9/2014 6:51:05 PM
Collection Start Time	2/9/2014 4:28:24 PM
Collection End Time	2/9/2014 6:28:14 PM
Jetstress Version	15.00.0775.000
ESE Version	15.00.0712.008
Operating System	Windows Server 2012 Datacenter (6.2.9200.0)
Performance Log	C:\Program Files\Exchange Jetstress\Final-ESRP\Performance_2014_2_9_16_21_10.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second	633.922
Target Transactional I/O per Second	453.75
Initial Database Size (bytes)	16173400719360
Final Database Size (bytes)	16175271378944
Database Files (Count)	14

Jetstress System Parameters

Thread Count	16
Minimum Database Cache	448.0 MB
Maximum Database Cache	3584.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%
Run Background Database Maintenance	True



Database Configuration

Instance3088.1 Log path: C:\databases\DB1
Database: C:\databases\DB1\teststress001001.edb

Instance3088.2 Log path: C:\databases\DB2
Database: C:\databases\DB2\teststress002001.edb

Instance3088.3 Log path: C:\databases\DB3
Database: C:\databases\DB3\teststress003001.edb

Instance3088.4 Log path: C:\databases\DB4
Database: C:\databases\DB4\teststress004001.edb

Instance3088.5 Log path: C:\databases\DB5
Database: C:\databases\DB5\teststress005001.edb

Instance3088.6 Log path: C:\databases\DB6
Database: C:\databases\DB6\teststress006001.edb

Instance3088.7 Log path: C:\databases\DB7
Database: C:\databases\DB7\teststress007001.edb

Instance3088.8 Log path: C:\databases\DB8
Database: C:\databases\DB8\teststress008001.edb

Instance3088.9 Log path: C:\databases\DB9
Database: C:\databases\DB9\teststress009001.edb

Instance3088.10 Log path: C:\databases\DB10
Database: C:\databases\DB10\teststress010001.edb

Instance3088.11 Log path: C:\databases\DB11
Database: C:\databases\DB11\teststress011001.edb

Instance3088.12 Log path: C:\databases\DB12
Database: C:\databases\DB12\teststress012001.edb

Instance3088.13 Log path: C:\databases\DB13
Database: C:\databases\DB13\teststress013001.edb

Instance3088.14 Log path: C:\databases\DB14
Database: C:\databases\DB14\teststress014001.edb

Transactional I/O Performance

MSExchangeDatabase ==>	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
Instance3088.1	13.388	9.305	31.161	13.987	33411.099	35550.671	0.000	2.689	0.000	3.284	0.000	20428.128
Instance3088.2	16.411	8.919	31.289	14.331	33321.669	35481.911	0.000	2.273	0.000	3.390	0.000	20398.229
Instance3088.3	16.065	7.673	31.174	14.214	33428.321	35550.638	0.000	3.033	0.000	3.367	0.000	20447.353
Instance3088.4	16.978	7.493	31.235	14.308	33471.254	35463.945	0.000	2.304	0.000	3.367	0.000	20541.546
Instance3088.5	15.777	7.705	31.152	14.026	33449.044	35395.136	0.000	2.784	0.000	3.254	0.000	20591.352
Instance3088.6	16.485	9.824	30.999	14.136	33499.669	35339.861	0.000	2.930	0.000	3.343	0.000	20840.162
Instance3088.7	15.810	9.153	31.179	14.244	33432.428	35514.229	0.000	2.732	0.000	3.383	0.000	20485.300
Instance3088.8	16.402	8.881	31.108	14.158	33506.834	35335.466	0.000	2.463	0.000	3.324	0.000	20630.941
Instance3088.9	16.180	8.384	31.183	14.274	33480.326	35521.355	0.000	2.760	0.000	3.370	0.000	20701.845
Instance3088.10	16.774	8.644	31.043	14.003	33478.124	35552.692	0.000	2.419	0.000	3.296	0.000	20729.298
Instance3088.11	13.961	9.296	30.777	14.112	33210.438	35341.364	0.000	2.618	0.000	3.376	0.000	20929.438
Instance3088.12	16.497	8.869	31.016	14.160	33496.546	35465.046	0.000	3.103	0.000	3.343	0.000	20611.622
Instance3088.13	15.687	8.365	31.162	14.133	33454.072	35407.118	0.000	3.036	0.000	3.304	0.000	21095.027
Instance3088.14	16.397	7.829	31.201	14.160	33460.608	35543.491	0.000	2.392	0.000	3.324	0.000	20509.034



Background Database Maintenance I/O Performance

MSExchange Database => Instance	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3088.1	8.589	261790.847
Instance3088.2	8.523	261754.109
Instance3088.3	8.546	261721.783
Instance3088.4	8.457	261796.427
Instance3088.5	8.550	261800.850
Instance3088.6	8.521	261796.015
Instance3088.7	8.553	261820.670
Instance3088.8	8.496	261780.369
Instance3088.9	8.513	261757.537
Instance3088.10	8.521	261694.417
Instance3088.11	8.562	261827.738
Instance3088.12	8.513	261766.658
Instance3088.13	8.565	261753.027
Instance3088.14	8.533	261740.327

Log Replication I/O Performance

MSExchange Database => Instance	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3088.1	0.571	111161.604
Instance3088.2	0.586	114611.222
Instance3088.3	0.581	113547.053
Instance3088.4	0.584	114086.910
Instance3088.5	0.576	112671.581
Instance3088.6	0.586	114086.910
Instance3088.7	0.589	114574.461
Instance3088.8	0.581	110311.808
Instance3088.9	0.591	110507.747
Instance3088.10	0.576	112571.951
Instance3088.11	0.599	116524.664
Instance3088.12	0.584	113599.359
Instance3088.13	0.586	114086.910
Instance3088.14	0.579	112624.257

Total I/O Performance

MSExchange Database => Instance	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
Instance3088.1	15.588	9.205	39.750	13.987	82757.710	35550.671	0.995	2.689	0.571	2.284	111161.604	20428.128
Instance3088.2	16.411	8.919	39.812	14.331	82981.656	35481.911	0.845	2.273	0.586	3.390	114611.222	20398.225
Instance3088.3	16.065	7.673	39.720	14.214	82544.919	35550.628	0.937	3.033	0.581	3.367	113547.053	20447.355
Instance3088.4	16.978	7.493	39.692	14.306	82119.560	35463.945	0.986	2.354	0.584	3.367	114086.910	20541.546
Instance3088.5	15.999	9.785	39.703	14.076	82677.958	35395.136	0.940	2.754	0.576	3.294	112671.581	20691.352
Instance3088.6	16.485	9.834	39.520	14.136	82724.786	35539.861	1.041	2.530	0.586	3.343	114086.910	20840.462
Instance3088.7	15.810	9.133	39.732	14.244	82999.297	35514.229	0.815	2.732	0.589	3.383	114574.461	20485.300
Instance3088.8	16.402	8.881	39.603	14.138	82477.823	35520.466	1.020	2.463	0.581	3.324	113111.808	20630.941
Instance3088.9	16.180	8.384	39.698	14.274	82446.186	35521.353	1.018	2.760	0.591	3.370	110311.808	20701.847
Instance3088.10	16.774	8.644	39.264	14.003	82629.736	35552.692	1.038	2.419	0.576	3.296	112571.951	20729.298
Instance3088.11	15.861	9.296	39.339	14.112	83205.109	35541.364	0.920	2.618	0.599	3.376	116524.664	20929.438
Instance3088.12	16.497	8.869	39.329	14.160	82658.423	35465.046	0.954	3.103	0.584	3.343	113599.359	20611.622
Instance3088.13	15.607	0.365	39.727	14.133	82673.797	35487.110	1.000	3.036	0.586	3.304	114086.910	21095.027
Instance3088.14	16.397	7.829	39.733	14.160	82484.524	35542.491	0.790	2.392	0.579	3.324	112624.257	20809.034



B Stress Test Result Report

B.1 Server 1

Microsoft Exchange Jetstress 2013

Stress Test Result Report

Test Summary

Overall Test Result	Pass
Machine Name	HOST-1
Test Description	Server 1 3 Copy DAG (2 Local Site + 1 Remote Site) 12 Servers (8 Local Site + 4 Remote Site) 3750 Mailboxes/Server 4 GB Mailbox Size 150 Messages a Day 0.121 IOPs tested 14 DBs per Server
Test Start Time	2/8/2014 12:59:43 PM
Test End Time	2/9/2014 4:17:02 PM
Collection Start Time	2/8/2014 1:06:48 PM
Collection End Time	2/9/2014 1:06:36 PM
Jetstress Version	15.00.0775.000
ESE Version	15.00.0712.008
Operating System	Windows Server 2012 Datacenter (6.2.9200.0)
Performance Log	C:\Program Files\Exchange Jetstress\ESRP-Final\Stress_2014_2_8_13_0_15.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second	642.116
Target Transactional I/O per Second	453.75
Initial Database Size (bytes)	16153049956352
Final Database Size (bytes)	16174214414336
Database Files (Count)	14

Jetstress System Parameters

Thread Count	16
Minimum Database Cache	448.0 MB
Maximum Database Cache	3584.0 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	3



Database Configuration

Instance3068.1 Log path: C:\databases\DB1
Database: C:\databases\DB1\Jetstress001001.edb

Instance3068.2 Log path: C:\databases\DB2
Database: C:\databases\DB2\Jetstress002001.edb

Instance3068.3 Log path: C:\databases\DB3
Database: C:\databases\DB3\Jetstress003001.edb

Instance3068.4 Log path: C:\databases\DB4
Database: C:\databases\DB4\Jetstress004001.edb

Instance3068.5 Log path: C:\databases\DB5
Database: C:\databases\DB5\Jetstress005001.edb

Instance3068.6 Log path: C:\databases\DB6
Database: C:\databases\DB6\Jetstress006001.edb

Instance3068.7 Log path: C:\databases\DB7
Database: C:\databases\DB7\Jetstress007001.edb

Instance3068.8 Log path: C:\databases\DB8
Database: C:\databases\DB8\Jetstress008001.edb

Instance3068.9 Log path: C:\databases\DB9
Database: C:\databases\DB9\Jetstress009001.edb

Instance3068.10 Log path: C:\databases\DB10
Database: C:\databases\DB10\Jetstress010001.edb

Instance3068.11 Log path: C:\databases\DB11
Database: C:\databases\DB11\Jetstress011001.edb

Instance3068.12 Log path: C:\databases\DB12
Database: C:\databases\DB12\Jetstress012001.edb

Instance3068.13 Log path: C:\databases\DB13
Database: C:\databases\DB13\Jetstress013001.edb

Instance3068.14 Log path: C:\databases\DB14
Database: C:\databases\DB14\Jetstress014001.edb

Transactional I/O Performance

Instance	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
Instance3068.1	15.025	7.523	31.452	14.206	33627.382	35659.387	0.000	2.421	0.000	3.275	0.000	20857.488
Instance3068.2	15.560	7.240	31.453	14.316	33658.654	35666.166	0.000	2.477	0.000	3.273	0.000	20810.905
Instance3068.3	15.324	7.557	31.524	14.368	33625.803	35642.681	0.000	2.446	0.000	3.389	0.000	20699.406
Instance3068.4	15.748	7.247	31.503	14.329	33620.128	35675.363	0.000	2.413	0.000	3.380	0.000	20794.074
Instance3068.5	15.025	7.828	31.505	14.321	33653.591	35674.355	0.000	2.493	0.000	3.374	0.000	20714.367
Instance3068.6	15.430	7.390	31.503	14.332	33674.372	35684.624	0.000	2.466	0.000	3.372	0.000	20794.481
Instance3068.7	15.273	7.790	31.545	14.372	33638.227	35612.115	0.000	2.477	0.000	3.378	0.000	20711.485
Instance3068.8	15.676	7.237	31.528	14.336	33644.938	35647.780	0.000	2.383	0.000	3.377	0.000	20738.079
Instance3068.9	15.228	7.651	31.609	14.417	33641.499	35643.679	0.000	2.318	0.000	3.387	0.000	20696.203
Instance3068.10	15.604	7.292	31.375	14.381	33636.325	35682.868	0.000	2.378	0.000	3.390	0.000	20686.409
Instance3068.11	15.271	7.487	31.458	14.333	33656.249	35669.473	0.000	2.598	0.000	3.381	0.000	20883.440
Instance3068.12	15.792	7.023	31.486	14.339	33662.191	35645.020	0.000	2.343	0.000	3.377	0.000	20775.733
Instance3068.13	15.209	7.190	31.536	14.356	33629.373	35632.050	0.000	2.423	0.000	3.387	0.000	20667.288
Instance3068.14	15.716	7.010	31.551	14.381	33608.007	35650.115	0.000	2.309	0.000	3.391	0.000	20661.945



Background Database Maintenance I/O Performance

Instance	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3068.1	9.009	261762.153
Instance3068.2	8.979	261792.515
Instance3068.3	8.987	261757.493
Instance3068.4	8.966	261794.809
Instance3068.5	9.031	261758.340
Instance3068.6	8.015	261777.095
Instance3068.7	8.999	261748.664
Instance3068.8	8.996	261787.215
Instance3068.9	8.997	261705.104
Instance3068.10	8.973	261790.305
Instance3068.11	9.004	261786.709
Instance3068.12	8.962	261767.020
Instance3068.13	9.037	261774.257
Instance3068.14	9.003	261762.807

Log Replication I/O Performance

Instance	IO Log Reads/sec	IO Log Reads Average Bytes
Instance3068.1	0.594	115756.778
Instance3068.2	0.593	115492.970
Instance3068.3	0.593	115707.467
Instance3068.4	0.593	115492.047
Instance3068.5	0.591	115382.000
Instance3068.6	0.593	115516.591
Instance3068.7	0.592	115349.517
Instance3068.8	0.592	115510.202
Instance3068.9	0.593	115600.198
Instance3068.10	0.592	115399.208
Instance3068.11	0.593	115606.810
Instance3068.12	0.593	115550.088
Instance3068.13	0.592	115477.746
Instance3068.14	0.594	115748.686

