



# Dell PowerEdge R720xd 6,000 Mailbox Resiliency Microsoft Exchange 2013 Storage Solution

Tested with ESRP – Storage Version 4.0  
Tested Date: Feb 2014

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# 1 Overview

This document provides information about 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 for vendors to provide information on its storage solutions for Microsoft Exchange Server software. For more information about 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 storage solution for a 6,000 mailbox Exchange 2013 site resilient environment 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. DAG can span across sites to provide site resiliency. 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 a single DAG and three copies of each data base spanning two sites: Local and Remote. The local site has two database copies--active and passive--while the remote site has a passive copy of the database. The tested environment simulates up to 6,000 users with 3 Gigabyte (GB) Mailbox size and 150 messages a day profile or 0.121 IOPS per user including 20% headroom.

In this solution, Dell™ PowerEdge™ R720xd with 3.5-inch drives is configured for the Mailbox Server Role. Each Dell PowerEdge R720xd hosts one active copy of an Exchange 2013 database and transaction logs and one passive copy of the peer node's active databases at the local site. Secondary passive copies of databases for the local site are hosted at the remote site. Dell PowerEdge R720xd provides SAS-based internal storage with RAID. The following are major features of the server/storage system:

- Capable of hosting up to 12, 3.5-inch Large Form Factor(LFF) SAS/Nearline SAS/SATA drives of up to 4 TB<sup>1</sup>, plus two additional 2.5-inch disk drives in the back of the system (The 3.5-inch LFF configuration of the PowerEdge R720xd is used as part of this solution.)
- Or up to 26, 2.5-inch Small Form Factor(SFF) SAS/Nearline SAS/SATA drives of up to 1.2 TB<sup>1</sup> capacity (including the two 2.5-inch back-accessible disk drives).
- Host-based RAID options with Dell PowerEdge RAID Controller H710P Mini.

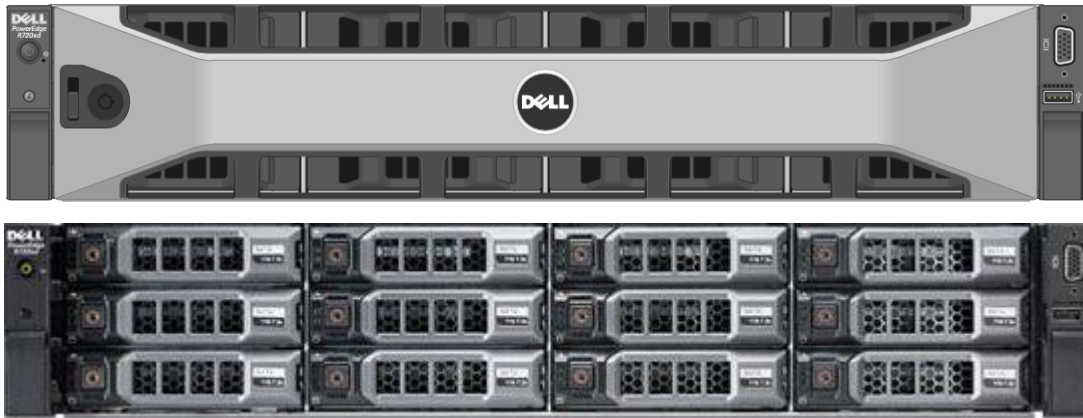
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<sup>1</sup> This information is accurate as of the date written

## 3 Solution Components

The presented solution employs Dell PowerEdge R720xd server/storage combination building blocks, which are capable of meeting the high performance requirements of messaging deployments. The presented solution is for up to 6,000 mailboxes of size 3GB each. The following sub-sections describe the hardware components that are part of this Exchange solution.

Figure 1 Dell PowerEdge R720xd 3.5-inch Server



### 3.1 Dell PowerEdge R720xd Features

Dell PowerEdge R720xd is a 2-socket CPU, 2U, multi-purpose server, offering an excellent balance of an ultra-dense internal storage, redundancy and value in a compact form factor. It is a great hardware building block for any mid-size or large business that requires scalability in both memory density and storage capacity. It delivers enormous storage capacity and IOPS performance in a dense 2U form-factor, enabling larger and more efficient databases and mail servers. The internal RAID controller enables a range of RAID levels for improved storage reliability, while the optional CacheCade™ feature caches most frequently accessed data, boosting database performance. The following are major features of the server or storage system:

- Intel® Xeon® processor E5-2600 and E5-2600 v2 product family
- Dual processor sockets
- Up to 768GB of Memory with 24 DIMMs
- Up to 48TB Maximum Raw Internal Storage
- Choice of chassis configuration with 12 (3.5-inch LFF disk drives) or 24 (2.5-inch SFF disk drives) front loading drive bays plus two 2.5-inch SFF back-accessible drives
- Integrated RAID support via PERC H310, PERC H710, PERC H710P & External JBOD RAID support via PERC H810
- Six PCIe 3.0 expansion slots
- Choice of NIC technologies
- Dell OpenManage™ Essentials and Dell Management Console, Dell OpenManage Power Center & Dell OpenManage Connections.

The PowerEdge R720xd chassis configured with the 3.5-inch large form factor drives is used as part of this solution. For more information, see [Dell PowerEdge R720xd Server product page](#).

## 3.2 Overview of the Dell PowerEdge RAID Controller H710P Mini

The Dell PowerEdge RAID Controller (PERC) H710P Mini is used in the PowerEdge R720xd server hosting the Exchange server. The PERC H710P Mini is the newest line of internal host-based RAID Controller cards from the PERC Series 8 Family. PERC cards are built on the LSISA2208 dual-core PowerPC RAID-on-Chip (ROC), offer unmatched I/O performance for database, applications and streaming digital media environments.

Table 1 shows the technical specification of the PERC H710P Mini. For more information, see [Dell PowerEdge RAID Controller product page](#).

Table 1 Dell PowerEdge RAID Controller H710P Mini Technical Specifications

Feature	Specification
Solution	Eight-port internal SATA+SAS solution supporting up to 32 hard disk drives (HDDs) and solid-state drives (SSDs)
Physical dimension	167.6mm (6.6in) x 64.4mm (2.5-inch) (MD2 low profile)
Connectors	Two internal mini-SAS SFF8088
Device support	Up to 32 (SAS, SATA)
Host bus type	8-lane, PCI Express 2.0 compliant
Data transfer rate	Up to 6 Gb/s per port
SAS controller	LSISAS2208 dual-core PowerPC ROC
Cache size	1 GB
RAID management	Dell OpenManage™ Storage Services & Additional management through UEFI (HII) & CEM
Optional SSD optimization	<ul style="list-style-type: none"><li>CacheCade™ software: provides boost in READs from SSD cache</li><li>Dell FastPath™ software: delivers high IOPs performance on SSD arrays</li></ul>

For more information about recommended hardware specifications, see [Section 4.3](#).



## 4 Solution Description

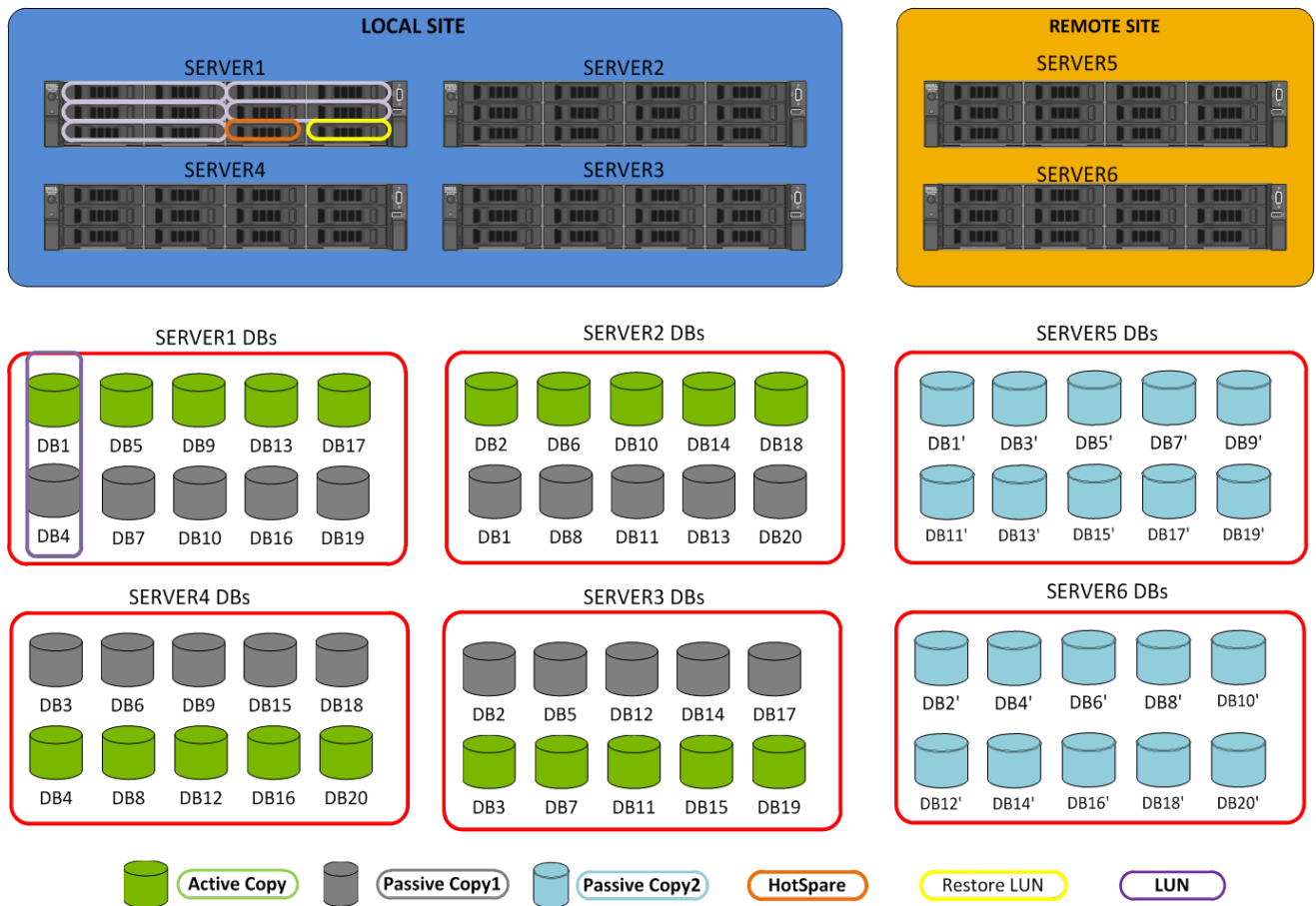
In this solution, the Dell PowerEdge R720xd server with 3.5-inch LFF drives is used for the Mailbox Server Role. PowerEdge R720xd provides SAS-based Internal Storage with RAID. The presented solution utilizes all of the 12 3.5-inch LFF 7.2KRPM NL-SAS disks along with the back-accessible 2.5-inch disks drives in the following layout.

- Two back-accessible disk drives (in RAID 1 container) for the operating system plus application files and Exchange Transport database
- Ten disk drives (in five RAID 1 containers) for Exchange database and its transaction logs
- One disk drive marked for Restore LUN
- One disk drive configured as a Global Hot-spare

The presented solution has a 3-copy DAG Layout with Exchange Servers distributed between two sites: Local and Remote. Each server node has 5-RAID 1 LUNs hosting one active and one passive database per LUN. Each of these databases hosts 300 users with 3GB mailbox size each. Thus, a single server can accommodate 1,500 users during normal operating conditions. Four such servers placed in the local site provide Exchange Mailbox Services for 6,000 users. The mailbox user profile tested was 150 messages per day or 0.121 IOPS per user, which included a 20% IO overhead.

Figure 2 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 is shown in the figure. 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. If a server fails in the local site, the databases are activated on the surviving hosts to provide mailbox service continuity. In case of a Site failure, the databases are activated in the remote site to provide the Exchange Server service.

Figure 2 Database Availability Group architectural diagram



## 4.1 Failure and Recovery Scenarios

Figure 2 shows the logical diagram of the solution on the local site and remote site. There are a total of four servers on the local site and two servers on the remote site. A single server failure on the local site activates the passive copies of the impacted databases local to the site because there are two copies at the local site, thus ensuring that the users impacted stay local. If there is a complete site failure, then the remote passive copies get activated and the users connect to their databases on the remote site. The condition considered and simulated here is a worst-case failure where in local site is completely unavailable and all the databases are activated on the remote site. Thus, each of the hosts is designed in such that any two servers are capable of holding the entire load. Each server is capable of handling the load for 3,000 users. Therefore, with two servers all the 6,000 users can be managed without compromising the performance.

Figure 3 represents the scenario where local site is completely unavailable. In this case, the databases are activated on the remote site. These hosts are designed such that each host is capable of handling 3,000 users in the worst case scenario. Thus, a total of 6000 users could be handled by two servers located in the remote site.

