

Dell EqualLogic PS Series

20,000-User Mailbox Resiliency Storage Solution for Microsoft Exchange Server 2010

ESRP – Storage Version 3.0

PS Series Firmware Version 5.0.2



Tested with: ESRP – Storage Version 3.0

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Overview

This document provides information on the Dell storage solution for Microsoft Exchange Server, based on the *Microsoft Exchange Solution Reviewed Program (ESRP) – Storage* program¹. For any questions or comments regarding the contents of this document, contact Dell.

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

¹ The *ESRP – Storage* program was developed by Microsoft Corporation to provide a common storage testing framework for vendors to provide information on their storage solutions for Microsoft Exchange Server software. For more details on the *Microsoft ESRP – Storage* program, see the following URL:

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

Dell EqualLogic PS Series storage array features

With Dell™ EqualLogic™ PS Series storage arrays, your business can leverage its existing Ethernet infrastructure and deploy a comprehensive, easy-to-manage iSCSI SAN with all-inclusive enterprise-level features. The PS Series architecture was specifically designed to decrease the storage management burden on IT administrators and alleviate CIO planning and budgetary concerns. Dell chose the iSCSI protocol—with its networking and connectivity advantages—as the basis of the storage solution, and then built intelligence, automation, and redundancy into each PS Series storage array.

PS Series storage arrays use storage virtualization technology to mask the underlying complexity of the storage configuration. This virtualization occurs within and across multiple arrays that are logically grouped together, making management simple and efficient. Reliable hardware, intuitive graphical and command line user interfaces, and automated operations offer excellent productivity and service levels, while RAID configuration, storage expansion, drive sparing, and performance optimization occur automatically.

An IP network is used to connect hosts and applications to storage volumes, and also to connect arrays to each other, providing a communication mechanism that the arrays use to share configuration data and collaborate during data provisioning and load balancing. With the automated management capabilities of PS Series storage arrays, your storage administrators can provision data on-demand and make configuration changes quickly and easily—without disrupting running applications.

The PS Series storage array is a truly modular storage system. Each array contains redundant hot-swappable components for high availability and is designed for 99.999% reliability. An array does not act individually, but as part of a group of one or more arrays, accessed through a single IP address. Each array is configured with the RAID level of your choice. Performance load balancing enables volume data to be stored where the RAID configuration is optimal. When more capacity is needed, you simply add another member to the group. Capacity and performance scale automatically and linearly. Whether you have one array or many, the group provides a single management view, and the administrative effort remains the same.

Using a PS Series group for drive storage, diverse operating systems and a wide range of applications enables sharing of a reliable and high-performance storage system that can scale from hundreds of gigabytes to more than 100 terabytes. Administrators can access the group through a web browser, network connection, or serial connection. The graphical and command line user interfaces present a unified view of the storage that makes provisioning quick and easy. You can instantly create, expand, and delete volumes. Group storage space can be organized into a single pool or multiple pools for increased control and optimal flexibility. In addition, volume snapshots and replicas can be created on demand or through a schedule, providing online backup and restore capabilities with unmatched performance.

The PS Series of arrays provides for an efficient, self-regulating, tiered architecture. Without administrator intervention, data placement within a storage volume is optimized based upon latency. For applications where data becomes “hot” or most accessed, the PS Series arrays will move those pages of data to the pool member with the lowest latency, and move “cold” pages to arrays with higher latency. The result is a well-balanced, high-performing pool of storage.

Event notification mechanisms—including e-mail, syslog, and SNMP—ensure that any problems in the SAN can be quickly identified and resolved. Automatic controller failover and drive sparing mean that failures can generally be handled without user intervention. Servicing of the system (including replacing drives, controllers, fans, and power supplies) can be performed through the management interface.

For a comprehensive storage solution, Dell also provides host-based utilities that are all-inclusive in the purchase of your EqualLogic array. The Host Integration Tools enable easy point-and-click array initialization and host configuration. In addition, multipath I/O support enables you to create a reliable and high-performance I/O path between servers and PS Series group data, while Auto-Snapshot Manager (VSS provider) enables you to create snapshots that are coordinated with Windows applications.

To provide you with a truly comprehensive system, Dell includes numerous advanced features as standard functionality (no hardware add-ons or software licenses) in every PS Series storage array.

- **Modular hardware:** A PS Series group can easily grow or shrink to accommodate workload changes. Therefore, administrators can purchase only the storage they need when they need it. Future products will fully interoperate with first-generation arrays, protecting your initial investment.

- **Fully-redundant, fault-tolerant storage array.** Each array includes redundant, hot-swappable components—drives, control modules, fans, and power supplies—for a no-single-point-of-failure configuration. Components fail over automatically, without user intervention or disrupting data availability. In addition, data in each array is protected with RAID technology.
- **Support for RAID 10, RAID 5, RAID 6, RAID 6 Accelerated, and RAID 50.** You can choose to configure arrays with the appropriate RAID policy, depending on your capacity and application needs.
- **Support for a variety of drives.** Serial ATA (SATA) and Serial-Attached SCSI (SAS) provide flexibility in capacity and performance to meet your needs.
- **Automatic spare configuration and utilization.** Drive spares are automatically configured and used to replace failed drives. No user intervention is required.
- **Auto-Stat Drive Monitoring System (ADMS).** By continually monitoring drive health within a PS Series storage array or across a PS Series group, ADMS ensures optimal data availability. ADMS automatically scans drives in the background to proactively detect and correct media anomalies.
- **High-performance control modules.** Dual control modules provide support for network interface and control module failover. Nonvolatile write-back caches are mirrored across the control modules to protect data. Each control module has two, three, or four 1-Gigabit Ethernet interfaces or two 10-Gigabit Ethernet interfaces. Some control modules also have a dedicated management port.
- **Simple hardware installation.** Only a single network connection on an array is required for operation. Additional network connections can be added at any time for increased bandwidth and reliability.
- **Support for standard Ethernet networks.** Because PS Series storage arrays use standard Ethernet connections to provide access to storage, there is no need to train administrators in unfamiliar and complex technologies like Fibre Channel. Also, costs are reduced due to the high volumes and intense vendor competition among Ethernet hardware vendors.
- **Easy setup and management.** A simple setup utility lets you quickly configure an array on the network and create a PS Series group. In minutes, you have a functioning iSCSI SAN. By automating complex operations like RAID configuration, drive sparing, data provisioning, and load balancing, your storage administrators can effectively manage the SAN.
 - **Graphical- and command-line user interfaces.** Password-protected management interfaces provide a single-system view of the storage. Administrators do not need multiple consoles to perform storage management tasks. Using the Group Manager graphical user interface (GUI), creating and managing volumes and configuring security, networking, and event notification are point-and-click operations. In addition, an equivalent command-line interface (CLI) can be accessed through telnet, SSH, or a serial connection, or can be used in scripts.
 - **Automatic data provisioning.** There is no need for administrators to manually create RAID sets or map data onto drives or individual controllers. Arrays in a group contribute space to a shared pool of storage, from which you create volumes. Each volume has a specific size and access controls. To increase a volume, just specify a new size. The group handles storage allocation and capacity balancing across the drives and arrays.
 - **Dynamic load balancing.** As the workload changes, data and network I/O are automatically load-balanced within and across arrays in the group—with no impact on applications and no user intervention. Thus, “hot spots” can be quickly detected and eliminated.
- **Online and seamless scalability.** Increasing array capacity is as easy as installing additional drives or adding more network connections. You can seamlessly expand overall group capacity adding another array to a PS Series group. In all cases, performance scales automatically as drive data and network I/O are load-balanced across the added resources. Processing power also increases due to the additional controllers and caches. Meanwhile, volumes remain available with no impact on hosts and applications. There is no need to open a server cabinet or reconfigure an operating system. The additional storage space and network bandwidth are immediately available for use.

More than 1000 TB of storage can be configured in a single group. As the group expands, the management effort remains constant. A group with one array (member) is as easy to manage as a multi-member group.

Different sizes and generations of EqualLogic arrays can join into the same management group or even the same resource pool. Therefore, one does not need to throw away previous investments to fully benefit from new technology and new features.

- **Robust security for both data and management access.** Security between an iSCSI initiator (host) and iSCSI target (volume) can be based on IP address, iSCSI initiator name, or CHAP user name. This eliminates the need to understand complicated security technologies (such as Fibre Channel Switch Zoning or LUN Masking). CHAP authentication can be provided through the PS Series group itself or an external RADIUS server.

In addition, access to the group for management purposes requires an administrative account and password. Accounts can have either read-write or read-only privileges.

- **Advanced features are standard in all arrays.** A key PS Series design principle is to include advanced functionality in all arrays. The result is a comprehensive solution with built-in intelligence and advanced features. All the features described below are standard on each array with our all-inclusive software package and require no additional software, licenses, or cost.
 - **Cloning.** A clone is an image copy of a volume. Cloning is commonly used in multiple server deployments. For example, a master image of a system can be created and then cloned for each server. Cloning can dramatically reduce overhead when deploying replicated servers, such as blade servers and web servers.
 - **Snapshots.** A snapshot quickly captures a volume's contents at a specific point in time and can be used for backups, testing, and upgrades. Both instant and scheduled snapshots are supported. Snapshots greatly simplify and improve the performance of backup and recovery operations. Consistency groups can be created for simultaneous snapshots, maintaining application synchronization across multiple data volumes.
 - **Volume Shadow Copy Service (VSS).** EqualLogic arrays are integrated with the Microsoft VSS framework, which is included with Windows Server. This feature enables turnkey snapshot backups that can offload the backup process from application servers.
 - **Virtual Drive Service (VDS).** The EqualLogic VDS provider enables you to use Microsoft Storage Manager for SANs to create and manage volumes in a PS Series group.
 - **Replication.** Using two PS Series groups, you can replicate volumes across unlimited distances to protect your data. Replication enables you to set up a simple, yet robust disaster recovery plan that guards against catastrophic events.

A replica represents the contents of a volume at a specific point in time and is similar to a snapshot, except that it must be stored separately from the original volume. If the original volume is destroyed, you can recover data by cloning a replica. This creates a new volume containing the volume data that existed at the time the replica was created.

- **Multipath I/O.** A redundant network path eliminates failure points between hosts and storage and improves availability. For high performance, you can load balance I/O across multiple ports (HBAs or NICs).
 - **SAN Boot.** Booting servers directly from the SAN is operationally identical to a traditional boot process, but can be accomplished easily and efficiently across hundreds of servers.
 - **Storage Pools.** With PS Series storage, you can divide SAN space into multiple storage pools in a single PS Series group to build an efficient, flexible, easy-to-manage networked storage environment. Pools can be used for segregation or tiering of data online.
 - **Tiered Storage Pools.** Automatically, without administrator intervention, each pool of storage will balance and spread data across a pool of storage or arrays, providing for linear scaling of capacity and performance. The system automatically swaps hot data with cold data between the arrays. This ensures that IO bottlenecks are avoided and both the IO performance and the capacity capabilities of different tiers or different generations of hardware can be automatically applied to maximize the ability of the solution to support application needs.
- **Wide-spread interoperability.** PS Series storage arrays are ideal for heterogeneous environments, with support for most major operating systems and cluster software.