Total I/O Performance

Instance	IO Database Reads Average Latency (msec)	IO Database Writes Average Latency (msec)	IO Database Reads/sec	IO Database Writes/sec	IO Database Reads Average Bytes	IO Database Writes Average Bytes	IO Log Reads Average Latency (msec)	IO Log Writes Average Latency (msec)	IO Log Reads/sec	IO Log Writes/sec	IO Log Reads Average Bytes	IO Log Writes Average Bytes
Instance3068.1	13.023	7.323	40461	14306	84422.389	32659.387	0.995	2.431	0.594	3.373	115756.778	20837.488
Instance3068.2	15.560	7.240	40432	14316	84322.389	32666.166	0.927	2.477	0.593	3.373	115492.970	20810.905
Instance3068.3	15.334	7.557	40511	14368	84324.033	32647.681	0.940	2.446	0.593	3.389	115707.467	20699.406
Instance3068.4	15.748	7.247	40469	14329	84172.119	32675.363	0.902	2.413	0.593	3.380	115492.047	20799.074
Instance3068.5	15.025	7.828	40537	14321	84473.973	32674.255	0.959	2.492	0.591	3.374	115382.000	20716.267
Instance3068.6	15.430	7.990	40518	14332	84427.155	32684.624	0.890	2.466	0.593	3.372	115516.591	20784.481
Instance3068.7	15.273	7.750	40544	14372	84259.908	32621.115	0.924	2.477	0.592	3.378	115349.517	20717.488
Instance3068.8	15.676	7.227	40514	14326	84249.054	32647.780	0.908	2.382	0.592	3.377	115510.202	20738.079
Instance3068.9	15.220	7.651	40507	14417	84191.742	32643.673	0.742	2.518	0.593	3.387	115600.198	20696.203
Instance3068.10	15.604	7.292	40540	14301	84124.639	32662.860	0.901	2.378	0.592	3.390	115399.208	20686.409
Instance3068.11	15.271	7.487	40482	14333	84424.132	32669.473	0.938	2.398	0.593	3.381	115606.810	20883.440
Instance3068.12	15.792	7.023	40448	14339	84402.893	32640.020	0.940	2.343	0.593	3.377	115550.088	20775.733
Instance3068.13	15.209	7.196	40573	14356	84442.631	32632.038	0.949	2.423	0.592	3.387	115477.746	20667.288
Instance3068.14	15.716	7.010	40554	14381	84226.971	32650.115	0.905	2.309	0.594	3.391	115748.686	20681.945

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	1.577	0.000	5.229
Available MBytes	26430.318	26580.000	26993.000
Free System Page Table Entries	3355883.962	3355846.000	3355856.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	234704959.219	233263104.000	234459136.000
Pool Paged Bytes	110666843.014	110384320.000	111284224.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



Test Log

2/8/2014 12:59:43 PM -- Preparing for testing ...
2/8/2014 12:59:58 PM -- Attaching databases ...
2/8/2014 12:59:58 PM -- Preparations for testing are complete.
2/8/2014 12:59:58 PM -- Starting transaction dispatch ...
2/8/2014 12:59:58 PM -- Database cache settings: (minimum: 448.0 MB, maximum: 2.5 GB)
2/8/2014 12:59:58 PM -- Database flush thresholds: (start: 35.8 MB, stop: 71.7 MB)
2/8/2014 1:00:15 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
2/8/2014 1:00:15 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
2/8/2014 1:00:17 PM -- Operation mix: Sessions 16, Inserts 40%, Deletes 20%, Replaces 5%, Reads 25%, Lazy Commits 70%.
2/8/2014 1:00:17 PM -- Performance logging started (interval: 15000 ms).
2/8/2014 1:00:17 PM -- Attaining prerequisites:
2/8/2014 1:06:48 PM -- (MSExchangeDatabaseJETstressWin)\Database Cache Size, Last: 3392082000.0 (lower bound: 3382287000.0, upper bound: none)
2/9/2014 1:06:49 PM -- Performance logging has ended.
2/9/2014 4:16:35 PM -- Just-in-time batch transaction stats: 108014, 108014, 108014, 108014, 108014, 108014, 108014, 108014, 108014, 108014, 108013 and 108013.
2/9/2014 4:16:35 PM -- Dispatching transactions ends.
2/9/2014 4:16:36 PM -- Shutting down databases ...
2/9/2014 4:17:02 PM -- Instance3068.1 [complete], Instance3068.2 [complete], Instance3068.3 [complete], Instance3068.4 [complete], Instance3068.5 [complete], Instance3068.6 [complete], Instance3068.7 [complete], Instance3068.8 [complete], Instance3068.9 [complete], Instance3068.10 [complete], Instance3068.11 [complete], Instance3068.12 [complete], Instance3068.13 [complete] and Instance3068.14 [complete]
2/9/2014 4:17:02 PM -- C:\Program Files\Exchange\Jestress\ESRP-Final\Stress_2014_2_8_13_0_15.sql has 5769 samples.
2/9/2014 4:17:02 PM -- Creating test report.
2/9/2014 4:18:08 PM -- Instance3068.1 has 15.0 for I/O Database Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.1 has 2.4 for I/O Log Writes Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.1 has 2.4 for I/O Log Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.2 has 15.6 for I/O Database Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.2 has 2.0 for I/O Log Writes Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.2 has 2.3 for I/O Log Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.3 has 15.3 for I/O Database Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.3 has 2.4 for I/O Log Writes Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.3 has 2.4 for I/O Log Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.4 has 15.7 for I/O Database Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.4 has 2.4 for I/O Log Writes Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.4 has 2.4 for I/O Log Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.5 has 15.0 for I/O Database Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.5 has 2.5 for I/O Log Writes Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.5 has 2.5 for I/O Log Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.6 has 15.4 for I/O Database Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.6 has 2.0 for I/O Log Writes Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.6 has 2.3 for I/O Log Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.7 has 15.3 for I/O Database Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.7 has 2.5 for I/O Log Writes Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.7 has 2.5 for I/O Log Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.8 has 15.7 for I/O Database Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.8 has 2.4 for I/O Log Writes Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.8 has 2.4 for I/O Log Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.9 has 15.2 for I/O Database Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.9 has 2.5 for I/O Log Writes Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.9 has 2.5 for I/O Log Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.10 has 15.6 for I/O Database Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.10 has 2.4 for I/O Log Writes Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.10 has 2.4 for I/O Log Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.11 has 15.3 for I/O Database Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.11 has 2.6 for I/O Log Writes Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.11 has 2.6 for I/O Log Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.12 has 15.8 for I/O Database Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.12 has 2.3 for I/O Log Writes Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.12 has 2.3 for I/O Log Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.13 has 15.2 for I/O Database Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.13 has 2.4 for I/O Log Writes Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.13 has 2.4 for I/O Log Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.14 has 15.7 for I/O Database Reads Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.14 has 2.3 for I/O Log Writes Average Latency.
2/9/2014 4:18:08 PM -- Instance3068.14 has 2.3 for I/O Log Reads Average Latency.
2/9/2014 4:18:08 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
2/9/2014 4:18:08 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
2/9/2014 4:18:08 PM -- C:\Program Files\Exchange\Jestress\ESRP-Final\Stress_2014_2_8_13_0_15.sql has 5737 samples queried.



B.2 Server 2

Microsoft Exchange Jetstress 2013

Stress Test Result Report

Test Summary	
Overall Test Result	Pass
Machine Name	HOST-2
Test Description	Server 2 3 Copy DAG (2 Local Site + 1 Remote Site) 12 Servers (8 Local Site + 4 Remote Site) 3750 Mailboxes/Server 4 GB Mailbox Size 150 Messages a Day 0.121 IOPs tested 14 DBs per Server
Test Start Time	2/8/2014 12:59:14 PM
Test End Time	2/9/2014 4:16:41 PM
Collection Start Time	2/8/2014 1:06:54 PM
Collection End Time	2/9/2014 1:06:48 PM
Jetstress Version	15.00.0775.000
ESE Version	15.00.0712.008
Operating System	Windows Server 2012 Datacenter (6.2.9200.0)
Performance Log	C:\Program Files\Exchange Jetstress\ESRP-Final\Stress_2014_2_8_12_59_45.blg

Database Sizing and Throughput	
Achieved Transactional I/O per Second	635.229
Target Transactional I/O per Second	453.75
Initial Database Size (bytes)	16152781520896
Final Database Size (bytes)	16173711097856
Database Files (Count)	14

Jetstress System Parameters	
Thread Count	16
Minimum Database Cache	448.0 MB
Maximum Database Cache	3584.0 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	3



Database Configuration

Instance200.1 Log path: C:\databases\001
Database: C:\databases\001\testres001001.edb

Instance200.2 Log path: C:\databases\002
Database: C:\databases\002\testres002001.edb

Instance200.3 Log path: C:\databases\003
Database: C:\databases\003\testres003001.edb

Instance200.4 Log path: C:\databases\004
Database: C:\databases\004\testres004001.edb

Instance200.5 Log path: C:\databases\005
Database: C:\databases\005\testres005001.edb

Instance200.6 Log path: C:\databases\006
Database: C:\databases\006\testres006001.edb

Instance200.7 Log path: C:\databases\007
Database: C:\databases\007\testres007001.edb

Instance200.8 Log path: C:\databases\008
Database: C:\databases\008\testres008001.edb

Instance200.9 Log path: C:\databases\009
Database: C:\databases\009\testres009001.edb

Instance200.10 Log path: C:\databases\010
Database: C:\databases\010\testres010001.edb

Instance200.11 Log path: C:\databases\011
Database: C:\databases\011\testres011001.edb

Instance200.12 Log path: C:\databases\012
Database: C:\databases\012\testres012001.edb

Instance200.13 Log path: C:\databases\013
Database: C:\databases\013\testres013001.edb

Instance200.14 Log path: C:\databases\014
Database: C:\databases\014\testres014001.edb

Transactional I/O Performance

Instance	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
Instance200.1	15.573	9.405	31.184	14.141	33579.084	35639.406	0.000	2.654	0.000	3.337	0.000	20816.855
Instance200.2	16.002	9.049	31.166	14.137	33580.546	35688.477	0.000	2.565	0.000	3.342	0.000	20817.096
Instance200.3	15.202	9.200	31.167	14.077	33505.741	35020.441	0.000	2.708	0.000	3.330	0.000	20806.692
Instance200.4	15.982	9.020	31.261	14.203	33610.704	36627.433	0.000	2.325	0.000	3.348	0.000	20770.972
Instance200.5	15.475	8.788	31.164	14.127	33600.118	35636.954	0.000	2.626	0.000	3.335	0.000	20855.385
Instance200.6	15.945	8.486	31.217	14.163	33607.220	35640.777	0.000	2.392	0.000	3.343	0.000	20773.806
Instance200.7	15.651	9.253	31.248	14.186	33889.956	35639.693	0.000	2.610	0.000	3.345	0.000	20699.270
Instance200.8	16.171	9.190	31.151	14.126	33609.366	35662.604	0.000	2.483	0.000	3.340	0.000	20880.227
Instance200.9	15.200	9.084	31.213	14.124	33372.834	35617.236	0.000	2.624	0.000	3.341	0.000	20720.216
Instance200.10	15.990	8.942	31.211	14.163	33800.138	35623.468	0.000	2.504	0.000	3.348	0.000	20681.060
Instance200.11	15.739	8.822	31.199	14.189	33581.119	35660.267	0.000	2.798	0.000	3.352	0.000	20750.415
Instance200.12	16.202	8.672	31.233	14.227	33889.781	35633.393	0.000	2.659	0.000	3.337	0.000	20783.437
Instance200.13	16.200	8.466	31.203	14.172	33600.302	35610.023	0.000	2.701	0.000	3.331	0.000	20715.402
Instance200.14	16.713	8.244	31.222	14.204	33897.431	35647.326	0.000	2.455	0.000	3.380	0.000	20623.295



- Background Database Maintenance I/O Performance

MSExchange Database => Instance	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance2200.1	8.536	261788.054
Instance2200.2	8.517	261814.735
Instance2200.3	8.529	261788.089
Instance2200.4	8.518	261809.797
Instance2200.5	8.502	261003.179
Instance2200.6	8.534	261800.339
Instance2200.7	8.535	261810.453
Instance2200.8	8.501	261774.267
Instance2200.9	8.549	261799.738
Instance2200.10	8.516	261000.163
Instance2200.11	8.540	261776.734
Instance2200.12	8.505	261813.534
Instance2200.13	8.534	261768.367
Instance2200.14	8.501	261791.184

- Log Replication I/O Performance

MSExchange Database => Instance	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance2200.1	0.587	114393.545
Instance2200.2	0.500	114851.341
Instance2200.3	0.585	114124.612
Instance2200.4	0.587	114316.610
Instance2200.5	0.587	114573.868
Instance2200.6	0.586	114230.838
Instance2200.7	0.586	114093.992
Instance2200.8	0.589	114753.147
Instance2200.9	0.586	114220.714
Instance2200.10	0.586	114445.415
Instance2200.11	0.589	115007.032
Instance2200.12	0.589	114868.688
Instance2200.13	0.583	113760.416
Instance2200.14	0.589	114859.188