Figure 3 With all four Servers being unavailable in the Local Site

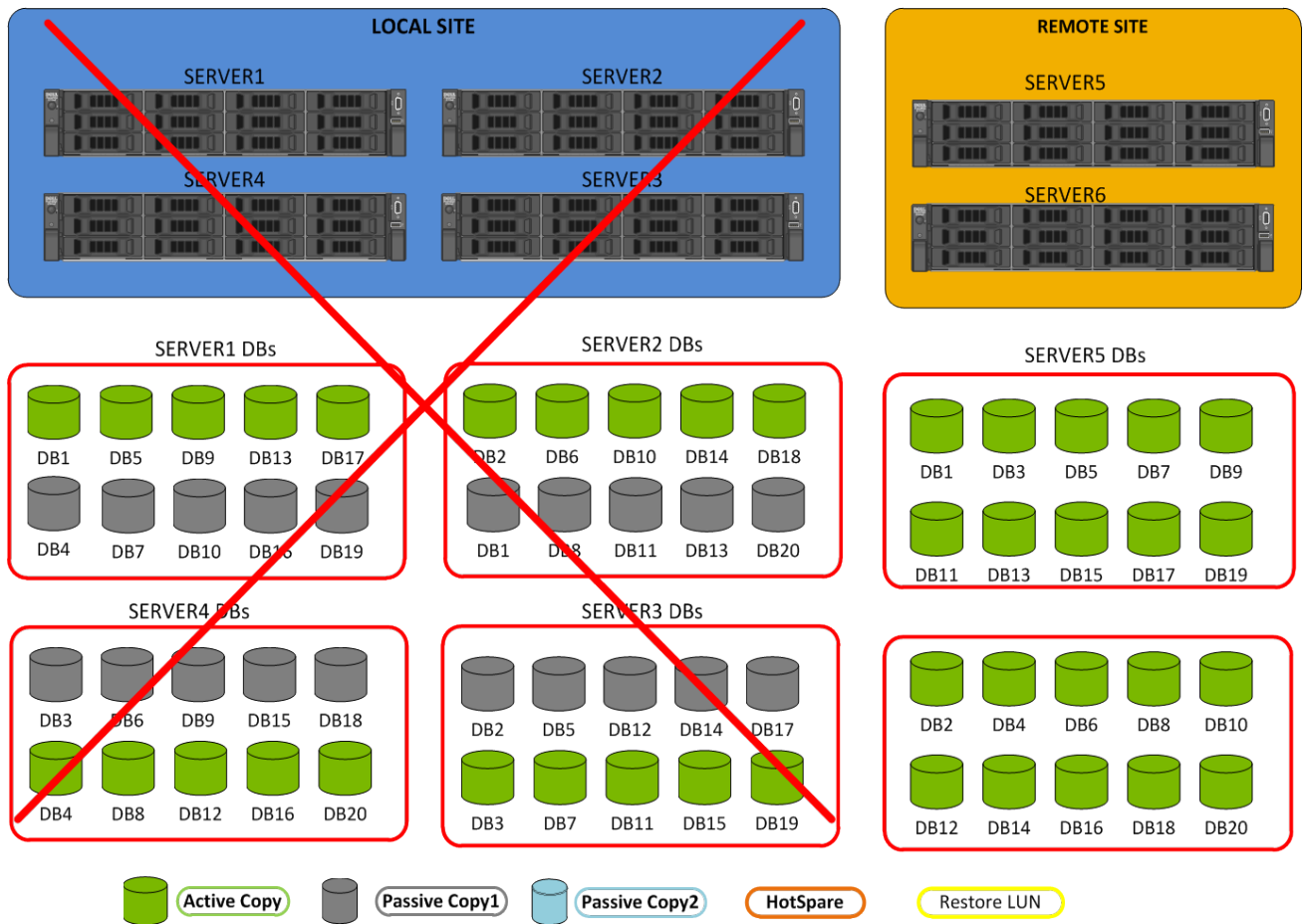


Figure 4 represents the database distribution across servers. The [Microsoft Exchange 2013 Server Role Requirements Calculator](#) can be used to derive the database distribution including the active and passive copies across servers located both in local and remote sites. The database distribution follows a particular pattern to ensure that, if a server fails, the passive copies are activated on the remaining host such that the load on each of the host machines is evenly distributed.

Figure 4 Database/Transaction Log Layout across servers in DAG

Database Name	Active Server	Local Site				Remote Site		
		Server1	Server2	Server3	Server4	Servers5	Server6	
DB1	Server1	1	2			3		1 Active Copy
DB2	Server2		1	2			3	
DB3	Server3			1	2	3		2 Passive Copy 1
DB4	Server4	2			1		3	
DB5	Server1	1		2		3		
DB6	Server2		1		2		3	
DB7	Server3	2		1		3		3 Passive Copy 2
DB8	Server4		2		1		3	
DB9	Server1	1			2	3		
DB10	Server2	2	1				3	
DB11	Server3		2	1		3		
DB12	Server4			2	1		3	
DB13	Server1	1	2			3		
DB14	Server2		1	2			3	
DB15	Server3			1	2	3		
DB16	Server4	2			1		3	
DB17	Server1	1		2		3		
DB18	Server2		1		2		3	
DB19	Server3	2		1		3		
DB20	Server4		2		1		3	

## 4.2 Storage Sizing

The storage sizing typically includes the type of RAID, type of disk drives and number of disk drives both from Capacity and IOPS perspective. Selecting the right storage is crucial to achieving the balance between cost and performance. Jetstress tools provide a way of capturing the IOPS provided by the storage subsystem. The storage design also depends on the actual size of the mailbox on the disk drive, content indexing space and Log space required. You can use Dell Open Manage Server Administrator (OMSA) software for managing the storage.

[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 6,000 users with 150 messages per day profile. The recommended IOPS per server is 362. This will be the target IOPS that will be verified and tested as part of ESRP Jetstress verification. For more information, see [Section 5](#).

Figure 5 Recommended IOPS from the Microsoft Exchange 2013 Server Role Requirements Calculator

Host IO and Throughput Requirements	/ Database	/ Server	/ DAG	/ Environment
Total Database Required IOPS	36	362	2171	2171
Total Log Required IOPS	8	77	465	465
Database Read I/O Percentage	60%	--	--	--
Background Database Maintenance Throughput Requirements	1.0 MB/s	10 MB/s	60 MB/s	60 MB/s

## 4.3 Recommended Hardware Configuration

Based on the solution requirements as described in the earlier sections, table 2 provides more information about the server and storage configuration. Additionally, the firmware and driver versions are also provided for the tested solution.

Table 2 Exchange Server Configuration

Microsoft Exchange Server System	Dell PowerEdge R720xd Server with 3.5" HDD Chassis
CPU	2 x 2.2GHz Intel® Xeon® processor E5-2660 v2 with 10 cores
Memory	Up to 128 GB DDR3
NIC	Broadcom NetXtreme II
RAID Controller	Dell PowerEdge RAID Controller H710P Mini Firmware version: 21.2.0-0007 Storport Driver Version 6.2.9200.16384 Driver version 5.2.122.0
Internal Disks	2 x 1.2 TB SAS 2.5-inch 10K RPM disk drives (Operating System and Application)

Table 3 Storage Subsystem configuration

Storage System	Dell PowerEdge R720xd Internal 3.5-inch drives
Disks	12 x 4 TB 7.2K RPM NL-SAS 3.5-inch disk: <ul style="list-style-type: none"> <li>10 x 4 TB 7.2K RPM NL-SAS 3.5-inch drive in 5 x RAID 1 (for DB and Log)</li> <li>1 x 4 TB 7.2K RPM NL-SAS 3.5-inch drive (for Restore LUN)</li> <li>1 x 4 TB 7.2K RPM NL-SAS 3.5-inch drive (for Global Hot-spare)</li> </ul>
RAID Controller	Dell PowerEdge RAID Controller H710P Mini (Firmware version: 21.2.0.007)

## 5 Targeted Customer Profile

This solution is intended for mid-size to large organizations hosting up to 6,000 Exchange 2013 mailboxes. The configuration used for testing was as follows:

- Number of mailboxes: 6,000
- Number of sites: 2 (Local & Remote)
- Number of servers in each Site: 4 in Local and 2 in Remote
- User IO profile: 150 messages sent and received or 0.121 I/O Operations per second per mailbox (This includes 20% IO overhead factor.)
- 3GB Mailbox quota per mailbox
- 24x7 Background Database Maintenance enabled
- Data Availability Group (DAG) for Mailbox Resiliency (3 copies simulated--1 Active, 2 Passive)

### 5.1 Tested User Profile

The tested user profile was 0.121 IOPS per user with a 3GB mailbox size. This IO profile for Exchange 2013 represents about 150 messages (sent or received) per mailbox per day and accounts for an additional 20% I/O overhead. Sometimes additional applications, such as certain mobile messaging applications, can raise the IOPS profile of a user as high as three or four times this number.

### 5.2 Tested Deployment

The tested deployment simulated a failure scenario where up to 4 members of the local site are completely unavailable 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 3,000 active mailboxes on the same Exchange 2013 Server. The target IOPs for the given profile was 362. The achieved IOPs were 628--much higher than the target--and the solution still maintains read and write latencies well within the recommended thresholds. The following tables summarize the testing environment.

Table 4 Simulated Exchange Configuration

Feature	Specification
Number of Exchange mailboxes simulated	6,000 (at 3 GB mailbox size each)
Number of Database Availability Groups (DAGs)	1
Number of Sites	2 ( Local and Remote)

Feature	Specification
Number of servers/DAG	6 ( 4 Local and 2 Remote) ( 2 Tested)
Number of active mailboxes/server	1,500 (during normal operations) & 3,000 (during site failure)
Number of databases/server	10 (5 active, 5 passive)
Number of copies/database	3 (2 in Local and 1 in remote site)
Number of mailboxes/database	300
Simulated profile: IOPS/mailbox	0.121 (150 messages/day) This includes 20% IO overhead factor
Database/Log LUN size	3725GB
Number of LUNs per server	5
Number of DBs per LUN	2 (one active, one passive)
Background database maintenance (BDM)	Tested with BDM enabled
Total database size for performance testing	902GB per DB 17.6 TB total
% storage capacity used by Exchange database	17.6 TB / 36.4 TB 48.36%

Table 5 Storage and Server Hardware

Feature	Specification
Storage Connectivity (Fiber Channel, SAS, SATA, iSCSI)	SAS
Storage model and OS/firmware revision	Dell PowerEdge R720xd with PERC H710P Mini Firmware 6.2.9200.1638421.2.0-0007
Storage cache	1 GB- PERC H710P
Number of storage controllers	1
Number of storage ports	2 (Two internal mini-SAS SFF8088)
Maximum bandwidth of storage connectivity to host	6 Gb/s per port
Switch type/model/firmware revision	NA
HBA model and firmware	H710P Mini Firmware 21.2.0.007
Number of HBA's/host	1
Host server type	Dell PowerEdge R720xd 2 CPU 10-core Intel® Xeon® processor E5-2660 v2 128 GB RAM
Total number of disks tested in solution	20 (10 per server)
Maximum number of spindles can be hosted in the storage	12 x 3.5" and 2 x 2.5" per Dell PowerEdge R720xd server

Table 6 Storage and Server Software

Feature	Specification
HBA driver	PERC H710P SAS-RAID 5.2.122.0
HBA QueueTarget Setting	N/A
HBA QueueDepth Setting	N/A



Multi-Pathing	N/A
Host OS	Windows™ Server 2012 standard X64 Edition
ESE.dll file version	15.00.0775.028
Replication solution name/version	N/A

Table 7 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 – ST4000NM0063
Raw capacity per disk (TB)	4 TB
Number of physical disks in test	20 (10 per Server)
Total raw storage capacity (TB)	80 TB(40 TB per Server)
Raid level	RAID 1 pairs
Number of disks per LUN	2
Total formatted capacity	3725 GB per LUN 36.4 TB total
Storage capacity utilization	$36.4/80=45.5\%$ Formatted capacity/Total raw capacity
Database capacity utilization	$17.6 \text{ TB} / 36.4 \text{ TB}=48.36\%$ Database size / Total formatted capacity

## 5.3 Best Practices

Exchange Server 2007, 2010 and 2013 overcome the memory limitations of earlier Exchange versions by providing support as a 64-bit application capable of running on supported x64 platforms. On Windows Server 2012 x64 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 increase in system memory. This decrease in database IOPS is primarily caused by a decrease in database reads.

Even with the decrease in database IOPS using larger server memory, it is essential to size the Exchange Storage subsystem accurately to make sure that there are no I/O bottlenecks from an IOP 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, the following best practices are recommended 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, sharing the spindles hosting the Exchange Database and log with any other application or operating system is not recommended.
- 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 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. While formatting the windows partitions, GUID partition table (GPT) should be used.
- Exchange Server 2013 storage latencies are most often related to the number of disk drives 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 email 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. This passive copy of the database may be used to backup to tape or disk drive.

