

**ESRP Storage Program**

**EMC Symmetrix VMAX (100,000 User)  
Exchange 2010 Mailbox Resiliency  
Storage Solution**

**Tested with:** ESRP - Storage Version 3.0  
**Tested Date:** March, 2010



**EMC Global Solutions**

Copyright © 1998-2011 EMC Corporation. All rights reserved.

Published May, 2011

EMC believes the information in this publication is accurate as of its publication date. The information is subject to change without notice.

THE INFORMATION IN THIS PUBLICATION IS PROVIDED "AS IS." EMC CORPORATION MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WITH RESPECT TO THE INFORMATION IN THIS PUBLICATION, AND SPECIFICALLY DISCLAIMS IMPLIED WARRANTIES OF

MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Use, copying, and distribution of any EMC software described in this publication requires an applicable software license. For the most up-to-date listing of EMC product names, see EMC Corporation Trademarks on EMC.com

All other trademarks used herein are the property of their respective owners.

EMC Symmetrix VMAX (100,000 User) Exchange 2010 Mailbox Resiliency Storage Solution  
Part Number: H8225.1

---

## Table of Contents

Overview.....	4
Disclaimer.....	4
Features.....	5
Solution description.....	8
Storage design for Exchange 2010.....	10
Targeted customer profile.....	13
Tested deployment.....	14
Best practices.....	18
Test results summary.....	21
Conclusion.....	27
Contact information.....	27
Appendix A: Test reports.....	28

---

## Overview

This document provides information on the EMC® Symmetrix® VMAX™ (100,000 User) Mailbox Resiliency storage solution based on the *Microsoft Exchange Solution Reviewed Program (ESRP) - Storage* program. For any questions or comments regarding the contents of this document, see “[Contact information](#)” on [page 27](#).

The ESRP Storage program was developed by Microsoft Corporation to provide a common storage testing framework for vendors to present information on its storage solutions for Microsoft Exchange Server software. For more details on the Microsoft ESRP - Storage program, visit:

<http://technet.microsoft.com/en-us/exchange/ff182054.aspx>

---

## Disclaimer

This document has been produced independently of Microsoft Corporation. Microsoft Corporation expressly disclaims responsibility for, and makes no warranty—express or implied—with respect to the accuracy of the contents of this document.

The information contained in this document represents the current view of EMC on the issues discussed as of the date of publication. Due to changing market conditions, it should not be interpreted as a commitment on the part of EMC. In addition, EMC cannot guarantee the accuracy of any information presented after the date of publication.

## Features

The EMC Symmetrix VMAX system features a revolutionary Virtual Matrix Architecture™ that builds upon the rich heritage of the Symmetrix multicontroller platform, and extends the value of the Direct Matrix Architecture® to deliver unprecedented performance, availability, and functionality at a reduced cost. The Symmetrix VMAX system's Enginuity™ operating environment is optimized for increased availability, reliability, performance, and capacity utilization on all tiers with all RAID types, reducing total cost of ownership (TCO) while achieving predictable service-level attainment.

Symmetrix VMAX systems with the scale-out Virtual Matrix Architecture can be configured with 48 to 2,400 drives for a maximum capacity of up to 2 petabytes. Systems provide up to 1 TB of memory and up to 128 Fibre Channel (FC) ports, or 64 Fibre Connectivity (FICON) ports, or sixty four 10 Gb/s Ethernet ports, or 64 internet small computer interface (iSCSI) connections.

**Figure 1** depicts the Symmetrix VMAX SE array, which is an ideal entry point for high-end configurations. Key features include:

- 48 to 360 drives
- 8 Gb/s Fibre Channel, FICON, and FC Symmetrix Remote Data Facility (SRDF)
- Single-phase power option.



**Figure 1** VMAX high-end scalability with a single VMAX Engine

Figure 2 depicts the VMAX model which is ideal for high-end configurations that require high performance and high-end scaling.

Key features include:

- 48 to 2,400 drives (3 times more usable capacity)
- One to eight VMAX Engines
- 8 Gb/s FC, FICON, and FC SRDF
- Twice the back-end connections for Flash, FC, and SATA drives (up to 128 ports)
- Quad-core 2.3 GHz processors provide more than twice the IOPS
- Extended drive loop configurations: up to 1,200 drives with two engines, up to 2,400 drives with four engines
- Single-phase power option



**Figure 2** VMAX high scalability with one to eight VMAX Engines

Table 1 lists Symmetrix VMAX features and benefits.

**Table 1 Symmetrix VMAX features**

<b>Feature</b>	<b>Benefit</b>
Flash drives	Extends tiering capabilities by establishing a new tier 0 for ultra-high performance.
FC, FICON, iSCSI, and 1 and 10 Gigabit Ethernet connectivity	Integrates: <ul style="list-style-type: none"> <li>- 128 FC ports</li> <li>- 64 FICON ports</li> <li>- 64 10 Gb/s Ethernet ports</li> <li>- 64 iSCSI connections</li> </ul>
Symmetrix Virtual Provisioning™ software	Provides increased capacity utilization while simplifying and accelerating the process of allocating storage capacity across tiers in a storage array.
Fully Automated Storage Tiering (FAST) Virtual Provisioning (VP)	Extends the capabilities of Virtual Provisioning and provides for storage tiering at a sub-LUN level. Optimizes the use of a storage configuration comprising different drive technologies.
Virtualization-aware management	Provides a real-time, dynamic view of the virtual environment with end-to-end mapping and reporting capabilities.
Virtual LUN technology	Enables administrators to easily manage tiered storage deployments with nondisruptive data migration within the array.

---

## Solution description

This solution is intended for large enterprise-size businesses that are planning to deploy Microsoft Exchange Server 2010 and would like to leverage the Database Availability Group (DAG) feature. The solution design represents an Exchange 2010 environment supporting 100,000 users in a mailbox resiliency configuration across two intelligent VMAX storage arrays. The solution is designed to provide outstanding performance and flexibility for today's and tomorrow's Exchange users.

The design provides a configuration with no single point of failure, where each Exchange database is RAID-protected by a VMAX array and replicated to a different server on a second array. All 100,000 users are distributed between two DAGs across 20 mailbox servers (10 servers per DAG). Each DAG was designed with two copies of the Exchange databases (one half of the active/passive database copies on one VMAX array, and the other half of the active/passive database copies residing on the secondary VMAX array).

Each Exchange Mailbox Server was designed to support up to 10,000 (0.12 IOPS plus 20percent) users with a 2 GB mailbox size. The solution is designed to handle the loss of an array, server, database volume, HBA, or switch. During a mailbox server failure or patching operation each server is capable of handling the compute requirements for all active databases and users.

---

**Note:** This configuration can also be compared to a design where Exchange 2010 is deployed in a stand-alone configuration (no DAG), and where a single array is providing service to all 100,000 users configured across 10 mailbox servers.

---

For more information, access the Windows Hardware Compatibility List link for the Symmetrix VMAX:

<http://www.windowsservercatalog.com/item.aspx?itemId=f9cf91b6-0603-c3c1-7561-f406e2e55263&bCatID=1282>

Figure 3 illustrates the layout of the physical architecture

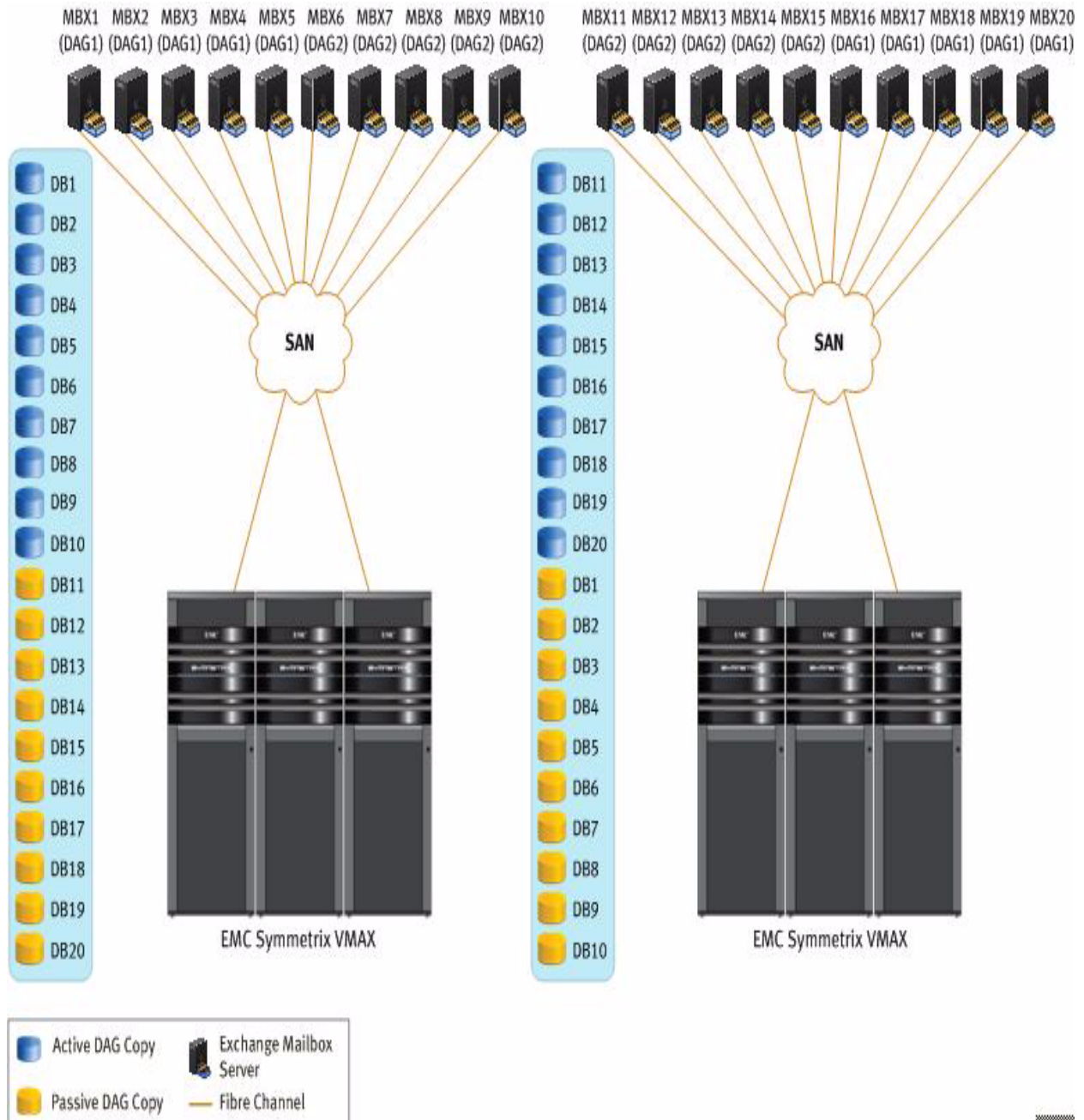


Figure 3 Physical architecture

---

## Storage design for Exchange 2010

Storage design is an important element for ensuring the successful deployment of Microsoft Exchange Server 2010. Sizing and configuring storage for use with Exchange 2010 can be a complicated process, driven by many variables and factors, which vary from organization to organization. Properly configured Exchange storage, combined with optimally sized server and network infrastructures, can guarantee smooth Exchange operation. One of the methods that can be used to simplify the sizing and configuration of large amounts of EMC VMAX storage for use with Exchange 2010 is to define a unit of measure—a mailbox server *building-block*.

A mailbox server building-block represents the required amount of disk and server resources required to support a specific number of Exchange 2010 users. The amount of required resources is derived from a specific user profile type, mailbox size, and disk requirements. Using the building-block approach removes the guesswork and simplifies the implementation of Exchange 2010 Mailbox Server.

