



## **Sun StorageTek 2530 4000 Mailbox Exchange 2007 Storage Solution**



**Tested with: ESRP – Storage Version 2.0**  
**Tested Date: January 21<sup>st</sup>, 2008**

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## Overview

This document provides information on Sun Microsystem's storage solution for Microsoft Exchange 2007 Server, based the *Microsoft Exchange Solution Reviewed Program (ESRP) – Storage* program\*. For any questions or comments regarding the contents of this document, see Contact for Additional Information.

\*The *ESRP – Storage* program was developed by Microsoft Corporation to provide a common storage testing framework for vendors to provide information on its storage solutions for Microsoft Exchange Server software. For more details on the *Microsoft ESRP – Storage* program, please click <http://www.microsoft.com/technet/prodtechnol/exchange/2007/esrp.msp>

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## Features

This document describes a Microsoft Exchange 2007 primary storage solution on the Sun Microsystems StorageTek 2530 array. The targeted number of users in this environment is 4000. The tested user profile was 0.5 IOPS (0.42 + 20%) per mailbox with a limit of 250MB. This solution can be scaled by adding additional arrays. The ST2530 is an excellent chose for medium to large sized businesses.

## Solution Description

The tested solution consists of (1) Sun StorageTek 2530 RAID Unit with (12) 146GB 15,000 rpm SAS 4Gb/s drives and (1) Expansion Unit with (12) 146GB 15,000 rpm SAS 4Gb/s drives for 3.5TB (raw) / 1.8TB (usable, RAID 10). This solution can expand to (2) Expansion units for a total of 5.26 (raw) / 2.63 TB (usable, RAID 5 with hot spares) SAS. Optional drives are also available in 73GB 15,000 rpm or 300GB 15,000 rpm configurations. For more detailed specs, please see:

[http://www.sun.com/storagetek/disk\\_systems/workgroup/2530/](http://www.sun.com/storagetek/disk_systems/workgroup/2530/)



The Sun StorageTek 2530 Array is listed on the Windows Server Catalog of tested products here:

<http://www.windowsservercatalog.com/item.aspx?idItem=53b769e5-acbd-4119-7d29-27a55a49306f>

### **RAID Module LUNs**

Sun StorageTek 2530 RAID Module LUNs can be managed through Sun StorageTek Common Array Manager (CAM). RAID levels 0, 1, (1+0), 3 and 5 are supported.

### **Tested Configuration**

The LUN layout of this solution is as follows. Two LUNs per tray were created. One LUN was created for sequential writes (4 drive RAID 10) and a second volume (8 drive RAID 10) for random access. This solution is comprised of two 4-drive RAID 10 volumes for the logs and two 8-drive RAID 10 volumes for the database.

The I/O activity to the log is 100% small sequential writes. The I/O activity to the database is mostly random. By separating the two distinct I/O characteristics to different LUNs, performance will increase.

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 2007 solution. Other factors which affect the server scalability are: server processor utilization, server physical and virtual memory limitations, resource requirements for other applications, directory and network service latencies, network infrastructure limitations, replication and recovery requirements, and client usage profiles. All these factors are beyond the scope 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 2007 system, please refer to Microsoft's Troubleshooting Microsoft Exchange 2007 Server Performance, available at <http://go.microsoft.com/fwlink/?LinkId=23454>.

### **Targeted Customer Profile**

This solution is targeted towards a 4000 user Exchange 2007 deployment.

- Medium to large organization
- One Exchange 2007 Server
- .42 IOPS + 20% headroom User I/O profile (0.5 tested)
- 250MB mailbox quota

### **Tested Deployment**

The following tables summarize the testing environment:

#### **Simulated Exchange Configuration:**

|  |                          |
|--|--------------------------|
| Number of Exchange mailboxes simulated                                       | 4000                     |
| Number of hosts  | 1                        |
| Number of mailboxes/host   | 4000                     |
| Number of storage groups/host  | 8                        |
| Number of mailbox stores/storage group                                       | 1                        |
| Number of mailboxes/mailbox store  | 500                      |
| Number of mailbox store LUNs/storage group                                   | 1                        |
| Simulated profile: I/O's per second per mailbox (IOPS, include 20% headroom) | .5 (very heavy workload) |
| Database LUN size  | 540 GB                   |
| Log LUN size   | 272 GB                   |
| Total database size for performance testing                                  | 1070 GB                  |
| % storage capacity used by Exchange database**                               | 65%                      |