The test performed for backup was log replay. The log replay test was used to measure the maximum rate at which the log files can be played against the databases. This is used to determine the restore times and also the database write throughput that can be achieved during a log recovery.

## 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. The tests run for 24 hours. The goal is to verify that the storage can handle a high I/O load for a long period. Both log and database files are analyzed for integrity after the stress test to make sure 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 I/O for two hours. The test shows how long it takes the storage to respond to an I/O under load. The data here is the sum of all of the logical disks I/O and average of all the logical disks I/O latency in the two hour test duration. The achieved IOPs were around 628.

As part of the ESRP framework, the Stress Test was also performed. The duration of the test was for 24 hours with a target IOPS of 0.121 per user or 362 IOPs per server. The achieved IOPs were around 630 IOPs per server. This is well above the target IOPs. The [Stress Test Result](#) Report is provided for reference.

#### 6.2.1 Individual Server Metrics

Table 8 shows the sum of I/O across Mailbox Databases and the average latency across all databases on a per server basis.

Table 8      Individual Server Metrics  
Server 1:

Database I/O	
Target Disk Transfers/sec	362
Database Disks Transfers/sec	631.338
Database Disks Reads/sec	430.345
Database Disks Writes/sec	200.993
Average Database Disk Read Latency (ms)	13.54

Database I/O	
Average Database Disk Write Latency (ms)	1.08
Transaction Log I/O	
Log Disks Writes/sec	48.8
Average Log Disk Write Latency (ms)	0.93

Server 2:

Database I/O	
Target Disk Transfers/sec	362
Database Disks Transfers/sec	630.583
Database Disks Reads/sec	428.602
Database Disks Writes/sec	206.028
Average Database Disk Read Latency (ms)	13.53
Average Database Disk Write Latency (ms)	1.05
Transaction Log I/O	
Log Disks Writes/sec	48.80
Average Log Disk Write Latency (ms)	0.90

### 6.2.1 Aggregate Performance across all servers/DAGs Metrics

Table 9 shows the aggregated results of I/O across servers in solution and the average latency across all servers in solution.

Table 9 Aggregated Performance Metrics across all Servers

Database I/O	
Database Disks Transfers/sec	1262.221
Database Disks Reads/sec	859.052
Database Disks Writes/sec	407.021
Average Database Disk Read Latency (ms)	15.66
Average Database Disk Write Latency (ms)	1.065

<b>Database I/O</b>	
<b>Transaction Log I/O</b>	
Log Disks Writes/sec	97.6
Average Log Disk Write Latency (ms)	0.915

## 6.3 Database Backup/Recovery Performance

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

### 6.3.1 Database Backup Test Result Report

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

Table 10 Database Backup Test Metrics

MB read/sec per database	168.04
MB read/sec total per server	1680.43

### 6.3.2 Soft Recovery 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 503 log files played in a single storage group. Each log file is 1 MB in size.

Table 11 SoftRecovery Test metrics

Average number of log files played	503.5
Average time to play one Log file (sec)	2.917

## 7 Conclusion

This ESRP document presents a tested and validated Exchange solution for 6,000 mailboxes with 3GB mailbox size supporting up to 150 messages per day in a three-copy DAG. The solution uses the Dell PowerEdge R720xd server for the Exchange mailbox server role and uses the internal storage of R720xd for storing the 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 6,000 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 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 obtain 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 Unified Communications and Collaboration website](#)
  - b. [Dell PowerEdge R720xd](#)
  - c. [Dell PowerEdge RAID Controller \(PERC\) H710P Spec Sheet](#)

# A Performance Test Result Report

## A.1 Server1

### Microsoft Exchange Jetstress 2013

#### Performance Test Result Report

##### Test Summary

<b>Overall Test Result</b>	<b>Pass</b>
<b>Machine Name</b>	WIN-EXCH1
<b>Test Description</b>	12*4TB Disks 7.2 KRPM NL-SAS 5 RAID1 Volumes for Exchange Databases 1 Global HotSpare, 1 Restore LUN 150 msg/day---0.121 IOPS 3000 users ,3GB mailbox size
<b>Test Start Time</b>	2/17/2014 10:22:31 AM
<b>Test End Time</b>	2/17/2014 12:28:40 PM
<b>Collection Start Time</b>	2/17/2014 10:27:25 AM
<b>Collection End Time</b>	2/17/2014 12:27:25 PM
<b>Jetstress Version</b>	15.00.0775.000
<b>ESE Version</b>	15.00.0775.028
<b>Operating System</b>	Windows Server 2012 Datacenter (6.2.9200.0)
<b>Performance Log</b>	<a href="C:\Users\Administrator\Desktop\ESRP\PerformanceTest\Performance_2014_2_17_10_22_52.blg">C:\Users\Administrator\Desktop\ESRP\PerformanceTest\Performance_2014_2_17_10_22_52.blg</a>

##### Database Sizing and Throughput

<b>Achieved Transactional I/O per Second</b>	628.512
<b>Target Transactional I/O per Second</b>	363
<b>Initial Database Size (bytes)</b>	9668227891200
<b>Final Database Size (bytes)</b>	9669955944448
<b>Database Files (Count)</b>	10

##### Jetstress System Parameters

<b>Thread Count</b>	13
<b>Minimum Database Cache</b>	320.0 MB
<b>Maximum Database Cache</b>	2560.0 MB
<b>Insert Operations</b>	40%
<b>Delete Operations</b>	20%
<b>Replace Operations</b>	5%
<b>Read Operations</b>	35%
<b>Lazy Commits</b>	70%
<b>Run Background Database Maintenance</b>	True
<b>Number of Copies per Database</b>	3



### Database Configuration

<b>Instance1168.1</b>	Log path: E:\DB1 Database: E:\DB1\Jetstress001001.edb
<b>Instance1168.2</b>	Log path: E:\DB2 Database: E:\DB2\Jetstress002001.edb
<b>Instance1168.3</b>	Log path: F:\DB3 Database: F:\DB3\Jetstress003001.edb
<b>Instance1168.4</b>	Log path: F:\DB4 Database: F:\DB4\Jetstress004001.edb
<b>Instance1168.5</b>	Log path: G:\DB5 Database: G:\DB5\Jetstress005001.edb
<b>Instance1168.6</b>	Log path: G:\DB6 Database: G:\DB6\Jetstress006001.edb
<b>Instance1168.7</b>	Log path: H:\DB7 Database: H:\DB7\Jetstress007001.edb
<b>Instance1168.8</b>	Log path: H:\DB8 Database: H:\DB8\Jetstress008001.edb
<b>Instance1168.9</b>	Log path: I:\DB9 Database: I:\DB9\Jetstress009001.edb
<b>Instance1168.10</b>	Log path: I:\DB10 Database: I:\DB10\Jetstress010001.edb

### Transactional I/O Performance

MSEExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance1168.1	13.532	1.130	42.669	19.862	33091.833	37620.428	0.000	1.188	0.000	5.050	0.000	20438.310
Instance1168.2	14.273	1.087	42.967	20.204	33064.213	37482.942	0.000	1.325	0.000	5.076	0.000	20425.424
Instance1168.3	13.303	1.069	42.851	19.829	33044.988	37547.632	0.000	1.474	0.000	5.009	0.000	20516.613
Instance1168.4	14.430	1.073	42.804	19.900	33084.734	37499.630	0.000	1.755	0.000	5.041	0.000	20463.528
Instance1168.5	14.206	1.127	42.728	19.879	33056.809	37563.793	0.000	1.138	0.000	5.088	0.000	20510.297
Instance1168.6	13.389	1.113	42.847	19.921	33107.142	37504.260	0.000	1.120	0.000	5.040	0.000	20529.599
Instance1168.7	13.858	1.136	42.836	20.059	33103.056	37568.594	0.000	0.625	0.000	5.092	0.000	20662.476
Instance1168.8	12.796	1.128	42.929	19.886	33091.448	37540.423	0.000	0.560	0.000	5.017	0.000	20573.894
Instance1168.9	12.970	1.188	43.056	20.078	33085.045	37520.667	0.000	0.559	0.000	5.052	0.000	20402.162
Instance1168.10	13.815	1.187	43.014	20.195	33066.577	37530.703	0.000	0.590	0.000	5.139	0.000	20487.167

### Background Database Maintenance I/O Performance

MSEExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Writes Average Bytes
Instance1168.1	8.727	261603.899
Instance1168.2	8.570	261683.654
Instance1168.3	8.766	261653.903
Instance1168.4	8.576	261636.182
Instance1168.5	8.560	261744.627
Instance1168.6	8.744	261662.771
Instance1168.7	8.595	261681.700
Instance1168.8	8.766	261674.510
Instance1168.9	8.760	261517.324
Instance1168.10	8.583	261667.717

Log Replication I/O Performance		
MSEXchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance1168.1	0.879	171870.747
Instance1168.2	0.882	170642.814
Instance1168.3	0.877	170984.712
Instance1168.4	0.877	171120.824
Instance1168.5	0.887	172053.161
Instance1168.6	0.879	171035.717
Instance1168.7	0.892	174308.501
Instance1168.8	0.877	171078.059
Instance1168.9	0.879	172871.345
Instance1168.10	0.897	174055.670

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
Instance1168.1	13.532	1.130	51.396	19.862	71894.933	37620.428	2.899	1.188	0.879	5.050	171870.747	20438.310
Instance1168.2	14.273	1.087	51.536	20.204	71080.745	37482.942	2.581	1.325	0.882	5.076	170642.814	20425.424
Instance1168.3	13.303	1.069	51.617	19.829	71867.723	37547.632	2.904	1.474	0.877	5.009	170984.712	20516.613
Instance1168.4	14.430	1.073	51.380	19.900	71233.224	37499.630	2.745	1.755	0.877	5.041	171120.824	20463.528
Instance1168.5	14.206	1.127	51.287	19.879	71223.565	37563.793	2.566	1.138	0.887	5.088	172053.161	20510.297
Instance1168.6	13.389	1.113	51.591	19.921	71843.414	37504.260	2.740	1.120	0.879	5.040	171035.717	20529.599
Instance1168.7	13.858	1.136	51.431	20.059	71302.236	37568.594	2.644	0.625	0.892	5.092	174308.501	20662.476
Instance1168.8	12.796	1.128	51.695	19.886	71852.239	37540.423	2.467	0.560	0.877	5.017	171078.059	20573.894
Instance1168.9	12.970	1.188	51.816	20.078	71702.147	37520.667	2.423	0.559	0.879	5.052	172871.345	20402.162
Instance1168.10	13.815	1.187	51.597	20.195	71094.363	37530.703	2.448	0.590	0.897	5.139	174055.670	20487.167

Host System Performance			
Counter	Average	Minimum	Maximum
% Processor Time	0.342	0.143	0.796
Available MBytes	152938.368	152923.000	153044.000
Free System Page Table Entries	33558768.366	33558474.000	33559869.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	114820657.272	114794496.000	114962432.000
Pool Paged Bytes	155214449.540	155123712.000	155275264.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

**Test Log**

2/17/2014 10:22:31 AM -- Preparing for testing ...

2/17/2014 10:22:42 AM -- Attaching databases ...

2/17/2014 10:22:42 AM -- Preparations for testing are complete.

2/17/2014 10:22:42 AM -- Starting transaction dispatch ..

2/17/2014 10:22:42 AM -- Database cache settings: (minimum: 320.0 MB, maximum: 2.5 GB)

2/17/2014 10:22:42 AM -- Database flush thresholds: (start: 25.6 MB, stop: 51.2 MB)

2/17/2014 10:22:52 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).

2/17/2014 10:22:52 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).

2/17/2014 10:22:54 AM -- Operation mix: Sessions 13, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.

2/17/2014 10:22:54 AM -- Performance logging started (interval: 15000 ms).

2/17/2014 10:22:54 AM -- Attaining prerequisites:

2/17/2014 10:27:25 AM -- \MSEXchange Database(JetstressWin)\Database Cache Size, Last: 2428105000.0 (lower bound: 2415919000.0, upper bound: none)

2/17/2014 12:27:25 PM -- Performance logging has ended.

2/17/2014 12:28:21 PM -- JetInterop batch transaction stats: 12411, 12411, 12411, 12411, 12411, 12411, 12411, 12411, 12410 and 12410.

2/17/2014 12:28:21 PM -- Dispatching transactions ends.

2/17/2014 12:28:21 PM -- Shutting down databases ...