- Total I/O Performance

MSExchange Database => Instance	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
Instance2200.1	15.373	9.405	35.720	14.141	82619.943	35638.406	0.970	2.654	0.587	3.337	114393.545	20816.855
Instance2200.2	16.032	9.049	35.683	14.137	82594.569	35688.477	0.917	2.565	0.588	3.342	114551.341	20817.096
Instance2200.3	15.587	9.268	35.696	14.099	82603.510	35639.441	1.036	2.708	0.585	3.330	114124.612	20806.642
Instance2200.4	15.982	9.020	35.778	14.203	82475.088	35627.433	0.844	2.325	0.587	3.348	114316.610	20770.572
Instance2200.5	15.473	9.790	35.727	14.127	82704.791	35636.934	0.936	2.626	0.587	3.335	114573.868	20855.235
Instance2200.6	15.940	8.486	35.701	14.163	82399.170	35640.777	1.023	2.392	0.586	3.343	114330.838	20773.806
Instance2200.7	15.651	9.293	35.783	14.186	82502.063	35639.693	0.965	2.610	0.586	3.345	114093.992	20699.370
Instance2200.8	16.171	9.190	35.692	14.136	82527.975	35662.604	0.879	2.483	0.589	3.340	114753.147	20880.727
Instance2200.9	15.505	9.084	35.764	14.154	82637.748	35617.296	0.916	2.624	0.586	3.341	114220.714	20720.216
Instance2200.10	15.990	8.742	35.727	14.163	82507.090	35623.465	0.993	2.804	0.586	3.346	114445.415	20681.068
Instance2200.11	15.739	8.822	35.738	14.189	82619.496	35660.267	1.100	2.798	0.589	3.352	115007.032	20750.413
Instance2200.12	16.202	8.672	35.729	14.227	82412.244	35633.393	0.898	2.629	0.589	3.357	114868.688	20783.437
Instance2200.13	16.398	8.466	35.804	14.172	82496.754	35618.229	0.982	2.701	0.583	3.331	113760.416	20715.482
Instance2200.14	16.713	8.244	35.723	14.204	82431.948	35647.236	1.010	2.455	0.589	3.380	114859.188	20623.295

- Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.979	0.000	10.983
Available MBytes	26878.821	26852.000	27120.000
Free System Page Table Entries	33555053.953	33555047.000	33555056.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	233824448.803	233122032.000	234164224.000
Pool Paged Bytes	110632485.847	110383104.000	111226880.000



```

Test Log
2/8/2014 12:59:14 PM -- Preparing for testing ...
2/8/2014 12:59:29 PM -- Attaching databases ...
2/8/2014 12:59:29 PM -- Preparations for testing are complete.
2/8/2014 12:59:29 PM -- Starting transaction database ...
2/8/2014 12:59:29 PM -- Database cache settings (minimum: 448.0 MB, maximum: 3.5 GB)
2/8/2014 12:59:29 PM -- Database flush thresholds (start: 25.0 MB, stop: 71.7 MB)
2/8/2014 12:59:45 PM -- Database read latency thresholds (average: 20 msec/read, maximum: 200 msec/read)
2/8/2014 12:59:45 PM -- Log write latency thresholds (average: 10 msec/write, maximum: 200 msec/write)
2/8/2014 12:59:47 PM -- Operation mix: Sessions: 16, Inserts: 40%, Deletes: 20%, Replaces: 5%, Reads: 35%, Lazy Commits: 70%
2/8/2014 12:59:47 PM -- Performance logging started (interval: 15000 ms)
2/8/2014 12:59:47 PM -- Starting preprocessor:
2/8/2014 1:06:54 PM -- MSExchangeDatabaseJETstressWin/Database Cache Size: Last: 3387736000.0 (lower bound: 3382287000.0, upper bound: none)
2/8/2014 1:06:55 PM -- Performance logging has ended.
2/8/2014 4:16:16 PM -- JetInterop basic transaction stats: 106946, 106945, 106945, 106945, 106945, 106945, 106945, 106945, 106945, 106945 and 106945.
2/8/2014 4:16:16 PM -- DatabaseChng transaction ends.
2/8/2014 4:16:17 PM -- Shutting down database ...
2/8/2014 4:16:41 PM -- Instance2200.2 (complete), Instance2200.3 (complete), Instance2200.4 (complete), Instance2200.5 (complete), Instance2200.6 (complete), Instance2200.7 (complete), Instance2200.8 (complete), Instance2200.9 (complete), Instance2200.10 (complete), Instance2200.11 (complete), Instance2200.12 (complete), Instance2200.13 (complete) and Instance2200.14 (complete)
2/8/2014 4:16:41 PM -- C:\Program Files\Exchange\JETstress\JET-Stress_2014_2_8_12_59_45.kilo has 5764 samples.
2/8/2014 4:16:41 PM -- Creating test report ...
2/8/2014 4:17:39 PM -- Instance2200.1 has 15.6 for I/O Database Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.1 has 2.7 for I/O Log Writes Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.1 has 2.7 for I/O Log Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.2 has 16.1 for I/O Database Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.2 has 2.6 for I/O Log Writes Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.2 has 2.6 for I/O Log Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.3 has 15.6 for I/O Database Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.3 has 2.7 for I/O Log Writes Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.3 has 2.7 for I/O Log Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.4 has 16.0 for I/O Database Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.4 has 2.3 for I/O Log Writes Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.4 has 2.3 for I/O Log Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.5 has 12.5 for I/O Database Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.5 has 2.6 for I/O Log Writes Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.5 has 2.6 for I/O Log Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.6 has 15.9 for I/O Database Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.6 has 2.4 for I/O Log Writes Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.6 has 2.4 for I/O Log Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.7 has 15.7 for I/O Database Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.7 has 2.6 for I/O Log Writes Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.7 has 2.6 for I/O Log Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.8 has 16.7 for I/O Database Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.8 has 2.5 for I/O Log Writes Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.8 has 2.5 for I/O Log Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.9 has 12.5 for I/O Database Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.9 has 2.6 for I/O Log Writes Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.9 has 2.6 for I/O Log Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.10 has 16.0 for I/O Database Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.10 has 2.5 for I/O Log Writes Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.10 has 2.5 for I/O Log Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.11 has 15.7 for I/O Database Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.11 has 2.8 for I/O Log Writes Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.11 has 2.8 for I/O Log Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.12 has 16.2 for I/O Database Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.12 has 2.7 for I/O Log Writes Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.12 has 2.7 for I/O Log Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.13 has 16.4 for I/O Database Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.13 has 2.7 for I/O Log Writes Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.13 has 2.7 for I/O Log Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.14 has 16.7 for I/O Database Reads Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.14 has 2.5 for I/O Log Writes Average Latency.
2/8/2014 4:17:39 PM -- Instance2200.14 has 2.5 for I/O Log Reads Average Latency.
2/8/2014 4:17:39 PM -- The test has 0 Database Page Fault Stalls/req. samples higher than 0.
2/8/2014 4:17:39 PM -- The test has 0 Maximum Database Page Fault Stalls/req.
2/8/2014 4:17:39 PM -- C:\Program Files\Exchange\JETstress\JET-Stress_2014_2_8_12_59_45.kilo has 5734 samples queried.

```



B.3 Server 3

Microsoft Exchange Jetstress 2013

Stress Test Result Report

Test Summary

Overall Test Result	Pass
Machine Name	HOST-3
Test Description	Server 3 3 Copy DAG (2 Local Site + 1 Remote Site) 12 Servers (8 Local Site + 4 Remote Site) 3750 Mailboxes/Server 4 GB Mailbox Size 150 Messages a Day 0.121 IOPs tested 14 DBs per Server
Test Start Time	2/8/2014 12:59:35 PM
Test End Time	2/9/2014 4:17:04 PM
Collection Start Time	2/8/2014 1:06:43 PM
Collection End Time	2/9/2014 1:06:40 PM
Jetstress Version	15.00.0775.000
ESE Version	15.00.0712.008
Operating System	Windows Server 2012 Datacenter (6.2.9200.0)
Performance Log	C:\Program Files\Exchange Jetstress\ESRP-Final\Stress_2014_2_8_13_0_7.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second	630.688
Target Transactional I/O per Second	453.75
Initial Database Size (bytes)	16154585071616
Final Database Size (bytes)	16175355265024
Database Files (Count)	14

Jetstress System Parameters

Thread Count	16
Minimum Database Cache	448.0 MB
Maximum Database Cache	3584.0 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	3



Database Configuration

Instance001 Log path: C:\databases\001
Database: C:\databases\001\Jetstress001001.edb

Instance002 Log path: C:\databases\002
Database: C:\databases\002\Jetstress002001.edb

Instance003 Log path: C:\databases\003
Database: C:\databases\003\Jetstress003001.edb

Instance004 Log path: C:\databases\004
Database: C:\databases\004\Jetstress004001.edb

Instance005 Log path: C:\databases\005
Database: C:\databases\005\Jetstress005001.edb

Instance006 Log path: C:\databases\006
Database: C:\databases\006\Jetstress006001.edb

Instance007 Log path: C:\databases\007
Database: C:\databases\007\Jetstress007001.edb

Instance008 Log path: C:\databases\008
Database: C:\databases\008\Jetstress008001.edb

Instance009 Log path: C:\databases\009
Database: C:\databases\009\Jetstress009001.edb

Instance010 Log path: C:\databases\010
Database: C:\databases\010\Jetstress010001.edb

Instance011 Log path: C:\databases\011
Database: C:\databases\011\Jetstress011001.edb

Instance012 Log path: C:\databases\012
Database: C:\databases\012\Jetstress012001.edb

Instance013 Log path: C:\databases\013
Database: C:\databases\013\Jetstress013001.edb

Instance014 Log path: C:\databases\014
Database: C:\databases\014\Jetstress014001.edb

Transactional I/O performance

MSExchange Database ->> Instance	I/O Database Reads Average (MB/s)	Average Latency (msec)	I/O Database Writes Average (MB/s)	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)
Instance001	15.461	8.885	30.992	14.085	33710.596	35393.376	0.000	2.432	0.000	3.314	0.000	20712.294		
Instance002	15.929	8.823	30.887	13.985	32678.850	32619.237	0.000	2.446	0.000	3.302	0.000	20778.598		
Instance003	15.492	8.876	31.023	14.119	32651.157	35391.685	0.000	2.542	0.000	3.310	0.000	20745.890		
Instance004	15.993	8.767	30.987	14.120	32695.725	32621.110	0.000	2.419	0.000	3.323	0.000	20763.134		
Instance005	15.443	8.624	30.929	14.043	32661.524	32625.930	0.000	2.630	0.000	3.315	0.000	20812.941		
Instance006	15.961	8.282	30.978	14.071	32678.669	35390.222	0.000	2.385	0.000	3.313	0.000	20720.863		
Instance007	16.896	8.601	30.910	14.071	32641.811	32617.525	0.000	3.385	0.000	3.323	0.000	20783.699		
Instance008	17.685	8.277	30.960	14.088	32607.013	32606.118	0.000	3.091	0.000	3.309	0.000	20831.752		
Instance009	15.520	8.866	30.940	14.024	32690.284	32609.533	0.000	2.678	0.000	3.310	0.000	20793.593		
Instance010	16.019	8.645	30.946	14.060	32658.594	32613.050	0.000	2.447	0.000	3.318	0.000	20715.706		
Instance011	15.701	8.429	31.010	14.177	32694.737	35399.860	0.000	2.593	0.000	3.323	0.000	20749.226		
Instance012	16.127	8.421	31.047	14.139	32688.565	32604.201	0.000	2.506	0.000	3.323	0.000	20727.722		
Instance013	15.519	8.469	30.953	14.107	32658.264	32623.898	0.000	2.576	0.000	3.326	0.000	20766.964		
Instance014	16.040	8.127	30.994	14.062	32681.663	35397.824	0.000	2.469	0.000	3.323	0.000	20682.202		



Background Database Maintenance I/O Performance

MSExchange Database => Instance	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance880.1	8.551	261791.245
Instance880.2	8.523	261784.208
Instance880.3	8.568	261818.587
Instance880.4	8.527	261782.166
Instance880.5	8.553	261767.540
Instance880.6	8.519	261770.251
Instance880.7	8.407	261706.604
Instance880.8	8.419	261783.192
Instance880.9	8.203	261793.128
Instance880.10	8.329	261796.118
Instance880.11	8.534	261762.224
Instance880.12	8.513	261762.788
Instance880.13	8.559	261797.222
Instance880.14	8.524	261786.401

Log Replication I/O Performance

MSExchange Database => Instance	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance880.1	0.580	112875.332
Instance880.2	0.581	113129.461
Instance880.3	0.581	113161.312
Instance880.4	0.580	112872.611
Instance880.5	0.583	112873.973
Instance880.6	0.580	113084.392
Instance880.7	0.504	113733.300
Instance880.8	0.503	113077.657
Instance880.9	0.502	113290.959
Instance880.10	0.582	113251.115
Instance880.11	0.585	114017.090
Instance880.12	0.582	113483.461
Instance880.13	0.584	113778.779
Instance880.14	0.580	113077.809

Total I/O Performance

MSExchange Database => Instance	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
Instance880.1	15.461	8.865	38.042	14.085	83029.888	35593.376	0.884	2.432	0.580	3.314	112875.332	20712.284
Instance880.2	15.929	8.823	38.411	13.965	83010.688	35619.237	0.861	2.446	0.581	3.302	113129.461	20778.598
Instance880.3	15.492	8.876	38.091	14.119	83028.491	35591.685	1.037	2.542	0.581	3.310	113161.312	20745.880
Instance880.4	15.993	8.767	38.513	14.120	82915.114	35621.110	0.904	2.419	0.583	3.323	112872.611	20763.134
Instance880.5	15.443	8.634	38.482	14.043	83075.659	35625.930	0.892	2.650	0.583	3.315	112873.973	20812.941
Instance880.6	15.961	8.282	38.497	14.071	82876.768	35590.222	0.931	2.365	0.580	3.313	113084.392	20720.863
Instance880.7	16.896	9.601	38.397	14.071	82788.115	35617.525	0.985	3.365	0.584	3.325	113733.300	20783.899
Instance880.8	17.682	9.377	38.380	14.088	82391.330	35606.118	0.955	3.091	0.583	3.309	113077.657	20831.752
Instance880.9	15.320	8.866	38.493	14.024	83088.384	35609.533	0.918	2.678	0.582	3.310	113290.959	20793.293
Instance880.10	16.019	8.645	38.475	14.060	82950.496	35613.090	0.892	2.447	0.582	3.318	113251.115	20715.706
Instance880.11	15.701	8.429	38.544	14.177	82914.085	35594.860	0.987	2.593	0.585	3.333	114017.090	20749.276
Instance880.12	16.127	8.421	38.960	14.139	82769.294	35604.701	0.899	2.506	0.582	3.323	113483.461	20727.222
Instance880.13	15.519	8.469	38.512	14.107	83076.003	35623.888	0.926	2.576	0.584	3.326	113778.779	20766.964
Instance880.14	16.040	8.127	38.518	14.062	82883.572	35578.824	0.893	2.469	0.580	3.323	113077.809	20652.202