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

## Primary Storage Hardware

|   |   |
|---|---|
| Storage Connectivity (Fiber Channel, SAS, SATA, iSCSI)  | SAS   |
| Storage model and OS/firmware revision                  | StorageTek 2530 6.17.52.10<br><a href="http://www.windowsservercatalog.com/item.aspx?idItem=53b769e5-acbd-4119-7d29-27a55a49306f">http://www.windowsservercatalog.com/item.aspx?idItem=53b769e5-acbd-4119-7d29-27a55a49306f</a> |
| Storage cache   | 680MB   |
| Number of storage controllers                           | 2   |
| Number of storage ports                                 | 2   |
| Maximum bandwidth of storage connectivity to host       | 18Gb/s (up to 6 3Gb/s host connections per controller)  |
| Switch type/model/firmware revision                     | N/A   |
| HBA model and firmware                                  | SG-XPCIE8SAS-E-Z<br>01.18.00.00   |
| Number of HBA's/host                                    | 2   |
| Host server type  | Sun Microsystems, Inc. SunFire x4200M2<br>2 Dual-Core AMD Opteron 2216 Processors<br>22,528MB RAM   |
| Total number of disks tested in solution                | 24  |
| Maximum number of spindles can be hosted in the storage | As Configured: 24<br>Maximum Configuration: 36  |

## Primary Storage Software

|                                   |   |
|-----------------------------------|---|
| HBA driver                        | 1.21.26.0   |
| HBA QueueTarget Setting           | N/A   |
| HBA QueueDepth Setting            | N/A   |
| Multi-Pathing                     | SMIA-WSX64-01.01.32.04 MPIO DSM                           |
| Host OS                           | Microsoft Windows Server 2003, Enterprise Edition x64 SP2 |
| ESE.dll file version              | 08.00.0685.024  |
| Replication solution name/version | N/A   |

## Primary Storage Disk Configuration (Mailbox Store Disks)

|                               |                                   |
|-------------------------------|-----------------------------------|
| Disk type, speed and firmware | 146 GB 15,000-rpm 3 Gb/sec - 0791 |
|-------------------------------|-----------------------------------|

|   |         |
|---|---------|
| revision  |         |
| Raw capacity per disk (GB)                          | 136.7GB |
| Number of physical disks in test                    | 16      |
| total raw storage capacity (GB)                     | 2187GB  |
| Disk slice size (GB)                                | N/A     |
| Number of slices per LUN or number of disks per LUN | 8       |
| Raid level  | RAID 10 |
| Total formatted capacity                            | 1070GB  |
| <a href="#">Storage capacity utilization</a>        | 49%     |
| <a href="#">Database capacity utilization</a>       | 33%     |

### **Primary Storage Disk Configuration (Transactional Log Disks)**

|   |                                  |
|---|----------------------------------|
| Disk type, speed and firmware rev                   | 146 GB 15,000-rpm 3 Gb/sec - 079 |
| Raw capacity per disk (GB)                          | 136.7GB                          |
| Number of Spindles in test                          | 8                                |
| total raw storage capacity (GB)                     | 1010GB                           |
| Disk slice size (GB)                                | N/A                              |
| Number of slices per LUN or number of disks per LUN | 4                                |
| Raid level  | RAID 10                          |
| Total formatted capacity                            | 270GB                            |

## **Best Practices**

Exchange 2007 server is a disk-intensive application. Based on the testing run using the ESRP framework, we would recommend the following to improve the storage performance.

For Exchange 2007 best practices on storage design, please visit <http://technet.microsoft.com/en-us/library/bb124518.aspx>

### **Core Storage**

1. Use the Microsoft Diskpart utility to align the sectors of all Exchange 2007 storage volumes before formatting. The Diskpart value should be set to 64.

2. Do not share Exchange 2007 disks with any other applications that are I/O intensive. This will have a negative effect on your disk subsystem performance.
3. When possible, separate the sequential writes of logs from the random access of database volumes.
4. Primary focus should be on the speed of the disks and not size.