2/17/2014 12:28:40 PM -- Instance1168.1 (complete), Instance1168.2 (complete), Instance1168.3 (complete), Instance1168.4 (complete), Instance1168.5 (complete), Instance1168.6 (complete), Instance1168.7 (complete), Instance1168.8 (complete), Instance1168.9 (complete) and Instance1168.10 (complete)

2/17/2014 12:28:40 PM -- C:\Users\Administrator\Desktop\ESRP\PerformanceTest\Performance\_2014\_2\_17\_10\_22\_52.blg has 496 samples.

2/17/2014 12:28:40 PM -- Creating test report ...  
 2/17/2014 12:28:45 PM -- Instance1168.1 has 13.5 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.1 has 1.2 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.1 has 1.2 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.2 has 14.3 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.2 has 1.3 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.2 has 1.3 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.3 has 13.3 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.3 has 1.5 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.3 has 1.5 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.4 has 14.4 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.4 has 1.8 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.4 has 1.8 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.5 has 14.2 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.5 has 1.1 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.5 has 1.1 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.6 has 13.4 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.6 has 1.1 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.6 has 1.1 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.7 has 13.9 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.7 has 0.6 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.7 has 0.6 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.8 has 12.8 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.8 has 0.6 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.8 has 0.6 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.9 has 13.0 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.9 has 0.6 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.9 has 0.6 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.10 has 13.8 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.10 has 0.6 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:45 PM -- Instance1168.10 has 0.6 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:45 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
 2/17/2014 12:28:45 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.  
 2/17/2014 12:28:45 PM -- [C:\Users\Administrator\Desktop\ESRP\PerformanceTest\Performance\\_2014\\_2\\_17\\_10\\_22\\_52.xml](C:\Users\Administrator\Desktop\ESRP\PerformanceTest\Performance_2014_2_17_10_22_52.xml) has 477 samples queried.

## A.2 Server 2

### Microsoft Exchange Jetstress 2013

#### Performance Test Result Report

##### Test Summary

<b>Overall Test Result</b>	<b>Pass</b>
<b>Machine Name</b>	WIN-EXCH2
<b>Test Description</b>	12*4TB Disks 7.2 KRPM NL-SAS 5 RAID1 Volumes for Exchange Databases 1 Global HotSpare, 1 Restore LUN 150 msg/day---0.121 IOPS 3000 users ,3GB mailbox size
<b>Test Start Time</b>	2/17/2014 10:22:43 AM
<b>Test End Time</b>	2/17/2014 12:28:43 PM
<b>Collection Start Time</b>	2/17/2014 10:27:37 AM
<b>Collection End Time</b>	2/17/2014 12:27:37 PM
<b>Jetstress Version</b>	15.00.0775.000
<b>ESE Version</b>	15.00.0775.028
<b>Operating System</b>	Windows Server 2012 Datacenter (6.2.9200.0)
<b>Performance Log</b>	<a href="C:\Users\Administrator\Desktop\ESRP\PerformanceTest\Performance_2014_2_17_10_23_5.blg">C:\Users\Administrator\Desktop\ESRP\PerformanceTest\Performance_2014_2_17_10_23_5.blg</a>

#### Database Sizing and Throughput

<b>Achieved Transactional I/O per Second</b>	629.755
<b>Target Transactional I/O per Second</b>	363
<b>Initial Database Size (bytes)</b>	9668345331712
<b>Final Database Size (bytes)</b>	9670081773568
<b>Database Files (Count)</b>	10

#### Jetstress System Parameters

<b>Thread Count</b>	13
<b>Minimum Database Cache</b>	320.0 MB
<b>Maximum Database Cache</b>	2560.0 MB
<b>Insert Operations</b>	40%
<b>Delete Operations</b>	20%
<b>Replace Operations</b>	5%
<b>Read Operations</b>	35%
<b>Lazy Commits</b>	70%
<b>Run Background Database Maintenance</b>	True
<b>Number of Copies per Database</b>	3

#### Database Configuration

<b>Instance3864.1</b>	Log path: E:\DB1 Database: E:\DB1\Jetstress001001.edb
<b>Instance3864.2</b>	Log path: E:\DB2 Database: E:\DB2\Jetstress002001.edb
<b>Instance3864.3</b>	Log path: F:\DB3 Database: F:\DB3\Jetstress003001.edb
<b>Instance3864.4</b>	Log path: F:\DB4 Database: F:\DB4\Jetstress004001.edb
<b>Instance3864.5</b>	Log path: G:\DB5 Database: G:\DB5\Jetstress005001.edb
<b>Instance3864.6</b>	Log path: G:\DB6 Database: G:\DB6\Jetstress006001.edb
<b>Instance3864.7</b>	Log path: H:\DB7 Database: H:\DB7\Jetstress007001.edb
<b>Instance3864.8</b>	Log path: H:\DB8 Database: H:\DB8\Jetstress008001.edb
<b>Instance3864.9</b>	Log path: I:\DB9 Database: I:\DB9\Jetstress009001.edb
<b>Instance3864.10</b>	Log path: I:\DB10 Database: I:\DB10\Jetstress010001.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
Instance3864.1	13.617	1.066	42.937	19.932	33065.745	37640.529	0.000	1.177	0.000	5.071	0.000	20671.971
Instance3864.2	14.558	1.024	43.091	19.999	33065.231	37562.695	0.000	1.128	0.000	5.052	0.000	20455.173
Instance3864.3	13.260	1.034	42.863	19.941	33088.357	37630.292	0.000	1.045	0.000	5.060	0.000	20778.147
Instance3864.4	14.193	1.033	43.262	20.222	33057.343	37503.826	0.000	1.201	0.000	5.135	0.000	20384.498
Instance3864.5	13.151	1.082	42.981	20.024	33081.145	37571.716	0.000	0.834	0.000	5.075	0.000	20770.041
Instance3864.6	14.366	1.060	43.042	19.974	33036.103	37624.735	0.000	1.002	0.000	5.047	0.000	20639.760
Instance3864.7	12.812	1.088	43.037	19.955	33061.960	37680.856	0.000	0.827	0.000	5.078	0.000	20621.074
Instance3864.8	13.732	1.094	42.764	19.690	33095.902	37619.815	0.000	0.839	0.000	5.062	0.000	20578.857
Instance3864.9	12.674	1.142	42.930	19.913	33060.572	37601.643	0.000	0.604	0.000	5.025	0.000	20666.496
Instance3864.10	13.811	1.171	43.040	20.157	33037.572	37652.828	0.000	0.624	0.000	5.148	0.000	20617.651

#### Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3864.1	8.735	261715.981
Instance3864.2	8.546	261661.430
Instance3864.3	8.780	261715.151
Instance3864.4	8.583	261643.010
Instance3864.5	8.768	261719.607
Instance3864.6	8.573	261718.320
Instance3864.7	8.782	261627.816
Instance3864.8	8.617	261657.156
Instance3864.9	8.774	261682.451
Instance3864.10	8.589	261730.348

#### Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3864.1	0.890	173205.006
Instance3864.2	0.878	168339.697
Instance3864.3	0.893	174125.872
Instance3864.4	0.893	172734.079
Instance3864.5	0.898	173721.053
Instance3864.6	0.885	170772.351
Instance3864.7	0.893	173691.537
Instance3864.8	0.885	172231.944
Instance3864.9	0.885	172137.494
Instance3864.10	0.900	176019.799

#### 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
Instance3864.1	13.617	1.066	51.672	19.932	71716.668	37640.529	2.752	1.177	0.890	5.071	173205.006	20671.971
Instance3864.2	14.558	1.024	51.637	19.999	70898.241	37562.695	2.646	1.128	0.878	5.052	168339.697	20455.173
Instance3864.3	13.260	1.034	51.643	19.941	71957.372	37630.292	2.668	1.045	0.893	5.060	174125.872	20778.147
Instance3864.4	14.193	1.033	51.846	20.222	70900.211	37503.826	3.170	1.201	0.893	5.135	172734.079	20384.498
Instance3864.5	13.151	1.082	51.749	20.024	71820.005	37571.716	2.515	0.834	0.898	5.075	173721.053	20770.041
Instance3864.6	14.366	1.060	51.615	19.974	71017.819	37624.735	2.581	1.002	0.885	5.047	170772.351	20639.760
Instance3864.7	12.812	1.088	51.819	19.955	71797.884	37680.856	2.520	0.827	0.893	5.078	173691.537	20621.074
Instance3864.8	13.732	1.094	51.381	19.690	71428.169	37619.815	2.379	0.839	0.885	5.062	172231.944	20578.857
Instance3864.9	12.674	1.142	51.704	19.913	71858.385	37601.643	2.458	0.604	0.885	5.025	172137.494	20666.496
Instance3864.10	13.811	1.171	51.628	20.157	71082.622	37652.828	2.496	0.624	0.900	5.148	176019.799	20617.651

#### Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.344	0.177	0.690
Available MBytes	121554.094	121541.000	121761.000
Free System Page Table Entries	33558832.528	33558539.000	33559933.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	108984495.299	108863488.000	109215744.000
Pool Paged Bytes	146606597.344	146546688.000	146710528.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

#### Test Log

2/17/2014 10:22:43 AM -- Preparing for testing ...  
2/17/2014 10:22:54 AM -- Attaching databases ...  
2/17/2014 10:22:54 AM -- Preparations for testing are complete.  
2/17/2014 10:22:54 AM -- Starting transaction dispatch ...  
2/17/2014 10:22:54 AM -- Database cache settings: (minimum: 320.0 MB, maximum: 2.5 GB)  
2/17/2014 10:22:54 AM -- Database flush thresholds: (start: 25.6 MB, stop: 51.2 MB)  
2/17/2014 10:23:05 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).  
2/17/2014 10:23:05 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).  
2/17/2014 10:23:06 AM -- Attaining prerequisites:  
2/17/2014 10:23:37 AM -- WSExchange Database(JetstressWin)/Database Cache Size, Last: 2422546000.0 (lower bound: 2415919000.0, upper bound: none)  
2/17/2014 12:27:37 PM -- Performance logging has ended.  
2/17/2014 12:28:24 PM -- JetInterop batch transaction stats: 12484, 12484, 12484, 12484, 12484, 12484, 12484, 12484, 12483 and 12483.  
2/17/2014 12:28:24 PM -- Dispatching transactions ends.  
2/17/2014 12:28:24 PM -- Shutting down databases ...  
2/17/2014 12:28:43 PM -- Instance3864.1 (complete), Instance3864.2 (complete), Instance3864.3 (complete), Instance3864.4 (complete), Instance3864.5 (complete), Instance3864.6 (complete), Instance3864.7 (complete), Instance3864.8 (complete), Instance3864.9 (complete) and Instance3864.10 (complete)  
2/17/2014 12:28:43 PM -- C:\Users\Administrator\Desktop\ESRP\PerformanceTest\Performance\_2014\_2\_17\_10\_23\_5.blg has 496 samples.

2/17/2014 12:28:43 PM -- Creating test report ...  
 2/17/2014 12:28:47 PM -- Instance3864.1 has 13.6 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.1 has 1.2 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.1 has 1.2 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.2 has 14.6 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.2 has 1.1 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.2 has 1.1 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.3 has 13.3 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.3 has 1.0 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.3 has 1.0 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.4 has 14.2 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.4 has 1.2 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.4 has 1.2 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.5 has 13.2 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.5 has 0.8 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.5 has 0.8 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.6 has 14.4 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.6 has 1.0 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.6 has 1.0 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.7 has 12.8 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.7 has 0.8 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.7 has 0.8 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.8 has 13.7 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.8 has 0.8 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.8 has 0.8 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.9 has 12.7 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.9 has 0.6 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.9 has 0.6 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.10 has 13.8 for I/O Database Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.10 has 0.6 for I/O Log Writes Average Latency.  
 2/17/2014 12:28:47 PM -- Instance3864.10 has 0.6 for I/O Log Reads Average Latency.  
 2/17/2014 12:28:47 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
 2/17/2014 12:28:47 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.  
 2/17/2014 12:28:47 PM -- C:\Users\Administrator\Desktop\ESRP\PerformanceTest\Performance\_2014\_2\_17\_10\_23\_5.xml has 478 samples queried.