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.970	0.278	3.923
Available MBytes	26835.054	26809.000	27065.000
Free System Page Table Entries	33556255.156	33555893.000	33556268.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	232732073.372	231600320.000	232972200.000
Pool Paged Bytes	110933434.020	110202000.000	111861760.000



```

Test Log
2/8/2014 12:59:35 PM -- Preparing for testing ...
2/8/2014 12:59:36 PM -- Attaching databases ...
2/8/2014 12:59:50 PM -- Preparations for testing are complete.
2/8/2014 12:59:50 PM -- Starting transaction dispatch ...
2/8/2014 12:59:50 PM -- Database cache settings: (minimum: 448.0 MB, maximum: 3.5 GB)
2/8/2014 12:59:50 PM -- Database flush thresholds: (start: 35.8 MB, stop: 71.7 MB)
2/8/2014 1:00:07 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read)
2/8/2014 1:00:07 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write)
2/8/2014 1:00:10 PM -- Operation min: success 16, Insert 40%, Update 20%, Replace 5%, Read 35%, Lazy Commit 70%.
2/8/2014 1:00:10 PM -- Performance logging started (interval: 15000 ms).
2/8/2014 1:00:10 PM -- Attaining prerequisites:
2/8/2014 1:06:43 PM -- [MSExchangeDatabaseSet\aresa\Win]Database Cache Size, Last: 3388232000.0 (lower bound: 3382287000.0, upper bound: none)
2/8/2014 1:06:43 PM -- Performance logging has ended.
2/8/2014 4:16:37 PM -- TestItem batch transaction stats: 109306, 109306, 109306, 109305, 109305, 109305, 109305, 109305, 109305, 109305, 109305, 109305, 109305, 109305, 109305 and 109305.
2/8/2014 4:16:37 PM -- Dispatching transactions ends.
2/8/2014 4:16:39 PM -- Shutting down databases ...
2/8/2014 4:17:04 PM -- Instance880.1 (complete), Instance880.2 (complete), Instance880.3 (complete), Instance880.4 (complete), Instance880.5 (complete), Instance880.6 (complete), Instance880.7 (complete), Instance880.8 (complete), Instance880.9 (complete), Instance880.10 (complete), Instance880.11 (complete), Instance880.12 (complete), Instance880.13 (complete) and Instance880.14 (complete)
2/8/2014 4:17:04 PM -- C:\Program Files\Exchange\Jstestres\ESD-Final\Stress_2014_2_8_12_0_7.txt has 5762 samples.
2/8/2014 4:18:08 PM -- Instance880.1 has 15.5 for I/O Database Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.1 has 2.4 for I/O Log Writes Average Latency.
2/8/2014 4:18:08 PM -- Instance880.1 has 2.4 for I/O Log Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.2 has 10.9 for I/O Database Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.2 has 2.4 for I/O Log Writes Average Latency.
2/8/2014 4:18:08 PM -- Instance880.2 has 2.4 for I/O Log Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.3 has 15.5 for I/O Database Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.3 has 2.5 for I/O Log Writes Average Latency.
2/8/2014 4:18:08 PM -- Instance880.3 has 2.5 for I/O Log Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.4 has 16.0 for I/O Database Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.4 has 2.4 for I/O Log Writes Average Latency.
2/8/2014 4:18:08 PM -- Instance880.4 has 2.4 for I/O Log Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.5 has 15.4 for I/O Database Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.5 has 2.6 for I/O Log Writes Average Latency.
2/8/2014 4:18:08 PM -- Instance880.5 has 2.6 for I/O Log Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.6 has 16.0 for I/O Database Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.6 has 2.4 for I/O Log Writes Average Latency.
2/8/2014 4:18:08 PM -- Instance880.6 has 2.4 for I/O Log Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.7 has 16.0 for I/O Database Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.7 has 2.4 for I/O Log Writes Average Latency.
2/8/2014 4:18:08 PM -- Instance880.7 has 2.4 for I/O Log Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.8 has 17.7 for I/O Database Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.8 has 3.1 for I/O Log Writes Average Latency.
2/8/2014 4:18:08 PM -- Instance880.8 has 3.1 for I/O Log Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.9 has 15.5 for I/O Database Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.9 has 2.7 for I/O Log Writes Average Latency.
2/8/2014 4:18:08 PM -- Instance880.9 has 2.7 for I/O Log Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.10 has 16.0 for I/O Database Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.10 has 2.4 for I/O Log Writes Average Latency.
2/8/2014 4:18:08 PM -- Instance880.10 has 2.4 for I/O Log Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.11 has 15.7 for I/O Database Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.11 has 2.6 for I/O Log Writes Average Latency.
2/8/2014 4:18:08 PM -- Instance880.11 has 2.6 for I/O Log Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.12 has 16.1 for I/O Database Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.12 has 2.5 for I/O Log Writes Average Latency.
2/8/2014 4:18:08 PM -- Instance880.12 has 2.5 for I/O Log Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.13 has 15.5 for I/O Database Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.13 has 2.6 for I/O Log Writes Average Latency.
2/8/2014 4:18:08 PM -- Instance880.13 has 2.6 for I/O Log Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.14 has 16.0 for I/O Database Reads Average Latency.
2/8/2014 4:18:08 PM -- Instance880.14 has 2.5 for I/O Log Writes Average Latency.
2/8/2014 4:18:08 PM -- Instance880.14 has 2.5 for I/O Log Reads Average Latency.
2/8/2014 4:18:08 PM -- The test has 0 Database Page Faults/sec (samples higher than 0).
2/8/2014 4:18:08 PM -- C:\Program Files\Exchange\Jstestres\ESD-Final\Stress_2014_2_8_12_0_7.txt has 5735 samples queried.

```



B.4 Server 4

Microsoft Exchange Jetstress 2013

Stress Test Result Report

Test Summary

Overall Test Result	Pass
Machine Name	HOST-4
Test Description	Server 4 3 Copy DAG (2 Local Site + 1 Remote Site) 12 Servers (8 Local Site + 4 Remote Site) 3750 Mailboxes/Server 4 GB Mailbox Size 150 Messages a Day 0.121 IOPs tested 14 DBs per Server
Test Start Time	2/8/2014 12:59:38 PM
Test End Time	2/9/2014 4:17:14 PM
Collection Start Time	2/8/2014 1:06:50 PM
Collection End Time	2/9/2014 1:06:45 PM
Jetstress Version	15.00.0775.000
ESE Version	15.00.0712.008
Operating System	Windows Server 2012 Datacenter (6.2.9200.0)
Performance Log	C:\Program Files\Exchange Jetstress\Final-ESRP\Stress_2014_2_8_13_0_10.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second	633.127
Target Transactional I/O per Second	453.75
Initial Database Size (bytes)	16152504696832
Final Database Size (bytes)	16173400719360
Database Files (Count)	14

Jetstress System Parameters

Thread Count	16
Minimum Database Cache	448.0 MB
Maximum Database Cache	3584.0 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	3



Background Database Maintenance I/O Performance

MSExchange Database => Instance	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance2088.1	8.545	261787.237
Instance2088.2	8.513	261799.324
Instance2088.3	8.527	261787.629
Instance2088.4	8.511	261002.356
Instance2088.5	8.548	261867.538
Instance2088.6	8.522	261782.059
Instance2088.7	8.516	261778.895
Instance2088.8	8.521	261780.037
Instance2088.9	8.555	261778.389
Instance2088.10	8.510	261761.477
Instance2088.11	8.540	261784.524
Instance2088.12	8.504	261781.043
Instance2088.13	8.522	261790.343
Instance2088.14	8.496	261788.147

Log Replication I/O Performance

MSExchange Database => Instance	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance2088.1	0.507	114340.461
Instance2088.2	0.585	114118.819
Instance2088.3	0.584	112879.013
Instance2088.4	0.592	112489.968
Instance2088.5	0.503	113530.022
Instance2088.6	0.594	113964.466
Instance2088.7	0.589	114069.895
Instance2088.8	0.584	113066.530
Instance2088.9	0.581	113382.156
Instance2088.10	0.585	113904.287
Instance2088.11	0.587	114121.545
Instance2088.12	0.584	114009.653
Instance2088.13	0.585	114173.036
Instance2088.14	0.587	114378.752

Total I/O Performance

MSExchange Database => Instance	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
Instance2088.1	15.432	9.239	39.623	14.129	82849.136	33543.362	0.508	2.753	0.587	3.337	114340.461	20833.940
Instance2088.2	16.036	9.264	39.378	14.128	82711.155	33485.938	0.482	2.421	0.585	3.337	114118.819	20752.272
Instance2088.3	15.619	9.146	39.310	14.023	82923.630	33494.029	0.589	2.999	0.589	3.337	112879.013	20821.203
Instance2088.4	16.073	9.308	39.027	14.126	82821.203	33440.070	0.542	2.403	0.592	3.337	112489.968	20776.442
Instance2088.5	15.424	9.517	39.682	14.155	82770.556	33404.375	0.573	2.373	0.585	3.337	113530.022	20797.458
Instance2088.6	16.011	9.312	39.621	14.145	82889.280	33442.788	0.566	2.392	0.594	3.343	113964.466	20769.338
Instance2088.7	15.615	9.331	39.603	14.173	82853.007	33431.536	0.584	2.555	0.588	3.343	114069.895	20827.145
Instance2088.8	16.016	9.150	39.620	14.163	82846.969	33445.395	0.515	2.592	0.584	3.339	113066.530	20807.447
Instance2088.9	15.668	9.358	39.650	14.084	82851.834	33429.085	0.579	2.564	0.581	3.315	113382.156	20754.319
Instance2088.10	16.202	9.360	39.617	14.170	82829.741	33406.987	0.547	2.594	0.585	3.343	113904.287	20712.926
Instance2088.11	15.685	9.196	39.599	14.127	82827.781	33414.861	0.599	2.616	0.587	3.333	114121.545	20858.299
Instance2088.12	16.182	9.310	39.597	14.132	82803.741	33440.427	0.501	2.426	0.584	3.327	114009.653	20759.730
Instance2088.13	16.253	9.136	39.631	14.161	82881.483	33447.076	0.544	2.564	0.585	3.337	114173.036	20764.523
Instance2088.14	16.704	9.326	39.590	14.175	82597.239	33441.833	0.506	2.516	0.587	3.342	114378.752	20778.674



C SoftRecovery Test Result Report

C.1 Server 1

Microsoft Exchange Jetstress 2013

SoftRecovery Test Result Report

Soft-Recovery Statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance3068.1	505	1837.5228868
Instance3068.2	504	1865.5626148
Instance3068.3	501	1810.0164103
Instance3068.4	505	1885.2241056
Instance3068.5	507	1822.7247869
Instance3068.6	505	1882.5970259
Instance3068.7	506	1836.4134294
Instance3068.8	505	1895.337397
Instance3068.9	503	1838.0542003
Instance3068.10	502	1889.7259192
Instance3068.11	508	1865.828268
Instance3068.12	503	1903.8067719
Instance3068.13	506	1828.5846253
Instance3068.14	501	1877.2721583
Avg	504	1859.905
Sum	7061	26038.6705997

Database Configuration

Instance3068.1	Log path: C:\databases\DB1 Database: C:\databases\DB1\Jetstress001001.edb
Instance3068.2	Log path: C:\databases\DB2 Database: C:\databases\DB2\Jetstress002001.edb
Instance3068.3	Log path: C:\databases\DB3 Database: C:\databases\DB3\Jetstress003001.edb
Instance3068.4	Log path: C:\databases\DB4 Database: C:\databases\DB4\Jetstress004001.edb
Instance3068.5	Log path: C:\databases\DB5 Database: C:\databases\DB5\Jetstress005001.edb
Instance3068.6	Log path: C:\databases\DB6 Database: C:\databases\DB6\Jetstress006001.edb
Instance3068.7	Log path: C:\databases\DB7 Database: C:\databases\DB7\Jetstress007001.edb
Instance3068.8	Log path: C:\databases\DB8 Database: C:\databases\DB8\Jetstress008001.edb
Instance3068.9	Log path: C:\databases\DB9 Database: C:\databases\DB9\Jetstress009001.edb
Instance3068.10	Log path: C:\databases\DB10 Database: C:\databases\DB10\Jetstress010001.edb
Instance3068.11	Log path: C:\databases\DB11 Database: C:\databases\DB11\Jetstress011001.edb
Instance3068.12	Log path: C:\databases\DB12 Database: C:\databases\DB12\Jetstress012001.edb
Instance3068.13	Log path: C:\databases\DB13 Database: C:\databases\DB13\Jetstress013001.edb
Instance3068.14	Log path: C:\databases\DB14 Database: C:\databases\DB14\Jetstress014001.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
Instance3068.1	46.390	1.201	116.891	1.097	38509.244	32688.659	37.251	0.000	1.376	0.000	209060.905	0.000
Instance3068.2	49.027	1.212	114.178	1.081	38558.026	32689.795	27.607	0.000	1.351	0.000	209099.683	0.000
Instance3068.3	46.500	1.203	118.944	1.107	38460.123	32768.000	34.530	0.000	1.383	0.000	209081.011	0.000
Instance3068.4	49.957	1.199	114.251	1.071	38709.753	32690.534	26.832	0.000	1.338	0.000	208223.204	0.000
Instance3068.5	46.312	1.204	117.715	1.113	38441.326	32687.883	34.947	0.000	1.391	0.000	209216.601	0.000
Instance3068.6	49.227	1.188	114.517	1.073	38578.196	32535.603	26.471	0.000	1.341	0.000	208218.148	0.000
Instance3068.7	46.513	1.211	116.720	1.102	38422.561	32768.000	36.118	0.000	1.377	0.000	208692.305	0.000
Instance3068.8	49.711	1.212	113.815	1.065	38625.720	32614.160	27.496	0.000	1.331	0.000	208225.333	0.000
Instance3068.9	46.295	1.211	116.940	1.094	38373.988	32688.659	35.196	0.000	1.367	0.000	209074.396	0.000
Instance3068.10	49.239	1.207	112.761	1.062	38585.240	32768.000	28.062	0.000	1.329	0.000	208308.237	0.000
Instance3068.11	46.864	1.190	116.005	1.089	38439.639	32689.795	36.601	0.000	1.361	0.000	208938.109	0.000
Instance3068.12	49.939	1.208	113.024	1.057	38611.164	32768.000	26.931	0.000	1.321	0.000	209221.516	0.000
Instance3068.13	46.929	1.218	116.770	1.105	38455.144	32688.078	35.758	0.000	1.381	0.000	209108.463	0.000
Instance3068.14	49.669	1.199	113.603	1.067	38600.287	32690.351	27.881	0.000	1.333	0.000	209313.068	0.000