Windows and Exchange integration

Windows integration for Dell EqualLogic PS Series SANs is provided at several levels. VDS and VSS providers are included as part of the Host Integration Tools (HIT) and provide integration with Windows® file systems and compatible backup tools. Also provided is an MPIO Device Specific Module (DSM). This provides connection awareness of the PS Series SAN to Windows hosts, simplifying configuration, enabling reliable network connections, and enhancing performance.

Auto Snapshot Manager / Microsoft Edition (ASM/ME) is an all-inclusive software package that ships with all Dell EqualLogic PS Series arrays to facilitate the deployment, ongoing management, and protection of Dell EqualLogic iSCSI SANs in your Microsoft® Windows environments. ASM/ME has specific integration with Microsoft Exchange including Exchange Server 2010.

ASM/ME leverages VSS to enable the creation of application-consistent “Smart Copies”. These allow clean capture and recovery of email database information from Exchange 2010 using space-efficient EqualLogic snapshots. These point-in-time copies essentially preserve the state of the database at a specific moment. Incremental storage is then used to store changes to the database. This is more space efficient than having to keep a complete database copy online, as is required with lagged logs. ASM also allows the creation of flexible schedules for the capture of Smart Copies. Database integrity checks can be configured to run on a designated server, offloading the verification process. With these capabilities, the administrator can keep a set of point-in-time copies of the email databases, increasing the number of recovery points available. These additional Recovery Points (RPO) enhance recoverability in the event of a database corruption. Point-in-time copies of the email databases can be used for granular mailbox recovery, e-discovery, and Database reseeding. ASM/ME Smart Copy restore functions reduces the Recovery Time (RTO) associated with e-mail and database recoveries as well as database reseeds.

Solution description

The following sections outline the hardware and software environment for a Microsoft Exchange Server 2010 solution intended for medium and large organizations that support up to 20,000 users in a mailbox resiliency configuration utilizing the Database Availability Group (DAG) feature. The solution consists of a single DAG (2 copy) solution hosted across 4 individual Dell R610 servers with storage provided by 8 Dell EqualLogic PS6000XV storage arrays. Connectivity between servers and storage is via iSCSI protocol and a single Force10 C300 chassis switch.

The design features a configuration with no single point of failure among storage or servers and additional redundancy within each component. Each Exchange database is replicated to a different server on a separate array, where it is protected by RAID-50 redundancy. Two of the 16 SAS drives in each array are reserved as hot spares for automatic resynchronization in the case of drive failure. In addition, arrays provide redundant controllers and network interfaces with automatic failover. This is backed by dual quad port Ethernet adaptors on each server providing MPIO for performance and reliability.

Further, resiliency within the virtual subdivisions of the storage is achieved by replicating each Exchange database to different pools and volumes within pools. In the event that any pool or volume is lost or destroyed (for example, by administrator error) the Exchange servers will continue serving all users.

As a whole the solution design provides high availability and resiliency at multiple layers of hardware and software.

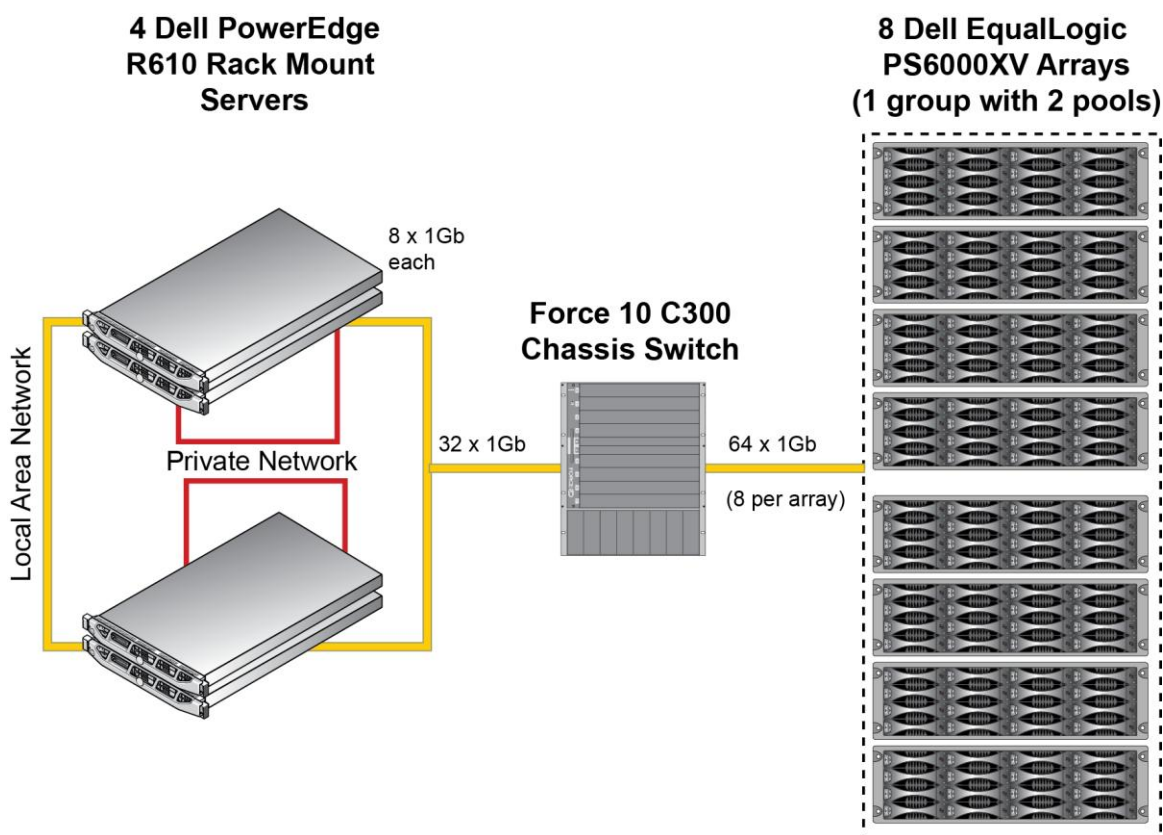
Hardware and software

The solution hardware environment is described in the following table.

Storage	Drives	Servers	Ethernet connections
8 PS6000XV storage arrays Configured into 1 PS Series array group containing 2 data storage pools with 4 members per pool (for db and log data).	128 15K-RPM 600GB Serial Attached SCSI drives	4 Dell PowerEdge™ R610 Servers, each with Intel Xeon 2.66 GHz quad Core CPU and 12GB memory running MS Windows Server 2008 R2 Enterprise x64 Edition	8 gigabit Ethernet connections per Server: 2 quad port Intel Gigabit Ethernet Adapters (model: PRO/1000 ET, driver V11.7.32.0)

Dell EqualLogic PS Series storage arrays provide active load balancing of storage and connection allocation. With four arrays per pool instantiating two volumes, PS Series array controllers will over time select an ideal location for each page of data, optimizing performance characteristics. This feature provides balanced demand of array resources providing highest throughput and lowest latencies with no administrative intervention. Additionally, network traffic is balanced across all 8 server network interfaces through Host Integration Tools multipathing, applying intelligent automatic load-balancing to server resources as well.

PS Series topology for Exchange storage solution



Exchange DAG architecture

This mailbox resiliency solution utilizes a single PS Series array group. The array group consists of 8 Dell EqualLogic PS6000XV storage arrays. There are two data storage pools in the array group, each pool consisting of 4 arrays. All arrays are configured as RAID-50. Within each storage pool two volumes are created for a total of 4 volumes per array group. Each volume may span up to the four arrays in its pool, and each volume provides database and log storage for a single Microsoft Exchange server.

There are 4 simulated Microsoft Exchange servers in the solution. Each Exchange server uses 5 databases and 5 log folders configured in the single volume. Within the overall solution, 2 servers provision active database copies and 2 servers provision passive database copies. There are a total of 10 active database copies spread across all PS Series arrays. This design ensures that a fully functioning implementation shares load across all storage, Yet it is capable of providing access to all mail databases and meeting service level agreements in the case that up to half of all servers and/or storage has failed.

The following table and diagram provides details of the solutions data layout on PS Group volumes and maps the volumes to the servers in the DAG.

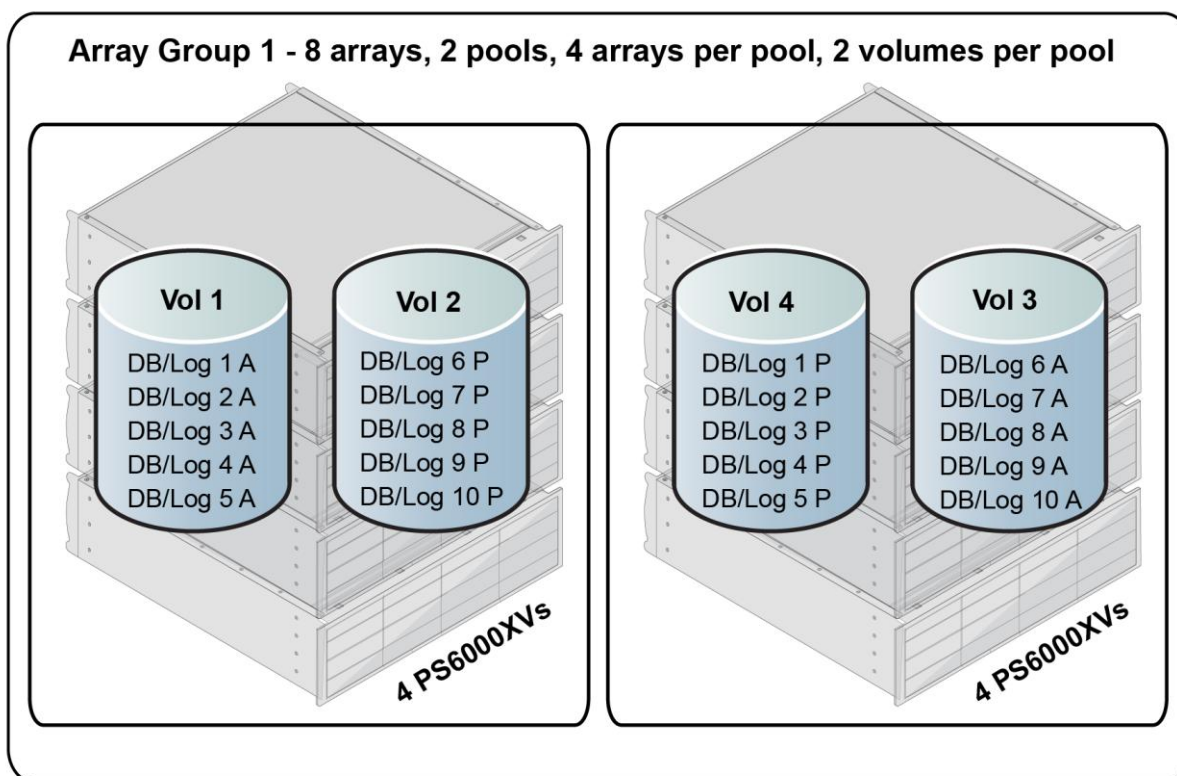
Table 1: Solution data layout

Server	PS Array Group	Pool	Volume	DB and Log Group	Active/Passive
Server 1	PS Array Group 1 consisting of 8 PS6000XV arrays	Data Pool 1 consisting of four PS6000XV arrays, 1 – 4	Volume 1	DB/Log 1	Active (copy 1)
				DB/Log 2	Active (copy 1)
				DB/Log 3	Active (copy 1)
				DB/Log 4	Active (copy 1)
				DB/Log 5	Active (copy 1)
Server 2		Volume 2	DB/Log 6	Passive (copy 2)	
			DB/Log 7	Passive (copy 2)	
			DB/Log 8	Passive (copy 2)	
			DB/Log 9	Passive (copy 2)	
			DB/Log 10	Passive (copy 2)	
Server 3	Data Pool 2 consisting of four PS6000XV arrays, 5-8	Volume 3	DB/Log 6	Active (copy 1)	
			DB/Log 7	Active (copy 1)	
			DB/Log 8	Active (copy 1)	

Server	PS Array Group	Pool	Volume	DB and Log Group	Active/Passive
Server 4				DB/Log 9	Active (copy 1)
				DB/Log 10	Active (copy 1)
			Volume 4	DB/Log 1	Passive (copy 2)
				DB/Log 2	Passive (copy 2)
				DB/Log 3	Passive (copy 2)
				DB/Log 4	Passive (copy 2)
				DB/Log 5	Passive (copy 2)

By design the data layout of the solution provides redundancy at the volume layer. Therefore, as many as half of all servers or volumes may be lost or destroyed (e.g. by disaster or administrator error) while the solution maintains a copy of all databases, and the remaining mailbox servers continue servicing all Exchange users.