Once the initial building-block is designed, it can be easily reproduced to support the required number of total users in your organization. By using this approach, Exchange administrators can now create their own building-blocks that are based on their company's specific Exchange environment requirements. This approach is very helpful when future growth is expected, as it makes Exchange environment expansion much easier, and straightforward. EMC's best practices involving the building-block approach for Exchange Server design has proven to be very successful throughout many customer implementations.

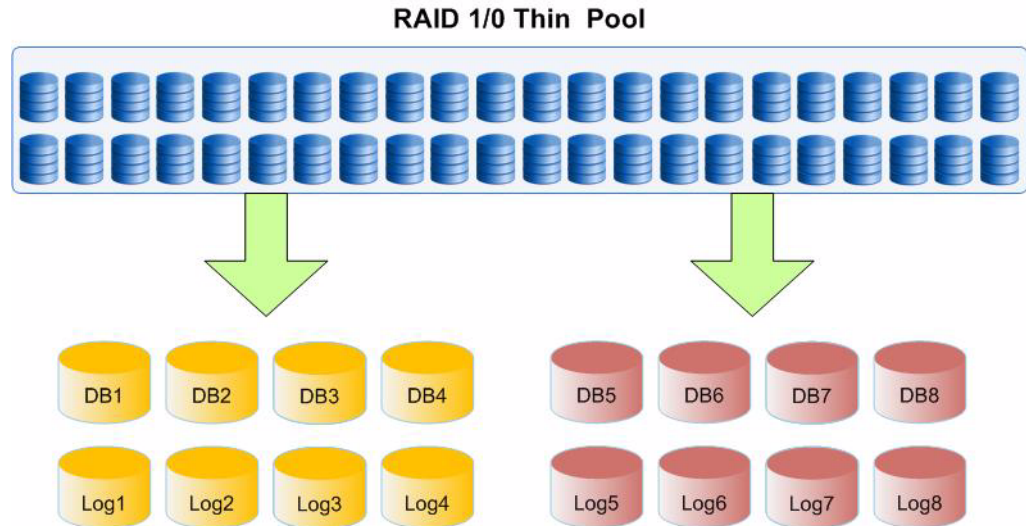
---

### Building-block applied in this solution

The building-block used in this solution was based on a user profile of 0.12 IOPS plus 20 percent with a 2 GB mailbox. VMAX virtual provisioning for Exchange was deployed for this configuration. VMAX virtual provisioning, also known as thin provisioning, can easily (and without any server interruptions) increase the database volume storage as the user mailboxes grow. This technology can deliver tremendous savings in disk cost, power, cooling, and reduction in footprint. It also provides outstanding storage flexibility for the Exchange environment.

The design included utilizing one thin pool of forty four, 2 TB SATA II drives in a RAID 10 configuration per server building block to support 10,000 users from both an I/O and space perspective. Ten of the building-blocks were used to scale up the configuration to 100,000 users.

Figure 4 shows how database and log LUNs were configured within the building-block, and in the VMAX for best performance and high availability (HA). This building-block provides all the necessary requirements for performance, capacity, and data protection to support 10,000 users.



**Figure 4** Storage building-block design

### Building-block used for this solution

Table 2 summarizes the building-block created for this configuration based on the user profile and mailbox requirements.

**Table 2** Building-block characteristics

Item	Description
User profile	0.14 IOPS (0.12 + 20% headroom)
Mailbox size	2 GB
Drive type and capacity	2 TB 7.2k SATA II drives
RAID type	RAID 1/0
Database LUN size	1,920 GB
Log LUN size	115 GB
Total disks required for performance and capacity	44

---

### **Additional factors that may impact server scalability**

The ESRP-Storage program focuses on storage solution testing to address performance and reliability issues with storage design. However, storage is not the only factor to take into consideration when designing a scaled-up Exchange solution. Other factors that affect the server scalability include:

- Server processor utilization
- Server physical and virtual memory limitations
- Resource requirements for other applications
- Directory and network service latencies
- Network infrastructure limitations, replication and recovery requirements
- Client usage profiles

All these factors are beyond the scope of the ESRP-Storage program. Therefore, the number of mailboxes hosted per server as part of the tested configuration may not necessarily be viable for some customer deployments.

Refer to Microsoft's Troubleshooting Microsoft Exchange Server Performance website for more information on identifying and addressing performance bottlenecks in an Exchange system:

<http://technet.microsoft.com/en-us/library/dd335215.aspx>

---

## Targeted customer profile

This solution is designed for medium-to-large enterprise organizations that are planning to consolidate their Exchange Server 2010 storage environments, and require a highly reliable and scalable storage solution like the EMC VMAX storage system. The configuration presented in this solution is designed to support 100,000 Exchange users with the following specifications:

- 20 Exchange servers with a 5,000 active/5,000 passive configuration (10 servers tested, simulating 10,000 users per server in a switchover or failover condition)
- 120 messages user profile - 0.12 IOPS per user (0.14 tested, adding 20 percent headroom)
- 2 GB mailbox size
- Exchange 2010 uses native DAG replication for mailbox resiliency and high availability as the primary data protection mechanism for Exchange data
- 24x7 background database maintenance (BDM) enabled
- Two VMAX high-end storage systems (one tested)

**Note:** If more than two copies are required, EMC recommends having two RAID-protected DAG copies locally, and having a third RAID-protected copy on a separate array.

## Tested deployment

The following tables summarize the test environment.

### Simulated Exchange configuration

Table 3 lists the simulated Exchange configuration details.

**Table 3 Simulated Exchange configuration**

Item	Description
Number of Exchange mailboxes simulated	100,000
Number of DAGs	2
Number of servers/DAG	10
Number of active mailboxes/server	10,000
Number of databases/host	20
Number of copies/database	2
Number of mailboxes/database	500
Simulated profile: I/Os per second per mailbox (IOPS, includes 20% headroom)	0.14
Database LUN size	1,920 GB
Log LUN size	115 GB
Total database size for performance testing	200,079 GB
% formatted storage capacity used by Exchange database **	52.14%

\*\*Storage performance characteristics change based on the percentage utilization of the individual disks. Tests that use a small percentage of the storage (less than 25 percent) may exhibit reduced throughput if the storage capacity utilization is significantly increased beyond what is tested in this document.

## Storage hardware

Table 4 lists the hardware used in the environment.

**Table 4 Hardware used during testing**

Item	Description
Storage connectivity (FC, SAS, SATA, iSCSI)	FC
Storage model and OS/firmware revision	Symmetrix VMAX, Enginuity version: 5875
Storage cache	352 GB
Number of storage controllers	6
Number of storage ports	48 available (36 used for testing)
Maximum bandwidth of storage connectivity to host	288 Gb/s (36 ports @ 8 Gb/s)
Switch type/model/firmware revision	Cisco MDS 9509 FC switch
HBA model and firmware	QLogic dual port 8 Gb HBAs QLA2562, Firmware: 5.04.02
Number of HBAs/host	2
Host server type	Dell PowerEdge R900 with Intel Xeon CPU X7350 @ 2.93 GHz, 2.92 GHz, 4 core, 128 MB RAM
Total number of disks tested in solution	440
Maximum number of spindles that can be hosted in the storage	2,400

## Storage software

Table 5 lists the software used in the environment.

**Table 5 Software used during testing**

Item	Description
HBA driver	STOR Miniport 9.1.9.25
HBA QueueTarget setting	256
HBA QueueDepth setting	256
Multipathing	EMC PowerPath® 5.3 SP1
Host OS	Microsoft Windows Server 2008 R2 Enterprise
ESE.dll file version	14.01.0218.012
Replication solution name/version	N/A

## Storage disk configuration (database/log disks)

**Table 6** Disk configuration (mailbox store and transaction logs)

Item	Description
Disk type, speed and firmware revision	2 TB 7.2k SATA II drives
Raw capacity per disk	2 TB (1,843 GB usable)
Number of physical disks in test	440
Total raw storage capacity	880 TB
Number of slices per LUN or number of disks per LUN	N/A
RAID level	RAID 1/0
Total formatted capacity (database)	375 TB
Total formatted capacity (logs)	22.5 TB
Total formatted capacity (database and logs)	397.5 TB
Storage capacity utilization	45%
Database capacity utilization	52%

---

## Best practices

In comparison to earlier versions of Microsoft Exchange, Exchange Server 2010 contains significant improvements in the areas of I/O and storage. For example, there have been many changes to the core schema, and the extensible storage engine (ESE) to reduce the I/O usage profile. Due to this I/O reduction, Exchange 2010 now supports a variety of different drive types such as serial advanced technology attachment (SATA), serial attached SCSI (SAS), FC and Flash drives.

Low-cost SATA drives can now be used for Exchange databases and logs. This allows for larger mailboxes at a reduced cost without performance degradation.

For Exchange 2010 Mailbox Server design best practices, visit <http://technet.microsoft.com/en-us/library/dd346703.aspx>. In addition to Microsoft recommendations, EMC recommends following the best practices described in this section to improve VMAX storage performance with Exchange 2010.

For Exchange 2010 best practices on storage design, please visit:

[http://technet.microsoft.com/en-us/library/dd346703\(EXCHG.140\).aspx](http://technet.microsoft.com/en-us/library/dd346703(EXCHG.140).aspx)

---

## Mailbox servers

Follow these recommendations to ensure the best possible mailbox server performance:

- Format new Windows NT file system (NTFS) volumes on Windows 2008 Server, to be used for Exchange database and logs, with a allocation unit size (ALU) of 64 KB. You can do this from the drop down list in Disk Manager, or through the command prompt using `diskpart`.

---

**Note:** Partition alignment is no longer required when running Microsoft Windows Server 2008 since partitions are automatically aligned to a 1 MB offset.

---

- In SAN environments, use redundant host bus adapters (HBAs) connected to different fabrics. Install EMC PowerPath for optimal path management and maximum I/O performance. For more information on installing and configuring the PowerPath application, visit:

<http://www.emc.com/products/detail/software/powerpath-multipathing.htm>

- Verify that the HBA installed in the server can support the IOPS requirements, even in a failover situation. To avoid throttling, ensure that the queue depth is set according to EMC recommendations.

## Core storage

Tuning the VMAX storage system parameters is important to ensure optimal Exchange 2010 performance. The following list details the recommended configuration settings for Exchange 2010 on an EMC VMAX storage array for a large enterprise deployment of Exchange 2010:

- Plan for performance even in a failover situation. Balance LUNs across the array's front-end adapters for both failover and load balancing.
- Isolate the Exchange database workload from other I/O-intensive applications or workloads. This ensures the highest level of performance for Exchange, and simplifies troubleshooting in the event of disk-related performance issues.
- Always calculate spindle sizing for IOPS requirements before sizing for capacity. I/O requirements include user I/O (send/receive), any other overhead (growth, BlackBerry, and so on) plus an additional 20 percent for logs and BDM I/O.
- For Microsoft Exchange 2010 data it is acceptable to lay out the database and log volumes across the same spindles.
- Evenly distribute database and log I/O among the SAN and storage back end.
- When user requirements call for large mailboxes consider using VMAX virtual provisioning technology (thin LUNs) and add disks as needed to support the database growth. Remember that I/O requirements still must be met.
- When using thin devices, add disks without production interruption as user mailbox capacity grows; but the initial sizing needs to accommodate enough disks needed to support the I/O requirements.
- Use large data devices (120 to 240 GB) for the thin pools.
  - Use concatenated Thin Device Metas, since the data devices are already striped, from a disk group perspective.
- Use larger hypervolumes when creating LUNs to achieve better performance.
- To prevent a thin pool from running out of space, use the thin pool utilization threshold tool (Symmetrix Management Console) to monitor each pool's disk space utilization.
- Microsoft recommends a maximum database size of 200 GB in solutions where DAG is not used. When DAG is used with a minimum of two RAID-protected copies the maximum database size is 2 TB. Backup (if applicable) and restore times should be accounted for when calculating database size.