Background Database Maintenance I/O Performance

MSExchange Database ->>> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Writes Average Bytes
Instance3068.1	7.139	261784.298
Instance3068.2	7.476	261813.256
Instance3068.3	7.172	261800.546
Instance3068.4	7.386	261768.228
Instance3068.5	7.279	261852.746
Instance3068.6	7.549	261913.216
Instance3068.7	7.151	261924.476
Instance3068.8	7.341	261838.214
Instance3068.9	7.231	261866.706
Instance3068.10	7.403	261977.801
Instance3068.11	7.152	261869.512
Instance3068.12	7.413	261935.532
Instance3068.13	7.251	261929.722
Instance3068.14	7.489	261725.987

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
Instance3068.1	46.390	1.201	124.029	1.097	51360.453	32688.659	37.251	0.000	1.376	0.000	209060.905	0.000
Instance3068.2	49.027	1.212	121.653	1.081	52276.961	32689.795	27.607	0.000	1.351	0.000	209099.683	0.000
Instance3068.3	46.500	1.203	126.117	1.107	51161.186	32768.000	34.530	0.000	1.383	0.000	209081.011	0.000
Instance3068.4	49.957	1.199	121.636	1.071	52293.524	32690.534	26.832	0.000	1.338	0.000	208223.204	0.000
Instance3068.5	46.312	1.204	124.995	1.113	51452.196	32687.883	34.947	0.000	1.391	0.000	209216.601	0.000
Instance3068.6	49.227	1.188	122.066	1.073	52389.676	32535.603	26.471	0.000	1.341	0.000	208218.148	0.000
Instance3068.7	46.513	1.211	123.870	1.102	51325.195	32768.000	36.118	0.000	1.377	0.000	208692.305	0.000
Instance3068.8	49.711	1.212	121.156	1.065	52150.706	32614.160	27.496	0.000	1.331	0.000	208225.333	0.000
Instance3068.9	46.295	1.211	124.171	1.094	51389.533	32688.659	35.196	0.000	1.367	0.000	209074.396	0.000
Instance3068.10	49.239	1.207	120.164	1.062	52347.346	32768.000	28.062	0.000	1.329	0.000	208308.237	0.000
Instance3068.11	46.864	1.190	123.156	1.089	51413.870	32689.795	36.601	0.000	1.361	0.000	208938.109	0.000
Instance3068.12	49.939	1.208	120.437	1.057	52357.226	32768.000	26.931	0.000	1.321	0.000	209221.516	0.000
Instance3068.13	46.929	1.218	124.021	1.105	51521.585	32688.078	35.758	0.000	1.381	0.000	209108.463	0.000
Instance3068.14	49.669	1.199	121.092	1.067	52399.712	32690.351	27.881	0.000	1.333	0.000	209313.068	0.000



Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	31.612	5.512	70.105
Available MBytes	26416.634	26278.000	29900.000
Free System Page Table Entries	33257784.938	33257646.000	33258428.000
Transition Pages ReDwapped/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	237071561.966	236367072.000	237338624.000
Pool Paged Bytes	124320204.643	120225424.000	124575744.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

2/10/2014 10:04:34 AM -- Preparing for testing ...
 2/10/2014 10:04:49 AM -- Attaching databases ...
 2/10/2014 10:04:49 AM -- Preparations for testing are complete.
 2/10/2014 10:04:49 AM -- Starting transaction dispatch ...
 2/10/2014 10:04:49 AM -- Database cache settings: (minimum: 448.0 MB, maximum: 3.5 GB)
 2/10/2014 10:04:49 AM -- Database flush thresholds: (start: 35.8 MB, stop: 71.7 MB)
 2/10/2014 10:05:06 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
 2/10/2014 10:05:06 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
 2/10/2014 10:05:06 AM -- Operation mix: Sessions 16, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.
 2/10/2014 10:05:08 AM -- Performance logging started (interval: 15000 ms).
 2/10/2014 10:05:08 AM -- Generating log file.
 2/10/2014 2:14:40 PM -- C:\databases\DB1 (101.0% generated), C:\databases\DB2 (100.8% generated), C:\databases\DB3 (100.2% generated), C:\databases\DB4 (101.0% generated), C:\databases\DB5 (101.4% generated), C:\databases\DB6 (101.0% generated), C:\databases\DB7 (101.2% generated), C:\databases\DB8 (101.0% generated), C:\databases\DB9 (100.6% generated), C:\databases\DB10 (100.4% generated), C:\databases\DB11 (101.6% generated), C:\databases\DB12 (100.6% generated), C:\databases\DB13 (101.2% generated) and C:\databases\DB14 (100.2% generated).
 2/10/2014 2:14:40 PM -- Performance logging has ended.
 2/10/2014 2:14:40 PM -- sqlrsmrg batch transaction stats: 16882, 16882, 16882, 16881, 16881, 16881, 16881, 16881, 16881, 16881, 16881, 16881, 16881, 16881, 16881 and 16881.
 2/10/2014 2:14:40 PM -- Dispatching transactions ends.
 2/10/2014 2:14:40 PM -- Stopping down databases.
 2/10/2014 2:15:16 PM -- Instance3060.1 (complete), Instance3060.2 (complete), Instance3060.3 (complete), Instance3060.4 (complete), Instance3060.5 (complete), Instance3060.6 (complete), Instance3060.7 (complete), Instance3060.8 (complete), Instance3060.9 (complete), Instance3060.10 (complete), Instance3060.11 (complete), Instance3060.12 (complete), Instance3068.1 (complete) and Instance3068.14 (complete).
 2/10/2014 2:15:16 PM -- C:\Program Files\Exchange\testres\FSD-Final\Performance_2014_2_10_10_5_6.bj has 994 samples.
 2/10/2014 2:15:16 PM -- Creating test report.
 2/10/2014 2:15:50 PM -- Instance3060.1 has 16.5 for I/O Database Reads Average Latency.
 2/10/2014 2:16:50 PM -- Instance3068.1 has 2.7 for I/O Log Writes Average Latency.
 2/10/2014 2:16:50 PM -- Instance3068.1 has 2.7 for I/O Log Reads Average Latency.
 2/10/2014 2:16:50 PM -- Instance3068.2 has 17.3 for I/O Database Reads Average Latency.
 2/10/2014 2:16:50 PM -- Instance3068.2 has 2.7 for I/O Log Writes Average Latency.
 2/10/2014 2:16:50 PM -- Instance3068.2 has 2.7 for I/O Log Reads Average Latency.
 2/10/2014 2:16:50 PM -- Instance3068.3 has 16.9 for I/O Database Reads Average Latency.
 2/10/2014 2:16:50 PM -- Instance3068.3 has 2.7 for I/O Log Writes Average Latency.
 2/10/2014 2:16:50 PM -- Instance3068.3 has 2.7 for I/O Log Reads Average Latency.
 2/10/2014 2:16:50 PM -- Instance3068.4 has 17.7 for I/O Database Reads Average Latency.
 2/10/2014 2:16:50 PM -- Instance3068.4 has 2.7 for I/O Log Writes Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.4 has 2.7 for I/O Log Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.5 has 16.6 for I/O Database Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.5 has 2.8 for I/O Log Writes Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.5 has 2.0 for I/O Log Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.6 has 17.4 for I/O Database Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.6 has 2.6 for I/O Log Writes Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.6 has 2.6 for I/O Log Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.7 has 17.0 for I/O Database Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.7 has 2.6 for I/O Log Writes Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.7 has 2.6 for I/O Log Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.8 has 17.4 for I/O Database Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.8 has 2.5 for I/O Log Writes Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.8 has 2.5 for I/O Log Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.9 has 16.9 for I/O Database Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.9 has 2.7 for I/O Log Writes Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.9 has 2.7 for I/O Log Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.10 has 17.4 for I/O Database Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.10 has 2.6 for I/O Log Writes Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.10 has 2.6 for I/O Log Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.11 has 16.8 for I/O Database Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.11 has 2.6 for I/O Log Writes Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.11 has 2.6 for I/O Log Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.12 has 17.7 for I/O Database Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.12 has 2.4 for I/O Log Writes Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.12 has 2.4 for I/O Log Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.13 has 17.0 for I/O Database Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.13 has 2.4 for I/O Log Writes Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.13 has 2.4 for I/O Log Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.14 has 17.6 for I/O Database Reads Average Latency.
 2/10/2014 2:16:51 PM -- Instance3068.14 has 2.5 for I/O Log Writes Average Latency.



C.2 Server 2

Microsoft Exchange Jetstress 2013

SoftRecovery Test Result Report

Soft-Recovery Statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance2300.1	509	1749.0331145
Instance2300.2	510	1816.5801463
Instance2300.3	508	1737.1785788
Instance2300.4	504	1817.8658631
Instance2300.5	506	1745.410399
Instance2300.6	501	1811.6638082
Instance2300.7	513	1752.1266179
Instance2300.8	506	1815.5448001
Instance2300.9	512	1766.0557859
Instance2300.10	508	1833.8474122
Instance2300.11	510	1742.85034
Instance2300.12	509	1820.9553953
Instance2300.13	510	1756.5203955
Instance2300.14	507	1823.5343443
Avg	508	1784.941
Sum	7113	24989.1670011

Database Configuration

Instance2300.1	Log path: C:\databases\DB1 Database: C:\databases\DB1\Jetstress001001.edb
Instance2300.2	Log path: C:\databases\DB2 Database: C:\databases\DB2\Jetstress002001.edb
Instance2300.3	Log path: C:\databases\DB3 Database: C:\databases\DB3\Jetstress003001.edb
Instance2300.4	Log path: C:\databases\DB4 Database: C:\databases\DB4\Jetstress004001.edb
Instance2300.5	Log path: C:\databases\DB5 Database: C:\databases\DB5\Jetstress005001.edb
Instance2300.6	Log path: C:\databases\DB6 Database: C:\databases\DB6\Jetstress006001.edb
Instance2300.7	Log path: C:\databases\DB7 Database: C:\databases\DB7\Jetstress007001.edb
Instance2300.8	Log path: C:\databases\DB8 Database: C:\databases\DB8\Jetstress008001.edb
Instance2300.9	Log path: C:\databases\DB9 Database: C:\databases\DB9\Jetstress009001.edb
Instance2300.10	Log path: C:\databases\DB10 Database: C:\databases\DB10\Jetstress010001.edb
Instance2300.11	Log path: C:\databases\DB11 Database: C:\databases\DB11\Jetstress011001.edb
Instance2300.12	Log path: C:\databases\DB12 Database: C:\databases\DB12\Jetstress012001.edb
Instance2300.13	Log path: C:\databases\DB13 Database: C:\databases\DB13\Jetstress013001.edb
Instance2300.14	Log path: C:\databases\DB14 Database: C:\databases\DB14\Jetstress014001.edb



Transactional I/O Performance

Instance	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
Instance2300.1	46.617	0.549	123.160	1.162	38475.154	32591.972	33.767	0.000	1.433	0.000	209277.429	0.000
Instance2300.2	50.374	0.517	116.842	1.021	38704.006	32548.371	28.922	0.000	1.601	0.000	206801.462	0.000
Instance2300.3	46.727	0.541	125.082	1.165	38553.719	32591.618	38.475	0.000	1.462	0.000	209445.484	0.000
Instance2300.4	51.066	0.535	117.894	1.101	38873.264	32708.200	30.186	0.000	1.399	0.000	205240.147	0.000
Instance2300.5	47.405	0.546	122.473	1.156	38504.626	32768.000	43.646	0.000	1.444	0.000	209166.729	0.000
Instance2300.6	50.709	0.536	118.002	1.100	38992.181	31961.620	25.382	0.000	1.379	0.000	204310.570	0.000
Instance2300.7	47.185	0.544	121.541	1.169	38314.702	32768.000	40.904	0.000	1.461	0.000	209527.151	0.000
Instance2300.8	50.869	0.510	118.766	1.112	38738.071	32329.143	30.507	0.000	1.290	0.000	206445.660	0.000
Instance2300.9	47.282	0.542	123.123	1.156	38485.573	32768.000	41.174	0.000	1.445	0.000	209610.761	0.000
Instance2300.10	51.338	0.537	116.396	1.104	38750.468	33333.027	23.694	0.000	1.380	0.000	205634.533	0.000
Instance2300.11	47.200	0.547	123.707	1.170	38441.003	32615.591	30.106	0.000	1.402	0.000	207980.000	0.000
Instance2300.12	50.921	0.514	117.594	1.114	38843.732	32287.140	30.647	0.000	1.392	0.000	206149.535	0.000
Instance2300.13	47.043	0.551	122.913	1.197	38499.544	32616.847	41.827	0.000	1.446	0.000	208424.091	0.000
Instance2300.14	51.001	0.542	116.300	1.109	38656.313	32238.276	28.866	0.000	1.386	0.000	205884.754	0.000

Background Database Maintenance I/O Performance

Instance	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance2300.1	7.132	261919.612
Instance2300.2	7.416	261907.813
Instance2300.3	7.002	261000.573
Instance2300.4	7.363	261771.444
Instance2300.5	7.028	261819.762
Instance2300.6	7.364	261904.856
Instance2300.7	7.132	261849.463
Instance2300.8	7.200	261900.540
Instance2300.9	7.179	261862.719
Instance2300.10	7.270	261824.376
Instance2300.11	7.120	261930.423
Instance2300.12	7.400	261937.329
Instance2300.13	7.145	262050.064
Instance2300.14	7.280	261911.209