## B Stress Test Result Report

### B.1 Server 1

## Microsoft Exchange Jetstress 2013

### Stress Test Result Report

#### Test Summary

<b>Overall Test Result</b>	<b>Pass</b>
<b>Machine Name</b>	WIN-EXCH1
<b>Test Description</b>	12*4TB Disks 7.2 KRPM NL-SAS 5 RAID1 Volumes for Exchange Databases 1 Global HotSpare, 1 Restore LUN 150 msg/day---0.121 IOPS 3000 users ,3GB mailbox size
<b>Test Start Time</b>	2/17/2014 4:52:30 PM
<b>Test End Time</b>	2/18/2014 5:03:37 PM
<b>Collection Start Time</b>	2/17/2014 4:57:25 PM
<b>Collection End Time</b>	2/18/2014 4:57:23 PM
<b>Jetstress Version</b>	15.00.0775.000
<b>ESE Version</b>	15.00.0775.028
<b>Operating System</b>	Windows Server 2012 Datacenter (6.2.9200.0)
<b>Performance Log</b>	C:\Users\Administrator\Desktop\ESRP\StressTest\Stress_2014_2_17_16_52_51.blg

#### Database Sizing and Throughput

<b>Achieved Transactional I/O per Second</b>	631.338
<b>Target Transactional I/O per Second</b>	363
<b>Initial Database Size (bytes)</b>	9669955944448
<b>Final Database Size (bytes)</b>	9689283297280
<b>Database Files (Count)</b>	10

#### Jetstress System Parameters

<b>Thread Count</b>	13
<b>Minimum Database Cache</b>	320.0 MB
<b>Maximum Database Cache</b>	2560.0 MB
<b>Insert Operations</b>	40%
<b>Delete Operations</b>	20%
<b>Replace Operations</b>	5%
<b>Read Operations</b>	35%
<b>Lazy Commits</b>	70%
<b>Run Background Database Maintenance</b>	True
<b>Number of Copies per Database</b>	3



### Database Configuration

<b>Instance1168.1</b>	Log path: E:\DB1 Database: E:\DB1\Jetstress001001.edb
<b>Instance1168.2</b>	Log path: E:\DB2 Database: E:\DB2\Jetstress002001.edb
<b>Instance1168.3</b>	Log path: F:\DB3 Database: F:\DB3\Jetstress003001.edb
<b>Instance1168.4</b>	Log path: F:\DB4 Database: F:\DB4\Jetstress004001.edb
<b>Instance1168.5</b>	Log path: G:\DB5 Database: G:\DB5\Jetstress005001.edb
<b>Instance1168.6</b>	Log path: G:\DB6 Database: G:\DB6\Jetstress006001.edb
<b>Instance1168.7</b>	Log path: H:\DB7 Database: H:\DB7\Jetstress007001.edb
<b>Instance1168.8</b>	Log path: H:\DB8 Database: H:\DB8\Jetstress008001.edb
<b>Instance1168.9</b>	Log path: I:\DB9 Database: I:\DB9\Jetstress009001.edb
<b>Instance1168.10</b>	Log path: I:\DB10 Database: I:\DB10\Jetstress010001.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
Instance1168.1	13.642	1.053	43.006	20.063	33051.736	36484.474	0.000	1.155	0.000	4.874	0.000	20601.680
Instance1168.2	14.394	1.018	43.085	20.114	33058.396	36486.510	0.000	1.181	0.000	4.881	0.000	20557.541
Instance1168.3	13.179	1.012	43.014	20.077	33061.665	36487.492	0.000	1.186	0.000	4.870	0.000	20685.697
Instance1168.4	14.193	1.030	43.115	20.173	33055.879	36481.134	0.000	1.320	0.000	4.897	0.000	20516.712
Instance1168.5	14.026	1.063	43.066	20.125	33065.973	36491.816	0.000	1.089	0.000	4.878	0.000	20642.029
Instance1168.6	13.062	1.049	42.956	20.029	33062.186	36495.596	0.000	1.015	0.000	4.872	0.000	20636.359
Instance1168.7	13.672	1.125	43.049	20.096	33070.418	36472.308	0.000	0.574	0.000	4.881	0.000	20593.634
Instance1168.8	12.724	1.117	43.090	20.141	33069.203	36473.762	0.000	0.537	0.000	4.889	0.000	20571.833
Instance1168.9	12.747	1.189	42.966	20.105	33061.912	36489.429	0.000	0.621	0.000	4.900	0.000	20657.692
Instance1168.10	13.773	1.199	42.998	20.070	33063.606	36488.684	0.000	0.630	0.000	4.875	0.000	20637.569

#### Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance1168.1	8.747	261692.750
Instance1168.2	8.560	261629.018
Instance1168.3	8.777	261675.174
Instance1168.4	8.612	261644.670
Instance1168.5	8.603	261653.140
Instance1168.6	8.777	261709.029
Instance1168.7	8.627	261643.353
Instance1168.8	8.791	261659.692
Instance1168.9	8.798	261665.160
Instance1168.10	8.622	261686.780

#### Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance1168.1	0.854	166278.766
Instance1168.2	0.853	166231.079
Instance1168.3	0.857	166881.085
Instance1168.4	0.855	166504.694
Instance1168.5	0.856	166637.056
Instance1168.6	0.854	166722.036
Instance1168.7	0.855	166797.887
Instance1168.8	0.855	166495.442
Instance1168.9	0.860	167575.636
Instance1168.10	0.854	166079.770

#### 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
Instance1168.1	13.642	1.053	51.753	20.063	71694.930	36484.474	2.686	1.155	0.854	4.874	166278.766	20601.680
Instance1168.2	14.394	1.018	51.645	20.114	70944.531	36486.510	2.794	1.181	0.853	4.881	166231.079	20557.541
Instance1168.3	13.179	1.012	51.791	20.077	71804.916	36487.492	2.718	1.186	0.857	4.870	166881.085	20685.697
Instance1168.4	14.193	1.030	51.728	20.173	71114.947	36481.134	2.748	1.320	0.855	4.897	166504.694	20516.712
Instance1168.5	14.026	1.063	51.669	20.125	71124.740	36491.816	2.719	1.089	0.856	4.878	166637.056	20642.029
Instance1168.6	13.062	1.049	51.733	20.029	71854.525	36495.596	2.658	1.015	0.854	4.872	166722.036	20636.359
Instance1168.7	13.672	1.125	51.676	20.096	71228.720	36472.308	2.570	0.574	0.855	4.881	166797.887	20593.634
Instance1168.8	12.724	1.117	51.882	20.141	71802.703	36473.762	2.485	0.537	0.855	4.889	166495.442	20571.833
Instance1168.9	12.747	1.189	51.765	20.105	71917.094	36489.429	2.530	0.621	0.860	4.900	167575.636	20657.692
Instance1168.10	13.773	1.199	51.621	20.070	71251.418	36488.684	2.589	0.630	0.854	4.875	166079.770	20637.569

#### Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.344	0.074	1.567
Available MBytes	152890.480	152809.000	153013.000
Free System Page Table Entries	33558740.868	33558471.000	33559867.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	114905077.289	114700288.000	116068352.000
Pool Paged Bytes	156037139.994	155619328.000	157151232.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

#### Test Log

2/17/2014 4:52:30 PM -- Preparing for testing ...  
 2/17/2014 4:52:40 PM -- Attaching databases ...  
 2/17/2014 4:52:40 PM -- Preparations for testing are complete.  
 2/17/2014 4:52:40 PM -- Starting transaction dispatch ...  
 2/17/2014 4:52:40 PM -- Database cache settings: (minimum: 320.0 MB, maximum: 2.5 GB)  
 2/17/2014 4:52:40 PM -- Database flush thresholds: (start: 25.6 MB, stop: 51.2 MB)  
 2/17/2014 4:52:51 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).  
 2/17/2014 4:52:51 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).  
 2/17/2014 4:52:52 PM -- Operation mix: Sessions 13, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.  
 2/17/2014 4:52:52 PM -- Performance logging started (interval: 15000 ms).  
 2/17/2014 4:52:52 PM -- Attaining prerequisites:  
 2/17/2014 4:57:25 PM -- MSExchange Database(JetstressWin)\Database Cache Size, Last: 2421416000.0 (lower bound: 2415919000.0, upper bound: none)  
 2/18/2014 4:57:25 PM -- Performance logging has ended.  
 2/18/2014 5:03:17 PM -- JetInterop batch transaction stats: 138762, 138762, 138762, 138762, 138762, 138762, 138762, 138762 and 138761.  
 2/18/2014 5:03:17 PM -- Dispatching transactions ends.  
 2/18/2014 5:03:17 PM -- Shutting down databases ...  
 2/18/2014 5:03:37 PM -- Instance1168.1 (complete), Instance1168.2 (complete), Instance1168.3 (complete), Instance1168.4 (complete), Instance1168.5 (complete), Instance1168.6 (complete), Instance1168.7 (complete), Instance1168.8 (complete), Instance1168.9 (complete) and Instance1168.10 (complete)  
 2/18/2014 5:03:37 PM -- C:\Users\Administrator\Desktop\ESRP\StressTest\Stress\_2014\_2\_17\_16\_52\_51.blg has 5754 samples.

```

2/18/2014 5:03:37 PM -- Creating test report ...
2/18/2014 5:04:17 PM -- Instance1168.1 has 13.6 for I/O Database Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.1 has 1.2 for I/O Log Writes Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.1 has 1.2 for I/O Log Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.2 has 14.4 for I/O Database Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.2 has 1.2 for I/O Log Writes Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.2 has 1.2 for I/O Log Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.3 has 13.2 for I/O Database Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.3 has 1.2 for I/O Log Writes Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.3 has 1.2 for I/O Log Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.4 has 14.2 for I/O Database Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.4 has 1.3 for I/O Log Writes Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.4 has 1.3 for I/O Log Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.5 has 14.0 for I/O Database Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.5 has 1.1 for I/O Log Writes Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.5 has 1.1 for I/O Log Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.6 has 13.1 for I/O Database Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.6 has 1.0 for I/O Log Writes Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.6 has 1.0 for I/O Log Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.7 has 13.7 for I/O Database Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.7 has 0.6 for I/O Log Writes Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.7 has 0.6 for I/O Log Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.8 has 12.7 for I/O Database Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.8 has 0.5 for I/O Log Writes Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.8 has 0.5 for I/O Log Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.9 has 12.7 for I/O Database Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.9 has 0.6 for I/O Log Writes Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.9 has 0.6 for I/O Log Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.10 has 13.8 for I/O Database Reads Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.10 has 0.6 for I/O Log Writes Average Latency.
2/18/2014 5:04:17 PM -- Instance1168.10 has 0.6 for I/O Log Reads Average Latency.
2/18/2014 5:04:17 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.
2/18/2014 5:04:17 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.
2/18/2014 5:04:17 PM -- C:\Users\Administrator\Desktop\ESRP\StressTest\Stress_2014_2_17_16_52_51.xml has 5735 samples queried.

```

## B.2 Server 2

### Microsoft Exchange Jetstress 2013

#### Stress Test Result Report

##### Test Summary

<b>Overall Test Result</b>	<b>Pass</b>
<b>Machine Name</b>	WIN-EXCH2
<b>Test Description</b>	12*4TB Disks 7.2 KRPM NL-SAS 5 RAID1 Volumes for Exchange Databases 1 Global HotSpare, 1 Restore LUN 150 msg/day---0.121 IOPS 3000 users ,3GB mailbox size
<b>Test Start Time</b>	2/17/2014 4:52:36 PM
<b>Test End Time</b>	2/18/2014 5:03:42 PM
<b>Collection Start Time</b>	2/17/2014 4:57:30 PM
<b>Collection End Time</b>	2/18/2014 4:57:16 PM
<b>Jetstress Version</b>	15.00.0775.000
<b>ESE Version</b>	15.00.0775.028
<b>Operating System</b>	Windows Server 2012 Datacenter (6.2.9200.0)
<b>Performance Log</b>	<a href="C:\Users\Administrator\Desktop\ESRP\StressTest\Stress_2014_2_17_16_52_57.blg">C:\Users\Administrator\Desktop\ESRP\StressTest\Stress_2014_2_17_16_52_57.blg</a>

#### Database Sizing and Throughput

<b>Achieved Transactional I/O per Second</b>	630.583
<b>Target Transactional I/O per Second</b>	363
<b>Initial Database Size (bytes)</b>	9670081773568
<b>Final Database Size (bytes)</b>	9689375571968
<b>Database Files (Count)</b>	10

#### Jetstress System Parameters

<b>Thread Count</b>	13
<b>Minimum Database Cache</b>	320.0 MB
<b>Maximum Database Cache</b>	2560.0 MB
<b>Insert Operations</b>	40%
<b>Delete Operations</b>	20%
<b>Replace Operations</b>	5%
<b>Read Operations</b>	35%
<b>Lazy Commits</b>	70%
<b>Run Background Database Maintenance</b>	True
<b>Number of Copies per Database</b>	3