For more information on EMC solutions for Microsoft Exchange visit:

<http://www.emc.com/exchange>

---

## Storage validation tool

Jetstress 2010 was used to verify the performance and stability of the VMAX disk subsystem. Jetstress helps verify disk performance by simulating the Exchange disk I/O load. Specifically, Jetstress simulates the Exchange database and log file loads produced by a specific number of users. This tool is designed to simulate Exchange I/O at the database level by interacting directly with the database technology of the ESE (also known as Jet) that Exchange is built on. Note that Jetstress testing focuses on storage solution testing, and highlights performance and reliability issues with storage design.

Jetstress can be configured to test the maximum I/O throughput available to your disk subsystem within the required performance constraints of Exchange, or it can accept a desired profile of user count and I/Os per second per user and validate that the disk subsystem is capable of maintaining an acceptable level of performance with such a profile.

---

**Note:** The Jetstress tool is designed to test performance of the Exchange storage subsystem before placing it in the production environment. It is not designed to test server CPU, memory configuration, and the impact of MAPI user activity.

---

The documentation for Jetstress describes how to configure and execute an I/O validation or evaluation on your server hardware. The Jetstress application is available from:

<http://go.microsoft.com/fwlink/?LinkId=178616>

---

## Test results summary

This section provides a high-level summary of the ESRP test data, as well as links to the detailed HTML reports that are generated using the ESRP testing framework. Refer to [“Appendix A: Test reports” on page 28](#) for test results.

---

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

---

---

## Reliability

A number of the tests in the framework are designed to test reliability over a 24-hour period. The goal is to verify that the storage can handle a high I/O load for a long period of time. Both log and database files are analyzed for integrity after the stress test to ensure that no database or log corruption occurs.

The following list provides an overview:

- No errors were reported in the event log file for the storage reliability testing.
- No errors were reported for the database and log checksum.
- The backup-to-disk test is not applicable.

---

## Storage performance results

The primary storage performance testing is designed to exercise the storage with the maximum sustainable Exchange type of I/O for two hours. The test validates how long it takes for the storage to respond to an I/O under load. The data below details the sum of all of the logical disk I/O, and the average of all the logical disks I/O latency during the two-hour test. Each server is listed separately, and the aggregate numbers across all servers is listed as well.

---

**Note:** The sum of achieved transactional database I/O only includes database reads/sec I/O and database writes/sec I/O. It does not include BDM I/O, log I/O, and log replication I/O.

---

For more details about Exchange 2010 I/O, see "Understanding Database and Log Performance Factors" at <http://technet.microsoft.com/en-us/library/ee832791.aspx>.

For more details about mailbox server storage performance and thresholds, review the "Mailbox Server Counters" topic:

<http://technet.microsoft.com/en-us/library/ff367871.aspx>.

### Individual server metrics for Server 1 through Server 5

The information in this table includes the sum of I/O across achieved transactional database I/O, transaction log I/O, and the average I/O latencies across all databases and logs on a per-server basis.

Database I/O	Target values	Server 1	Server 2	Server 3	Server 4	Server 5
Achieved transactional I/O per sec	1400	1424.414	1448.535	1442.904	1445.341	1446.975
Database reads/sec	N/A	877.436	891.734	888.039	899.57	9890.577
Database writes/sec	N/A	546.977	556.801	554.865	555.771	556.399
I/O database reads average latency (msec)	< 20 msec	18.547	18.132	18.453	18.369	18.144
I/O database writes average latency (msec)	< 20 msec**	3.817	3.522	3.363	3.227	3.563
<b>Transaction log I/O</b>						
Log writes/sec	N/A	487.754	499.619	498.448	498.536	498.52
I/O log writes average latency (msec)	< 10 msec	1.127	0.883	0.856	0.860	0.902

\*\* General recommendations are < 20 msec. This counter is not a good indicator for client latency since database writes are asynchronous, see <http://technet.microsoft.com/en-us/library/ff367871.aspx>.

### Individual server metrics for Server 6 through Server 10

The information in this table includes the sum of I/O across achieved transactional database I/O, transaction log I/O, and the average I/O latencies across all databases and logs on a per-server basis.

Database I/O	Target values	Server 6	Server 7	Server 8	Server 9	Server 10
Achieved transactional I/O per sec	1400	1442.156	1441.798	1442.870	1437.596	1449.811
Database reads/sec	N/A	887.399	887.331	888.034	884.944	892.572
Database writes/sec	N/A	554.756	554.469	554.833	552.65	557.239
I/O database reads average latency (msec)	< 20 msec	18.479	18.462	18.537	18.520	18.271
I/O database writes average latency (msec)	< 20 msec **	3.474	3.462	3.442	3.446	2.930
<b>Transaction log I/O</b>						
Log writes/sec	N/A	497.963	496.687	498.155	496.042	506.509
I/O log writes average latency (msec)	< 10 msec	0.917	0.896	0.919	0.893	0.662

\*\* General recommendations are < 20 msec. This counter is not a good indicator for client latency since database writes are asynchronous, see <http://technet.microsoft.com/en-us/library/ff367871.aspx>.

**Aggregate performance across all servers metrics**

The information in this table includes the sum of I/O across servers in the solution, and the average latency across all servers in the solution.

<b>Database I/O</b>	<b>Target values for ten servers</b>	<b>Values across all servers</b>
Achieved transactional I/O per sec	14,000	14,422.400
I/O database disk reads/sec	N/A	8877.636
I/O database disk writes/sec	N/A	5544.76
I/O database reads average latency (msec)	< 20 msec	18.391
I/O database writes average latency (msec)	< 20 msec**	3.425
<b>Transaction log I/O</b>		
I/O log disk writes/sec	N/A	4975.233
I/O log writes average latency (msec)	< 10 msec	0.891

\*\* General recommendations are < 20 msec. This counter is not a good indicator for client latency since database writes are asynchronous, see <http://technet.microsoft.com/en-us/library/ff367871.aspx>.

## Database backup/recovery performance

This section provides two tests reports. The first one measures the sequential read rate of the database files. The second test report measures the recovery/replay performance (playing transaction logs in to the database).

### Database read-only performance

This test measures the maximum rate at which Microsoft Visual SourceSafe (VSS) backs up databases. The following shows the average rate for a single database file across all 10 servers.

- MB read/sec per database - 23.70
- MB read/sec total per server - 473.40

### Transaction log recovery/replay performance

This test measures the maximum rate at which the log files can be played against the databases. The following tables show the average rate for 500 log files played against a single database store. Each log file is 1 MB in size.

	Server 1	Server 2	Server 3	Server 4	Server 5
<b>Average time to play one log file (sec)</b>	3.70	3.73	3.75	3.73	3.69

	Server 6	Server 7	Server 8	Server 9	Server 10
<b>Average time to play one log file (sec)</b>	3.71	3.73	3.68	3.73	3.81

---

## Conclusion

The testing described in this document validates the ESRP for Exchange 2010 on the EMC VMAX high-end storage array. The storage array combines the Symmetrix VMAX five 9s availability with innovative technologies:

- Fully Automated Storage Tiering
- Flash drives
- Virtual Provisioning
- Up to 1 TB of global memory
- Quad-core processors to generate more IOPS

EMC recommends using the building-block approach when designing storage solutions that support Exchange Server 2010. In this solution, a building-block of 10,000 users with a 120 messages user profile of 0.12 IOPS and 2 GB mailbox was used to scale the configuration up to 100,000 users, utilizing 10 of the building-blocks on the VMAX storage array. This configuration was defined and tested to meet all of the Microsoft Exchange Server recommended metrics.

In addition, the performance results outlined in this Microsoft-approved ESRP document demonstrate that the IOPS and latencies achieved will provide additional headroom to accommodate future user growth.

EMC has published multiple Proven Solutions white papers that validate how the VMAX can handle a very heavy Exchange 2010 load. For more information, visit:

<http://www.emc.com/exchange>

---

**Note:** This document was developed by EMC, and reviewed by the Microsoft Exchange Product team. The test results and data presented in this document are based on the tests introduced in the ESRP test framework. Customers should not quote the data directly for their predeployment verification. It is still necessary to go through the exercises to validate the storage design for a specific customer environment.

---

---

## Contact information

EMC recommends that you consult with EMC Professional Services to assist with the design and deployment of a similar solution. For information regarding this or any other EMC solution, use the following numbers:

United States: **(800) 782-4362 (SVC-4EMC)**

Canada: **(800) 543-4782 (543-4SVC)**

Worldwide: **(508) 497-7901**

For additional information on EMC products and services available to customers and partners, visit:

<http://EMC.com>

or

<http://Powerlink.EMC.com>

## Appendix A: Test reports

The test reports included in this section are a representative sample of the test results for the EMAIL5 machines as follows:

- [“Microsoft Exchange Server 2010 Jetstress – 2-hour performance” on page 28](#)
- [“Microsoft Exchange Server 2010 Jetstress – 24-hour stress” on page 41](#)
- [“Microsoft Exchange Server 2010 Jetstress – database backup” on page 51](#)
- [“Microsoft Exchange Server 2010 Jetstress – soft recovery” on page 57](#)

### Microsoft Exchange Server 2010 Jetstress – 2-hour performance

#### Performance test result report

##### Test summary

<b>Overall Test Result</b>	Pass
<b>Machine Name</b>	EMAIL5
<b>Test Description</b>	N/A
<b>Test Start Time</b>	3/11/2011 1:27:01 PM
<b>Test End Time</b>	3/11/2011 3:33:50 PM
<b>Collection Start Time</b>	3/11/2011 1:32:28 PM
<b>Collection End Time</b>	3/11/2011 3:32:18 PM
<b>Jetstress Version</b>	14.01.0225.017
<b>Ese Version</b>	14.01.0218.012
<b>Operating System</b>	Windows Server 2008 R2 Enterprise (6.1.7600.0)
<b>Performance Log</b>	<a href="#">C:\Program Files\Exchange Jetstress\Performance_2011_3_11_13_27_46.blg</a>

**Database sizing and throughput**

<b>Achieved Transactional I/O per Second</b>	1445.341
<b>Target Transactional I/O per Second</b>	1400
<b>Initial Database Size (bytes)</b>	21497143099392
<b>Final Database Size (bytes)</b>	21501899440128
<b>Database Files (Count)</b>	20

**Jetstress system parameters**

<b>Thread Count</b>	5 (per database)
<b>Minimum Database Cache</b>	640.0 MB
<b>Maximum Database Cache</b>	5120.0
<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>	2

**Database configuration**

<b>Instance2756.1</b>	Log path: C:\MP\LOG\LOG1 Database: C:\MP\DB\DB1\Jetstress001001.edb
<b>Instance2756.2</b>	Log path: C:\MP\LOG\LOG2 Database: C:\MP\DB\DB2\Jetstress002001.edb
<b>Instance2756.3</b>	Log path: C:\MP\LOG\LOG3 Database: C:\MP\DB\DB3\Jetstress003001.edb
<b>Instance2756.4</b>	Log path: C:\MP\LOG\LOG4 Database: C:\MP\DB\DB4\Jetstress004001.edb
<b>Instance2756.5</b>	Log path: C:\MP\LOG\LOG5 Database: C:\MP\DB\DB5\Jetstress005001.edb
<b>Instance2756.6</b>	Log path: C:\MP\LOG\LOG6 Database: C:\MP\DB\DB6\Jetstress006001.edb
<b>Instance2756.7</b>	Log path: C:\MP\LOG\LOG7 Database: C:\MP\DB\DB7\Jetstress007001.edb
<b>Instance2756.8</b>	Log path: C:\MP\LOG\LOG8 Database: C:\MP\DB\DB8\Jetstress008001.edb
<b>Instance2756.9</b>	Log path: C:\MP\LOG\LOG9 Database: C:\MP\DB\DB9\Jetstress009001.edb
<b>Instance2756.10</b>	Log path: C:\MP\LOG\LOG10 Database: C:\MP\DB\DB10\Jetstress010001.edb
<b>Instance2756.11</b>	Log path: C:\MP\LOG\LOG11 Database: C:\MP\DB\DB11\Jetstress011001.edb
<b>Instance2756.12</b>	Log path: C:\MP\LOG\LOG12 Database: C:\MP\DB\DB12\Jetstress012001.edb
<b>Instance2756.13</b>	Log path: C:\MP\LOG\LOG13 Database: C:\MP\DB\DB13\Jetstress013001.edb
<b>Instance2756.14</b>	Log path: C:\MP\LOG\LOG14 Database: C:\MP\DB\DB14\Jetstress014001.edb
<b>Instance2756.15</b>	C:\MP\LOG\LOG15 Database: C:\MP\DB\DB15\Jetstress015001.edb
<b>Instance2756.16</b>	C:\MP\LOG\LOG16 Database: C:\MP\DB\DB16\Jetstress016001.edb
<b>Instance2756.17</b>	C:\MP\LOG\LOG17 Database: C:\MP\DB\DB17\Jetstress017001.edb