PS Series solution for Exchange Server data configuration



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 scale-up Exchange solution. Other factors which affect the server scalability are:

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

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

For more information on identifying and addressing performance bottlenecks in an Exchange system, please see *Troubleshooting Microsoft Exchange Server Performance*, available at:

<http://go.microsoft.com/fwlink/?LinkId=23454>

Targeted customer profile

The PS Series storage solution is intended for small, medium, and large Microsoft Exchange Server 2010 organizations that want reliable, high-performance, and easy-to-manage drive storage. The tested configuration can support the following:

- 4 (2 tested) Exchange 2010 servers
- 20,000 user mailboxes
- 0.25 I/O per second per user (0.3 tested for 20% headroom)
- 1024 MB mailbox quota per user
- 5 databases per server
- 2TB database size
- Mailbox Resiliency (2 copies) provides high availability and is the primary data protection mechanism.

Tested deployment

Since primary (active) and secondary (passive) storage in the solution is identical, the tested deployment configured primary storage only, as allowed in the ESRP Storage v3.0 program. The following tables summarize the testing environment.

Simulated Exchange configuration

Number of Exchange mailboxes simulated	20,000
Number of Database Availability Groups (DAGs)	1
Number of servers/DAG	4 (2 tested)
Number of active mailboxes/server	5000 (10000 tested)
Number of databases/host	5
Number of copies/database	2
Number of mailboxes/database	2000
Simulated profile: I/O's per second per mailbox (IOPS, include 20% headroom)	.3
Database and Log LUN size	11.9 TB (5 DBs and 5 log sets per LUN)
Total database size for performance testing	19.53 TB
% storage capacity used by Exchange database ²	82.1 % (19.53TB/23.8TB)

² Storage performance characteristics change based on the percentage utilization of the individual disks. Tests that use a small percentage of the storage (~25%) might exhibit reduced throughput if the storage capacity utilization is significantly increased beyond what is tested in this paper.

Primary storage hardware

Storage Connectivity	iSCSI
Storage model and OS/firmware revision	Dell EqualLogic PS6000XV Firmware Rev: V5.0.2 http://www.dell.com/products/view.aspx?id=2509
Storage cache	16GB (4-PS6000s * 4GB = 16GB)
Number of storage controllers	8 (2 per array in active/passive configuration)
Number of storage ports	32 (4 per controller/8 per array)
Maximum bandwidth of storage connectivity to host	4 x 1 GB Ethernet per array
Switch type/model/firmware revision	Force10 C300 Chassis Switch (GB Ethernet) Firmware Rev: V12.2(46)SE
HBA model and firmware	Intel PRO/1000 ET Quad Port Gigabit Ethernet Adapters with Jumbo frames enabled.
Number of HBAs/host	2
Host server type	Dell PowerEdge R610 Intel Xeon Dual Core 2.66 GHz with 12GB RAM
Total number of drives tested	64
Maximum number of spindles	64

Primary storage software

HBA driver	Intel Driver Version: 11.7.32.0
HBA QueueTarget Setting	N/A
HBA QueueDepth Setting	N/A
Multipath I/O DSM	Dell EqualLogic HIT (Host Integration Toolkit) 3.4.2
Host OS	Windows Server 2008 R2, Enterprise x64 Edition, SP1
ESE.dll file version	14.0.639.19
Replication solution name/version	N/A

Primary drive configuration (Mailbox and Log Store Drives)

Drive type, speed and firmware revision	Seagate Cheetah 15K.6 600G 15,000 rpm SAS drives Model: ST3600057SS Firmware Revision: EN00
Raw capacity per drive (GB)	558.91GB
Number of physical drives in test	64 (56 + 8 hot spares)
Total raw storage capacity (GB)	34.93TB (35770.24 GB) including spares
Drive slice size (GB)	N/A
Number of disks per LUN	Up to 64 (automatically allocated based on load)
Raid level	All storage pools configured as RAID 50
Total formatted capacity (GB)	23.8TB
Storage capacity utilization	68.1% (23.8TB/34.93TB)
Database capacity utilization	55.9% (19.53TB/34.93TB)

Best practices

Microsoft Exchange Server is a drive-intensive application. Based on the tests using the ESRP framework, Dell recommends the following best practices to help improve storage performance.

- Allow the PS Series group to automatically balance the load across arrays, caches, and network links. Automatic load balancing reduces administrator effort as Exchange workloads change over time.
- In large Exchange deployments, isolate the Exchange workload from other application workloads by creating separate storage pools for Exchange-related volumes in a PS Series group and setting up separate servers for Exchange and other applications.
- Windows NTFS allocation unit size for partitions containing Exchange 2010 databases should be set to 64k for best performance.
- Depending on the desired level of availability, you can configure Exchange using multiple storage pools in a PS Series group to provide complete resource and hardware isolation between logs and databases. You can also deploy Exchange using a single pool, which provides a high level of availability and makes provisioning simple. Performance and reliability are similar in either a single pool group or multiple pool group.
- Size and configure first for I/O performance, then for storage capacity.
- Enable Dell EqualLogic Host Integration Tools V3.4.2 on Exchange servers to ensure highly-available SAN connections with Microsoft's MPIO.
- Use Microsoft iSCSI software initiators in Exchange configurations. In these tests, the Microsoft iSCSI software initiator was used.
- Use separate volumes for Exchange databases and transaction logs to improve backup and recovery operations. This solution chose shared volumes for databases and logs in the interest of ease of maintenance.
- Place SAN infrastructure on VLANs or subnets that differ from other production network traffic.
- Use non-blocking Gigabit Ethernet switches.
- Enable use of Jumbo Frames on the Intel Quadport ET devices
- Set the nic transmit/receive buffers to their maximum setting

For additional best practices on storage design in Exchange 2010, see the URL:

<http://technet.microsoft.com/en-us/library/bb124518.aspx>

Additional information

For more information, see the Dell website (www.dell.com). In addition, Dell EqualLogic technical documents may be useful:

<http://support.dell.com/equallogic>

Test result summary

This section provides a high-level summary of the test data from ESRP and the link to the detailed html reports which are generated by the ESRP testing framework. See [Appendix A](#) for detailed information about test results.

Reliability results

A number of tests in the framework check reliability, running for 24 hours. The goal is to verify the storage can handle 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 no database or log corruption.

The following list provides an overview:

- No relevant errors were reported in the event log for the storage reliability test.
- No errors were reported by the database and log checksum process.

Storage performance results

The Primary Storage performance testing is designed to exercise the storage with maximum sustainable Exchange I/O for over two hours. The test shows how long it takes for the storage to respond to an I/O under load. The data below is the sum of all of the logical drive I/Os and the average of all the logical drives' I/O latency during the test (which was run for six hours). Each server is listed separately and the aggregate numbers across all servers are also presented.

Individual server metrics

The server metrics include the sum of I/Os across storage groups and the average latency across all storage groups on a per server basis.

Table 1 IMEGA3 Performance Results

Database I/O	
Database Drive Transfers/sec	3273.02
Database Drive Reads/sec	2107.957
Database Drive Writes/sec	1165.063
Average Database Drive Read Latency (ms)	17.504
Average Database Drive Write Latency (ms)	8.3156
Transaction Log I/O	
Log Drive Writes/sec	561.386
Average Log Drive Write Latency (ms)	1.884

Table 2 IMEGA4 Performance Results

Database I/O	
Average Database Drive Transfers/sec	3135.061
Average Database Drive Reads/sec	2021.558
Average Database Drive Writes/sec	1113.503
Average Database Drive Read Latency (ms)	18.4766
Average Database Drive Write Latency (ms)	8.4336
Transaction Log I/O	
Average Log Drive Writes/sec	527.997
Average Log Drive Write Latency (ms)	2.2288

Aggregate performance across all servers metrics:

Aggregate performance is the sum of I/Os across all servers and the average latency across all servers. This solution yields an exceptional performance of 100.2 IOPS/spindle (including hot spare spindles).

Database I/O	
Database Drive Transfers/sec	6408.081
Database Drive Reads/sec	4129.515
Database Drive Writes/sec	2278.566
Average Database Drive Read Latency (ms)	17.9903
Average Database Drive Write Latency (ms)	8.3746
Transaction Log I/O	
Log Drive Writes/sec	1089.383
Average Log Drive Write Latency (ms)	2.0564

Database Backup/Recovery performance

This section includes two tests. The first test measures sequential read rates of the database files. The second test measures the recovery/replay performance.

Database Read-Only performance

The test measures the maximum rate to back up databases using VSS. The following table shows the average rate for a single database file and the total and average rates per server, with an overall aggregate rate of greater than 479 MB/s for the tested solution.

MB read/sec per database	47.915
MB read/sec per server	239.575

Transaction Log Recovery/Replay performance

The following table shows the average rate for ~500 log files played in a single storage group. Each log file is 1 MB in size.

Average time to play one log file (sec)	1.439
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Conclusion

This document was developed by Dell Inc., 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 pre-deployment verification. It is still necessary to go through the exercises to validate the storage design for a specific customer environment.

The ESRP Storage program is not designed to be a benchmarking program. Its tests are not designed for achieving the maximum throughput for a given solution. Rather, they are 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.