### Database Configuration

<b>Instance3864.1</b>	Log path: E:\DB1 Database: E:\DB1\Jetstress001001.edb
<b>Instance3864.2</b>	Log path: E:\DB2 Database: E:\DB2\Jetstress002001.edb
<b>Instance3864.3</b>	Log path: F:\DB3 Database: F:\DB3\Jetstress003001.edb
<b>Instance3864.4</b>	Log path: F:\DB4 Database: F:\DB4\Jetstress004001.edb
<b>Instance3864.5</b>	Log path: G:\DB5 Database: G:\DB5\Jetstress005001.edb
<b>Instance3864.6</b>	Log path: G:\DB6 Database: G:\DB6\Jetstress006001.edb
<b>Instance3864.7</b>	Log path: H:\DB7 Database: H:\DB7\Jetstress007001.edb
<b>Instance3864.8</b>	Log path: H:\DB8 Database: H:\DB8\Jetstress008001.edb
<b>Instance3864.9</b>	Log path: I:\DB9 Database: I:\DB9\Jetstress009001.edb
<b>Instance3864.10</b>	Log path: I:\DB10 Database: I:\DB10\Jetstress010001.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
Instance3864.1	13.600	1.004	42.994	20.171	33074.991	36465.601	0.000	0.988	0.000	4.907	0.000	20513.878
Instance3864.2	14.465	0.977	42.989	20.127	33064.587	36468.838	0.000	0.999	0.000	4.875	0.000	20601.731
Instance3864.3	13.131	0.984	42.912	20.023	33069.534	36502.135	0.000	1.113	0.000	4.867	0.000	20591.911
Instance3864.4	14.128	0.997	43.050	20.161	33062.445	36456.019	0.000	1.231	0.000	4.892	0.000	20486.900
Instance3864.5	13.165	1.019	42.933	20.021	33062.610	36463.196	0.000	1.052	0.000	4.865	0.000	20594.112
Instance3864.6	14.086	1.037	42.917	20.037	33074.436	36480.611	0.000	1.203	0.000	4.876	0.000	20599.988
Instance3864.7	12.493	1.096	42.971	20.155	33068.336	36470.892	0.000	0.576	0.000	4.905	0.000	20546.135
Instance3864.8	13.742	1.103	42.953	20.067	33073.086	36474.597	0.000	0.615	0.000	4.866	0.000	20639.705
Instance3864.9	12.719	1.185	42.953	20.098	33079.829	36492.229	0.000	0.638	0.000	4.879	0.000	20619.313
Instance3864.10	13.825	1.191	42.930	20.121	33072.852	36476.958	0.000	0.651	0.000	4.876	0.000	20648.946

#### Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3864.1	8.772	261721.247
Instance3864.2	8.561	261726.390
Instance3864.3	8.798	261697.568
Instance3864.4	8.618	261719.116
Instance3864.5	8.799	261699.048
Instance3864.6	8.612	261706.175
Instance3864.7	8.828	261718.585
Instance3864.8	8.639	261700.320
Instance3864.9	8.818	261704.737
Instance3864.10	8.631	261705.312

#### Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3864.1	0.856	166910.765
Instance3864.2	0.853	166287.816
Instance3864.3	0.852	166152.507
Instance3864.4	0.852	166319.341
Instance3864.5	0.851	165682.006
Instance3864.6	0.854	166818.679
Instance3864.7	0.857	166993.437
Instance3864.8	0.853	166341.220
Instance3864.9	0.855	166555.990
Instance3864.10	0.856	166788.227

#### 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
Instance3864.1	13.600	1.004	51.767	20.171	71821.553	36465.601	2.727	0.988	0.856	4.907	166910.765	20513.878
Instance3864.2	14.465	0.977	51.550	20.127	71036.891	36468.838	2.756	0.999	0.853	4.875	166287.816	20601.731
Instance3864.3	13.131	0.984	51.710	20.023	71969.748	36502.135	2.757	1.113	0.852	4.867	166152.507	20591.911
Instance3864.4	14.128	0.997	51.668	20.161	71199.945	36456.019	2.841	1.231	0.852	4.892	166319.341	20486.900
Instance3864.5	13.165	1.019	51.732	20.021	71950.967	36463.196	2.795	1.052	0.851	4.865	165682.006	20594.112
Instance3864.6	14.086	1.037	51.530	20.037	71286.422	36480.611	2.851	1.203	0.854	4.876	166818.679	20599.988
Instance3864.7	12.493	1.096	51.799	20.155	72036.894	36470.892	2.512	0.576	0.857	4.905	166993.437	20546.135
Instance3864.8	13.742	1.103	51.592	20.067	71356.232	36474.597	2.560	0.615	0.853	4.866	166341.220	20639.705
Instance3864.9	12.719	1.185	51.772	20.098	72022.386	36492.229	2.564	0.638	0.855	4.879	166555.990	20619.313
Instance3864.10	13.825	1.191	51.560	20.121	71343.361	36476.958	2.497	0.651	0.856	4.876	166788.227	20648.946

#### Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.349	0.080	0.885
Available MBytes	121504.386	121490.000	121624.000
Free System Page Table Entries	33558812.786	33558535.000	33559933.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	109075495.817	109039616.000	109150208.000
Pool Paged Bytes	147220526.781	146976768.000	147513344.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

#### Test Log

2/17/2014 4:52:36 PM -- Preparing for testing ...  
2/17/2014 4:52:46 PM -- Attaching databases ...  
2/17/2014 4:52:46 PM -- Preparations for testing are complete.  
2/17/2014 4:52:46 PM -- Starting transaction dispatch ...  
2/17/2014 4:52:46 PM -- Database cache settings: (minimum: 320.0 MB, maximum: 2.5 GB)  
2/17/2014 4:52:46 PM -- Database read latency thresholds: (start: 25.6 MB, stop: 51.2 MB)  
2/17/2014 4:52:57 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).  
2/17/2014 4:52:57 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).  
2/17/2014 4:52:58 PM -- Operation mix: Sessions 13, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.  
2/17/2014 4:52:58 PM -- Performance logging started (interval: 15000 ms).  
2/17/2014 4:52:58 PM -- Attaining prerequisites:  
2/17/2014 4:57:30 PM -- VMSExchange Database(JetstressWin)Database Cache Size, Last: 2426831000.0 (lower bound: 2415919000.0, upper bound: none)  
2/18/2014 4:57:31 PM -- Performance logging has ended.  
2/18/2014 5:03:21 PM -- JetInterop batch transaction stats: 138453, 138453, 138452, 138452, 138452, 138452, 138452, 138452, 138452 and 138452.  
2/18/2014 5:03:21 PM -- Dispatching transactions ends.  
2/18/2014 5:03:21 PM -- Shutting down databases ...  
2/18/2014 5:03:42 PM -- Instance3864.1 (complete), Instance3864.2 (complete), Instance3864.3 (complete), Instance3864.4 (complete), Instance3864.5 (complete), Instance3864.6 (complete), Instance3864.7 (complete), Instance3864.8 (complete), Instance3864.9 (complete) and Instance3864.10 (complete)  
2/18/2014 5:03:42 PM -- C:\Users\Administrator\Desktop\ESRP\StressTest\Stress\_2014\_2\_17\_16\_52\_57.blg has 5753 samples.

2/18/2014 5:03:42 PM -- Creating test report ...  
2/18/2014 5:04:20 PM -- Instance3864.1 has 13.6 for I/O Database Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.1 has 1.0 for I/O Log Writes Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.1 has 1.0 for I/O Log Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.2 has 14.5 for I/O Database Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.2 has 1.0 for I/O Log Writes Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.2 has 1.0 for I/O Log Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.3 has 13.1 for I/O Database Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.3 has 1.1 for I/O Log Writes Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.3 has 1.1 for I/O Log Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.4 has 14.1 for I/O Database Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.4 has 1.2 for I/O Log Writes Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.4 has 1.2 for I/O Log Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.5 has 13.2 for I/O Database Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.5 has 1.1 for I/O Log Writes Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.5 has 1.1 for I/O Log Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.6 has 14.1 for I/O Database Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.6 has 1.2 for I/O Log Writes Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.6 has 1.2 for I/O Log Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.7 has 12.5 for I/O Database Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.7 has 0.6 for I/O Log Writes Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.7 has 0.6 for I/O Log Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.8 has 13.7 for I/O Database Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.8 has 0.6 for I/O Log Writes Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.8 has 0.6 for I/O Log Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.9 has 12.7 for I/O Database Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.9 has 0.6 for I/O Log Writes Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.9 has 0.6 for I/O Log Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.10 has 13.8 for I/O Database Reads Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.10 has 0.7 for I/O Log Writes Average Latency.  
2/18/2014 5:04:20 PM -- Instance3864.10 has 0.7 for I/O Log Reads Average Latency.  
2/18/2014 5:04:20 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
2/18/2014 5:04:20 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.  
2/18/2014 5:04:20 PM -- C:\Users\Administrator\Desktop\ESRP\StressTest\Stress\_2014\_2\_17\_16\_52\_57.xml has 5734 samples queried.

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## C Database Backup Test Result Report

### C.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
Instance1168.1	921802.09	01:29:26	171.77
Instance1168.2	921802.09	01:37:11	158.07
Instance1168.3	921802.09	01:26:02	178.57
Instance1168.4	921802.09	01:37:03	158.28
Instance1168.5	921802.09	01:35:09	161.45
Instance1168.6	921802.09	01:27:10	176.23
Instance1168.7	921802.09	01:35:23	161.05
Instance1168.8	921802.09	01:25:04	180.60
Instance1168.9	921802.09	01:29:03	172.52
Instance1168.10	921802.09	01:35:44	160.47
Avg			167.90
Sum			1679.02

#### Jetstress System Parameters

Thread Count	13
Minimum Database Cache	320.0 MB
Maximum Database Cache	2560.0 MB
Insert Operations	40%
Delete Operations	20%
Replace Operations	5%
Read Operations	35%
Lazy Commits	70%



### Database Configuration

**Instance1168.1** Log path: E:\DB1  
Database: E:\DB1\Jetstress001001.edb

**Instance1168.2** Log path: E:\DB2  
Database: E:\DB2\Jetstress002001.edb

**Instance1168.3** Log path: F:\DB3  
Database: F:\DB3\Jetstress003001.edb

**Instance1168.4** Log path: F:\DB4  
Database: F:\DB4\Jetstress004001.edb

**Instance1168.5** Log path: G:\DB5  
Database: G:\DB5\Jetstress005001.edb

**Instance1168.6** Log path: G:\DB6  
Database: G:\DB6\Jetstress006001.edb

**Instance1168.7** Log path: H:\DB7  
Database: H:\DB7\Jetstress007001.edb

**Instance1168.8** Log path: H:\DB8  
Database: H:\DB8\Jetstress008001.edb

**Instance1168.9** Log path: I:\DB9  
Database: I:\DB9\Jetstress009001.edb

**Instance1168.10** Log path: I:\DB10  
Database: I:\DB10\Jetstress010001.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
Instance1168.1	1.972	0.000	688.591	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1168.2	2.171	0.000	632.356	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1168.3	1.888	0.000	714.353	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1168.4	2.156	0.000	633.199	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1168.5	2.129	0.000	645.676	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1168.6	1.933	0.000	704.865	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1168.7	2.146	0.000	644.191	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1168.8	1.886	0.000	722.471	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1168.9	1.974	0.000	690.140	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance1168.10	2.139	0.000	641.785	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	2.127	0.524	2.424
Available MBytes	155604.701	155594.000	155613.000
Free System Page Table Entries	33558474.021	33558474.000	33558476.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	115417742.515	115277824.000	115621888.000
Pool Paged Bytes	154388585.567	154320896.000	154447872.000
Database Page Fault Stalls/sec	0.000	0.000	0.000



**Test Log**  
2/17/2014 12:06:44 AM -- Preparing for testing ...  
2/17/2014 12:06:55 AM -- Attaching databases ...  
2/17/2014 12:06:55 AM -- Preparations for testing are complete.  
2/17/2014 12:07:06 AM -- Performance logging started (interval: 30000 ms).  
2/17/2014 12:07:06 AM -- Backing up databases ...  
2/17/2014 1:44:18 AM -- Performance logging has ended.  
2/17/2014 1:44:18 AM -- Instance1168.1 (100% processed), Instance1168.2 (100% processed), Instance1168.3 (100% processed), Instance1168.4 (100% processed), Instance1168.5 (100% processed), Instance1168.6 (100% processed), Instance1168.7 (100% processed), Instance1168.8 (100% processed), Instance1168.9 (100% processed) and Instance1168.10 (100% processed)  
2/17/2014 1:44:18 AM -- C:\Users\Administrator\Desktop\ESRP\DatabaseBackup\DatabaseBackup\_2014\_2\_17\_0\_6\_55.blq has 194 samples.  
2/17/2014 1:44:18 AM -- Creating test report ...