**Instance2756.18**

Log path: C:\MP\LOG\LOG18  
Database: C:\MP\DB\DB18\Jetstress018001.edb

**Instance2756.19**

Log path: C:\MP\LOG\LOG19  
Database: C:\MP\DB\DB19\Jetstress019001.edb

**Instance2756.20**

Log path: C:\MP\LOG\LOG20  
Database: C:\MP\DB\DB20\Jetstress020001.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
Instance2756.1	18.471	2.976	44.658	27.880	35881.671	36467.874	0.000	0.848	0.000	24.988	0.000	4626.481
Instance2756.2	18.353	2.982	44.293	27.818	35837.119	36401.048	0.000	0.857	0.000	24.974	0.000	4568.232
Instance2756.3	18.448	2.982	45.119	28.317	35645.983	36437.997	0.000	0.855	0.000	25.342	0.000	4575.940
Instance2756.4	18.358	3.005	44.336	27.609	35635.467	36489.313	0.000	0.859	0.000	24.955	0.000	4639.189
Instance2756.5	18.405	3.004	44.798	28.090	35817.037	36387.205	0.000	0.856	0.000	24.944	0.000	4623.418
Instance2756.6	18.389	3.014	45.170	28.119	35729.966	36425.151	0.000	0.857	0.000	25.192	0.000	4607.302
Instance2756.7	18.359	3.057	44.219	27.631	35853.877	36431.871	0.000	0.855	0.000	24.549	0.000	4660.187
Instance2756.8	18.308	3.061	44.263	27.680	35683.525	36417.432	0.000	0.862	0.000	24.924	0.000	4658.486
Instance2756.9	18.329	3.094	44.317	27.672	35985.835	36504.732	0.000	0.856	0.000	25.068	0.000	4621.074
Instance2756.10	18.320	3.104	44.695	27.895	35999.168	36503.976	0.000	0.861	0.000	25.117	0.000	4661.883
Instance2756.11	18.378	3.185	44.001	27.478	35890.695	36359.852	0.000	0.867	0.000	24.481	0.000	4560.764
Instance2756.12	18.322	3.195	44.122	27.541	35879.585	36462.718	0.000	0.864	0.000	24.640	0.000	4670.711
Instance2756.13	18.414	3.278	44.700	27.897	35756.043	36450.539	0.000	0.863	0.000	24.887	0.000	4633.404
Instance2756.14	18.279	3.321	44.568	27.788	35824.327	36397.193	0.000	0.851	0.000	25.125	0.000	4632.555
Instance2756.15	18.437	3.352	45.041	28.111	36146.662	36455.614	0.000	0.862	0.000	25.168	0.000	4659.347
Instance2756.16	18.339	3.436	44.031	27.553	36113.265	36440.787	0.000	0.863	0.000	24.747	0.000	4666.976
Instance2756.17	18.357	3.504	44.053	27.469	35765.129	36504.191	0.000	0.861	0.000	24.819	0.000	4625.880
Instance2756.18	18.347	3.581	44.464	27.771	35978.074	36446.437	0.000	0.867	0.000	24.882	0.000	4676.772
Instance2756.19	18.326	3.661	43.817	27.411	35813.217	36481.817	0.000	0.856	0.000	24.610	0.000	4642.025
Instance2756.20	18.439	3.750	44.905	28.041	35946.435	36376.303	0.000	0.873	0.000	25.114	0.000	4603.592

## Background database maintenance I/O performance

MSExchange Database ==> Instances	Database Maintenance I/O Reads/sec	Database Maintenance I/O Reads Average Bytes
Instance2756.1	30.814	261788.334
Instance2756.2	30.828	261748.958
Instance2756.3	30.816	261736.156
Instance2756.4	30.812	261781.297
Instance2756.5	30.835	261697.569
Instance2756.6	30.838	261718.795
Instance2756.7	30.818	261704.581
Instance2756.8	30.830	261818.145
Instance2756.9	30.818	261779.938
Instance2756.10	30.834	261685.137
Instance2756.11	30.823	261755.779
Instance2756.12	30.825	261754.910
Instance2756.13	30.836	261753.511
Instance2756.14	30.843	261801.612
Instance2756.15	30.815	261776.115
Instance2756.16	30.832	261749.262
Instance2756.17	30.823	261734.556
Instance2756.18	30.831	261771.931
Instance2756.19	30.815	261777.842
Instance2756.20	30.826	261740.868

## Log replication I/O performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log I/O Reads Average Bytes
Instance2756.1	0.467	180732.473
Instance2756.2	0.461	177515.278
Instance2756.3	0.469	178916.534
Instance2756.4	0.467	175999.958
Instance2756.5	0.465	176493.425
Instance2756.6	0.469	178443.628
Instance2756.7	0.462	177941.432
Instance2756.8	0.470	181368.934
Instance2756.9	0.468	179370.834
Instance2756.10	0.473	178443.628
Instance2756.11	0.450	174543.221
Instance2756.12	0.465	176493.425
Instance2756.13	0.465	178443.628
Instance2756.14	0.467	176042.635
Instance2756.15	0.475	181368.934
Instance2756.16	0.465	178931.179
Instance2756.17	0.464	176493.425
Instance2756.18	0.470	176493.425
Instance2756.19	0.462	176054.609
Instance2756.20	0.466	177566.561

## 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
Instance2756.1	18.471	2.976	75.472	27.880	128116.141	36467.874	2.062	0.848	0.467	24.988	180732.473	4626.481
Instance2756.2	18.353	2.982	75.121	27.818	128546.961	36401.048	2.203	0.857	0.461	24.974	177515.278	4568.232
Instance2756.3	18.448	2.982	75.935	28.317	127398.241	36437.997	2.118	0.855	0.469	25.342	178916.534	4575.940
Instance2756.4	18.358	3.005	75.148	27.609	128359.196	36489.313	2.055	0.859	0.467	24.955	175999.958	4639.189
Instance2756.5	18.405	3.004	75.633	28.090	127907.438	36387.205	2.032	0.856	0.465	24.944	176493.425	4623.418
Instance2756.6	18.389	3.014	76.008	28.119	127418.461	36425.151	2.159	0.857	0.469	25.192	178443.628	4607.302
Instance2756.7	18.359	3.057	75.036	27.631	128611.368	36431.871	2.009	0.855	0.462	24.549	177941.432	4660.187
Instance2756.8	18.308	3.061	75.092	27.680	128524.138	36417.432	2.115	0.862	0.470	24.924	181368.934	4658.486
Instance2756.9	18.329	3.094	75.135	27.672	128599.009	36504.732	2.062	0.856	0.468	25.068	179370.834	4621.074
Instance2756.10	18.320	3.104	75.529	27.895	128132.317	36503.976	2.012	0.861	0.473	25.117	178443.628	4661.883
Instance2756.11	18.378	3.185	74.825	27.478	128933.749	36359.852	2.124	0.867	0.450	24.481	174543.221	4560.764
Instance2756.12	18.322	3.195	74.947	27.541	128780.844	36462.718	2.147	0.864	0.465	24.640	176493.425	4670.711
Instance2756.13	18.414	3.278	75.536	27.897	128015.150	36450.539	2.047	0.863	0.465	24.887	178443.628	4633.404
Instance2756.14	18.279	3.321	75.411	27.788	128249.667	36397.193	2.200	0.851	0.467	25.125	176042.635	4632.555
Instance2756.15	18.437	3.352	75.856	28.111	127803.412	36455.614	2.089	0.862	0.475	25.168	181368.934	4659.347
Instance2756.16	18.339	3.436	74.863	27.553	129040.450	36440.787	2.073	0.863	0.465	24.747	178931.179	4666.976
Instance2756.17	18.357	3.504	74.876	27.469	128786.771	36504.191	1.933	0.861	0.464	24.819	176493.425	4625.880
Instance2756.18	18.347	3.581	75.295	27.771	128434.426	36446.437	2.071	0.867	0.470	24.882	176493.425	4676.772
Instance2756.19	18.326	3.661	74.632	27.411	129112.622	36481.817	2.139	0.856	0.462	24.610	176054.609	4642.025
Instance2756.20	18.439	3.750	75.731	28.041	127854.382	36376.303	2.098	0.873	0.466	25.114	177566.561	4603.592

## Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.947	0.599	1.357
Available MBytes	119200.149	119175.000	119586.000
Free System Page Table Entries	3355334.975	33555331.000	33555335.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	79914733.791	79908864.000	79933440.000
Pool Paged Bytes	154784832.268	154714112.000	154865664.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

## Test log

```

3/10/2011 8:37:55 PM -- Jetstress testing begins ...
3/10/2011 8:37:55 PM -- Preparing for testing ...
3/10/2011 8:38:16 PM -- Attaching databases ...
3/10/2011 8:38:16 PM -- Preparations for testing are complete.
3/10/2011 8:38:17 PM -- Starting transaction dispatch ..
3/10/2011 8:38:17 PM -- Database cache settings: (minimum: 640.0 MB, maximum: 5.0 GB)
3/10/2011 8:38:17 PM -- Database flush thresholds: (start: 51.2 MB, stop: 102.4 MB)
3/10/2011 8:38:41 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
3/10/2011 8:38:41 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
3/10/2011 8:39:01 PM -- Operation mix: Sessions 5, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits
70%.
3/10/2011 8:39:01 PM -- Performance logging started (interval: 15000 ms).
3/10/2011 8:39:01 PM -- Attaining prerequisites:
3/10/2011 8:42:58 PM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 4853748000.0 (lower bound:
4831838000.0, upper bound: none)
3/10/2011 10:42:59 PM -- Performance logging has ended.
3/10/2011 10:42:59 PM -- JetInterop batch transaction stats: 16886, 16965, 17023, 16940, 16755, 16644, 17077,
16755, 16778, 16743, 16810, 16905, 16522, 16994, 16697, 16835, 16704, 17109, 16916 and 16829.
3/10/2011 10:42:59 PM -- Dispatching transactions ends.
3/10/2011 10:42:59 PM -- Shutting down databases ...
3/10/2011 10:43:07 PM -- Instance2756.1 (complete), Instance2756.2 (complete), Instance2756.3 (complete),
Instance2756.4 (complete), Instance2756.5 (complete), Instance2756.6 (complete), Instance2756.7 (complete),
Instance2756.8 (complete), Instance2756.9 (complete), Instance2756.10 (complete), Instance2756.11 (complete),
Instance2756.12 (complete), Instance2756.13 (complete), Instance2756.14 (complete), Instance2756.15 (complete),
Instance2756.16 (complete), Instance2756.17 (complete), Instance2756.18 (complete), Instance2756.19 (complete)
and Instance2756.20 (complete)
3/10/2011 10:43:07 PM -- C:\Program Files\Exchange Jetstress\Performance 2011 3 10 20 38 41.blg has 494 samples.
3/10/2011 10:43:07 PM -- Creating test report ...
3/10/2011 10:43:18 PM -- Instance2756.1 has 18.4 for I/O Database Reads Average Latency.
3/10/2011 10:43:18 PM -- Instance2756.1 has 0.8 for I/O Log Writes Average Latency.
3/10/2011 10:43:18 PM -- Instance2756.1 has 0.8 for I/O Log Reads Average Latency.
3/10/2011 10:43:18 PM -- Instance2756.2 has 18.4 for I/O Database Reads Average Latency.