Appendix A

Microsoft Exchange **Jetstress 2010**

IMEGA3 Performance Test Result Report

Test Summary

Overall Test Result **Pass**

Machine Name IMEGA3

Test Description

Test Start Time 6/24/2011 9:24:28 AM

Test End Time 6/24/2011 11:26:08 AM

Collection Start Time 6/24/2011 9:25:35 AM

Collection End Time 6/24/2011 11:25:21 AM

Jetstress Version 14.01.0180.003

Ese Version 14.00.0639.019

Operating System Windows Server 2008 R2 Enterprise Service Pack 1 (6.1.7601.65536)

Performance Log C:\Program Files\Exchange Jetstress\Performance_2011_6_24_9_24_40.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second 3273.02

Target Transactional I/O per Second 3000

Initial Database Size (bytes) 10737481482240

Final Database Size (bytes) 10743949099008

Database Files (Count) 5

Jetstress System Parameters

Thread Count 17 (per database)

Minimum Database Cache 160.0 MB

Maximum Database Cache 1280.0 MB

Insert Operations 40%

Delete Operations 20%

Replace Operations 5%

Read Operations 35%

Lazy Commits 70%

Run Background Database Maintenance True

Number of Copies per Database 2

Database Configuration

Instance3380.1 Log Path: F:\log1
Database: F:\db1\Jetstress001001.edb

Instance3380.2 Log Path: F:\log2
Database: F:\db2\Jetstress002001.edb

Instance3380.3 Log Path: F:\log3
Database: F:\db3\Jetstress003001.edb

Instance3380.4 Log Path: F:\log4
Database: F:\db4\Jetstress004001.edb

Instance3380.5 Log Path: F:\log5
Database: F:\db5\Jetstress005001.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
Instance3380.1	17.487	8.284	422.876	233.630	33053.594	35259.999	0.000	1.863	0.000	112.379	0.000	5684.309
Instance3380.2	17.481	8.227	422.270	233.483	33001.293	35267.679	0.000	1.893	0.000	112.522	0.000	5717.326
Instance3380.3	17.489	8.486	420.536	232.431	33031.187	35269.458	0.000	1.902	0.000	112.251	0.000	5668.781
Instance3380.4	17.548	8.452	421.481	233.066	33035.187	35250.202	0.000	1.885	0.000	112.575	0.000	5691.327
Instance3380.5	17.515	8.129	420.794	232.453	33018.852	35267.200	0.000	1.877	0.000	111.659	0.000	5686.104

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3380.1	19.922	261982.289
Instance3380.2	19.836	261955.340
Instance3380.3	19.752	261925.796
Instance3380.4	19.943	261938.926
Instance3380.5	19.820	261901.502

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3380.1	2.646	232568.083
Instance3380.2	2.665	232558.321
Instance3380.3	2.635	232559.284
Instance3380.4	2.654	232559.723
Instance3380.5	2.630	232559.192

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
Instance3380.1	17.487	8.284	442.798	233.630	43353.435	35259.999	4.103	1.863	2.646	112.379	232568.083	5684.309
Instance3380.2	17.481	8.227	442.106	233.483	43273.627	35267.679	4.263	1.893	2.665	112.522	232558.321	5717.326
Instance3380.3	17.489	8.486	440.288	232.431	43299.574	35269.458	4.087	1.902	2.635	112.251	232559.284	5668.781
Instance3380.4	17.548	8.452	441.424	233.066	43376.813	35250.202	4.188	1.885	2.654	112.575	232559.723	5691.327
Instance3380.5	17.515	8.129	440.614	232.453	43314.716	35267.200	4.231	1.877	2.630	111.659	232559.192	5686.104

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.272	0.000	7.992
Available MBytes	9442.106	9397.000	9457.000
Free System Page Table Entries	33555604.875	33555537.000	33556115.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	82210833.102	79114240.000	85020672.000
Pool Paged Bytes	91677099.557	89047040.000	145309696.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log 6/24/2011 9:24:28 AM -- Jetstress testing begins ...

6/24/2011 9:24:28 AM -- Prepare testing begins ...

6/24/2011 9:24:34 AM -- Attaching databases ...

6/24/2011 9:24:34 AM -- Prepare testing ends.

6/24/2011 9:24:34 AM -- Dispatching transactions begins ...

6/24/2011 9:24:34 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)

6/24/2011 9:24:34 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)

6/24/2011 9:24:40 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).

6/24/2011 9:24:40 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).

6/24/2011 9:24:45 AM -- Operation mix: Sessions 17, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.

6/24/2011 9:24:45 AM -- Performance logging begins (interval: 15000 ms).

6/24/2011 9:24:45 AM -- Attaining prerequisites:

6/24/2011 9:25:35 AM -- MSExchange Database(JetstressWin)\Database Cache Size, Last: 1211462000.0 (lower bound: 1207960000.0, upper bound: none)

6/24/2011 11:25:35 AM -- Performance logging ends.

6/24/2011 11:26:03 AM -- JetInterop batch transaction stats: 91204, 91314, 91028, 91411 and 91093.

6/24/2011 11:26:03 AM -- Dispatching transactions ends.

6/24/2011 11:26:03 AM -- Shutting down databases ...

6/24/2011 11:26:08 AM -- Instance3380.1 (complete), Instance3380.2 (complete), Instance3380.3 (complete), Instance3380.4 (complete) and Instance3380.5 (complete)

6/24/2011 11:26:08 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_24_9_24_40.blg has 482 samples.

6/24/2011 11:26:08 AM -- Creating test report ...

6/24/2011 11:26:11 AM -- Instance3380.1 has 17.5 for I/O Database Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.1 has 1.9 for I/O Log Writes Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.1 has 1.9 for I/O Log Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.2 has 17.5 for I/O Database Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.2 has 1.9 for I/O Log Writes Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.2 has 1.9 for I/O Log Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.3 has 17.5 for I/O Database Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.3 has 1.9 for I/O Log Writes Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.3 has 1.9 for I/O Log Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.4 has 17.5 for I/O Database Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.4 has 1.9 for I/O Log Writes Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.4 has 1.9 for I/O Log Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.5 has 17.5 for I/O Database Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.5 has 1.9 for I/O Log Writes Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.5 has 1.9 for I/O Log Reads Average Latency.

6/24/2011 11:26:11 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.

6/24/2011 11:26:11 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.

6/24/2011 11:26:11 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_24_9_24_40.xml has 478 samples queried.

IMEGA3 Database Checksum Report

Checksum Statistics - All

Database	Seen pages	Bad pages	Correctable pages	Wrong page-number pages	File length / seconds taken
F:\db1\Jetstress001001.edb	65575810	0	0	0	2049244 MBytes / 3855 sec
F:\db2\Jetstress002001.edb	65576066	0	0	0	2049252 MBytes / 3244 sec
F:\db3\Jetstress003001.edb	65575810	0	0	0	2049244 MBytes / 3270 sec
F:\db4\Jetstress004001.edb	65576066	0	0	0	2049252 MBytes / 3299 sec
F:\db5\Jetstress005001.edb	65575554	0	0	0	2049236 MBytes / 3326 sec
(Sum)	327879306	0	0	0	10246228 MBytes / 16998 sec

Disk Subsystem Performance (of checksum)

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Read
F:	0.031	0.000	9648.085	0.002	65536.000

Memory System Performance (of checksum)

Counter	Average	Minimum	Maximum
% Processor Time	5.255	4.437	6.350
Available MBytes	10773.636	10690.000	10809.000
Free System Page Table Entries	33556180.982	33555473.000	33557105.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	86152948.240	82530304.000	88535040.000
Pool Paged Bytes	95190533.428	90308608.000	140382208.000

Test Log 6/24/2011 9:24:28 AM -- Jetstress testing begins ...

6/24/2011 9:24:28 AM -- Prepare testing begins ...

6/24/2011 9:24:34 AM -- Attaching databases ...

6/24/2011 9:24:34 AM -- Prepare testing ends.

6/24/2011 9:24:34 AM -- Dispatching transactions begins ...

6/24/2011 9:24:34 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)

6/24/2011 9:24:34 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)

6/24/2011 9:24:40 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).

6/24/2011 9:24:40 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).

6/24/2011 9:24:45 AM -- Operation mix: Sessions 17, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.

6/24/2011 9:24:45 AM -- Performance logging begins (interval: 15000 ms).

6/24/2011 9:24:45 AM -- Attaining prerequisites:

6/24/2011 9:25:35 AM -- VMSExchange Database(JetstressWin)\Database Cache Size, Last: 1211462000.0 (lower bound:

1207960000.0, upper bound: none)

6/24/2011 11:25:35 AM -- Performance logging ends.

6/24/2011 11:26:03 AM -- JetInterop batch transaction stats: 91204, 91314, 91028, 91411 and 91093.

6/24/2011 11:26:03 AM -- Dispatching transactions ends.

6/24/2011 11:26:03 AM -- Shutting down databases ...

6/24/2011 11:26:08 AM -- Instance3380.1 (complete), Instance3380.2 (complete), Instance3380.3 (complete), Instance3380.4 (complete) and Instance3380.5 (complete)

6/24/2011 11:26:08 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_24_9_24_40.blg has 482 samples.

6/24/2011 11:26:08 AM -- Creating test report ...

6/24/2011 11:26:11 AM -- Instance3380.1 has 17.5 for I/O Database Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.1 has 1.9 for I/O Log Writes Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.1 has 1.9 for I/O Log Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.2 has 17.5 for I/O Database Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.2 has 1.9 for I/O Log Writes Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.2 has 1.9 for I/O Log Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.3 has 17.5 for I/O Database Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.3 has 1.9 for I/O Log Writes Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.3 has 1.9 for I/O Log Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.4 has 17.5 for I/O Database Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.4 has 1.9 for I/O Log Writes Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.4 has 1.9 for I/O Log Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.5 has 17.5 for I/O Database Reads Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.5 has 1.9 for I/O Log Writes Average Latency.

6/24/2011 11:26:11 AM -- Instance3380.5 has 1.9 for I/O Log Reads Average Latency.

6/24/2011 11:26:11 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.

6/24/2011 11:26:11 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.

6/24/2011 11:26:11 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_24_9_24_40.xml has 478 samples queried.

6/24/2011 11:26:12 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_24_9_24_40.html is saved.

6/24/2011 11:26:12 AM -- Performance logging begins (interval: 30000 ms).

6/24/2011 11:26:12 AM -- Verifying database checksums ...

6/24/2011 4:09:31 PM -- F: (100% processed)

6/24/2011 4:09:31 PM -- Performance logging ends.

6/24/2011 4:09:31 PM -- C:\Program Files\Exchange Jetstress\DBChecksum_2011_6_24_11_26_12.blg has 566 samples.