## Contact for Additional Information

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

## Test Result Summary

This section provides a high level summary of the test data from ESRP and the link to the detailed reports which are generated by ESRP testing framework. Please click on the underlined headings below to view the report for each test.

### ***Reliability***

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

The following list provides an overview:

- No errors were reported in the saved eventlog file
- No errors were reported during the database and log checksum process

### ***Primary Storage Performance Results***

The Primary Storage performance testing is designed to exercise the storage with maximum sustainable Exchange type of IO for 2 hours. The test is to show how long it takes for the storage to respond to an IO under load. The data below is the sum of all of the logical disk I/O's and average of all the logical disks I/O latency in the 2 hours test duration. Each server is listed separately and the aggregate numbers across all servers is listed as well.

#### **Individual Server Metrics:**

The sum of I/O's across Storage Groups and the average latency across all Storage Groups on a per server basis.

|                                     |          |
|-------------------------------------|----------|
| <b>Database I/O</b>                 |          |
| Average Database Disk Transfers/sec | 2296.404 |
| Average Database Disk Reads/sec     | 1186.25  |

|  |          |
|--|----------|
| Average Database Disk Writes/sec         | 1110.154 |
| Average Database Disk Read Latency (ms)  | 17.5     |
| Average Database Disk Write Latency (ms) | 7.5      |
| <b>Transaction Log I/O</b>               |          |
| Average Log Disk Writes/sec              | 667.556  |
| Average Log Disk Write Latency (ms)      | 1        |

### ***Streaming Backup/Recovery Performance***

For the Version 1.0 release, only streaming backup type is supported for testing in the framework. There are two tests in this section. First one is to measure the read IO performance metrics by running checksum on all the databases and log files. The second test is to measure the end to end performance when the databases are backed up to disks.

### **Database Read-only Performance**

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

|                                |        |
|--------------------------------|--------|
| MB read/sec per storage group_ | 55.91  |
| MB read/sec total              | 447.29 |

### **Log Read-only Performance**

The test is to measure the maximum rate at which the log files can be played against the databases. The following table shows the average rate for 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) | .423 |
|---|------|

## **Conclusion**

This document is developed by storage solution providers, and reviewed by Microsoft Exchange Product team. The test results/data presented in this document is based on the tests introduced in the ESRP test framework. Customer should not quote the data directly for his/her pre-deployment verification. It is still necessary to go through the exercises to validate the storage design for a specific customer environment.

ESRP program is not designed to be a benchmarking program; tests are not designed to getting the maximum throughput for a giving solution. Rather, it is focused on producing recommendations from vendors for Exchange application. So the data presented in this document should not be used for direct comparisons among the solutions.

## Appendix

### Microsoft Exchange Server **Jetstress**

#### *Performance Test Result Report*

Test Summary

**Overall Test** **Pass**

**Result**

**Machine Name** ISV-4100E

**Test Description**

**Test Start Time** 1/18/2008 2:41:41 PM

**Test End Time** 1/18/2008 7:08:02 PM

**Jetstress Version** 08.01.0112.000

**Ese Version** 08.00.0685.024

**Operating System** Microsoft Windows Server 2003 Service Pack 2 (5.2.3790.131072)

**Performance Log** [C:\Program Files\Exchange2007\Exchange2007\Performance\\_2008\\_1\\_18\\_17\\_1\\_2\\_1.blg](C:\Program Files\Exchange2007\Exchange2007\Performance_2008_1_18_17_1_2_1.blg)  
[C:\Program Files\Exchange2007\Exchange2007\DBChecksum\\_2008\\_1\\_18\\_19\\_8\\_2\\_1.blg](C:\Program Files\Exchange2007\Exchange2007\DBChecksum_2008_1_18_19_8_2_1.blg)

Database Sizing and Throughput

**Achieved I/O per Second** 2296.404

**Planned I/O per Second** 2000

**Initial database size** 1048617025536

**Final database size** 1070430552064

**Database files (count) 8**

## Jetstress System Parameters

**Thread count** 12 (per-storage group)  
**Log buffers** 9000  
**Minimum database cache** 256.0 MB  
**Maximum database cache** 2048.0 MB  
**Insert operations** 25%  
**Delete operations** 10%  
**Replace operations** 50%  
**Read operations** 15%  
**Lazy commits** 80%