```



3/10/2011 10:43:18 PM -- Instance2756.20 has 18.4 for I/O Database Reads Average Latency.  
 3/10/2011 10:43:18 PM -- Instance2756.20 has 0.8 for I/O Log Writes Average Latency.  
 3/10/2011 10:43:18 PM -- Instance2756.20 has 0.8 for I/O Log Reads Average Latency.  
 3/10/2011 10:43:18 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
 3/10/2011 10:43:18 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.  
 3/10/2011 10:43:18 PM -- [C:\Program Files\Exchange Jetstress\Performance 2011 3 10 20 38 41.xml](#) has 478 samples queried.  
 3/10/2011 10:43:19 PM -- [C:\Program Files\Exchange Jetstress\Performance 2011 3 10 20 38 41.html](#) was saved.  
 3/10/2011 10:43:20 PM -- Performance logging started (interval: 30000 ms).  
 3/10/2011 10:43:20 PM -- Verifying database checksums ...  
 3/11/2011 7:01:31 AM -- C:\MP\DB\DB1 (100% processed), C:\MP\DB\DB2 (100% processed), C:\MP\DB\DB3 (100% processed), C:\MP\DB\DB4 (100% processed), C:\MP\DB\DB5 (100% processed), C:\MP\DB\DB6 (100% processed), C:\MP\DB\DB7 (100% processed), C:\MP\DB\DB8 (100% processed), C:\MP\DB\DB9 (100% processed), C:\MP\DB\DB10 (100% processed), C:\MP\DB\DB11 (100% processed), C:\MP\DB\DB12 (100% processed), C:\MP\DB\DB13 (100% processed), C:\MP\DB\DB14 (100% processed), C:\MP\DB\DB15 (100% processed), C:\MP\DB\DB16 (100% processed), C:\MP\DB\DB17 (100% processed), C:\MP\DB\DB18 (100% processed), C:\MP\DB\DB19 (100% processed) and C:\MP\DB\DB20 (100% processed)  
 3/11/2011 7:01:31 AM -- Performance logging has ended.  
 3/11/2011 7:01:31 AM -- [C:\Program Files\Exchange Jetstress\DBChecksum 2011 3 10 22 43 19.blg](#) has 995 samples.  
 3/11/2011 7:01:51 AM -- [C:\Program Files\Exchange Jetstress\DBChecksum 2011 3 10 22 43 19.html](#) was saved.  
 3/11/2011 7:01:51 AM -- Verifying log checksums ...  
 3/11/2011 7:01:52 AM -- C:\MP\LOG\LOG1 (13 logs processed), C:\MP\LOG\LOG2 (14 logs processed), C:\MP\LOG\LOG3 (13 logs processed), C:\MP\LOG\LOG4 (13 logs processed), C:\MP\LOG\LOG5 (13 logs processed), C:\MP\LOG\LOG6 (13 logs processed), C:\MP\LOG\LOG7 (12 logs processed), C:\MP\LOG\LOG8 (13 logs processed), C:\MP\LOG\LOG9 (12 logs processed), C:\MP\LOG\LOG10 (13 logs processed), C:\MP\LOG\LOG11 (14 logs processed), C:\MP\LOG\LOG12 (13 logs processed), C:\MP\LOG\LOG13 (13 logs processed), C:\MP\LOG\LOG14 (13 logs processed), C:\MP\LOG\LOG15 (14 logs processed), C:\MP\LOG\LOG16 (13 logs processed), C:\MP\LOG\LOG17 (14 logs processed), C:\MP\LOG\LOG18 (13 logs processed), C:\MP\LOG\LOG19 (13 logs processed) and C:\MP\LOG\LOG20 (12 logs processed)  
 3/11/2011 7:01:52 AM -- [C:\Program Files\Exchange Jetstress\Application 2011 3 11 7 1 52.evt](#) is saved.  
 3/11/2011 7:01:52 AM -- [C:\Program Files\Exchange Jetstress\System 2011 3 11 7 1 52.evt](#) is saved.  
 3/11/2011 7:01:52 AM -- [C:\Program Files\Exchange Jetstress\XmlConfig 2011 3 11 7 1 52.xml](#) was saved.  
 3/11/2011 7:01:52 AM -- Jetstress testing has ended.  
 3/11/2011 1:27:01 PM -- Jetstress testing begins ...  
 3/11/2011 1:27:01 PM -- Preparing for testing ...  
 3/11/2011 1:27:23 PM -- Attaching databases ...  
 3/11/2011 1:27:23 PM -- Preparations for testing are complete.  
 3/11/2011 1:27:23 PM -- Starting transaction dispatch ..  
 3/11/2011 1:27:23 PM -- Database cache settings: (minimum: 640.0 MB, maximum: 5.0 GB)  
 3/11/2011 1:27:23 PM -- Database flush thresholds: (start: 51.2 MB, stop: 102.4 MB)  
 3/11/2011 1:27:46 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).  
 3/11/2011 1:27:46 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).  
 3/11/2011 1:28:05 PM -- Operation mix: Sessions 5, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.  
 3/11/2011 1:28:05 PM -- Performance logging started (interval: 15000 ms).  
 3/11/2011 1:28:05 PM -- Attaining prerequisites:  
 3/11/2011 1:32:28 PM -- \MSEExchange Database(JetstressWin)\Database Cache Size, Last: 4833878000.0 (lower bound: 4831838000.0, upper bound: none)  
 3/11/2011 3:32:29 PM -- Performance logging has ended.  
 3/11/2011 3:33:43 PM -- JetInterop batch transaction stats: 16830, 16795, 17036, 16837, 16758, 16929, 16873, 16800, 16888, 16839, 16602, 16637, 16778, 16810, 17024, 16748, 16701, 16865, 16748 and 16779.  
 3/11/2011 3:33:44 PM -- Dispatching transactions ends.  
 3/11/2011 3:33:44 PM -- Shutting down databases ...  
 3/11/2011 3:33:50 PM -- Instance2756.1 (complete), Instance2756.2 (complete), Instance2756.3 (complete),

Instance2756.4 (complete), Instance2756.5 (complete), Instance2756.6 (complete), Instance2756.7 (complete), Instance2756.8 (complete), Instance2756.9 (complete), Instance2756.10 (complete), Instance2756.11 (complete), Instance2756.12 (complete), Instance2756.13 (complete), Instance2756.14 (complete), Instance2756.15 (complete), Instance2756.16 (complete), Instance2756.17 (complete), Instance2756.18 (complete), Instance2756.19 (complete) and Instance2756.20 (complete)

3/11/2011 3:33:50 PM -- [C:\Program Files\Exchange Jetstress\Performance 2011 3 11 13 27 46.blg](#) has 495 samples.

3/11/2011 3:33:50 PM -- Creating test report ...

3/11/2011 3:34:01 PM -- Instance2756.1 has 18.5 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.1 has 0.8 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.1 has 0.8 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.2 has 18.4 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.2 has 0.9 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.2 has 0.9 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.3 has 18.4 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.3 has 0.9 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.3 has 0.9 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.4 has 18.4 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.4 has 0.9 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.4 has 0.9 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.5 has 18.4 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.5 has 0.9 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.5 has 0.9 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.6 has 18.4 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.6 has 0.9 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.6 has 0.9 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.7 has 18.4 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.7 has 0.9 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.7 has 0.9 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.8 has 18.3 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.8 has 0.9 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.8 has 0.9 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.9 has 18.3 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.9 has 0.9 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.9 has 0.9 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.10 has 18.3 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.10 has 0.9 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.10 has 0.9 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.11 has 18.4 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.11 has 0.9 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.11 has 0.9 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.12 has 18.3 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.12 has 0.9 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.12 has 0.9 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.13 has 18.4 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.13 has 0.9 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.13 has 0.9 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.14 has 18.3 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.14 has 0.9 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.14 has 0.9 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.15 has 18.4 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.15 has 0.9 for I/O Log Writes Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.15 has 0.9 for I/O Log Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.16 has 18.3 for I/O Database Reads Average Latency.

3/11/2011 3:34:01 PM -- Instance2756.16 has 0.9 for I/O Log Writes Average Latency.  
3/11/2011 3:34:01 PM -- Instance2756.16 has 0.9 for I/O Log Reads Average Latency.  
3/11/2011 3:34:01 PM -- Instance2756.17 has 18.4 for I/O Database Reads Average Latency.  
3/11/2011 3:34:01 PM -- Instance2756.17 has 0.9 for I/O Log Writes Average Latency.  
3/11/2011 3:34:01 PM -- Instance2756.17 has 0.9 for I/O Log Reads Average Latency.  
3/11/2011 3:34:01 PM -- Instance2756.18 has 18.3 for I/O Database Reads Average Latency.  
3/11/2011 3:34:01 PM -- Instance2756.18 has 0.9 for I/O Log Writes Average Latency.  
3/11/2011 3:34:01 PM -- Instance2756.18 has 0.9 for I/O Log Reads Average Latency.  
3/11/2011 3:34:01 PM -- Instance2756.19 has 18.3 for I/O Database Reads Average Latency.  
3/11/2011 3:34:01 PM -- Instance2756.19 has 0.9 for I/O Log Writes Average Latency.  
3/11/2011 3:34:01 PM -- Instance2756.19 has 0.9 for I/O Log Reads Average Latency.  
3/11/2011 3:34:01 PM -- Instance2756.20 has 18.4 for I/O Database Reads Average Latency.  
3/11/2011 3:34:01 PM -- Instance2756.20 has 0.9 for I/O Log Writes Average Latency.  
3/11/2011 3:34:01 PM -- Instance2756.20 has 0.9 for I/O Log Reads Average Latency.  
3/11/2011 3:34:01 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
3/11/2011 3:34:01 PM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.  
3/11/2011 3:34:01 PM -- <C:\Program Files\Exchange Jetstress\Performance 2011 3 11 13 27 46.xml> has 477 samples queried.

## Microsoft Exchange Server 2010 Jetstress – 24-hour stress

### Performance test result report

#### Test summary

<b>Overall Test Result</b>	Pass
<b>Machine Name</b>	EMAIL5
<b>Test Description</b>	N/A
<b>Test Start Time</b>	3/14/2011 9:01:18 AM
<b>Test End Time</b>	3/15/2011 9:28:41 AM
<b>Collection Start Time</b>	3/14/2011 9:06:31 AM
<b>Collection End Time</b>	3/15/2011 9:06:23 AM
<b>Jetstress Version</b>	14.01.0225.017
<b>Ese Version</b>	14.01.0218.012
<b>Operating System</b>	Windows Server 2008 R2 Enterprise (6.1.7600.0)
<b>Performance Log</b>	<a href="C:\Program Files\Exchange Jetstress\Stress_2011_3_14_9_2_3.blg">C:\Program Files\Exchange Jetstress\Stress_2011_3_14_9_2_3.blg</a>

#### Database sizing and throughput

<b>Achieved Transactional I/O per Second</b>	1427.46
<b>Target Transactional I/O per Second</b>	1400
<b>Initial Database Size (bytes)</b>	21554319851520
<b>Final Database Size (bytes)</b>	21607545569280
<b>Database Files (Count)</b>	20

**Jetstress system parameters**

<b>Thread Count</b>	5 (per database)
<b>Minimum Database Cache</b>	640.0 MB
<b>Maximum Database Cache</b>	5120.0
<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>	2