IMEGA3 Stress Test Result Report

Test Summary

Overall Test Result Pass

Machine Name IMEGA3

Test Description

Test Start Time 6/16/2011 10:21:27 AM

Test End Time 6/17/2011 10:33:25 AM

Collection Start Time 6/16/2011 10:22:31 AM

Collection End Time 6/17/2011 10:22:27 AM

Jetstress Version 14.01.0180.003

Ese Version 14.00.0639.019

Operating System Windows Server 2008 R2 Enterprise Service Pack 1 (6.1.7601.65536)

Performance Log C:\Program Files\Exchange Jetstress\Stress_2011_6_16_10_21_39.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second 3140.442

Target Transactional I/O per Second 3000

Initial Database Size (bytes) 10737481482240

Final Database Size (bytes) 10809262800896

Database Files (Count) 5

Jetstress System Parameters

Thread Count 17 (per database)

Minimum Database Cache 160.0 MB

Maximum Database Cache 1280.0 MB

Insert Operations 40%

Delete Operations 20%

Replace Operations 5%

Read Operations 35%

Lazy Commits 70%

Run Background Database Maintenance True

Number of Copies per Database 2

Database Configuration

Instance3920.1 Log Path: F:\log1
Database: F:\db1\Jetstress001001.edb

Instance3920.2 Log Path: F:\log2
Database: F:\db2\Jetstress002001.edb

Instance3920.3 Log Path: F:\log3
Database: F:\db3\Jetstress003001.edb

Instance3920.4 Log Path: F:\log4
Database: F:\db4\Jetstress004001.edb

Instance3920.5 Log Path: F:\log5
Database: F:\db5\Jetstress005001.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
Instance3920.1	18.995	7.503	401.662	226.148	32973.730	34436.037	0.000	1.851	0.000	107.058	0.000	5489.849
Instance3920.2	19.029	7.659	401.904	226.315	32972.761	34438.828	0.000	1.838	0.000	107.264	0.000	5492.143
Instance3920.3	19.032	7.587	400.917	225.698	32973.950	34441.693	0.000	1.845	0.000	106.958	0.000	5493.151
Instance3920.4	18.891	7.684	402.738	226.788	32976.530	34435.977	0.000	1.844	0.000	107.334	0.000	5481.737
Instance3920.5	18.929	7.705	401.890	226.382	32977.043	34435.907	0.000	1.847	0.000	107.176	0.000	5487.546

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3920.1	18.583	261948.915
Instance3920.2	18.545	261953.762
Instance3920.3	18.477	261955.551
Instance3920.4	18.652	261931.340
Instance3920.5	18.563	261946.698

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3920.1	2.431	232557.361
Instance3920.2	2.437	232558.461

Instance3920.3	2.430	232558.657
Instance3920.4	2.433	232558.471
Instance3920.5	2.433	232557.767

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
Instance3920.1	18.995	7.503	420.245	226.148	43098.899	34436.037	4.203	1.851	2.431	107.058	232557.361	5489.849
Instance3920.2	19.029	7.659	420.448	226.315	43072.429	34438.828	4.334	1.838	2.437	107.264	232558.461	5492.143
Instance3920.3	19.032	7.587	419.394	225.698	43061.871	34441.693	4.253	1.845	2.430	106.958	232558.657	5493.151
Instance3920.4	18.891	7.684	421.389	226.788	43110.640	34435.977	4.237	1.844	2.433	107.334	232558.471	5481.737
Instance3920.5	18.929	7.705	420.454	226.382	43086.194	34435.907	4.292	1.847	2.433	107.176	232557.767	5487.546

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.366	1.409	3.898
Available MBytes	9366.523	9301.000	9411.000
Free System Page Table Entries	33555645.546	33555517.000	33556621.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	84667948.475	80470016.000	87019520.000
Pool Paged Bytes	94112249.951	93138944.000	140107776.000
Database Page Fault Stalls/sec	0.037	0.000	195.852

Test Log 6/16/2011 10:21:27 AM -- Jetstress testing begins ...

6/16/2011 10:21:27 AM -- Prepare testing begins ...

6/16/2011 10:21:33 AM -- Attaching databases ...

6/16/2011 10:21:33 AM -- Prepare testing ends.

6/16/2011 10:21:33 AM -- Dispatching transactions begins ...

6/16/2011 10:21:33 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)

6/16/2011 10:21:33 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)

6/16/2011 10:21:39 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).

6/16/2011 10:21:39 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).

6/16/2011 10:21:44 AM -- Operation mix: Sessions 17, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.

6/16/2011 10:21:44 AM -- Performance logging begins (interval: 15000 ms).

6/16/2011 10:21:44 AM -- Attaining prerequisites:

6/16/2011 10:22:31 AM -- VMExchange Database(JetstressWin)\Database Cache Size, Last: 1215017000.0 (lower bound: 1207960000.0, upper bound: none)

6/17/2011 10:22:32 AM -- Performance logging ends.

6/17/2011 10:33:15 AM -- JetInterop batch transaction stats: 1006051, 1007614, 1005317, 1007592 and 1006492.

6/17/2011 10:33:16 AM -- Dispatching transactions ends.

6/17/2011 10:33:16 AM -- Shutting down databases ...

6/17/2011 10:33:25 AM -- Instance3920.1 (complete), Instance3920.2 (complete), Instance3920.3 (complete), Instance3920.4 (complete) and Instance3920.5 (complete)

6/17/2011 10:33:25 AM -- [C:\Program Files\Exchange Jetstress\Stress_2011_6_16_10_21_39.blg](#) has 5759 samples.
6/17/2011 10:33:25 AM -- Creating test report ...
6/17/2011 10:33:51 AM -- Instance3920.1 has 19.0 for I/O Database Reads Average Latency.
6/17/2011 10:33:51 AM -- Instance3920.1 has 1.9 for I/O Log Writes Average Latency.
6/17/2011 10:33:51 AM -- Instance3920.1 has 1.9 for I/O Log Reads Average Latency.
6/17/2011 10:33:51 AM -- Instance3920.2 has 19.0 for I/O Database Reads Average Latency.
6/17/2011 10:33:51 AM -- Instance3920.2 has 1.8 for I/O Log Writes Average Latency.
6/17/2011 10:33:51 AM -- Instance3920.2 has 1.8 for I/O Log Reads Average Latency.
6/17/2011 10:33:51 AM -- Instance3920.3 has 19.0 for I/O Database Reads Average Latency.
6/17/2011 10:33:51 AM -- Instance3920.3 has 1.8 for I/O Log Writes Average Latency.
6/17/2011 10:33:51 AM -- Instance3920.3 has 1.8 for I/O Log Reads Average Latency.
6/17/2011 10:33:51 AM -- Instance3920.4 has 18.9 for I/O Database Reads Average Latency.
6/17/2011 10:33:51 AM -- Instance3920.4 has 1.8 for I/O Log Writes Average Latency.
6/17/2011 10:33:51 AM -- Instance3920.4 has 1.8 for I/O Log Reads Average Latency.
6/17/2011 10:33:51 AM -- Instance3920.5 has 18.9 for I/O Database Reads Average Latency.
6/17/2011 10:33:51 AM -- Instance3920.5 has 1.8 for I/O Log Writes Average Latency.
6/17/2011 10:33:51 AM -- Instance3920.5 has 1.8 for I/O Log Reads Average Latency.
6/17/2011 10:33:51 AM -- Test has 195.852079620022 Maximum Database Page Fault Stalls/sec.
6/17/2011 10:33:51 AM -- Test has 4 Database Page Fault Stalls/sec samples higher than 0.
6/17/2011 10:33:51 AM -- [C:\Program Files\Exchange Jetstress\Stress_2011_6_16_10_21_39.xml](#) has 5755 samples queried.

IMEGA3 Database backup Test Result Report

Database Backup Statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance4048.1	2048004.09	10:00:27	56.85
Instance4048.2	2048004.09	10:13:14	55.66
Instance4048.3	2048004.09	10:25:26	54.57
Instance4048.4	2048004.09	10:32:01	54.01
Instance4048.5	2048004.09	10:01:39	56.73

Jetstress System Parameters

Thread Count 17 (per database)

Minimum Database Cache 160.0 MB

Maximum Database Cache 1280.0 MB

Insert Operations 40%

Delete Operations 20%

Replace Operations 5%

Read Operations 35%

Lazy Commits 70%

Database Configuration

Instance4048.1 Log Path: F:\log1
Database: F:\db1\Jetstress001001.edb

Instance4048.2 Log Path: F:\log2
Database: F:\db2\Jetstress002001.edb

Instance4048.3 Log Path: F:\log3
Database: F:\db3\Jetstress003001.edb

Instance4048.4 Log Path: F:\log4
Database: F:\db4\Jetstress004001.edb

Instance4048.5 Log Path: F:\log5
Database: F:\db5\Jetstress005001.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
Instance4048.1	7.531	0.000	227.366	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4048.2	7.668	0.000	222.609	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4048.3	7.790	0.000	218.283	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4048.4	7.896	0.000	215.989	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance4048.5	7.516	0.000	226.903	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	1.711	0.484	2.407
Available MBytes	10828.957	10751.000	10838.000
Free System Page Table Entries	33556065.762	33555517.000	33557101.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	79429113.108	79290368.000	81997824.000
Pool Paged Bytes	93382394.933	91836416.000	138829824.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log 6/28/2011 10:09:30 AM -- Jetstress testing begins ...

6/28/2011 10:09:30 AM -- Prepare testing begins ...

6/28/2011 10:09:35 AM -- Attaching databases ...

6/28/2011 10:09:35 AM -- Prepare testing ends.

6/28/2011 10:09:44 AM -- Performance logging begins (interval: 30000 ms).

6/28/2011 10:09:44 AM -- Backing up databases ...

6/28/2011 8:41:45 PM -- Performance logging ends.

6/28/2011 8:41:45 PM -- Instance4048.1 (100% processed), Instance4048.2 (100% processed), Instance4048.3 (100% processed), Instance4048.4 (100% processed) and Instance4048.5 (100% processed)

6/28/2011 8:41:45 PM -- [C:\Program Files\Exchange Jetstress\DatabaseBackup_2011_6_28_10_9_35.blg](#) has 1263 samples.

6/28/2011 8:41:45 PM -- Creating test report ...

IMEGA3 SoftRecovery Test Result Report

Soft-Recovery Statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance1160.1	510	691.1124139
Instance1160.2	500	688.9908102
Instance1160.3	509	703.0464349
Instance1160.4	514	691.1124139
Instance1160.5	509	698.2728265

Database Configuration

Instance1160.1 Log Path: F:\log1
Database: F:\db1\Jetstress001001.edb

Instance1160.2 Log Path: F:\log2
Database: F:\db2\Jetstress002001.edb

Instance1160.3 Log Path: F:\log3
Database: F:\db3\Jetstress003001.edb

Instance1160.4 Log Path: F:\log4
Database: F:\db4\Jetstress004001.edb

Instance1160.5 Log Path: F:\log5
Database: F:\db5\Jetstress005001.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
Instance1160.1	14.211	1.820	659.638	4.446	37027.882	32768.000	11.234	0.000	6.669	0.000	232378.283	0.000
Instance1160.2	14.284	1.783	651.310	4.375	37218.349	32382.494	11.002	0.000	6.563	0.000	229908.373	0.000
Instance1160.3	14.213	1.840	654.526	4.326	37199.281	32391.356	10.645	0.000	6.489	0.000	229907.351	0.000
Instance1160.4	14.402	1.667	656.668	4.457	36995.460	32576.374	11.166	0.000	6.687	0.000	231187.005	0.000
Instance1160.5	14.188	1.790	655.577	4.389	37091.748	31820.948	10.953	0.000	6.580	0.000	226042.964	0.000

Background Database Maintenance I/O Performance

MSEExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance1160.1	28.900	261807.417
Instance1160.2	28.940	262007.185
Instance1160.3	28.917	261884.114
Instance1160.4	29.007	261962.024
Instance1160.5	28.751	261931.389

Total 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
Instance1160.1	14.211	1.820	688.538	4.446	46462.397	32768.000	11.234	0.000	6.669	0.000	232378.283	0.000
Instance1160.2	14.284	1.783	680.250	4.375	46781.723	32382.494	11.002	0.000	6.563	0.000	229908.373	0.000
Instance1160.3	14.213	1.840	683.443	4.326	46705.972	32391.356	10.645	0.000	6.489	0.000	229907.351	0.000
Instance1160.4	14.402	1.667	685.676	4.457	46512.641	32576.374	11.166	0.000	6.687	0.000	231187.005	0.000
Instance1160.5	14.188	1.790	684.328	4.389	46538.175	31820.948	10.953	0.000	6.580	0.000	226042.964	0.000

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.313	0.899	4.304
Available MBytes	9457.046	9435.000	10641.000
Free System Page Table Entries	33556038.554	33555527.000	33556621.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	84534699.154	81604608.000	84877312.000
Pool Paged Bytes	90337139.566	90308608.000	90476544.000
Database Page Fault Stalls/sec	0.003	0.000	0.499

Test Log 6/29/2011 9:56:37 AM -- Jetstress testing begins ...