## C.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
<b>Instance3864.1</b>	921818.09	01:29:06	172.41
<b>Instance3864.2</b>	921818.09	01:36:19	159.51
<b>Instance3864.3</b>	921810.09	01:27:06	176.37
<b>Instance3864.4</b>	921818.09	01:37:03	158.28
<b>Instance3864.5</b>	921818.09	01:28:35	173.41
<b>Instance3864.6</b>	921818.09	01:35:39	160.60
<b>Instance3864.7</b>	921818.09	01:26:44	177.13
<b>Instance3864.8</b>	921818.09	01:34:55	161.85
<b>Instance3864.9</b>	921810.09	01:25:45	179.16
<b>Instance3864.10</b>	921810.09	01:34:11	163.12
<b>Avg</b>			168.18
<b>Sum</b>			1681.84

##### Jetstress System Parameters

<b>Thread Count</b>	13
<b>Minimum Database Cache</b>	320.0 MB
<b>Maximum Database Cache</b>	2560.0 MB
<b>Insert Operations</b>	40%
<b>Delete Operations</b>	20%
<b>Replace Operations</b>	5%
<b>Read Operations</b>	35%
<b>Lazy Commits</b>	70%

### Database Configuration

<b>Instance3864.1</b>	Log path: E:\DB1 Database: E:\DB1\Jetstress001001.edb
<b>Instance3864.2</b>	Log path: E:\DB2 Database: E:\DB2\Jetstress002001.edb
<b>Instance3864.3</b>	Log path: F:\DB3 Database: F:\DB3\Jetstress003001.edb
<b>Instance3864.4</b>	Log path: F:\DB4 Database: F:\DB4\Jetstress004001.edb
<b>Instance3864.5</b>	Log path: G:\DB5 Database: G:\DB5\Jetstress005001.edb
<b>Instance3864.6</b>	Log path: G:\DB6 Database: G:\DB6\Jetstress006001.edb
<b>Instance3864.7</b>	Log path: H:\DB7 Database: H:\DB7\Jetstress007001.edb
<b>Instance3864.8</b>	Log path: H:\DB8 Database: H:\DB8\Jetstress008001.edb
<b>Instance3864.9</b>	Log path: I:\DB9 Database: I:\DB9\Jetstress009001.edb
<b>Instance3864.10</b>	Log path: I:\DB10 Database: I:\DB10\Jetstress010001.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
<b>Instance3864.1</b>	1.978	0.000	691.247	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Instance3864.2</b>	2.153	0.000	638.159	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Instance3864.3</b>	1.932	0.000	705.616	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Instance3864.4</b>	2.178	0.000	633.158	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Instance3864.5</b>	1.971	0.000	693.688	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Instance3864.6</b>	2.154	0.000	642.267	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Instance3864.7</b>	1.918	0.000	708.484	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Instance3864.8</b>	2.110	0.000	647.403	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Instance3864.9</b>	1.909	0.000	716.584	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Instance3864.10</b>	2.112	0.000	652.359	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
<b>% Processor Time</b>	2.107	0.424	2.347
<b>Available MBytes</b>	124200.135	124190.000	124209.000
<b>Free System Page Table Entries</b>	33558539.021	33558539.000	33558541.000
<b>Transition Pages RePurposed/sec</b>	0.000	0.000	0.000
<b>Pool Nonpaged Bytes</b>	109233825.824	109096960.000	109318144.000
<b>Pool Paged Bytes</b>	145795995.192	145756160.000	145838080.000
<b>Database Page Fault Stalls/sec</b>	0.000	0.000	0.000

**Test Log**  
 2/17/2014 12:09:13 AM -- Preparing for testing ...  
 2/17/2014 12:09:24 AM -- Attaching databases ...  
 2/17/2014 12:09:24 AM -- Preparations for testing are complete.  
 2/17/2014 12:09:35 AM -- Performance logging started (interval: 30000 ms).  
 2/17/2014 12:09:35 AM -- Backing up databases ...  
 2/17/2014 1:46:39 AM -- Performance logging has ended.  
 2/17/2014 1:46:39 AM -- Instance3864.1 (100% processed), Instance3864.2 (100% processed), Instance3864.3 (100% processed), Instance3864.4 (100% processed), Instance3864.5 (100% processed), Instance3864.6 (100% processed), Instance3864.7 (100% processed), Instance3864.8 (100% processed), Instance3864.9 (100% processed) and Instance3864.10 (100% processed)  
 2/17/2014 1:46:39 AM -- C:\Users\Administrator\Desktop\ESRP\Database Backup\DatabaseBackup\_2014\_2\_17\_0\_9\_24.blg has 193 samples.  
 2/17/2014 1:46:39 AM -- Creating test report ...

## D Soft Recovery test Result Report

### D.1 Server 1

## Microsoft Exchange Jetstress 2013

## SoftRecovery Test Result Report

### Soft-Recovery Statistics - All

Database Instance	Log files replayed	Elapsed seconds
<b>Instance1168.1</b>	504	1582.1294432
<b>Instance1168.2</b>	504	1492.910491
<b>Instance1168.3</b>	506	1475.7330911
<b>Instance1168.4</b>	503	1417.6887094
<b>Instance1168.5</b>	504	1429.809098
<b>Instance1168.6</b>	506	1488.7913673
<b>Instance1168.7</b>	506	1417.6887094
<b>Instance1168.8</b>	501	1464.982216
<b>Instance1168.9</b>	503	1472.9054771
<b>Instance1168.10</b>	502	1426.4608423
<b>Avg</b>	503	1466.91
<b>Sum</b>	5039	14669.0994448

### Database Configuration

<b>Instance1168.1</b>	Log path: E:\DB1 Database: E:\DB1\Jetstress001001.edb
<b>Instance1168.2</b>	Log path: E:\DB2 Database: E:\DB2\Jetstress002001.edb
<b>Instance1168.3</b>	Log path: F:\DB3 Database: F:\DB3\Jetstress003001.edb
<b>Instance1168.4</b>	Log path: F:\DB4 Database: F:\DB4\Jetstress004001.edb
<b>Instance1168.5</b>	Log path: G:\DB5 Database: G:\DB5\Jetstress005001.edb
<b>Instance1168.6</b>	Log path: G:\DB6 Database: G:\DB6\Jetstress006001.edb
<b>Instance1168.7</b>	Log path: H:\DB7 Database: H:\DB7\Jetstress007001.edb
<b>Instance1168.8</b>	Log path: H:\DB8 Database: H:\DB8\Jetstress008001.edb
<b>Instance1168.9</b>	Log path: I:\DB9 Database: I:\DB9\Jetstress009001.edb
<b>Instance1168.10</b>	Log path: I:\DB10 Database: I:\DB10\Jetstress010001.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
Instance1168.1	39.450	12.591	139.435	1.272	39091.588	32515.938	3.588	0.000	1.590	0.000	208061.809	0.000
Instance1168.2	33.942	14.655	147.073	1.348	39151.383	32768.000	5.003	0.000	1.685	0.000	209727.386	0.000
Instance1168.3	37.866	10.808	147.029	1.371	39212.955	32768.000	4.699	0.000	1.713	0.000	209709.139	0.000
Instance1168.4	33.351	12.083	153.295	1.418	39078.589	32768.000	14.794	0.000	1.773	0.000	209617.378	0.000
Instance1168.5	33.466	11.128	153.495	1.409	39049.450	32768.000	15.209	0.000	1.761	0.000	209711.257	0.000
Instance1168.6	37.756	10.942	148.202	1.353	39223.596	32768.000	4.213	0.000	1.690	0.000	209746.955	0.000
Instance1168.7	33.225	11.577	155.112	1.427	39204.100	32768.000	14.576	0.000	1.783	0.000	209765.806	0.000
Instance1168.8	37.790	10.909	148.104	1.363	39270.865	32768.000	4.298	0.000	1.704	0.000	209747.483	0.000
Instance1168.9	37.789	11.220	148.351	1.361	39248.365	32768.000	4.206	0.000	1.701	0.000	209720.018	0.000
Instance1168.10	33.426	11.660	152.551	1.403	39101.979	32768.000	14.636	0.000	1.760	0.000	209746.207	0.000

#### Background Database Maintenance I/O Performance

MSEXchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance1168.1	0.000	0.000
Instance1168.2	0.000	0.000
Instance1168.3	0.000	0.000
Instance1168.4	0.000	0.000
Instance1168.5	0.000	0.000
Instance1168.6	0.000	0.000
Instance1168.7	0.000	0.000
Instance1168.8	0.000	0.000
Instance1168.9	0.000	0.000
Instance1168.10	0.000	0.000

#### 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
Instance1168.1	39.450	12.591	139.435	1.272	39091.588	32515.938	3.588	0.000	1.590	0.000	208061.809	0.000
Instance1168.2	33.942	14.655	147.073	1.348	39151.383	32768.000	5.003	0.000	1.685	0.000	209727.386	0.000
Instance1168.3	37.866	10.808	147.029	1.371	39212.955	32768.000	4.699	0.000	1.713	0.000	209709.139	0.000
Instance1168.4	33.351	12.083	153.295	1.418	39078.589	32768.000	14.794	0.000	1.773	0.000	209617.378	0.000
Instance1168.5	33.466	11.128	153.495	1.409	39049.450	32768.000	15.209	0.000	1.761	0.000	209711.257	0.000
Instance1168.6	37.756	10.942	148.202	1.353	39223.596	32768.000	4.213	0.000	1.690	0.000	209746.955	0.000
Instance1168.7	33.225	11.577	155.112	1.427	39204.100	32768.000	14.576	0.000	1.783	0.000	209765.806	0.000
Instance1168.8	37.790	10.909	148.104	1.363	39270.865	32768.000	4.298	0.000	1.704	0.000	209747.483	0.000
Instance1168.9	37.789	11.220	148.351	1.361	39248.365	32768.000	4.206	0.000	1.701	0.000	209720.018	0.000
Instance1168.10	33.426	11.660	152.551	1.403	39101.979	32768.000	14.636	0.000	1.760	0.000	209746.207	0.000

#### Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.596	0.000	1.410
Available MBytes	153056.320	152964.000	155443.000
Free System Page Table Entries	33558472.545	33558410.000	33558477.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	115017576.102	114991104.000	115277824.000
Pool Paged Bytes	155004068.992	154992640.000	155160576.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

#### Test Log

2/17/2014 2:12:49 AM -- Preparing for testing ...  
 2/17/2014 2:12:59 AM -- Attaching databases ...  
 2/17/2014 2:12:59 AM -- Preparations for testing are complete.  
 2/17/2014 2:12:59 AM -- Starting transaction dispatch ...  
 2/17/2014 2:12:59 AM -- Database cache settings: (minimum: 320.0 MB, maximum: 2.5 GB)  
 2/17/2014 2:12:59 AM -- Database flush thresholds: (start: 25.6 MB, stop: 51.2 MB)  
 2/17/2014 2:13:09 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).  
 2/17/2014 2:13:09 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).  
 2/17/2014 2:13:11 AM -- Operation mix: Sessions 13, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.  
 2/17/2014 2:13:11 AM -- Performance logging started (interval: 15000 ms).  
 2/17/2014 2:13:11 AM -- Generating log files ...  
 2/17/2014 4:51:38 AM -- E:\DB1 (100.8% generated), E:\DB2 (100.8% generated), F:\DB3 (101.2% generated), F:\DB4 (100.6% generated), G:\DB5 (100.8% generated), G:\DB6 (101.0% generated), H:\DB7 (101.2% generated), H:\DB8 (100.2% generated), I:\DB9 (100.6% generated) and I:\DB10 (100.4% generated)  
 2/17/2014 4:51:38 AM -- Performance logging has ended.  
 2/17/2014 4:51:38 AM -- JetInterop batch transaction stats: 16881, 16881, 16881, 16881, 16880, 16880, 16880, 16880 and 16880.  
 2/17/2014 4:51:38 AM -- Dispatching transactions ends.  
 2/17/2014 4:51:38 AM -- Shutting down databases ...  
 2/17/2014 4:51:57 AM -- Instance1168.1 (complete), Instance1168.2 (complete), Instance1168.3 (complete), Instance1168.4 (complete), Instance1168.5 (complete), Instance1168.6 (complete), Instance1168.7 (complete), Instance1168.8 (complete), Instance1168.9 (complete) and Instance1168.10 (complete)  
 2/17/2014 4:51:57 AM -- C:\Users\Administrator\Desktop\ESRP\Soft Recovery\Performance\_2014\_2\_17\_2\_13\_9.bla has 632 samples.  
 2/17/2014 4:51:57 AM -- Creating test report ...