Total I/O Performance

Instance	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
Instance2300.1	46.617	0.549	130.292	1.162	50705.557	32591.972	33.767	0.000	1.433	0.000	209277.429	0.000
Instance2300.2	50.374	0.517	124.259	1.021	50204.088	32548.371	28.922	0.000	1.601	0.000	206801.462	0.000
Instance2300.3	46.727	0.541	122.144	1.165	50487.429	32591.618	38.475	0.000	1.462	0.000	209445.484	0.000
Instance2300.4	51.066	0.535	124.426	1.107	50767.458	32038.200	31.186	0.000	1.389	0.000	205343.147	0.000
Instance2300.5	47.405	0.546	123.503	1.156	50626.359	32768.000	43.646	0.000	1.444	0.000	209166.729	0.000
Instance2300.6	50.709	0.536	120.286	1.100	51005.616	31961.620	25.382	0.000	1.379	0.000	204310.570	0.000
Instance2300.7	47.185	0.544	128.473	1.169	50708.219	32768.000	40.904	0.000	1.461	0.000	209527.151	0.000
Instance2300.8	50.869	0.510	126.136	1.112	50836.718	32329.143	30.507	0.000	1.290	0.000	206445.660	0.000
Instance2300.9	47.282	0.542	130.303	1.156	50783.326	32768.000	41.174	0.000	1.445	0.000	209610.761	0.000
Instance2300.10	51.338	0.537	123.766	1.104	50204.174	33333.027	23.694	0.000	1.380	0.000	205634.533	0.000
Instance2300.11	47.200	0.547	120.007	1.170	50900.491	32615.591	30.106	0.000	1.402	0.000	207980.000	0.000
Instance2300.12	50.921	0.514	124.994	1.114	50281.349	32287.140	30.647	0.000	1.392	0.000	206149.535	0.000
Instance2300.13	47.043	0.551	130.040	1.197	50764.776	32616.847	41.827	0.000	1.446	0.000	208424.091	0.000
Instance2300.14	51.001	0.542	123.961	1.109	51946.101	32238.276	28.866	0.000	1.386	0.000	205884.754	0.000

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	7.359	0.000	9.967
Available MBytes	26983.551	26869.000	30261.000
Free System Page Table Entries	3355503.420	3355503.000	3355505.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	234406240.097	234299392.000	234967040.000
Pool Paged Bytes	120364188.168	119798008.000	124633088.000



Test Log

2/10/2014 10:04:03 AM -- Preparing for testing ...

2/10/2014 10:04:17 AM -- Attaching databases ...

2/10/2014 10:04:17 AM -- Preparations for testing are complete.

2/10/2014 10:04:17 AM -- Starting transaction dispatch ...

2/10/2014 10:04:17 AM -- Database cache settings: (minimum: 440.0 MB, maximum: 3.5 GB)

2/10/2014 10:04:17 AM -- Database flush thresholds: (start: 25.8 MB, stop: 71.7 MB)

2/10/2014 10:04:39 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read)

2/10/2014 10:04:39 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write)

2/10/2014 10:04:37 AM -- Operation mix: Sessions 16, Inserts 40%, Deletes 20%, Replaces 5%, Reads 25%, Lazy Commits 70%.

2/10/2014 10:04:37 AM -- Performance logging started (interval: 15000 ms).

2/10/2014 10:04:37 AM -- Generating log files ...

2/10/2014 2:16:26 PM -- C:\databases\086 [101.8% generated], C:\databases\087 [102.0% generated], C:\databases\088 [101.6% generated], C:\databases\089 [100.8% generated], C:\databases\090 [100.2% generated], C:\databases\091 [102.6% generated], C:\databases\092 [101.8% generated], C:\databases\093 [102.0% generated] and C:\databases\094 [101.4% generated]

2/10/2014 2:16:26 PM -- Performance logging has ended.

2/10/2014 2:16:26 PM -- JetInterop batch transaction stats: 16945, 16945, 16945, 16945, 16945, 16945, 16945, 16945, 16944, 16944, 16944, 16944 and 16944.

2/10/2014 2:16:26 PM -- Dispatching transactions ends.

2/10/2014 2:16:28 PM -- Shutting down databases ...

2/10/2014 2:16:49 PM -- Instance2300.1 (complete), Instance2300.2 (complete), Instance2300.3 (complete), Instance2300.4 (complete), Instance2300.5 (complete), Instance2300.6 (complete), Instance2300.7 (complete), Instance2300.8 (complete), Instance2300.9 (complete), Instance2300.10 (complete), Instance2300.11 (complete), Instance2300.12 (complete), Instance2300.13 (complete) and Instance2300.14 (complete)

2/10/2014 2:16:40 PM -- C:\Program Files\Exchange\Stress\ESRP-Final\Performance_2014_2_10_10_4_35.txt has 1004 samples.

2/10/2014 2:16:48 PM -- Creating test report ...

2/10/2014 2:16:54 PM -- Instance2300.1 has 16.8 for I/O Database Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.1 has 3.3 for I/O Log Writes Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.1 has 3.3 for I/O Log Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.2 has 17.5 for I/O Database Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.2 has 2.5 for I/O Log Writes Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.2 has 2.5 for I/O Log Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.3 has 16.7 for I/O Database Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.3 has 2.5 for I/O Log Writes Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.3 has 2.9 for I/O Log Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.4 has 17.5 for I/O Database Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.4 has 2.6 for I/O Log Writes Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.4 has 2.6 for I/O Log Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.5 has 16.7 for I/O Database Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.5 has 2.6 for I/O Log Writes Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.5 has 2.8 for I/O Log Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.6 has 17.4 for I/O Database Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.6 has 2.8 for I/O Log Writes Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.6 has 2.8 for I/O Log Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.7 has 16.9 for I/O Database Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.7 has 3.1 for I/O Log Writes Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.7 has 3.1 for I/O Log Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.8 has 17.5 for I/O Database Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.8 has 2.6 for I/O Log Writes Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.8 has 2.6 for I/O Log Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.9 has 16.6 for I/O Database Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.9 has 2.9 for I/O Log Writes Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.9 has 2.9 for I/O Log Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.10 has 17.3 for I/O Database Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.10 has 2.6 for I/O Log Writes Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.10 has 2.6 for I/O Log Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.11 has 16.7 for I/O Database Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.11 has 3.0 for I/O Log Writes Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.11 has 3.0 for I/O Log Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.12 has 17.5 for I/O Database Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.12 has 2.9 for I/O Log Writes Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.12 has 2.9 for I/O Log Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.13 has 16.8 for I/O Database Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.13 has 2.9 for I/O Log Writes Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.13 has 2.6 for I/O Log Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.14 has 17.3 for I/O Database Reads Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.14 has 2.7 for I/O Log Writes Average Latency.

2/10/2014 2:16:54 PM -- Instance2300.14 has 2.7 for I/O Log Reads Average Latency.

2/10/2014 2:16:54 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.

2/10/2014 2:16:54 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.

2/10/2014 2:16:54 PM -- C:\Program Files\Exchange\Stress\ESRP-Final\Performance_2014_2_10_10_4_35.txt has 1000 samples queried.

2/10/2014 2:16:54 PM -- C:\Program Files\Exchange\Stress\ESRP-Final\Performance_2014_2_10_10_4_35.txt was saved.

2/10/2014 2:56:51 PM -- Performance logging started (interval: 4000 ms).

2/10/2014 2:56:51 PM -- Recovering databases ...

2/10/2014 3:27:25 PM -- Performance logging has ended.

2/10/2014 3:27:25 PM -- Instance2300.1 [1749.0311145], Instance2300.2 [1816.5801463], Instance2300.3 [1737.1785788], Instance2300.4 [1817.8658621], Instance2300.5 [1745.410399], Instance2300.6 [1811.6638082], Instance2300.7 [1752.1266179], Instance2300.8 [1815.5448001], Instance2300.9 [1766.0557859], Instance2300.10 [1833.8414122], Instance2300.11 [1742.830104], Instance2300.12 [1820.9339953], Instance2300.13 [1756.5203953] and Instance2300.14 [1827.5343443]

2/10/2014 3:27:25 PM -- C:\Program Files\Exchange\Stress\ESRP-Final\Performance_2014_2_10_14_46.txt has 454 samples.

2/10/2014 3:27:25 PM -- Creating test report ...



C.3 Server 3

Microsoft Exchange Jetstress 2013

SoftRecovery Test Result Report

Soft-Recovery Statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance880.1	501	1679.4289806
Instance880.2	506	1792.5857689
Instance880.3	511	1759.1004519
Instance880.4	509	1842.1260932
Instance880.5	504	1760.1274776
Instance880.6	506	1820.705502
Instance880.7	512	1765.0139197
Instance880.8	508	1829.9896434
Instance880.9	511	1753.6892984
Instance880.10	503	1810.3811492
Instance880.11	511	1770.6918914
Instance880.12	510	1840.2947218
Instance880.13	512	1752.4195259
Instance880.14	509	1832.8195581
Avg	508	1786.384
Sum	7113	25009.3739821

Database Configuration

Instance880.1	Log path: C:\databases\DB1 Database: C:\databases\DB1\Jetstress001001.edb
Instance880.2	Log path: C:\databases\DB2 Database: C:\databases\DB2\Jetstress002001.edb
Instance880.3	Log path: C:\databases\DB3 Database: C:\databases\DB3\Jetstress003001.edb
Instance880.4	Log path: C:\databases\DB4 Database: C:\databases\DB4\Jetstress004001.edb
Instance880.5	Log path: C:\databases\DB5 Database: C:\databases\DB5\Jetstress005001.edb
Instance880.6	Log path: C:\databases\DB6 Database: C:\databases\DB6\Jetstress006001.edb
Instance880.7	Log path: C:\databases\DB7 Database: C:\databases\DB7\Jetstress007001.edb
Instance880.8	Log path: C:\databases\DB8 Database: C:\databases\DB8\Jetstress008001.edb
Instance880.9	Log path: C:\databases\DB9 Database: C:\databases\DB9\Jetstress009001.edb
Instance880.10	Log path: C:\databases\DB10 Database: C:\databases\DB10\Jetstress010001.edb
Instance880.11	Log path: C:\databases\DB11 Database: C:\databases\DB11\Jetstress011001.edb
Instance880.12	Log path: C:\databases\DB12 Database: C:\databases\DB12\Jetstress012001.edb
Instance880.13	Log path: C:\databases\DB13 Database: C:\databases\DB13\Jetstress013001.edb
Instance880.14	Log path: C:\databases\DB14



Transactional I/O Performance

MSExchange Database ->>> Instance	I/O Database Reads Average Latency (ms)	I/O Database Writes Average Latency (ms)	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 (ms)	I/O Log Writes Average Latency (ms)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance001	46.913	0.554	136.813	1.191	38494.322	37688.850	24.860	0.000	1.489	0.000	209124.735	0.000
Instance002	50.789	0.547	119.142	1.127	38928.727	32471.457	29.996	0.000	1.409	0.000	207612.720	0.000
Instance003	47.676	0.564	123.009	1.161	38530.303	32768.000	40.100	0.000	1.452	0.000	209805.919	0.000
Instance004	51.158	0.543	117.549	1.101	38827.119	32047.824	30.732	0.000	1.377	0.000	204029.137	0.000
Instance005	47.593	0.545	121.870	1.143	38608.118	32229.484	41.408	0.000	1.429	0.000	205965.207	0.000
Instance006	50.726	0.541	118.745	1.107	38744.160	32111.180	30.700	0.000	1.384	0.000	204617.854	0.000
Instance007	47.585	0.555	120.579	1.158	38192.388	32617.688	39.495	0.000	1.453	0.000	208725.561	0.000
Instance008	50.787	0.548	117.760	1.109	38666.856	32188.025	29.858	0.000	1.386	0.000	201979.258	0.000
Instance009	47.237	0.532	121.703	1.164	30367.333	32760.000	41.367	0.000	1.455	0.000	209446.321	0.000
Instance010	50.030	0.540	117.550	1.110	38957.714	32100.242	29.436	0.000	1.307	0.000	204944.244	0.000
Instance011	47.639	0.551	122.104	1.153	30450.078	32673.016	42.030	0.000	1.442	0.000	20940.002	0.000
Instance012	51.076	0.549	116.076	1.106	30710.995	32262.767	32.572	0.000	1.303	0.000	205731.002	0.000
Instance013	46.971	0.534	123.861	1.167	38384.776	32692.148	40.623	0.000	1.438	0.000	207222.620	0.000
Instance014	50.721	0.542	117.225	1.106	38939.747	32333.027	31.415	0.000	1.383	0.000	206332.774	0.000

Background Database Maintenance I/O Performance

MSExchange Database ->>> Instance	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance001	7.121	261833.200
Instance002	7.401	261807.453
Instance003	7.119	261836.420
Instance004	7.399	261710.626
Instance005	7.069	261763.487
Instance006	7.429	261827.557
Instance007	7.082	261781.221
Instance008	7.436	261872.647
Instance009	7.111	261911.252
Instance010	7.364	261849.426
Instance011	7.099	261644.390
Instance012	7.400	261859.710
Instance013	7.117	261936.272
Instance014	7.683	261815.020