6/29/2011 9:56:37 AM -- Prepare testing begins ...

6/29/2011 9:56:42 AM -- Attaching databases ...

6/29/2011 9:56:42 AM -- Prepare testing ends.

6/29/2011 9:56:42 AM -- Dispatching transactions begins ...

6/29/2011 9:56:42 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)

6/29/2011 9:56:42 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)

6/29/2011 9:56:48 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).

6/29/2011 9:56:48 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).

6/29/2011 9:56:51 AM -- Operation mix: Sessions 17, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.

6/29/2011 9:56:51 AM -- Performance logging begins (interval: 15000 ms).

6/29/2011 9:56:51 AM -- Generating log files ...
 6/29/2011 10:24:05 AM -- F:\log1 (102.2% generated), F:\log2 (100.2% generated), F:\log3 (102.0% generated), F:\log4 (103.0% generated) and F:\log5 (102.0% generated)
 6/29/2011 10:24:05 AM -- Performance logging ends.
 6/29/2011 10:24:05 AM -- JetInterop batch transaction stats: 21521, 21344, 21709, 21807 and 21717.
 6/29/2011 10:24:06 AM -- Dispatching transactions ends.
 6/29/2011 10:24:06 AM -- Shutting down databases ...
 6/29/2011 10:24:08 AM -- Instance1160.1 (complete), Instance1160.2 (complete), Instance1160.3 (complete), Instance1160.4 (complete) and Instance1160.5 (complete)
 6/29/2011 10:24:08 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_29_9_56_48.blg has 108 samples.
 6/29/2011 10:24:08 AM -- Creating test report ...
 6/29/2011 10:24:09 AM -- Instance1160.1 has 16.1 for I/O Database Reads Average Latency.
 6/29/2011 10:24:09 AM -- Instance1160.1 has 2.2 for I/O Log Writes Average Latency.
 6/29/2011 10:24:09 AM -- Instance1160.1 has 2.2 for I/O Log Reads Average Latency.
 6/29/2011 10:24:09 AM -- Instance1160.2 has 16.3 for I/O Database Reads Average Latency.
 6/29/2011 10:24:09 AM -- Instance1160.2 has 2.2 for I/O Log Writes Average Latency.
 6/29/2011 10:24:09 AM -- Instance1160.2 has 2.2 for I/O Log Reads Average Latency.
 6/29/2011 10:24:09 AM -- Instance1160.3 has 16.1 for I/O Database Reads Average Latency.
 6/29/2011 10:24:09 AM -- Instance1160.3 has 2.2 for I/O Log Writes Average Latency.
 6/29/2011 10:24:09 AM -- Instance1160.3 has 2.2 for I/O Log Reads Average Latency.
 6/29/2011 10:24:09 AM -- Instance1160.4 has 16.2 for I/O Database Reads Average Latency.
 6/29/2011 10:24:09 AM -- Instance1160.4 has 2.1 for I/O Log Writes Average Latency.
 6/29/2011 10:24:09 AM -- Instance1160.4 has 2.1 for I/O Log Reads Average Latency.
 6/29/2011 10:24:09 AM -- Instance1160.5 has 16.1 for I/O Database Reads Average Latency.
 6/29/2011 10:24:09 AM -- Instance1160.5 has 2.1 for I/O Log Writes Average Latency.
 6/29/2011 10:24:09 AM -- Instance1160.5 has 2.1 for I/O Log Reads Average Latency.
 6/29/2011 10:24:09 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
 6/29/2011 10:24:09 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.
 6/29/2011 10:24:09 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_29_9_56_48.xml has 107 samples queried.
 6/29/2011 10:24:10 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_29_9_56_48.html is saved.
 6/29/2011 10:28:00 AM -- Performance logging begins (interval: 4000 ms).
 6/29/2011 10:28:00 AM -- Recovering databases ...
 6/29/2011 10:39:43 AM -- Performance logging ends.
 6/29/2011 10:39:43 AM -- Instance1160.1 (691.1124139), Instance1160.2 (688.9908102), Instance1160.3 (703.0464349), Instance1160.4 (691.1124139) and Instance1160.5 (698.2728265)
 6/29/2011 10:39:44 AM -- C:\Program Files\Exchange Jetstress\SoftRecovery_2011_6_29_10_27_58.blg has 175 samples.
 6/29/2011 10:39:44 AM -- Creating test report ...

IMEGA4 Performance Test Result Report

Test Summary

Overall Test Result Pass

Machine Name IMEGA4

Test Description

Test Start Time 6/24/2011 9:24:27 AM

Test End Time 6/24/2011 11:26:16 AM

Collection Start Time 6/24/2011 9:25:33 AM

Collection End Time 6/24/2011 11:25:33 AM

Jetstress Version 14.01.0180.003

Ese Version 14.00.0639.019

Operating System Windows Server 2008 R2 Enterprise Service Pack 1 (6.1.7601.65536)

Performance Log C:\Program Files\Exchange Jetstress\Performance_2011_6_24_9_24_39.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second 3135.062

Target Transactional I/O per Second 3000

Initial Database Size (bytes) 10737481482240

Final Database Size (bytes) 10743663886336

Database Files (Count) 5

Jetstress System Parameters

Thread Count 17 (per database)

Minimum Database Cache 160.0 MB

Maximum Database Cache 1280.0 MB

Insert Operations 40%

Delete Operations 20%

Replace Operations 5%

Read Operations 35%

Lazy Commits 70%

Run Background Database Maintenance True

Number of Copies per Database 2

Database Configuration

Instance3544.1 Log Path: F:\log1
Database: F:\db1\Jetstress001001.edb

Instance3544.2 Log Path: F:\log2
Database: F:\db2\Jetstress002001.edb

Instance3544.3 Log Path: F:\log3
Database: F:\db3\Jetstress003001.edb

Instance3544.4 Log Path: F:\log4
Database: F:\db4\Jetstress004001.edb

Instance3544.5 Log Path: F:\log5
Database: F:\db5\Jetstress005001.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
Instance3544.1	18.441	8.443	405.623	223.437	33041.539	35319.532	0.000	2.244	0.000	105.983	0.000	5776.504
Instance3544.2	18.451	8.354	400.775	220.813	33018.442	35318.149	0.000	2.242	0.000	104.799	0.000	5787.295
Instance3544.3	18.445	8.346	403.597	222.198	33007.257	35321.289	0.000	2.227	0.000	105.806	0.000	5792.936
Instance3544.4	18.484	8.428	404.213	222.461	33045.176	35320.770	0.000	2.203	0.000	105.200	0.000	5764.473
Instance3544.5	18.562	8.597	407.350	224.594	33019.117	35308.579	0.000	2.228	0.000	106.209	0.000	5777.377

Background Database Maintenance I/O Performance

MSEExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3544.1	20.879	261972.884
Instance3544.2	20.802	261881.909
Instance3544.3	20.781	261988.789
Instance3544.4	20.748	261928.328
Instance3544.5	20.794	261935.004

Log Replication I/O Performance

MSEExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3544.1	2.539	232562.769
Instance3544.2	2.514	232555.331
Instance3544.3	2.541	232549.393

Instance3544.4	2.513	232566.302
Instance3544.5	2.545	232563.113

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
Instance3544.1	18.441	8.443	426.502	223.437	44248.883	35319.532	4.735	2.244	2.539	105.983	232562.769	5776.504
Instance3544.2	18.451	8.354	421.577	220.813	44311.358	35318.149	4.762	2.242	2.514	104.799	232555.331	5787.295
Instance3544.3	18.445	8.346	424.378	222.198	44220.013	35321.289	4.817	2.227	2.541	105.806	232549.393	5792.936
Instance3544.4	18.484	8.428	424.961	222.461	44219.923	35320.770	4.776	2.203	2.513	105.200	232566.302	5764.473
Instance3544.5	18.562	8.597	428.143	224.594	44137.002	35308.579	4.779	2.228	2.545	106.209	232563.113	5777.377

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.326	1.598	3.112
Available MBytes	9450.842	9406.000	9468.000
Free System Page Table Entries	33555604.752	33555513.000	33556113.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	81713809.067	78807040.000	84271104.000
Pool Paged Bytes	90994790.400	88666112.000	148365312.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log 6/24/2011 9:24:27 AM -- Jetstress testing begins ...

6/24/2011 9:24:27 AM -- Prepare testing begins ...

6/24/2011 9:24:33 AM -- Attaching databases ...

6/24/2011 9:24:33 AM -- Prepare testing ends.

6/24/2011 9:24:33 AM -- Dispatching transactions begins ...

6/24/2011 9:24:33 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)

6/24/2011 9:24:33 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)

6/24/2011 9:24:39 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).

6/24/2011 9:24:39 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).

6/24/2011 9:24:44 AM -- Operation mix: Sessions 17, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.

6/24/2011 9:24:44 AM -- Performance logging begins (interval: 15000 ms).

6/24/2011 9:24:44 AM -- Attaining prerequisites:

6/24/2011 9:25:33 AM -- MSExchange Database(JetstressWin)\Database Cache Size, Last: 1225019000.0 (lower bound: 1207960000.0, upper bound: none)

6/24/2011 11:25:33 AM -- Performance logging ends.

6/24/2011 11:26:11 AM -- JetInterop batch transaction stats: 88009, 87060, 87765, 87356 and 88187.

6/24/2011 11:26:11 AM -- Dispatching transactions ends.

6/24/2011 11:26:11 AM -- Shutting down databases ...

6/24/2011 11:26:16 AM -- Instance3544.1 (complete), Instance3544.2 (complete), Instance3544.3 (complete), Instance3544.4 (complete) and Instance3544.5 (complete)

6/24/2011 11:26:16 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_24_9_24_39.blg has 483 samples.

6/24/2011 11:26:16 AM -- Creating test report ...

6/24/2011 11:26:19 AM -- Instance3544.1 has 18.4 for I/O Database Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.1 has 2.2 for I/O Log Writes Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.1 has 2.2 for I/O Log Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.2 has 18.5 for I/O Database Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.2 has 2.2 for I/O Log Writes Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.2 has 2.2 for I/O Log Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.3 has 18.4 for I/O Database Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.3 has 2.2 for I/O Log Writes Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.3 has 2.2 for I/O Log Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.4 has 18.5 for I/O Database Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.4 has 2.2 for I/O Log Writes Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.4 has 2.2 for I/O Log Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.5 has 18.6 for I/O Database Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.5 has 2.2 for I/O Log Writes Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.5 has 2.2 for I/O Log Reads Average Latency.
6/24/2011 11:26:19 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
6/24/2011 11:26:19 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.
6/24/2011 11:26:19 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_24_9_24_39.xml has 479 samples queried.