**Database configuration**

<b>Instance2908.1</b>	Log path: C:\MP\LOG\LOG1 Database: C:\MP\DB\DB1\Jetstress001001.edb
<b>Instance2908.2</b>	Log path: C:\MP\LOG\LOG2 Database: C:\MP\DB\DB2\Jetstress002001.edb
<b>Instance2908.3</b>	Log path: C:\MP\LOG\LOG3 Database: C:\MP\DB\DB3\Jetstress003001.edb
<b>Instance2908.4</b>	Log path: C:\MP\LOG\LOG4 Database: C:\MP\DB\DB4\Jetstress004001.edb
<b>Instance2908.5</b>	Log path: C:\MP\LOG\LOG5 Database: C:\MP\DB\DB5\Jetstress005001.edb
<b>Instance2908.6</b>	Log path: C:\MP\LOG\LOG6 Database: C:\MP\DB\DB6\Jetstress006001.edb
<b>Instance2908.7</b>	Log path: C:\MP\LOG\LOG7 Database: C:\MP\DB\DB7\Jetstress007001.edb
<b>Instance2908.8</b>	Log path: C:\MP\LOG\LOG8 Database: C:\MP\DB\DB8\Jetstress008001.edb
<b>Instance2908.9</b>	Log path: C:\MP\LOG\LOG9 Database: C:\MP\DB\DB9\Jetstress009001.edb
<b>Instance2908.10</b>	Log path: C:\MP\LOG\LOG10 Database: C:\MP\DB\DB10\Jetstress010001.edb

<b>Instance2908.11</b>	Log path: C:\MP\LOG\LOG11 Database: C:\MP\DB\DB11\Jetstress011001.edb
<b>Instance2908.12</b>	Log path: C:\MP\LOG\LOG12 Database: C:\MP\DB\DB12\Jetstress012001.edb
<b>Instance2908.13</b>	Log path: C:\MP\LOG\LOG13 Database: C:\MP\DB\DB13\Jetstress013001.edb
<b>Instance2908.14</b>	Log path: C:\MP\LOG\LOG14 Database: C:\MP\DB\DB14\Jetstress014001.edb
<b>Instance2908.15</b>	C:\MP\LOG\LOG15 Database: C:\MP\DB\DB15\Jetstress015001.edb
<b>Instance2908.16</b>	C:\MP\LOG\LOG16 Database: C:\MP\DB\DB16\Jetstress016001.edb
<b>Instance2908.17</b>	C:\MP\LOG\LOG17 Database: C:\MP\DB\DB17\Jetstress017001.edb
<b>Instance2908.18</b>	Log path: C:\MP\LOG\LOG18 Database: C:\MP\DB\DB18\Jetstress018001.edb
<b>Instance2908.19</b>	Log path: C:\MP\LOG\LOG19 Database: C:\MP\DB\DB19\Jetstress019001.edb
<b>Instance2908.20</b>	Log path: C:\MP\LOG\LOG20 Database: C:\MP\DB\DB20\Jetstress020001.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
Instance2908.1	18.748	3.363	43.509	27.857	36052.321	35425.055	0.000	0.860	0.000	23.882	0.000	4612.626
Instance2908.2	18.634	3.367	43.427	27.790	36000.265	35442.764	0.000	0.859	0.000	23.907	0.000	4625.127
Instance2908.3	18.612	3.377	43.559	27.886	36014.494	35446.051	0.000	0.861	0.000	23.928	0.000	4628.745
Instance2908.4	18.656	3.394	43.856	28.089	36072.857	35427.546	0.000	0.859	0.000	24.041	0.000	4611.473
Instance2908.5	18.733	3.405	43.507	27.840	36039.421	35432.627	0.000	0.860	0.000	23.896	0.000	4615.947
Instance2908.6	18.719	3.422	43.465	27.808	36092.275	35426.225	0.000	0.860	0.000	23.825	0.000	4636.523
Instance2908.7	18.646	3.444	43.607	27.914	36018.992	35417.380	0.000	0.861	0.000	23.926	0.000	4610.337
Instance2908.8	18.628	3.449	43.578	27.917	35936.100	35429.776	0.000	0.858	0.000	23.954	0.000	4622.291
Instance2908.9	18.693	3.460	43.495	27.845	36008.164	35442.589	0.000	0.861	0.000	23.903	0.000	4628.635
Instance2908.10	18.725	3.464	43.692	27.983	35935.993	35426.281	0.000	0.862	0.000	24.015	0.000	4636.305
Instance2908.11	18.680	3.474	43.543	27.881	35946.900	35436.606	0.000	0.858	0.000	23.906	0.000	4624.575
Instance2908.12	18.694	3.492	43.429	27.786	36013.905	35426.911	0.000	0.862	0.000	23.843	0.000	4630.075
Instance2908.13	18.586	3.500	43.405	27.761	36008.056	35411.661	0.000	0.861	0.000	23.823	0.000	4616.055
Instance2908.14	18.655	3.532	43.510	27.834	36086.164	35419.585	0.000	0.861	0.000	23.867	0.000	4616.769
Instance2908.15	18.666	3.569	43.634	27.944	36001.616	35421.216	0.000	0.858	0.000	23.883	0.000	4615.723
Instance2908.16	18.631	3.603	43.310	27.707	36022.645	35429.903	0.000	0.859	0.000	23.822	0.000	4616.410
Instance2908.17	18.598	3.657	43.483	27.832	35957.857	35441.595	0.000	0.859	0.000	23.879	0.000	4621.252
Instance2908.18	18.705	3.709	43.381	27.764	36119.051	35419.192	0.000	0.861	0.000	23.776	0.000	4628.124
Instance2908.19	18.700	3.765	43.504	27.836	36095.785	35438.107	0.000	0.862	0.000	23.870	0.000	4621.416
Instance2908.20	18.711	3.838	43.458	27.833	36042.065	35441.431	0.000	0.859	0.000	23.913	0.000	4631.566

## Background database maintenance I/O performance

MSExchange Database ==> Instances	Database Maintenance I/O Reads/sec	Database Maintenance I/O Reads Average Bytes
Instance2908.1	30.659	261709.568
Instance2908.2	30.679	261715.767
Instance2908.3	30.688	261700.096
Instance2908.4	30.687	261709.672
Instance2908.5	30.662	261706.695
Instance2908.6	30.660	261707.505
Instance2908.7	30.682	261720.274
Instance2908.8	30.688	261700.114
Instance2908.9	30.664	261721.000
Instance2908.10	30.665	261714.124
Instance2908.11	30.669	261723.986
Instance2908.12	30.672	261686.510
Instance2908.13	30.693	261709.313
Instance2908.14	30.678	261713.643
Instance2908.15	30.680	261703.818
Instance2908.16	30.682	261707.351
Instance2908.17	30.692	261715.139
Instance2908.18	30.663	261705.542
Instance2908.19	30.666	261723.412
Instance2908.20	30.670	261702.647

## Log replication I/O performance

MSExchange Database ==> Instances	Database Maintenance I/O Reads/sec	Database Maintenance I/O Reads Average Bytes
Instance2908.1	0.444	170194.297
Instance2908.2	0.446	170992.861
Instance2908.3	0.447	171154.281
Instance2908.4	0.447	171773.837
Instance2908.5	0.446	171199.132
Instance2908.6	0.446	171093.032
Instance2908.7	0.446	171059.582
Instance2908.8	0.447	171934.128
Instance2908.9	0.447	171302.319
Instance2908.10	0.449	172377.496
Instance2908.11	0.446	171552.355
Instance2908.12	0.446	170793.079
Instance2908.13	0.444	170369.851
Instance2908.14	0.445	170684.215
Instance2908.15	0.445	170584.215
Instance2908.16	0.444	170894.468
Instance2908.17	0.446	170998.760
Instance2908.18	0.444	170626.637
Instance2908.19	0.445	170793.997
Instance2908.20	0.447	170935.870

## 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
Instance2908.1	18.748	3.363	74.168	27.857	129332.517	35425.055	1.945	0.860	0.444	23.882	180732.473	4626.481
Instance2908.2	18.634	3.367	74.106	27.790	129443.741	35442.764	2.807	0.859	0.446	23.907	177515.278	4568.232
Instance2908.3	18.612	3.377	74.248	27.886	129295.872	35446.051	1.948	0.861	0.447	23.928	178916.534	4575.940
Instance2908.4	18.656	3.394	74.543	28.089	128960.630	35427.546	1.947	0.859	0.447	24.041	175999.958	4639.189
Instance2908.5	18.733	3.405	74.169	27.840	129332.572	35432.627	2.150	0.860	0.446	23.896	176493.425	4623.418
Instance2908.6	18.719	3.422	74.125	27.808	129413.507	35426.225	2.613	0.860	0.446	23.825	178443.628	4607.302
Instance2908.7	18.646	3.444	74.289	27.914	129235.825	35417.380	1.955	0.861	0.446	23.926	177941.432	4660.187
Instance2908.8	18.628	3.449	74.265	27.917	129225.410	35429.776	2.114	0.858	0.447	23.954	181368.934	4658.486
Instance2908.9	18.693	3.460	74.160	27.845	129338.307	35442.589	2.345	0.861	0.447	23.903	179370.834	4621.074
Instance2908.10	18.725	3.464	74.357	27.983	129046.089	35426.281	2.877	0.862	0.449	24.015	178443.628	4661.883
Instance2908.11	18.680	3.474	74.212	27.881	129251.850	35436.606	1.952	0.858	0.446	23.906	174543.221	4560.764
Instance2908.12	18.694	3.492	74.101	27.786	129424.138	35426.911	1.927	0.862	0.446	23.843	176493.425	4670.711
Instance2908.13	18.586	3.500	74.099	27.761	129498.524	35411.661	1.928	0.861	0.444	23.823	178443.628	4633.404
Instance2908.14	18.655	3.532	74.188	27.834	129387.185	35419.585	2.072	0.861	0.445	23.867	176042.635	4632.555
Instance2908.15	18.666	3.569	74.315	27.944	129180.858	35421.216	2.042	0.858	0.445	23.883	181368.934	4659.347
Instance2908.16	18.631	3.603	73.992	27.707	129607.189	35429.903	1.976	0.859	0.444	23.822	178931.179	4666.976
Instance2908.17	18.598	3.657	74.175	27.832	129371.193	35441.595	1.926	0.859	0.446	23.879	176493.425	4625.880
Instance2908.18	18.705	3.709	74.044	27.764	129538.240	35419.192	2.048	0.861	0.444	23.776	176493.425	4676.772
Instance2908.19	18.700	3.765	74.170	27.836	129382.253	35438.107	1.944	0.862	0.445	23.870	176054.609	4642.025
Instance2908.20	18.711	3.838	74.128	27.833	129407.586	35441.431	1.927	0.859	0.447	23.913	177566.561	4603.592

## Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	0.929	0.564	2.001
Available MBytes	119227.714	118994.000	119824.000
Free System Page Table Entries	33554847.765	33554777.000	33555337.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	66287377.263	63508480.000	67297280.000
Pool Paged Bytes	115662860.847	113270784.000	146653184.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

## Test log

```

3/14/2011 9:01:17 AM -- Jetstress testing begins ...
3/14/2011 9:01:18 AM -- Preparing for testing ...
3/14/2011 9:01:38 AM -- Attaching databases ...
3/14/2011 9:01:38 AM -- Preparations for testing are complete.
3/14/2011 9:01:38 AM -- Starting transaction dispatch ..
3/14/2011 9:01:38 AM -- Database cache settings: (minimum: 640.0 MB, maximum: 5.0 GB)
3/14/2011 9:01:38 AM -- Database flush thresholds: (start: 51.2 MB, stop: 102.4 MB)
3/14/2011 9:02:03 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).
3/14/2011 9:02:03 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).
3/14/2011 9:02:22 AM -- Operation mix: Sessions 5, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits
70%.
3/14/2011 9:02:22 AM -- Performance logging started (interval: 15000 ms).
3/14/2011 9:02:22 AM -- Attaining prerequisites:
3/14/2011 9:06:31 AM -- \MSExchange Database(JetstressWin)\Database Cache Size, Last: 4835049000.0 (lower bound:
4831838000.0, upper bound: none)
3/15/2011 9:06:31 AM -- Performance logging has ended.
3/15/2011 9:28:34 AM -- JetInterop batch transaction stats: 186955, 187240, 187781, 187950, 187345, 187015,
187303, 187386, 187023, 188095, 186984, 186919, 187027, 187175, 187423, 186561, 187373, 187090, 187352 and 187410.
3/15/2011 9:28:34 AM -- Dispatching transactions ends.
3/15/2011 9:28:34 AM -- Shutting down databases ...
3/15/2011 9:28:41 AM -- Instance2908.1 (complete), Instance2908.2 (complete), Instance2908.3 (complete),
Instance2908.4 (complete), Instance2908.5 (complete), Instance2908.6 (complete), Instance2908.7 (complete),
Instance2908.8 (complete), Instance2908.9 (complete), Instance2908.10 (complete), Instance2908.11 (complete),
Instance2908.12 (complete), Instance2908.13 (complete), Instance2908.14 (complete), Instance2908.15 (complete),
Instance2908.16 (complete), Instance2908.17 (complete), Instance2908.18 (complete), Instance2908.19 (complete)
and Instance2908.20 (complete)
3/15/2011 9:28:41 AM -- C:\Program Files\Exchange Jetstress\Stress 2011 3 14 9 2 3.blg has 5755 samples.
3/15/2011 9:28:41 AM -- Creating test report ...
3/15/2011 9:31:11 AM -- Instance2908.1 has 18.7 for I/O Database Reads Average Latency.
3/15/2011 9:31:11 AM -- Instance2908.1 has 0.9 for I/O Log Writes Average Latency.
3/15/2011 9:31:11 AM -- Instance2908.1 has 0.9 for I/O Log Reads Average Latency.
3/15/2011 9:31:11 AM -- Instance2908.2 has 18.6 for I/O Database Reads Average Latency.