2/17/2014 4:52:01 AM -- Instance1168.1 has 13.6 for I/O Database Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.1 has 0.9 for I/O Log Writes Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.1 has 0.9 for I/O Log Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.2 has 13.6 for I/O Database Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.2 has 0.9 for I/O Log Writes Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.2 has 0.9 for I/O Log Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.3 has 13.9 for I/O Database Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.3 has 1.2 for I/O Log Writes Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.3 has 1.2 for I/O Log Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.4 has 14.0 for I/O Database Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.4 has 1.3 for I/O Log Writes Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.4 has 1.3 for I/O Log Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.5 has 14.0 for I/O Database Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.5 has 0.8 for I/O Log Writes Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.5 has 0.8 for I/O Log Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.6 has 13.9 for I/O Database Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.6 has 0.7 for I/O Log Writes Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.6 has 0.7 for I/O Log Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.7 has 13.9 for I/O Database Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.7 has 0.9 for I/O Log Writes Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.7 has 0.9 for I/O Log Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.8 has 13.9 for I/O Database Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.8 has 0.8 for I/O Log Writes Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.8 has 0.8 for I/O Log Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.9 has 13.7 for I/O Database Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.9 has 0.8 for I/O Log Writes Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.9 has 0.8 for I/O Log Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.10 has 13.9 for I/O Database Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.10 has 1.0 for I/O Log Writes Average Latency.  
 2/17/2014 4:52:01 AM -- Instance1168.10 has 1.0 for I/O Log Reads Average Latency.  
 2/17/2014 4:52:01 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
 2/17/2014 4:52:01 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.  
 2/17/2014 4:52:01 AM -- C:\Users\Administrator\Desktop\ESRP\Soft Recovery\Performance\_2014\_2\_17\_2\_13\_9.xml has 631 samples queried.  
 2/17/2014 4:52:01 AM -- C:\Users\Administrator\Desktop\ESRP\Soft Recovery\Performance\_2014\_2\_17\_2\_13\_9.html was saved.  
 2/17/2014 7:21:22 AM -- Performance logging started (interval: 4000 ms).  
 2/17/2014 7:21:22 AM -- Recovering databases ...  
 2/17/2014 7:47:44 AM -- Performance logging has ended.  
 2/17/2014 7:47:44 AM -- Instance1168.1 (1582.1294432), Instance1168.2 (1492.910491), Instance1168.3 (1475.7330911), Instance1168.4 (1417.6887094), Instance1168.5 (1429.809098), Instance1168.6 (1488.7913673), Instance1168.7 (1417.6887094), Instance1168.8 (1464.982216), Instance1168.9 (1472.9054771) and Instance1168.10 (1426.4608423)  
 2/17/2014 7:47:45 AM -- C:\Users\Administrator\Desktop\ESRP\Soft Recovery\SoftRecovery\_2014\_2\_17\_7\_21\_21.blg has 391 samples.  
 2/17/2014 7:47:45 AM -- Creating test report ...

## D.2 Server 2

# Microsoft Exchange Jetstress 2013

## SoftRecovery Test Result Report

### Soft-Recovery Statistics - All

Database Instance	Log files replayed	Elapsed seconds
<b>Instance3864.1</b>	507	1574.1108206
<b>Instance3864.2</b>	505	1488.3505019
<b>Instance3864.3</b>	502	1487.3103148
<b>Instance3864.4</b>	510	1445.2884544
<b>Instance3864.5</b>	503	1469.0113488
<b>Instance3864.6</b>	502	1429.2935072
<b>Instance3864.7</b>	501	1479.3504371
<b>Instance3864.8</b>	505	1431.1063351
<b>Instance3864.9</b>	504	1473.6788345
<b>Instance3864.10</b>	502	1430.5845323
<b>Avg</b>	504	1470.809
<b>Sum</b>	5041	14708.0850867

## Database Configuration

<b>Instance3864.1</b>	Log path: E:\DB1 Database: E:\DB1\Jetstress001001.edb
<b>Instance3864.2</b>	Log path: E:\DB2 Database: E:\DB2\Jetstress002001.edb
<b>Instance3864.3</b>	Log path: F:\DB3 Database: F:\DB3\Jetstress003001.edb
<b>Instance3864.4</b>	Log path: F:\DB4 Database: F:\DB4\Jetstress004001.edb
<b>Instance3864.5</b>	Log path: G:\DB5 Database: G:\DB5\Jetstress005001.edb
<b>Instance3864.6</b>	Log path: G:\DB6 Database: G:\DB6\Jetstress006001.edb
<b>Instance3864.7</b>	Log path: H:\DB7 Database: H:\DB7\Jetstress007001.edb
<b>Instance3864.8</b>	Log path: H:\DB8 Database: H:\DB8\Jetstress008001.edb
<b>Instance3864.9</b>	Log path: I:\DB9 Database: I:\DB9\Jetstress009001.edb
<b>Instance3864.10</b>	Log path: I:\DB10 Database: I:\DB10\Jetstress010001.edb

## Transactional I/O Performance

MSEExchange Database ==> Instances	I/O Database Reads Average Latency (msec)	I/O Database Writes Average Latency (msec)	I/O Database Reads/sec	I/O Database Writes/sec	I/O Database Reads Average Bytes	I/O Database Writes Average Bytes	I/O Log Reads Average Latency (msec)	I/O Log Writes Average Latency (msec)	I/O Log Reads/sec	I/O Log Writes/sec	I/O Log Reads Average Bytes	I/O Log Writes Average Bytes
Instance3864.1	38.798	11.929	140.478	1.286	39346.550	32768.000	3.914	0.000	1.608	0.000	209708.150	0.000
Instance3864.2	33.666	15.252	149.087	1.357	39154.939	32768.000	5.082	0.000	1.696	0.000	209729.696	0.000
Instance3864.3	37.461	10.922	151.852	1.349	39265.458	32678.714	4.199	0.000	1.686	0.000	209148.672	0.000
Instance3864.4	33.149	11.062	154.800	1.410	39236.980	32768.000	13.828	0.000	1.762	0.000	209659.215	0.000
Instance3864.5	37.203	11.801	150.619	1.365	39395.324	32768.000	4.419	0.000	1.706	0.000	209698.479	0.000
Instance3864.6	33.368	11.340	154.143	1.406	39107.022	32768.000	14.701	0.000	1.758	0.000	209665.265	0.000
Instance3864.7	37.473	10.640	149.903	1.351	39071.236	32768.000	4.624	0.000	1.688	0.000	209701.119	0.000
Instance3864.8	33.034	12.114	154.611	1.411	39103.344	32768.000	15.509	0.000	1.763	0.000	209703.007	0.000
Instance3864.9	37.606	11.178	148.935	1.364	39233.434	32677.730	4.446	0.000	1.705	0.000	209142.429	0.000
Instance3864.10	32.943	12.070	157.772	1.402	39236.528	32768.000	15.277	0.000	1.755	0.000	209739.604	0.000

## Background Database Maintenance I/O Performance

MSEExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3864.1	0.000	0.000
Instance3864.2	0.000	0.000
Instance3864.3	0.000	0.000
Instance3864.4	0.000	0.000
Instance3864.5	0.000	0.000
Instance3864.6	0.000	0.000
Instance3864.7	0.000	0.000
Instance3864.8	0.000	0.000
Instance3864.9	0.000	0.000
Instance3864.10	0.000	0.000



#### 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
Instance3864.1	38.798	11.929	140.478	1.286	39346.550	32768.000	3.914	0.000	1.608	0.000	209708.150	0.000
Instance3864.2	33.666	15.252	149.087	1.357	39154.939	32768.000	5.082	0.000	1.696	0.000	209729.696	0.000
Instance3864.3	37.461	10.922	151.852	1.349	39265.458	32678.714	4.199	0.000	1.686	0.000	209148.672	0.000
Instance3864.4	33.149	11.062	154.800	1.410	39236.980	32768.000	13.828	0.000	1.762	0.000	209659.215	0.000
Instance3864.5	37.203	11.801	150.619	1.365	39395.324	32768.000	4.419	0.000	1.706	0.000	209698.479	0.000
Instance3864.6	33.368	11.340	154.143	1.406	39107.022	32768.000	14.701	0.000	1.758	0.000	209665.265	0.000
Instance3864.7	37.473	10.640	149.903	1.351	39071.236	32768.000	4.624	0.000	1.688	0.000	209701.119	0.000
Instance3864.8	33.034	12.114	154.611	1.411	39103.344	32768.000	15.509	0.000	1.763	0.000	209703.007	0.000
Instance3864.9	37.606	11.178	148.935	1.364	39233.434	32677.730	4.446	0.000	1.705	0.000	209142.429	0.000
Instance3864.10	32.943	12.070	157.772	1.402	39236.528	32768.000	15.277	0.000	1.755	0.000	209739.604	0.000

#### Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	0.607	0.000	1.393
Available MBytes	121652.211	121539.000	124052.000
Free System Page Table Entries	33558537.730	33558475.000	33558541.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	109041774.560	108982272.000	109273088.000
Pool Paged Bytes	146316543.342	146288640.000	146477056.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

#### Test Log

2/17/2014 2:12:57 AM -- Preparing for testing ...  
2/17/2014 2:13:08 AM -- Attaching databases ...  
2/17/2014 2:13:08 AM -- Preparations for testing are complete.  
2/17/2014 2:13:08 AM -- Starting transaction dispatch ...  
2/17/2014 2:13:08 AM -- Database cache settings: (minimum: 320.0 MB, maximum: 2.5 GB)  
2/17/2014 2:13:08 AM -- Database flush thresholds: (start: 25.6 MB, stop: 51.2 MB)  
2/17/2014 2:13:18 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).  
2/17/2014 2:13:18 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).  
2/17/2014 2:13:19 AM -- Operation mix: Sessions 13, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.  
2/17/2014 2:13:19 AM -- Performance logging started (interval: 15000 ms).  
2/17/2014 2:13:19 AM -- Generating log files ...  
2/17/2014 4:51:38 AM -- E:\DB1 (101.4% generated), E:\DB2 (101.0% generated), F:\DB3 (100.4% generated), F:\DB4 (102.0% generated), G:\DB5 (100.6% generated), G:\DB6 (100.4% generated), H:\DB7 (100.2% generated), H:\DB8 (101.0% generated), I:\DB9 (100.8% generated) and I:\DB10 (100.4% generated)  
2/17/2014 4:51:38 AM -- Performance logging has ended.  
2/17/2014 4:51:38 AM -- JetInterop batch transaction stats: 16829, 16829, 16829, 16829, 16829, 16829, 16829, 16829, 16829 and 16829.  
2/17/2014 4:51:38 AM -- Dispatching transactions ends.  
2/17/2014 4:51:38 AM -- Shutting down databases ...  
2/17/2014 4:51:58 AM -- Instance3864.1 (complete), Instance3864.2 (complete), Instance3864.3 (complete), Instance3864.4 (complete), Instance3864.5 (complete), Instance3864.6 (complete), Instance3864.7 (complete), Instance3864.8 (complete), Instance3864.9 (complete) and Instance3864.10 (complete)  
2/17/2014 4:51:58 AM -- C:\Users\Administrator\Desktop\ESRP\Soft Recovery\Performance\_2014\_2\_17\_2\_13\_18.blg has 631 samples.  
2/17/2014 4:51:58 AM -- Creating test report ...

2/17/2014 4:52:02 AM -- Instance3864.1 has 13.6 for I/O Database Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.1 has 1.1 for I/O Log Writes Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.1 has 1.1 for I/O Log Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.2 has 13.7 for I/O Database Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.2 has 1.0 for I/O Log Writes Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.2 has 1.0 for I/O Log Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.3 has 13.9 for I/O Database Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.3 has 0.8 for I/O Log Writes Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.3 has 0.8 for I/O Log Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.4 has 13.9 for I/O Database Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.4 has 0.9 for I/O Log Writes Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.4 has 0.9 for I/O Log Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.5 has 14.0 for I/O Database Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.5 has 1.0 for I/O Log Writes Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.5 has 1.0 for I/O Log Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.6 has 14.1 for I/O Database Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.6 has 1.1 for I/O Log Writes Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.6 has 1.1 for I/O Log Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.7 has 13.5 for I/O Database Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.7 has 0.9 for I/O Log Writes Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.7 has 0.9 for I/O Log Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.8 has 13.9 for I/O Database Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.8 has 1.1 for I/O Log Writes Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.8 has 1.1 for I/O Log Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.9 has 13.9 for I/O Database Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.9 has 0.7 for I/O Log Writes Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.9 has 0.7 for I/O Log Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.10 has 14.1 for I/O Database Reads Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.10 has 0.7 for I/O Log Writes Average Latency.  
2/17/2014 4:52:02 AM -- Instance3864.10 has 0.7 for I/O Log Reads Average Latency.  
2/17/2014 4:52:02 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
2/17/2014 4:52:02 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.  
2/17/2014 4:52:02 AM -- C:\Users\Administrator\Desktop\ESRP\Soft Recovery\Performance\_2014\_2\_17\_2\_13\_18.xml has 630 samples queried.  
2/17/2014 4:52:02 AM -- C:\Users\Administrator\Desktop\ESRP\Soft Recovery\Performance\_2014\_2\_17\_2\_13\_18.html was saved.  
2/17/2014 7:21:10 AM -- Performance logging started (interval: 4000 ms).  
2/17/2014 7:21:10 AM -- Recovering databases ...  
2/17/2014 7:47:24 AM -- Performance logging has ended.  
2/17/2014 7:47:24 AM -- Instance3864.1 (1574.1108206), Instance3864.2 (1488.3505019), Instance3864.3 (1487.3103148), Instance3864.4 (1445.2884544), Instance3864.5 (1469.0113488), Instance3864.6 (1429.2935072), Instance3864.7 (1479.3504371), Instance3864.8 (1431.1063351), Instance3864.9 (1473.6788345) and Instance3864.10 (1430.5845323)  
2/17/2014 7:47:25 AM -- C:\Users\Administrator\Desktop\ESRP\Soft Recovery\Soft Recovery\_2014\_2\_17\_2\_13\_18.blg has 389 samples.  
2/17/2014 7:47:25 AM -- Creating test report ...