IMEGA4 Database Checksum Report

Checksum Statistics - All

Database	Seen pages	Bad pages	Correctable pages	Wrong page-number pages	File length / seconds taken
F:\db1\Jetstress001001.edb	65574274	0	0	0	2049196 MBytes / 9528 sec
F:\db2\Jetstress002001.edb	65573762	0	0	0	2049180 MBytes / 8197 sec
F:\db3\Jetstress003001.edb	65574274	0	0	0	2049196 MBytes / 8193 sec
F:\db4\Jetstress004001.edb	65574018	0	0	0	2049188 MBytes / 8193 sec
F:\db5\Jetstress005001.edb	65574274	0	0	0	2049196 MBytes / 8193 sec
(Sum)	327870602	0	0	0	10245956 MBytes / 42305 sec

Disk Subsystem Performance (of checksum)

LogicalDisk	Avg. Disk sec/Read	Avg. Disk sec/Write	Disk Reads/sec	Disk Writes/sec	Avg. Disk Bytes/Read
F:	0.077	0.000	3875.288	0.001	65536.000

Memory System Performance (of checksum)

Counter	Average	Minimum	Maximum
% Processor Time	2.042	1.042	3.167
Available MBytes	10778.960	10697.000	10796.000
Free System Page Table Entries	33555850.092	33555505.000	33556609.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	82590351.534	81895424.000	84672512.000
Pool Paged Bytes	94037142.439	89780224.000	139702272.000

Test Log 6/24/2011 9:24:27 AM -- Jetstress testing begins ...

6/24/2011 9:24:27 AM -- Prepare testing begins ...

6/24/2011 9:24:33 AM -- Attaching databases ...

6/24/2011 9:24:33 AM -- Prepare testing ends.

6/24/2011 9:24:33 AM -- Dispatching transactions begins ...

6/24/2011 9:24:33 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)

6/24/2011 9:24:33 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)

6/24/2011 9:24:39 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).

6/24/2011 9:24:39 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).

6/24/2011 9:24:44 AM -- Operation mix: Sessions 17, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.

6/24/2011 9:24:44 AM -- Performance logging begins (interval: 15000 ms).

6/24/2011 9:24:44 AM -- Attaining prerequisites:

6/24/2011 9:25:33 AM -- VMSEExchange Database(JetstressWin)\Database Cache Size, Last: 1225019000.0 (lower bound:

1207960000.0, upper bound: none)
6/24/2011 11:25:33 AM -- Performance logging ends.
6/24/2011 11:26:11 AM -- JetInterop batch transaction stats: 88009, 87060, 87765, 87356 and 88187.
6/24/2011 11:26:11 AM -- Dispatching transactions ends.
6/24/2011 11:26:11 AM -- Shutting down databases ...
6/24/2011 11:26:16 AM -- Instance3544.1 (complete), Instance3544.2 (complete), Instance3544.3 (complete), Instance3544.4 (complete) and Instance3544.5 (complete)
6/24/2011 11:26:16 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_24_9_24_39.blg has 483 samples.
6/24/2011 11:26:16 AM -- Creating test report ...
6/24/2011 11:26:19 AM -- Instance3544.1 has 18.4 for I/O Database Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.1 has 2.2 for I/O Log Writes Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.1 has 2.2 for I/O Log Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.2 has 18.5 for I/O Database Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.2 has 2.2 for I/O Log Writes Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.2 has 2.2 for I/O Log Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.3 has 18.4 for I/O Database Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.3 has 2.2 for I/O Log Writes Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.3 has 2.2 for I/O Log Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.4 has 18.5 for I/O Database Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.4 has 2.2 for I/O Log Writes Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.4 has 2.2 for I/O Log Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.5 has 18.6 for I/O Database Reads Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.5 has 2.2 for I/O Log Writes Average Latency.
6/24/2011 11:26:19 AM -- Instance3544.5 has 2.2 for I/O Log Reads Average Latency.
6/24/2011 11:26:19 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
6/24/2011 11:26:19 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.
6/24/2011 11:26:19 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_24_9_24_39.xml has 479 samples queried.
6/24/2011 11:26:20 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_24_9_24_39.html is saved.
6/24/2011 11:26:20 AM -- Performance logging begins (interval: 30000 ms).
6/24/2011 11:26:20 AM -- Verifying database checksums ...
6/24/2011 11:11:26 PM -- F: (100% processed)
6/24/2011 11:11:26 PM -- Performance logging ends.
6/24/2011 11:11:26 PM -- C:\Program Files\Exchange Jetstress\DBChecksum_2011_6_24_11_26_20.blg has 1409 samples.

IMEGA4 Stress Test Result Report

Test Summary

Overall Test Result Pass

Machine Name IMEGA4

Test Description

Test Start Time 6/16/2011 10:21:26 AM

Test End Time 6/17/2011 10:33:18 AM

Collection Start Time 6/16/2011 10:22:33 AM

Collection End Time 6/17/2011 10:22:31 AM

Jetstress Version 14.01.0180.003

Ese Version 14.00.0639.019

Operating System Windows Server 2008 R2 Enterprise Service Pack 1 (6.1.7601.65536)

Performance Log C:\Program Files\Exchange Jetstress\Stress_2011_6_16_10_21_38.blg

Database Sizing and Throughput

Achieved Transactional I/O per Second 3107.988

Target Transactional I/O per Second 3000

Initial Database Size (bytes) 10737481482240

Final Database Size (bytes) 10808314888192

Database Files (Count) 5

Jetstress System Parameters

Thread Count 17 (per database)

Minimum Database Cache 160.0 MB

Maximum Database Cache 1280.0 MB

Insert Operations 40%

Delete Operations 20%

Replace Operations 5%

Read Operations 35%

Lazy Commits 70%

Run Background Database Maintenance True

Number of Copies per Database 2

Database Configuration

Instance3500.1 Log Path: F:\log1
Database: F:\db1\Jetstress001001.edb

Instance3500.2 Log Path: F:\log2
Database: F:\db2\Jetstress002001.edb

Instance3500.3 Log Path: F:\log3
Database: F:\db3\Jetstress003001.edb

Instance3500.4 Log Path: F:\log4
Database: F:\db4\Jetstress004001.edb

Instance3500.5 Log Path: F:\log5
Database: F:\db5\Jetstress005001.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
Instance3500.1	19.200	8.040	397.975	223.817	32976.236	34451.677	0.000	2.286	0.000	102.076	0.000	5678.528
Instance3500.2	19.188	8.004	398.161	223.941	32981.200	34453.835	0.000	2.283	0.000	101.876	0.000	5676.991
Instance3500.3	19.205	7.951	397.528	223.659	32980.194	34454.767	0.000	2.284	0.000	101.841	0.000	5691.817
Instance3500.4	19.164	8.103	397.181	223.476	32987.321	34447.006	0.000	2.271	0.000	101.687	0.000	5689.186
Instance3500.5	19.156	8.127	398.232	224.019	32983.925	34451.205	0.000	2.267	0.000	102.020	0.000	5675.230

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance3500.1	19.985	261949.512
Instance3500.2	20.059	261962.186
Instance3500.3	20.015	261951.707
Instance3500.4	20.045	261944.245
Instance3500.5	20.082	261932.252

Log Replication I/O Performance

MSExchange Database ==> Instances	I/O Log Reads/sec	I/O Log Reads Average Bytes
Instance3500.1	2.403	232559.781
Instance3500.2	2.397	232559.361

Instance3500.3	2.402	232561.702
Instance3500.4	2.398	232561.655
Instance3500.5	2.400	232556.479

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
Instance3500.1	19.200	8.040	417.960	223.817	43924.887	34451.677	4.858	2.286	2.403	102.076	232559.781	5678.528
Instance3500.2	19.188	8.004	418.220	223.941	43963.669	34453.835	4.908	2.283	2.397	101.876	232559.361	5676.991
Instance3500.3	19.205	7.951	417.543	223.659	43956.078	34454.767	4.876	2.284	2.402	101.841	232561.702	5691.817
Instance3500.4	19.164	8.103	417.227	223.476	43987.333	34447.006	4.856	2.271	2.398	101.687	232561.655	5689.186
Instance3500.5	19.156	8.127	418.314	224.019	43974.909	34451.205	4.858	2.267	2.400	102.020	232556.479	5675.230

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.366	1.351	3.709
Available MBytes	9398.780	9367.000	9468.000
Free System Page Table Entries	33555605.548	33555524.000	33556608.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	83375177.816	80343040.000	86630400.000
Pool Paged Bytes	90801185.973	89305088.000	95916032.000
Database Page Fault Stalls/sec	0.153	0.000	429.198

Test Log 6/16/2011 10:21:25 AM -- Jetstress testing begins ...

6/16/2011 10:21:26 AM -- Prepare testing begins ...

6/16/2011 10:21:32 AM -- Attaching databases ...

6/16/2011 10:21:32 AM -- Prepare testing ends.

6/16/2011 10:21:32 AM -- Dispatching transactions begins ...

6/16/2011 10:21:32 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)

6/16/2011 10:21:32 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)

6/16/2011 10:21:38 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 200 msec/read).

6/16/2011 10:21:38 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 200 msec/write).

6/16/2011 10:21:43 AM -- Operation mix: Sessions 17, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.

6/16/2011 10:21:43 AM -- Performance logging begins (interval: 15000 ms).

6/16/2011 10:21:43 AM -- Attaining prerequisites:

6/16/2011 10:22:33 AM -- VMExchange Database(JetstressWin)\Database Cache Size, Last: 1216778000.0 (lower bound: 1207960000.0, upper bound: none)

6/17/2011 10:22:34 AM -- Performance logging ends.

6/17/2011 10:33:14 AM -- JetInterop batch transaction stats: 996956, 995335, 995911, 996034 and 996918.

6/17/2011 10:33:14 AM -- Dispatching transactions ends.

6/17/2011 10:33:14 AM -- Shutting down databases ...

6/17/2011 10:33:18 AM -- Instance3500.1 (complete), Instance3500.2 (complete), Instance3500.3 (complete), Instance3500.4 (complete) and Instance3500.5 (complete)

6/17/2011 10:33:18 AM -- [C:\Program Files\Exchange Jetstress\Stress_2011_6_16_10_21_38.blg](#) has 5760 samples.
6/17/2011 10:33:18 AM -- Creating test report ...
6/17/2011 10:33:43 AM -- Instance3500.1 has 19.2 for I/O Database Reads Average Latency.
6/17/2011 10:33:43 AM -- Instance3500.1 has 2.3 for I/O Log Writes Average Latency.
6/17/2011 10:33:43 AM -- Instance3500.1 has 2.3 for I/O Log Reads Average Latency.
6/17/2011 10:33:43 AM -- Instance3500.2 has 19.2 for I/O Database Reads Average Latency.
6/17/2011 10:33:43 AM -- Instance3500.2 has 2.3 for I/O Log Writes Average Latency.
6/17/2011 10:33:43 AM -- Instance3500.2 has 2.3 for I/O Log Reads Average Latency.
6/17/2011 10:33:43 AM -- Instance3500.3 has 19.2 for I/O Database Reads Average Latency.
6/17/2011 10:33:43 AM -- Instance3500.3 has 2.3 for I/O Log Writes Average Latency.
6/17/2011 10:33:43 AM -- Instance3500.3 has 2.3 for I/O Log Reads Average Latency.
6/17/2011 10:33:43 AM -- Instance3500.4 has 19.2 for I/O Database Reads Average Latency.
6/17/2011 10:33:43 AM -- Instance3500.4 has 2.3 for I/O Log Writes Average Latency.
6/17/2011 10:33:43 AM -- Instance3500.4 has 2.3 for I/O Log Reads Average Latency.
6/17/2011 10:33:43 AM -- Instance3500.5 has 19.2 for I/O Database Reads Average Latency.
6/17/2011 10:33:43 AM -- Instance3500.5 has 2.3 for I/O Log Writes Average Latency.
6/17/2011 10:33:43 AM -- Instance3500.5 has 2.3 for I/O Log Reads Average Latency.
6/17/2011 10:33:43 AM -- Test has 429.197536779105 Maximum Database Page Fault Stalls/sec.
6/17/2011 10:33:43 AM -- Test has 8 Database Page Fault Stalls/sec samples higher than 0.
6/17/2011 10:33:43 AM -- [C:\Program Files\Exchange Jetstress\Stress_2011_6_16_10_21_38.xml](#) has 5756 samples queried.