```



3/15/2011 9:31:11 AM -- Instance2908.20 has 18.7 for I/O Database Reads Average Latency.  
3/15/2011 9:31:11 AM -- Instance2908.20 has 0.9 for I/O Log Writes Average Latency.  
3/15/2011 9:31:11 AM -- Instance2908.20 has 0.9 for I/O Log Reads Average Latency.  
3/15/2011 9:31:11 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.  
3/15/2011 9:31:11 AM -- The test has 0 Database Page Fault Stalls/sec samples higher than 0.  
3/15/2011 9:31:11 AM -- [C:\Program Files\Exchange Jetstress\Stress 2011 3 14 9 2 3.xml](#) has 5738 samples queried.

## Microsoft Exchange Server 2010 Jetstress – database backup

### Test result report

#### Database backup statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance2672.1	1031210.09	08:08:00	35.22
Instance2672.2	1031202.09	08:10:17	35.05
Instance2672.3	1031250.09	08:08:20	35.20
Instance2672.4	1031218.09	08:08:55	35.15
Instance2672.5	1031226.09	08:08:04	35.21
Instance2672.6	1031194.09	08:10:15	35.06
Instance2672.7	1031202.09	08:08:16	35.20
Instance2672.8	1031226.09	08:08:35	35.18
Instance2672.9	1031218.09	08:08:48	35.16
Instance2672.10	1031218.09	08:08:30	35.18
Instance2672.11	1031194.09	08:08:54	35.15
Instance2672.12	1031210.09	08:09:12	35.13
Instance2672.13	1031194.09	08:08:59	35.15
Instance2672.14	1031218.09	08:11:54	34.94
Instance2672.15	1031218.09	08:09:06	35.14
Instance2672.16	1031210.09	08:09:09	35.14
Instance2672.17	1031218.09	08:11:01	35.00
Instance2672.18	1031226.09	08:09:36	35.10
Instance2672.19	1031226.09	08:09:32	35.11
Instance2672.20	1031242.09	08:08:53	35.16

**Jetstress system parameters**

<b>Thread Count</b>	5 (per database)
<b>Minimum Database Cache</b>	640.0 MB
<b>Maximum Database Cache</b>	5120.0 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>Instance2672.1</b>	Log path: C:\MP\LOG\LOG1 Database: C:\MP\DB\DB1\Jetstress001001.edb
<b>Instance2672.2</b>	Log path: C:\MP\LOG\LOG2 Database: C:\MP\DB\DB2\Jetstress002001.edb
<b>Instance2672.3</b>	Log path: C:\MP\LOG\LOG3 Database: C:\MP\DB\DB3\Jetstress003001.edb
<b>Instance2672.4</b>	Log path: C:\MP\LOG\LOG4 Database: C:\MP\DB\DB4\Jetstress004001.edb
<b>Instance2672.5</b>	Log path: C:\MP\LOG\LOG5 Database: C:\MP\DB\DB5\Jetstress005001.edb
<b>Instance2672.6</b>	Log path: C:\MP\LOG\LOG6 Database: C:\MP\DB\DB6\Jetstress006001.edb
<b>Instance2672.7</b>	Log path: C:\MP\LOG\LOG7 Database: C:\MP\DB\DB7\Jetstress007001.edb
<b>Instance2672.8</b>	Log path: C:\MP\LOG\LOG8 Database: C:\MP\DB\DB8\Jetstress008001.edb
<b>Instance2672.9</b>	Log path: C:\MP\LOG\LOG9 Database: C:\MP\DB\DB9\Jetstress009001.edb
<b>Instance2672.10</b>	Log path: C:\MP\LOG\LOG10 Database: C:\MP\DB\DB10\Jetstress010001.edb
<b>Instance2672.11</b>	Log path: C:\MP\LOG\LOG11 Database: C:\MP\DB\DB11\Jetstress011001.edb
<b>Instance2672.12</b>	Log path: C:\MP\LOG\LOG12 Database: C:\MP\DB\DB12\Jetstress012001.edb
<b>Instance2672.13</b>	Log path: C:\MP\LOG\LOG13 Database: C:\MP\DB\DB13\Jetstress013001.edb
<b>Instance2672.14</b>	Log path: C:\MP\LOG\LOG14 Database: C:\MP\DB\DB14\Jetstress014001.edb
<b>Instance2672.15</b>	C:\MP\LOG\LOG15 Database: C:\MP\DB\DB15\Jetstress015001.edb
<b>Instance2672.16</b>	C:\MP\LOG\LOG16 Database: C:\MP\DB\DB16\Jetstress016001.edb
<b>Instance2672.17</b>	C:\MP\LOG\LOG17 Database: C:\MP\DB\DB17\Jetstress017001.edb

**Instance2672.18**

Log path: C:\MP\LOG\LOG18  
Database: C:\MP\DB\DB18\Jetstress018001.edb

**Instance2672.19**

Log path: C:\MP\LOG\LOG19  
Database: C:\MP\DB\DB19\Jetstress019001.edb

**Instance2672.20**

Log path: C:\MP\LOG\LOG20  
Database: C:\MP\DB\DB20\Jetstress020001.edb

## 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
Instance2672.1	12.327	0.000	140.887	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.2	12.370	0.000	140.213	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.3	12.355	0.000	140.784	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.4	12.362	0.000	140.603	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.5	12.342	0.000	140.861	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.6	12.358	0.000	140.232	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.7	12.342	0.000	140.796	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.8	12.352	0.000	140.700	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.9	12.360	0.000	140.652	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.10	12.353	0.000	140.734	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.11	12.364	0.000	140.618	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.12	12.356	0.000	140.484	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.13	12.368	0.000	140.579	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.14	12.383	0.000	139.759	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.15	12.351	0.000	140.529	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.16	12.368	0.000	140.520	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.17	12.378	0.000	139.976	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.18	12.360	0.000	140.367	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.19	12.360	0.000	140.401	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance2672.20	12.356	0.000	140.629	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	2.177	0.000	2.572
Available MBytes	124884.213	124865.000	124865.000
Free System Page Table Entries	33555334.997	33555332.000	33555335.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	59101571.910	58720256.000	59224064.000
Pool Paged Bytes	108528462.729	106356736.000	110170112.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

## Test log

```

3/17/2011 4:42:08 PM -- Jetstress testing begins ...
3/17/2011 4:42:08 PM -- Preparing for testing ...
3/17/2011 4:42:29 PM -- Attaching databases ...
3/17/2011 4:42:29 PM -- Preparations for testing are complete.
3/17/2011 4:43:01 PM -- Performance logging started (interval: 30000 ms).
3/17/2011 4:43:01 PM -- Backing up databases ...
3/18/2011 12:54:55 AM -- Performance logging has ended.
3/18/2011 12:54:55 AM -- Instance2672.1 (100% processed), Instance2672.2 (100% processed), Instance2672.3 (100%
processed), Instance2672.4 (100% processed), Instance2672.5 (100% processed), Instance2672.6 (100% processed),
Instance2672.7 (100% processed), Instance2672.8 (100% processed), Instance2672.9 (100% processed),
Instance2672.10 (100% processed), Instance2672.11 (100% processed), Instance2672.12 (100% processed),
Instance2672.13 (100% processed), Instance2672.14 (100% processed), Instance2672.15 (100% processed),
Instance2672.16 (100% processed), Instance2672.17 (100% processed), Instance2672.18 (100% processed),
Instance2672.19 (100% processed) and Instance2672.20 (100% processed)
3/18/2011 12:54:56 AM -- C:\Program Files\Exchange Jetstress\DatabaseBackup 2011 3 17 16 42 29.blg has 982
samples.
3/18/2011 12:54:56 AM -- Creating test report ...

```

## Microsoft Exchange Server 2010 Jetstress – soft recovery

### SoftRecovery test result report

#### Soft recovery statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance2196.1	522	1920.1683497
Instance2196.2	506	1976.6584844
Instance2196.3	515	1909.5598737
Instance2196.4	510	1915.9249593
Instance2196.5	516	1892.0558883
Instance2196.6	516	1960.7457704
Instance2196.7	521	1910.8859332
Instance2196.8	513	1890.4646169
Instance2196.9	507	1881.9778361
Instance2196.10	512	1889.4037693
Instance2196.11	514	1888.0777098
Instance2196.12	514	1885.9560146
Instance2196.13	509	1893.1167359
Instance2196.14	516	1912.4772046
Instance2196.15	510	1913.0076284
Instance2196.16	526	1930.5116138
Instance2196.17	521	1936.6114875
Instance2196.18	506	1909.0294499
Instance2196.19	505	1929.1855543
Instance2196.20	501	1908.764238

**Database configuration**

<b>Instance2196.1</b>	Log path: C:\MP\LOG\LOG1 Database: C:\MP\DB\DB1\Jetstress001001.edb
<b>Instance2196.2</b>	Log path: C:\MP\LOG\LOG2 Database: C:\MP\DB\DB2\Jetstress002001.edb
<b>Instance2196.3</b>	Log path: C:\MP\LOG\LOG3 Database: C:\MP\DB\DB3\Jetstress003001.edb
<b>Instance2196.4</b>	Log path: C:\MP\LOG\LOG4 Database: C:\MP\DB\DB4\Jetstress004001.edb
<b>Instance2196.5</b>	Log path: C:\MP\LOG\LOG5 Database: C:\MP\DB\DB5\Jetstress005001.edb
<b>Instance2196.6</b>	Log path: C:\MP\LOG\LOG6 Database: C:\MP\DB\DB6\Jetstress006001.edb
<b>Instance2196.7</b>	Log path: C:\MP\LOG\LOG7 Database: C:\MP\DB\DB7\Jetstress007001.edb
<b>Instance2196.8</b>	Log path: C:\MP\LOG\LOG8 Database: C:\MP\DB\DB8\Jetstress008001.edb
<b>Instance2196.9</b>	Log path: C:\MP\LOG\LOG9 Database: C:\MP\DB\DB9\Jetstress009001.edb
<b>Instance2196.10</b>	Log path: C:\MP\LOG\LOG10 Database: C:\MP\DB\DB10\Jetstress010001.edb
<b>Instance2196.11</b>	Log path: C:\MP\LOG\LOG11 Database: C:\MP\DB\DB11\Jetstress011001.edb
<b>Instance2196.12</b>	Log path: C:\MP\LOG\LOG12 Database: C:\MP\DB\DB12\Jetstress012001.edb
<b>Instance2196.13</b>	Log path: C:\MP\LOG\LOG13 Database: C:\MP\DB\DB13\Jetstress013001.edb
<b>Instance2196.14</b>	Log path: C:\MP\LOG\LOG14 Database: C:\MP\DB\DB14\Jetstress014001.edb
<b>Instance2196.15</b>	C:\MP\LOG\LOG15 Database: C:\MP\DB\DB15\Jetstress015001.edb
<b>Instance2196.16</b>	C:\MP\LOG\LOG16 Database: C:\MP\DB\DB16\Jetstress016001.edb
<b>Instance2196.17</b>	C:\MP\LOG\LOG17 Database: C:\MP\DB\DB17\Jetstress017001.edb