Total I/O Performance

MSExchange Database ->>> Instance	I/O Database Reads Average Latency (ms)	I/O Database Writes Average Latency (ms)	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 (ms)	I/O Log Writes Average Latency (ms)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance001	46.913	0.554	133.933	1.191	50373.929	37688.850	24.860	0.000	1.489	0.000	209124.735	0.000
Instance002	50.789	0.547	136.843	1.127	51963.520	32471.457	29.996	0.000	1.409	0.000	207612.720	0.000
Instance003	47.676	0.564	130.128	1.161	50749.223	32768.000	40.100	0.000	1.452	0.000	209805.919	0.000
Instance004	51.158	0.543	124.948	1.101	52035.321	32047.824	30.732	0.000	1.377	0.000	204029.137	0.000
Instance005	47.593	0.545	128.939	1.143	50842.836	32239.484	41.408	0.000	1.429	0.000	205965.207	0.000
Instance006	50.726	0.541	126.174	1.107	51879.754	32111.180	30.700	0.000	1.384	0.000	204617.854	0.000
Instance007	47.585	0.555	127.662	1.158	50879.624	32617.688	39.495	0.000	1.453	0.000	208725.561	0.000
Instance008	50.787	0.548	125.196	1.109	51924.301	32188.025	29.858	0.000	1.386	0.000	201979.258	0.000
Instance009	47.237	0.532	128.820	1.164	50709.537	32760.000	41.367	0.000	1.455	0.000	209446.321	0.000
Instance010	50.030	0.540	124.914	1.110	51757.075	32100.242	29.436	0.000	1.307	0.000	204944.244	0.000
Instance011	47.639	0.551	129.203	1.153	50750.602	32673.016	42.030	0.000	1.442	0.000	20940.002	0.000
Instance012	51.076	0.549	124.270	1.106	51990.461	32262.767	32.572	0.000	1.303	0.000	205731.002	0.000
Instance013	46.971	0.534	130.978	1.167	50720.697	32692.148	40.623	0.000	1.438	0.000	207222.620	0.000
Instance014	50.721	0.542	124.912	1.106	52667.125	32333.027	31.415	0.000	1.383	0.000	206332.774	0.000



C.4 Server 4

Microsoft Exchange Jetstress 2013

SoftRecovery Test Result Report

Soft-Recovery Statistics - All		
Database Instance	Log files replayed	Elapsed seconds
Instance3088.1	506	1727.6603029
Instance3088.2	501	1792.1411761
Instance3088.3	501	1719.4456409
Instance3088.4	510	1796.0174659
Instance3088.5	513	1763.0333395
Instance3088.6	504	1841.2737527
Instance3088.7	501	1718.4229967
Instance3088.8	507	1802.9654746
Instance3088.9	505	1743.9272444
Instance3088.10	505	1821.7273753
Instance3088.11	504	1707.0701125
Instance3088.12	501	1771.2389489
Instance3088.13	507	1768.9211862
Instance3088.14	503	1822.7590669
Avg	504	1771.186
Sum	7068	24796.6040835

Database Configuration	
Instance3088.1	Log path: C:\databases\DB1 Database: C:\databases\DB1\Jetstress001001.edb
Instance3088.2	Log path: C:\databases\DB2 Database: C:\databases\DB2\Jetstress002001.edb
Instance3088.3	Log path: C:\databases\DB3 Database: C:\databases\DB3\Jetstress003001.edb
Instance3088.4	Log path: C:\databases\DB4 Database: C:\databases\DB4\Jetstress004001.edb
Instance3088.5	Log path: C:\databases\DB5 Database: C:\databases\DB5\Jetstress005001.edb
Instance3088.6	Log path: C:\databases\DB6 Database: C:\databases\DB6\Jetstress006001.edb
Instance3088.7	Log path: C:\databases\DB7 Database: C:\databases\DB7\Jetstress007001.edb
Instance3088.8	Log path: C:\databases\DB8 Database: C:\databases\DB8\Jetstress008001.edb
Instance3088.9	Log path: C:\databases\DB9 Database: C:\databases\DB9\Jetstress009001.edb
Instance3088.10	Log path: C:\databases\DB10 Database: C:\databases\DB10\Jetstress010001.edb
Instance3088.11	Log path: C:\databases\DB11 Database: C:\databases\DB11\Jetstress011001.edb
Instance3088.12	Log path: C:\databases\DB12 Database: C:\databases\DB12\Jetstress012001.edb
Instance3088.13	Log path: C:\databases\DB13 Database: C:\databases\DB13\Jetstress013001.edb
Instance3088.14	Log path: C:\databases\DB14 Database: C:\databases\DB14\Jetstress014001.edb



- Transactional I/O Performance

MSExchange Database => Instance	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
Instance2088.1	46.653	0.534	123.866	1.171	18493.051	32891.080	40.296	0.000	1.464	0.000	209180.952	0.000
Instance2088.2	50.447	0.538	117.981	1.116	18734.236	32619.729	28.503	0.000	1.394	0.000	207590.689	0.000
Instance2088.3	46.976	0.531	123.980	1.163	18474.609	32613.434	27.999	0.000	1.454	0.000	208683.414	0.000
Instance2088.4	50.076	0.522	120.162	1.133	18673.967	32472.126	20.978	0.000	1.416	0.000	207448.164	0.000
Instance2088.5	47.329	0.530	123.030	1.161	18564.611	32022.071	38.593	0.000	1.449	0.000	209136.596	0.000
Instance2088.6	51.014	0.531	117.486	1.093	18861.871	31974.062	29.999	0.000	1.366	0.000	203616.067	0.000
Instance2088.7	47.056	0.510	124.095	1.163	18424.165	32768.000	39.978	0.000	1.434	0.000	209472.215	0.000
Instance2088.8	50.617	0.537	118.310	1.174	18858.251	33376.184	30.824	0.000	1.405	0.000	206506.144	0.000
Instance2088.9	47.291	0.539	123.478	1.158	18600.779	32691.795	39.700	0.000	1.448	0.000	209137.560	0.000
Instance2088.10	50.894	0.530	117.942	1.105	18689.983	32111.180	29.700	0.000	1.381	0.000	203320.804	0.000
Instance2088.11	46.413	0.524	124.075	1.170	18432.830	32012.333	27.097	0.000	1.473	0.000	208024.690	0.000
Instance2088.12	49.121	0.518	120.012	1.131	18799.127	32393.080	21.837	0.000	1.413	0.000	207475.142	0.000
Instance2088.13	47.278	0.541	122.125	1.145	18444.477	32892.844	42.875	0.000	1.431	0.000	208452.740	0.000
Instance2088.14	50.937	0.533	117.463	1.102	18451.294	32476.729	30.186	0.000	1.378	0.000	208132.511	0.000

- Background Database Maintenance I/O Performance

MSExchange Database => Instance	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance2088.1	7.094	261855.830
Instance2088.2	7.415	261820.904
Instance2088.3	7.913	261914.408
Instance2088.4	7.958	261859.220
Instance2088.5	7.125	261835.481
Instance2088.6	7.600	261847.799
Instance2088.7	7.070	261934.875
Instance2088.8	7.413	261872.673
Instance2088.9	7.095	261917.413
Instance2088.10	7.401	261833.117
Instance2088.11	7.929	261812.989
Instance2088.12	8.470	261916.545
Instance2088.13	7.110	261701.700
Instance2088.14	7.368	261904.147

- Total I/O Performance

MSExchange Database => Instance	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
Instance2088.1	46.653	0.534	130.760	1.171	18610.864	32891.080	40.296	0.000	1.464	0.000	209180.952	0.000
Instance2088.2	50.447	0.538	125.396	1.116	19252.827	32619.729	28.503	0.000	1.394	0.000	207590.689	0.000
Instance2088.3	46.976	0.531	131.032	1.163	19077.460	32613.434	27.999	0.000	1.454	0.000	208003.414	0.000
Instance2088.4	50.076	0.522	128.120	1.133	18538.195	32472.126	20.978	0.000	1.416	0.000	207448.164	0.000
Instance2088.5	47.329	0.538	130.533	1.161	18769.225	32692.671	38.593	0.000	1.449	0.000	209136.596	0.000
Instance2088.6	51.014	0.531	125.054	1.093	18430.192	31974.062	29.999	0.000	1.366	0.000	203616.067	0.000
Instance2088.7	47.056	0.510	131.165	1.163	18471.134	32768.000	39.978	0.000	1.434	0.000	209472.215	0.000
Instance2088.8	50.617	0.537	125.723	1.124	18007.627	33326.184	30.824	0.000	1.405	0.000	206506.144	0.000
Instance2088.9	47.291	0.539	130.573	1.158	18735.063	32021.795	39.700	0.000	1.448	0.000	209137.560	0.000
Instance2088.10	50.894	0.530	125.343	1.105	18866.819	32111.180	29.700	0.000	1.381	0.000	203320.804	0.000
Instance2088.11	46.413	0.524	132.804	1.178	18769.378	32012.333	27.097	0.000	1.473	0.000	208659.690	0.000
Instance2088.12	49.121	0.518	128.481	1.131	18907.330	32393.080	21.837	0.000	1.413	0.000	207475.142	0.000
Instance2088.13	47.278	0.541	124.735	1.145	18727.822	32892.844	42.875	0.000	1.431	0.000	208452.740	0.000
Instance2088.14	50.937	0.533	124.830	1.102	18827.895	32476.729	30.186	0.000	1.378	0.000	208132.511	0.000



D Database Backup Test Result Report

D.1 Server 1

Microsoft Exchange Jetstress 2013

Database backup Test Result Report

Database Backup Statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance3068.1	1101906.09	04:51:26	63.02
Instance3068.2	1101906.09	04:30:58	67.78
Instance3068.3	1101914.09	04:28:24	68.42
Instance3068.4	1101890.09	04:44:52	64.47
Instance3068.5	1101898.09	03:55:45	77.90
Instance3068.6	1101898.09	04:20:00	70.63
Instance3068.7	1101898.09	04:20:02	70.62
Instance3068.8	1101914.09	04:43:06	64.87
Instance3068.9	1101890.09	04:31:33	67.63
Instance3068.10	1101890.09	04:45:04	64.42
Instance3068.11	1101922.09	04:28:50	68.31
Instance3068.12	1101914.09	04:45:48	64.26
Instance3068.13	1101890.09	04:07:14	74.28
Instance3068.14	1101898.09	04:23:59	69.56
Avg			68.30
Sum			956.17

Jetstress System Parameters

Thread Count	16
Minimum Database Cache	448.0 MB
Maximum Database Cache	3584.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%



Database Configuration

Instance3068.1 Log path: C:\databases\DB1
Database: C:\databases\DB1\Jetstress001001.edb

Instance3068.2 Log path: C:\databases\DB2
Database: C:\databases\DB2\Jetstress002001.edb

Instance3068.3 Log path: C:\databases\DB3
Database: C:\databases\DB3\Jetstress003001.edb

Instance3068.4 Log path: C:\databases\DB4
Database: C:\databases\DB4\Jetstress004001.edb

Instance3068.5 Log path: C:\databases\DB5
Database: C:\databases\DB5\Jetstress005001.edb

Instance3068.6 Log path: C:\databases\DB6
Database: C:\databases\DB6\Jetstress006001.edb

Instance3068.7 Log path: C:\databases\DB7
Database: C:\databases\DB7\Jetstress007001.edb

Instance3068.8 Log path: C:\databases\DB8
Database: C:\databases\DB8\Jetstress008001.edb

Instance3068.9 Log path: C:\databases\DB9
Database: C:\databases\DB9\Jetstress009001.edb

Instance3068.10 Log path: C:\databases\DB10
Database: C:\databases\DB10\Jetstress010001.edb

Instance3068.11 Log path: C:\databases\DB11
Database: C:\databases\DB11\Jetstress011001.edb

Instance3068.12 Log path: C:\databases\DB12
Database: C:\databases\DB12\Jetstress012001.edb

Instance3068.13 Log path: C:\databases\DB13
Database: C:\databases\DB13\Jetstress013001.edb

Instance3068.14 Log path: C:\databases\DB14
Database: C:\databases\DB14\Jetstress014001.edb

Transactional I/O Performance

Instance	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
Instance3068.1	5.175	0.000	251,950	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3068.2	6.111	0.000	271,088	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3068.3	6.840	0.000	274,845	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3068.4	7.172	0.000	257,829	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3068.5	5.900	0.000	311,509	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3068.6	6.660	0.000	282,436	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3068.7	6.434	0.000	287,534	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3068.8	7.178	0.000	259,324	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3068.9	6.736	0.000	270,469	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3068.10	7.163	0.000	257,909	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3068.11	6.633	0.000	273,767	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3068.12	7.194	0.000	256,695	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3068.13	6.161	0.000	297,141	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3068.14	6.652	0.000	278,054	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	3.446	0.790	4.872
Available MBytes	30329.491	30335.000	30367.000
Free System Page Table Entries	33555853.983	33555851.000	33555856.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	234380143.723	234283008.000	235102208.000
Pool Paged Bytes	117809067.546	117637120.000	117940224.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

2/9/2014 6:54:01 PM -- Preparing for testing ...

2/9/2014 6:55:05 PM -- Attaching databases ...

2/9/2014 6:55:05 PM -- Preparations for testing are complete.

2/9/2014 6:55:24 PM -- Performance logging started (interval: 30000 ms).

2/9/2014 6:55:24 PM -- Hooking up databases ...

2/9/2014 11:46:50 PM -- Performance logging has ended.

2/9/2014 11:46:50 PM -- Instance3068.1 (100% processed), Instance3068.2 (100% processed), Instance3068.3 (100% processed), Instance3068.4 (100% processed), Instance3068.5 (100% processed), Instance3068.6 (100% processed), Instance3068.7 (100% processed), Instance3068.8 (100% processed), Instance3068.9 (100% processed), Instance3068.10 (100% processed), Instance3068.11 (100% processed), Instance3068.12 (100% processed), Instance3068.13 (100% processed) and Instance3068.14 (100% processed)

2/9/2014 11:46:50 PM -- C:\Program Files\Microsoft Jet OLEDB\MSD-Prod\Jetstress\Backup_2014_2_9_18_55_53.edb has 582 samples.

2/9/2014 11:46:50 PM -- Creating test report ...