IMEGA4 Database backup Test Result Report

Database Backup Statistics - All

Database Instance	Database Size (MBytes)	Elapsed Backup Time	MBytes Transferred/sec
Instance3748.1	2048004.09	13:52:16	41.01
Instance3748.2	2048004.09	14:09:55	40.16
Instance3748.3	2048004.09	14:20:52	39.65
Instance3748.4	2048004.09	14:20:29	39.67
Instance3748.5	2048004.09	13:55:44	40.84

Jetstress System Parameters

Thread Count 17 (per database)

Minimum Database Cache 160.0 MB

Maximum Database Cache 1280.0 MB

Insert Operations 40%

Delete Operations 20%

Replace Operations 5%

Read Operations 35%

Lazy Commits 70%

Database Configuration

Instance3748.1 Log Path: F:\log1
Database: F:\db1\Jetstress001001.edb

Instance3748.2 Log Path: F:\log2
Database: F:\db2\Jetstress002001.edb

Instance3748.3 Log Path: F:\log3
Database: F:\db3\Jetstress003001.edb

Instance3748.4 Log Path: F:\log4
Database: F:\db4\Jetstress004001.edb

Instance3748.5 Log Path: F:\log5
Database: F:\db5\Jetstress005001.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
Instance3748.1	10.857	0.000	164.040	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3748.2	11.107	0.000	160.644	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3748.3	11.260	0.000	158.534	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3748.4	11.275	0.000	158.659	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Instance3748.5	10.867	0.000	163.355	0.000	262144.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	1.129	0.506	1.608
Available MBytes	10835.765	10682.000	10848.000
Free System Page Table Entries	33555774.908	33555517.000	33557101.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	80165337.898	80052224.000	83124224.000
Pool Paged Bytes	93201134.140	91496448.000	166629376.000
Database Page Fault Stalls/sec	0.000	0.000	0.000

Test Log 6/28/2011 10:09:33 AM -- Jetstress testing begins ...

6/28/2011 10:09:33 AM -- Prepare testing begins ...

6/28/2011 10:09:39 AM -- Attaching databases ...

6/28/2011 10:09:39 AM -- Prepare testing ends.

6/28/2011 10:09:47 AM -- Performance logging begins (interval: 30000 ms).

6/28/2011 10:09:47 AM -- Backing up databases ...

6/29/2011 12:30:40 AM -- Performance logging ends.

6/29/2011 12:30:40 AM -- Instance3748.1 (100% processed), Instance3748.2 (100% processed), Instance3748.3 (100% processed), Instance3748.4 (100% processed) and Instance3748.5 (100% processed)

6/29/2011 12:30:40 AM -- C:\Program Files\Exchange Jetstress\DatabaseBackup_2011_6_28_10_9_39.blg has 1720 samples.

6/29/2011 12:30:40 AM -- Creating test report ...

IMEGA4 SoftRecovery Test Result Report

Soft-Recovery Statistics - All

Database Instance	Log files replayed	Elapsed seconds
Instance2736.1	500	761.1253369
Instance2736.2	503	784.4629779
Instance2736.3	502	775.7113625
Instance2736.4	510	755.5561271
Instance2736.5	510	741.235302

Database Configuration

Instance2736.1 Log Path: F:\log1
Database: F:\db1\Jetstress001001.edb

Instance2736.2 Log Path: F:\log2
Database: F:\db2\Jetstress002001.edb

Instance2736.3 Log Path: F:\log3
Database: F:\db3\Jetstress003001.edb

Instance2736.4 Log Path: F:\log4
Database: F:\db4\Jetstress004001.edb

Instance2736.5 Log Path: F:\log5
Database: F:\db5\Jetstress005001.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
Instance2736.1	17.778	1.319	561.413	3.948	37599.121	32245.106	10.799	0.000	5.922	0.000	229022.406	0.000
Instance2736.2	17.390	1.938	551.798	3.819	38359.595	30910.021	10.741	0.000	5.728	0.000	218270.452	0.000
Instance2736.3	17.397	6.414	559.772	3.897	38145.223	31232.000	10.499	0.000	5.846	0.000	220592.845	0.000
Instance2736.4	17.314	6.183	564.493	4.065	37746.701	31716.620	10.870	0.000	6.098	0.000	225086.139	0.000
Instance2736.5	17.841	1.291	572.184	4.122	37803.896	31514.579	10.924	0.000	6.182	0.000	223646.787	0.000

Background Database Maintenance I/O Performance

MSExchange Database ==> Instances	Database Maintenance IO Reads/sec	Database Maintenance IO Reads Average Bytes
Instance2736.1	28.201	262000.682
Instance2736.2	28.284	262030.002
Instance2736.3	28.120	261972.186
Instance2736.4	28.265	261869.559
Instance2736.5	27.979	261824.774

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
Instance2736.1	17.778	1.319	589.614	3.948	48332.236	32245.106	10.799	0.000	5.922	0.000	229022.406	0.000
Instance2736.2	17.390	1.938	580.082	3.819	49265.560	30910.021	10.741	0.000	5.728	0.000	218270.452	0.000
Instance2736.3	17.397	6.414	587.892	3.897	48851.381	31232.000	10.499	0.000	5.846	0.000	220592.845	0.000
Instance2736.4	17.314	6.183	592.758	4.065	48433.819	31716.620	10.870	0.000	6.098	0.000	225086.139	0.000
Instance2736.5	17.841	1.291	600.164	4.122	48247.687	31514.579	10.924	0.000	6.182	0.000	223646.787	0.000

Host System Performance

Counter	Average	Minimum	Maximum
% Processor Time	2.004	0.486	4.499
Available MBytes	9464.559	9440.000	10649.000
Free System Page Table Entries	33555680.072	33555533.000	33556557.000
Transition Pages RePurposed/sec	0.000	0.000	0.000
Pool Nonpaged Bytes	83422391.795	80596992.000	83935232.000
Pool Paged Bytes	89987901.703	89956352.000	90030080.000
Database Page Fault Stalls/sec	0.005	0.000	0.995

Test Log 6/29/2011 9:56:41 AM -- Jetstress testing begins ...

6/29/2011 9:56:41 AM -- Prepare testing begins ...

6/29/2011 9:56:47 AM -- Attaching databases ...

6/29/2011 9:56:47 AM -- Prepare testing ends.

6/29/2011 9:56:47 AM -- Dispatching transactions begins ...

6/29/2011 9:56:47 AM -- Database cache settings: (minimum: 160.0 MB, maximum: 1.2 GB)

6/29/2011 9:56:47 AM -- Database flush thresholds: (start: 12.8 MB, stop: 25.6 MB)

6/29/2011 9:56:53 AM -- Database read latency thresholds: (average: 20 msec/read, maximum: 100 msec/read).

6/29/2011 9:56:53 AM -- Log write latency thresholds: (average: 10 msec/write, maximum: 100 msec/write).

6/29/2011 9:56:56 AM -- Operation mix: Sessions 17, Inserts 40%, Deletes 20%, Replaces 5%, Reads 35%, Lazy Commits 70%.

6/29/2011 9:56:56 AM -- Performance logging begins (interval: 15000 ms).

6/29/2011 9:56:56 AM -- Generating log files ...
 6/29/2011 10:24:58 AM -- F:\log1 (100.2% generated), F:\log2 (100.8% generated), F:\log3 (100.6% generated), F:\log4 (102.2% generated) and F:\log5 (102.2% generated)
 6/29/2011 10:24:58 AM -- Performance logging ends.
 6/29/2011 10:24:58 AM -- JetInterop batch transaction stats: 21400, 21451, 21491, 21693 and 21565.
 6/29/2011 10:24:58 AM -- Dispatching transactions ends.
 6/29/2011 10:24:58 AM -- Shutting down databases ...
 6/29/2011 10:25:02 AM -- Instance2736.1 (complete), Instance2736.2 (complete), Instance2736.3 (complete), Instance2736.4 (complete) and Instance2736.5 (complete)
 6/29/2011 10:25:02 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_29_9_56_53.blg has 112 samples.
 6/29/2011 10:25:02 AM -- Creating test report ...
 6/29/2011 10:25:03 AM -- Instance2736.1 has 17.2 for I/O Database Reads Average Latency.
 6/29/2011 10:25:03 AM -- Instance2736.1 has 2.3 for I/O Log Writes Average Latency.
 6/29/2011 10:25:03 AM -- Instance2736.1 has 2.3 for I/O Log Reads Average Latency.
 6/29/2011 10:25:03 AM -- Instance2736.2 has 17.1 for I/O Database Reads Average Latency.
 6/29/2011 10:25:03 AM -- Instance2736.2 has 2.3 for I/O Log Writes Average Latency.
 6/29/2011 10:25:03 AM -- Instance2736.2 has 2.3 for I/O Log Reads Average Latency.
 6/29/2011 10:25:03 AM -- Instance2736.3 has 17.2 for I/O Database Reads Average Latency.
 6/29/2011 10:25:03 AM -- Instance2736.3 has 2.3 for I/O Log Writes Average Latency.
 6/29/2011 10:25:03 AM -- Instance2736.3 has 2.3 for I/O Log Reads Average Latency.
 6/29/2011 10:25:03 AM -- Instance2736.4 has 17.3 for I/O Database Reads Average Latency.
 6/29/2011 10:25:03 AM -- Instance2736.4 has 2.4 for I/O Log Writes Average Latency.
 6/29/2011 10:25:03 AM -- Instance2736.4 has 2.4 for I/O Log Reads Average Latency.
 6/29/2011 10:25:03 AM -- Instance2736.5 has 17.2 for I/O Database Reads Average Latency.
 6/29/2011 10:25:03 AM -- Instance2736.5 has 2.3 for I/O Log Writes Average Latency.
 6/29/2011 10:25:03 AM -- Instance2736.5 has 2.3 for I/O Log Reads Average Latency.
 6/29/2011 10:25:03 AM -- Test has 0 Maximum Database Page Fault Stalls/sec.
 6/29/2011 10:25:03 AM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.
 6/29/2011 10:25:03 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_29_9_56_53.xml has 111 samples queried.
 6/29/2011 10:25:03 AM -- C:\Program Files\Exchange Jetstress\Performance_2011_6_29_9_56_53.html is saved.
 6/29/2011 10:28:05 AM -- Performance logging begins (interval: 4000 ms).
 6/29/2011 10:28:05 AM -- Recovering databases ...
 6/29/2011 10:41:09 AM -- Performance logging ends.
 6/29/2011 10:41:09 AM -- Instance2736.1 (761.1253369), Instance2736.2 (784.4629779), Instance2736.3 (775.7113625), Instance2736.4 (755.5561271) and Instance2736.5 (741.235302)
 6/29/2011 10:41:10 AM -- C:\Program Files\Exchange Jetstress\SoftRecovery_2011_6_29_10_28_2.blg has 195 samples.
 6/29/2011 10:41:10 AM -- Creating test report ...