**Instance2196.18**

Log path: C:\MP\LOG\LOG18  
Database: C:\MP\DB\DB18\Jetstress018001.edb

**Instance2196.19**

Log path: C:\MP\LOG\LOG19  
Database: C:\MP\DB\DB19\Jetstress019001.edb

**Instance2196.20**

Log path: C:\MP\LOG\LOG20  
Database: C:\MP\DB\DB20\Jetstress020001.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
Instance2196.1	24.785	2.025	183.053	1.629	41617.708	32145.823	7.418	0.001	2.444	0.002	227635.196	1.080
Instance2196.2	24.366	5.360	174.130	1.532	42031.931	30955.016	14.145	0.000	2.297	0.000	219398.869	0.000
Instance2196.3	24.671	1.659	181.032	1.614	41874.555	31863.575	9.575	0.000	2.421	0.000	226028.637	0.000
Instance2196.4	24.729	1.565	178.691	1.592	41570.046	31659.569	13.314	0.000	2.388	0.000	224736.073	0.000
Instance2196.5	24.689	1.411	181.980	1.634	41752.994	31645.328	7.168	0.001	2.452	0.002	224337.799	1.096
Instance2196.6	24.156	3.471	179.736	1.577	42091.469	31549.355	13.815	0.000	2.366	0.002	221255.726	1.058
Instance2196.7	24.742	1.529	180.842	1.630	41742.256	31863.575	5.363	0.000	2.445	0.000	224654.574	0.000
Instance2196.8	24.836	1.813	182.898	1.625	41517.837	31783.554	4.792	0.000	2.438	0.000	224915.924	0.000
Instance2196.9	24.708	1.556	181.552	1.614	41823.049	31708.690	8.765	0.000	2.422	0.000	224957.028	0.000
Instance2196.10	24.693	1.488	180.682	1.625	41739.347	31853.871	9.026	0.001	2.438	0.002	226086.834	1.099
Instance2196.11	24.635	1.418	181.878	1.632	41731.571	32064.824	9.615	0.001	2.447	0.002	227603.052	1.099
Instance2196.12	24.885	1.515	181.117	1.632	41288.378	32133.781	7.753	0.000	2.448	0.000	227853.737	0.000
Instance2196.13	24.770	1.540	183.003	1.612	41604.468	32066.330	10.772	0.001	2.418	0.002	227403.527	1.096
Instance2196.14	24.706	1.561	179.952	1.617	41508.908	31934.915	13.688	0.001	2.426	0.002	224256.746	1.085
Instance2196.15	24.999	1.914	178.595	1.598	41579.589	31657.220	8.623	0.001	2.397	0.002	224530.608	1.085
Instance2196.16	24.294	2.939	182.375	1.632	41330.452	32217.277	9.875	0.000	2.448	0.000	227589.216	0.000
Instance2196.17	24.632	1.797	180.281	1.613	41604.751	31808.268	13.708	0.000	2.419	0.002	224512.861	1.071
Instance2196.18	24.552	1.818	179.725	1.589	41907.074	31585.291	12.613	0.000	2.384	0.002	223323.385	1.087
Instance2196.19	24.574	2.430	177.350	1.569	41923.976	31873.076	13.517	0.001	2.354	0.002	225025.303	1.076
Instance2196.20	24.275	2.948	181.697	1.570	42045.663	31585.291	15.131	0.000	2.355	0.000	223817.803	0.000

## Background database maintenance I/O performance

MSExchange Database ==> Instances	Database Maintenance I/O Reads/sec	Database Maintenance I/O Reads Average Bytes
Instance2196.1	30.363	261772.325
Instance2196.2	30.285	261800.595
Instance2196.3	30.452	261753.928
Instance2196.4	30.424	261917.634
Instance2196.5	0.30.441	261675.741
Instance2196.6	30.320	261779.324
Instance2196.7	30.428	261830.011
Instance2196.8	30.412	261788.032
Instance2196.9	30.445	261825.307
Instance2196.10	30.413	261881.160
Instance2196.11	30.446	261803.166
Instance2196.12	30.427	261823.866
Instance2196.13	30.453	261789.484
Instance2196.14	30.465	261819.012
Instance2196.15	30.391	261765.580
Instance2196.16	30.405	261780.445
Instance2196.17	30.410	261786.073
Instance2196.18	30.417	261863.298
Instance2196.19	30.400	261827.641
Instance2196.20	30.437	261783.818

## 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
Instance2196.1	24.785	2.025	213.416	1.629	72939.177	32145.823	7.418	0.001	2.444	0.002	227635.196	1.080
Instance2196.2	24.366	5.360	204.415	1.532	74591.494	30955.016	14.145	0.000	2.297	0.000	219398.869	0.000
Instance2196.3	24.671	1.659	211.484	1.614	73535.397	31863.575	9.575	0.000	2.421	0.000	226028.637	0.000
Instance2196.4	24.729	1.565	209.114	1.592	73627.957	31659.569	13.314	0.000	2.388	0.000	224736.073	0.000
Instance2196.5	24.689	1.411	212.421	1.634	73268.925	31645.328	7.168	0.001	2.452	0.002	224337.799	1.096
Instance2196.6	24.156	3.471	210.056	1.577	73801.776	31549.355	13.815	0.000	2.366	0.002	221255.726	1.058
Instance2196.7	24.742	1.529	211.270	1.630	73440.071	31863.575	5.363	0.000	2.445	0.000	224654.574	0.000
Instance2196.8	24.836	1.813	213.310	1.625	72921.907	31783.554	4.792	0.000	2.438	0.000	224915.924	0.000
Instance2196.9	24.708	1.556	211.997	1.614	73417.884	31708.690	8.765	0.000	2.422	0.000	224957.028	0.000
Instance2196.10	24.693	1.488	211.095	1.625	73455.570	31853.871	9.026	0.001	2.438	0.002	226086.834	1.099
Instance2196.11	24.635	1.418	212.324	1.632	73288.771	32064.824	9.615	0.001	2.447	0.002	227603.052	1.099
Instance2196.12	24.885	1.515	211.544	1.632	73008.786	32133.781	7.753	0.000	2.448	0.000	227853.737	0.000
Instance2196.13	24.770	1.540	213.456	1.612	73017.041	32066.330	10.772	0.001	2.418	0.002	227403.527	1.096
Instance2196.14	24.706	1.561	210.417	1.617	73406.078	31934.915	13.688	0.001	2.426	0.002	224256.746	1.085
Instance2196.15	24.999	1.914	208.986	1.598	73599.176	31657.220	8.623	0.001	2.397	0.002	224530.608	1.085
Instance2196.16	24.294	2.939	212.780	1.632	72831.118	32217.277	9.875	0.000	2.448	0.000	227589.216	0.000
Instance2196.17	24.632	1.797	210.691	1.613	73384.970	31808.268	13.708	0.000	2.419	0.002	224512.861	1.071
Instance2196.18	24.552	1.818	210.142	1.589	73744.377	31585.291	12.613	0.000	2.384	0.002	223323.385	1.087
Instance2196.19	24.574	2.430	207.750	1.569	74102.901	31873.076	13.517	0.001	2.354	0.002	225025.303	1.076
Instance2196.20	24.275	2.948	212.135	1.570	73573.900	31585.291	15.131	0.000	2.355	0.000	223817.803	0.000

## Host system performance

Counter	Average	Minimum	Maximum
% Processor Time	2.074	0.000	4.476
Available MBytes	119443.894	119238.000	124034.000
Free System Page Table Entries	33554822.065	33554821.000	33554824.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	74168198.544	73318400.000	76050432.000
Pool Paged Bytes	145077296.164	144990208.000	145235968.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

## Test Log

```

3/16/2011 1:19:46 PM -- Jetstress testing begins ...
3/16/2011 1:19:46 PM -- Preparing for testing ...
3/16/2011 1:20:07 PM -- Attaching databases ...
3/16/2011 1:20:07 PM -- Preparations for testing are complete.
3/16/2011 1:20:08 PM -- Starting transaction dispatch ..
3/16/2011 1:20:08 PM -- Database cache settings: (minimum: 640.0 MB, maximum: 5.0 GB)
3/16/2011 1:20:08 PM -- Database flush thresholds: (start: 51.2 MB, stop: 102.4 MB)
3/16/2011 1:20:33 PM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).
3/16/2011 1:20:33 PM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).
3/16/2011 1:20:44 PM -- Operation mix: Sessions 5, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits
70%.
3/16/2011 1:20:44 PM -- Performance logging started (interval: 15000 ms).
3/16/2011 1:20:44 PM -- Generating log files ...
3/16/2011 3:28:36 PM -- C:\MP\LOG\LOG1 (104.4% generated), C:\MP\LOG\LOG2 (101.2% generated), C:\MP\LOG\LOG3
(103.0% generated), C:\MP\LOG\LOG4 (102.0% generated), C:\MP\LOG\LOG5 (103.2% generated), C:\MP\LOG\LOG6 (103.2%
generated), C:\MP\LOG\LOG7 (104.2% generated), C:\MP\LOG\LOG8 (102.4% generated), C:\MP\LOG\LOG9 (101.4%
generated), C:\MP\LOG\LOG10 (102.4% generated), C:\MP\LOG\LOG11 (102.6% generated), C:\MP\LOG\LOG12 (102.8%
generated), C:\MP\LOG\LOG13 (101.8% generated), C:\MP\LOG\LOG14 (103.2% generated), C:\MP\LOG\LOG15 (102.0%
generated), C:\MP\LOG\LOG16 (105.2% generated), C:\MP\LOG\LOG17 (104.2% generated), C:\MP\LOG\LOG18 (101.2%
generated), C:\MP\LOG\LOG19 (101.0% generated) and C:\MP\LOG\LOG20 (100.2% generated)
3/16/2011 3:28:36 PM -- Performance logging has ended.
3/16/2011 3:28:36 PM -- JetInterop batch transaction stats: 22473, 21858, 21992, 22171, 22064, 22171, 22237,
22032, 21997, 21844, 21922, 21878, 22043, 22163, 22083, 22208, 22232, 21904, 21642 and 21656.
3/16/2011 3:28:36 PM -- Dispatching transactions ends.
3/16/2011 3:28:36 PM -- Shutting down databases ...
3/16/2011 3:28:42 PM -- Instance2196.1 (complete), Instance2196.2 (complete), Instance2196.3 (complete),
Instance2196.4 (complete), Instance2196.5 (complete), Instance2196.6 (complete), Instance2196.7 (complete),
Instance2196.8 (complete), Instance2196.9 (complete), Instance2196.10 (complete), Instance2196.11 (complete),
Instance2196.12 (complete), Instance2196.13 (complete), Instance2196.14 (complete), Instance2196.15 (complete),
Instance2196.16 (complete), Instance2196.17 (complete), Instance2196.18 (complete), Instance2196.19 (complete)
and Instance2196.20 (complete)
3/16/2011 3:28:42 PM -- C:\Program Files\Exchange Jetstress\Performance 2011 3 16 13 20 33.blg has 510 samples.

```