D.2 Server 2

Microsoft Exchange Jetstress 2013

Database backup Test Result Report

Database Backup Statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance2300.1	1101866.09	04:58:09	61.59
Instance2300.2	1101874.09	04:33:13	67.21
Instance2300.3	1101858.09	04:35:54	66.56
Instance2300.4	1101874.09	04:52:11	62.85
Instance2300.5	1101866.09	04:13:06	72.56
Instance2300.6	1101866.09	04:34:42	66.85
Instance2300.7	1101858.09	04:33:29	67.15
Instance2300.8	1101866.09	04:51:07	63.08
Instance2300.9	1101866.09	04:35:50	66.57
Instance2300.10	1101882.09	04:53:23	62.60
Instance2300.11	1101858.09	04:39:44	65.65
Instance2300.12	1101866.09	04:51:58	62.90
Instance2300.13	1101850.09	04:15:51	71.77
Instance2300.14	1101882.09	04:37:38	66.15
Avg			65.96
Sum			923.49

Jetstress System Parameters

Thread Count	16
Minimum Database Cache	448.0 MB
Maximum Database Cache	3584.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%



Database Configuration

Instance2300.1 Log path: C:\databases\DW1
Database: C:\databases\DW1\testres001001.edb

Instance2300.2 Log path: C:\databases\DW2
Database: C:\databases\DW2\testres002001.edb

Instance2300.3 Log path: C:\databases\DW3
Database: C:\databases\DW3\testres003001.edb

Instance2300.4 Log path: C:\databases\DW4
Database: C:\databases\DW4\testres004001.edb

Instance2300.5 Log path: C:\databases\DW5
Database: C:\databases\DW5\testres005001.edb

Instance2300.6 Log path: C:\databases\DW6
Database: C:\databases\DW6\testres006001.edb

Instance2300.7 Log path: C:\databases\DW7
Database: C:\databases\DW7\testres007001.edb

Instance2300.8 Log path: C:\databases\DW8
Database: C:\databases\DW8\testres008001.edb

Instance2300.9 Log path: C:\databases\DW9
Database: C:\databases\DW9\testres009001.edb

Instance2300.10 Log path: C:\databases\DW10
Database: C:\databases\DW10\testres010001.edb

Instance2300.11 Log path: C:\databases\DW11
Database: C:\databases\DW11\testres011001.edb

Instance2300.12 Log path: C:\databases\DW12
Database: C:\databases\DW12\testres012001.edb

Instance2300.13 Log path: C:\databases\DW13
Database: C:\databases\DW13\testres013001.edb

Instance2300.14 Log path: C:\databases\DW14
Database: C:\databases\DW14\testres014001.edb

Transactional I/O Performance

Instance	I/O Database Reads Average Latency (ms)	Average	I/O Database Writes Average Latency (ms)	Average	I/O Database Reads Average Latency (ms)	Average	I/O Database Writes Average Latency (ms)	Average	I/O Log Reads Average Latency (ms)	Average	I/O Log Writes Average Latency (ms)	Average	I/O Log Reads Average Latency (ms)	Average	I/O Log Writes Average Latency (ms)
Instance2300.1	5.871	0.000	246.117	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2300.2	6.727	0.000	268.781	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2300.3	6.732	0.000	266.237	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2300.4	7.231	0.000	251.205	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2300.5	6.243	0.000	270.230	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2300.6	6.924	0.000	267.215	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2300.7	6.721	0.000	268.602	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2300.8	7.283	0.000	252.171	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2300.9	6.761	0.000	266.296	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2300.10	7.375	0.000	250.405	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2300.11	6.861	0.000	262.364	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2300.12	7.241	0.000	251.333	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2300.13	6.244	0.000	267.127	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2300.14	7.214	0.000	264.416	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	3.473	0.513	4.079
Available MBytes	30612.054	30606.000	30619.000
Free System Page Table Entries	33555854.003	33555854.000	33555856.000
Transaction Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	234082613.220	233852928.000	23424048.000
Pool Paged Bytes	117727521.129	117563392.000	11772288.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

2/9/2014 6:54:37 PM -- Preparing for testing ...
 2/9/2014 6:54:51 PM -- Attaching databases ...
 2/9/2014 6:54:51 PM -- Preparations for testing are complete.
 2/9/2014 6:55:08 PM -- Performance logging started (interval: 30000 ms).
 2/9/2014 6:55:08 PM -- Backing up databases ...
 2/9/2014 11:53:17 PM -- Performance logging has ended.
 2/9/2014 11:53:17 PM -- Instance2300.1 (100% processed), Instance2300.2 (100% processed), Instance2300.3 (100% processed), Instance2300.4 (100% processed), Instance2300.5 (100% processed), Instance2300.6 (100% processed), Instance2300.7 (100% processed), Instance2300.8 (100% processed), Instance2300.9 (100% processed), Instance2300.10 (100% processed), Instance2300.11 (100% processed), Instance2300.12 (100% processed), Instance2300.13 (100% processed) and Instance2300.14 (100% processed)
 2/9/2014 11:53:17 PM -- C:\Program Files\Exchange\Exchange\ESSP-Final\DatabasesBackup_2014_2_9_18_54_51.biq has 595 samples.
 2/9/2014 11:53:17 PM -- Creating test report ...



D.3 Server 3

Microsoft Exchange Jetstress 2013

Database backup Test Result Report

Database Backup Statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance880.1	1101986.09	04:46:47	64.04
Instance880.2	1101978.09	04:27:57	68.54
Instance880.3	1101970.09	04:26:43	68.86
Instance880.4	1101962.09	04:45:52	64.24
Instance880.5	1101994.09	03:57:57	77.18
Instance880.6	1101978.09	04:24:55	69.32
Instance880.7	1101978.09	06:56:30	44.10
Instance880.8	1101978.09	07:40:20	39.90
Instance880.9	1101954.09	04:24:51	69.34
Instance880.10	1101978.09	04:43:34	64.77
Instance880.11	1101978.09	04:01:05	76.18
Instance880.12	1101962.09	04:25:07	69.27
Instance880.13	1101970.09	04:22:39	69.92
Instance880.14	1101962.09	04:39:30	65.71
Avg			65.10
Sum			911.38

Jetstress System Parameters

Thread Count	16
Minimum Database Cache	448.0 MB
Maximum Database Cache	3584.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%



- Database Configuration

Instance00.1 Log path: C:\databases\001
Database: C:\databases\001\testres001001.edb

Instance00.2 Log path: C:\databases\002
Database: C:\databases\002\testres002001.edb

Instance00.3 Log path: C:\databases\003
Database: C:\databases\003\testres003001.edb

Instance00.4 Log path: C:\databases\004
Database: C:\databases\004\testres004001.edb

Instance00.5 Log path: C:\databases\005
Database: C:\databases\005\testres005001.edb

Instance00.6 Log path: C:\databases\006
Database: C:\databases\006\testres006001.edb

Instance00.7 Log path: C:\databases\007
Database: C:\databases\007\testres007001.edb

Instance00.8 Log path: C:\databases\008
Database: C:\databases\008\testres008001.edb

Instance00.9 Log path: C:\databases\009
Database: C:\databases\009\testres009001.edb

Instance00.10 Log path: C:\databases\010
Database: C:\databases\010\testres010001.edb

Instance00.11 Log path: C:\databases\011
Database: C:\databases\011\testres011001.edb

Instance00.12 Log path: C:\databases\012
Database: C:\databases\012\testres012001.edb

Instance00.13 Log path: C:\databases\013
Database: C:\databases\013\testres013001.edb

Instance00.14 Log path: C:\databases\014
Database: C:\databases\014\testres014001.edb

- Transactional I/O Performance

Microsoft Exchange Database ->>	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
Instance00.1	3.500	0.000	253.823	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance00.2	6.670	0.000	274.136	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance00.3	6.333	0.000	275.436	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance00.4	7.187	0.000	256.955	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance00.5	5.931	0.000	308.789	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance00.6	6.768	0.000	277.287	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance00.7	10.641	0.000	176.401	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance00.8	11.547	0.000	159.496	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance00.9	6.541	0.000	277.376	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance00.10	7.147	0.000	258.963	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance00.11	6.029	0.000	304.045	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance00.12	6.626	0.000	276.924	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance00.13	6.533	0.000	270.670	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance00.14	7.655	0.000	262.765	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	2.231	0.000	3.992
Available MBytes	30271.734	30262.000	30281.000
Free System Page Table Entries	33222824.000	33222824.000	33222824.000
Transaction Pages Repurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	232657404.100	232213336.000	233336852.000
Pool Paged Bytes	118348491.331	117944320.000	118460096.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

- Test Log

2/9/2014 6:04:40 PM -- Preparing for testing ...
 2/9/2014 6:04:54 PM -- Attaching databases ...
 2/9/2014 6:04:54 PM -- Preparations for testing are complete.
 2/9/2014 6:05:13 PM -- Performance logging started (Interval: 30000 ms).
 2/9/2014 6:05:13 PM -- Backing up databases ...
 2/10/2014 2:05:33 AM -- Performance logging has ended.
 2/10/2014 2:05:33 AM -- Instance00.1 (100% processed), Instance00.2 (100% processed), Instance00.3 (100% processed), Instance00.4 (100% processed), Instance00.5 (100% processed), Instance00.6 (100% processed), Instance00.7 (100% processed), Instance00.8 (100% processed), Instance00.9 (100% processed), Instance00.10 (100% processed), Instance00.11 (100% processed), Instance00.12 (100% processed), Instance00.13 (100% processed) and Instance00.14 (100% processed)
 2/10/2014 2:05:33 AM -- C:\Program Files\Exchange\testres\ESRP-Final\DatabaseBackup_2014_2_9_18_04_34.hkx has 919 samples.
 2/10/2014 2:05:33 AM -- Creating test report ...



D.4 Server 4

Microsoft Exchange Jetstress 2013

Database backup Test Result Report

Database Backup Statistics - All			
Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance3088.1	1101842.09	05:00:52	61.04
Instance3088.2	1101834.09	04:34:30	66.90
Instance3088.3	1101850.09	04:12:33	72.71
Instance3088.4	1101834.09	04:37:49	66.10
Instance3088.5	1101842.09	04:38:05	66.04
Instance3088.6	1101850.09	04:53:10	62.64
Instance3088.7	1101850.09	04:42:19	65.05
Instance3088.8	1101850.09	04:48:10	63.72
Instance3088.9	1101834.09	04:31:21	67.67
Instance3088.10	1101850.09	04:53:34	62.56
Instance3088.11	1101850.09	04:14:44	72.09
Instance3088.12	1101850.09	04:34:39	66.86
Instance3088.13	1101842.09	04:45:58	64.22
Instance3088.14	1101850.09	04:53:12	62.63
Avg			65.73
Sum			920.22

Jetstress System Parameters	
Thread Count	16
Minimum Database Cache	448.0 MB
Maximum Database Cache	3584.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%



Database Configuration

Instance3088.1 Log path: C:\databases\DD1
Database: C:\databases\DD1\Jetstress001001.adb

Instance3088.2 Log path: C:\databases\DD2
Database: C:\databases\DD2\Jetstress002001.adb

Instance3088.3 Log path: C:\databases\DD3
Database: C:\databases\DD3\Jetstress003001.adb

Instance3088.4 Log path: C:\databases\DD4
Database: C:\databases\DD4\Jetstress004001.adb

Instance3088.5 Log path: C:\databases\DD5
Database: C:\databases\DD5\Jetstress005001.adb

Instance3088.6 Log path: C:\databases\DD6
Database: C:\databases\DD6\Jetstress006001.adb

Instance3088.7 Log path: C:\databases\DD7
Database: C:\databases\DD7\Jetstress007001.adb

Instance3088.8 Log path: C:\databases\DD8
Database: C:\databases\DD8\Jetstress008001.adb

Instance3088.9 Log path: C:\databases\DD9
Database: C:\databases\DD9\Jetstress009001.adb

Instance3088.10 Log path: C:\databases\DD10
Database: C:\databases\DD10\Jetstress010001.adb

Instance3088.11 Log path: C:\databases\DD11
Database: C:\databases\DD11\Jetstress011001.adb

Instance3088.12 Log path: C:\databases\DD12
Database: C:\databases\DD12\Jetstress012001.adb

Instance3088.13 Log path: C:\databases\DD13
Database: C:\databases\DD13\Jetstress013001.adb

Instance3088.14 Log path: C:\databases\DD14
Database: C:\databases\DD14\Jetstress014001.adb

Transactional I/O Performance

Microsoft Exchange Database Instance	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 Bytes	I/O Database Writes Bytes	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance3088.1	5.957	0.000	248.227	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3088.2	6.724	0.000	267.260	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3088.3	6.246	0.000	290.835	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3088.4	7.045	0.000	264.105	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3088.5	6.794	0.000	264.118	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3088.6	7.896	0.000	280.828	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3088.7	6.518	0.000	260.135	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3088.8	7.114	0.000	224.751	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3088.9	6.614	0.000	270.747	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3088.10	7.376	0.000	290.173	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3088.11	6.315	0.000	288.223	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3088.12	6.983	0.000	267.303	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3088.13	6.982	0.000	256.992	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3088.14	7.253	0.000	260.204	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	3.496	0.347	4.625
Available MBytes	40193.490	40168.000	40204.000
Free System Page Table Entries	33203737.997	33203735.000	33203740.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	236742956.373	236642304.000	237106988.000
Pool Paged Bytes	117476420.267	117383168.000	117600256.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log

2/8/2014 6:54:38 PM -- Preparing for testing ...
 2/8/2014 6:54:52 PM -- Attaching databases ...
 2/8/2014 6:54:52 PM -- Preparations for testing are complete.
 2/8/2014 6:55:10 PM -- Performance logging started (interval: 30000 ms).
 2/8/2014 6:55:10 PM -- Backing up databases ...
 2/8/2014 11:56:03 PM -- Performance logging has ended.
 2/8/2014 11:56:03 PM -- Instance3088.1 (100% processed), Instance3088.2 (100% processed), Instance3088.3 (100% processed), Instance3088.4 (100% processed), Instance3088.5 (100% processed), Instance3088.6 (100% processed), Instance3088.7 (100% processed), Instance3088.8 (100% processed), Instance3088.9 (100% processed), Instance3088.10 (100% processed), Instance3088.11 (100% processed), Instance3088.12 (100% processed), Instance3088.13 (100% processed) and Instance3088.14 (100% processed)
 2/8/2014 11:56:03 PM -- C:\Program Files\Exchange\Jetstress\Final\BGRP\DatabaseStatus_2014_2_8_14_54_52.txt has 600 samples.
 2/8/2014 11:56:03 PM -- Closing test report ...