## Disk Subsystem Performance

| LogicalDisk          | Avg. Disk sec/Read | Avg. Disk sec/Write | Disk Reads/sec | Disk Writes/sec | Avg. Disk Bytes/Write |
|----------------------|--------------------|---------------------|----------------|-----------------|-----------------------|
| <b>Database (G:)</b> | 0.018              | 0.008               | 594.690        | 558.160         | (n/a)                 |
| <b>Database (H:)</b> | 0.017              | 0.007               | 591.560        | 551.994         | (n/a)                 |
| <b>Log (F:)</b>      | 0.000              | 0.001               | 0.000          | 334.447         | 11756.454             |
| <b>Log (I:)</b>      | 0.000              | 0.001               | 0.000          | 333.109         | 11666.898             |

## Host System Performance

| Counter                                | Average      | Minimum      | Maximum      |
|--|--------------|--------------|--------------|
| <b>% Processor Time</b>                | 6.118        | 4.115        | 14.646       |
| <b>Available MBytes</b>                | 4602.490     | 4597.000     | 4781.000     |
| <b>Free System Page Table Entries</b>  | 16751641.000 | 16751641.000 | 16751641.000 |
| <b>Transition Pages RePurposed/sec</b> | 0.000        | 0.000        | 0.000        |
| <b>Pool Nonpaged Bytes</b>             | 58023876.267 | 58019840.000 | 58044416.000 |
| <b>Pool Paged Bytes</b>                | 73158929.067 | 73027584.000 | 73637888.000 |
| <b>Database Page Fault Stalls/sec</b>  | 0.000        | 0.000        | 0.000        |

Test Log1/18/2008 2:41:40 PM -- Jetstress testing begins ...

1/18/2008 2:41:41 PM -- Prepare testing begins ...

1/18/2008 2:41:41 PM -- Creating G:\sg1\Jetstress1.edb.

1/18/2008 2:41:41 PM -- Database cache settings: (minimum: 32.0 MB, maximum: 256.0 MB)

1/18/2008 2:41:41 PM -- Database flush thresholds: (start: 2.6 MB, stop: 5.1 MB)

1/18/2008 3:06:20 PM -- 60.0% of 122.1 GB complete (4463139 records inserted).

1/18/2008 3:27:48 PM -- 100.0% of 122.1 GB complete (7161293 records inserted).

1/18/2008 3:27:50 PM -- Duplicating 7 databases:

1/18/2008 5:01:19 PM -- 100.0% of 854.5 GB complete (854.5 GB duplicated).

1/18/2008 5:01:20 PM -- Attaching databases ...

1/18/2008 5:01:20 PM -- Prepare testing ends.

1/18/2008 5:01:20 PM -- Dispatching transactions begins ...

1/18/2008 5:01:20 PM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)

1/18/2008 5:01:20 PM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)

1/18/2008 5:01:21 PM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).

1/18/2008 5:01:21 PM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).

1/18/2008 5:01:22 PM -- Operation mix: Sessions 12, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.

1/18/2008 5:01:22 PM -- Performance logging begins (interval: 15000 ms).

1/18/2008 5:01:22 PM -- Attaining prerequisites:

1/18/2008 5:07:45 PM -- \Database(JetstressWin)\Database Cache Size, Last: 1934754000.0 (lower bound: 1932735000.0, upper bound: none)

1/18/2008 7:07:46 PM -- Performance logging ends.

1/18/2008 7:07:46 PM -- JetInterop batch transaction stats: 65514, 65088, 65697, 65940, 65318, 65209, 65439, and 65472.

1/18/2008 7:07:47 PM -- Dispatching transactions ends.

1/18/2008 7:07:47 PM -- Shutting down databases ...

1/18/2008 7:08:02 PM -- Instance344.1 (complete), Instance344.2 (complete), Instance344.3 (complete), Instance344.4 (complete), Instance344.5 (complete), Instance344.6 (complete), Instance344.7 (complete), and Instance344.8 (complete)

1/18/2008 7:08:02 PM -- Performance logging begins (interval: 30000 ms).

1/18/2008 7:08:02 PM -- Verifying database checksums ...

1/18/2008 7:40:10 PM -- G: (100% processed), and H: (100% processed)

1/18/2008 7:40:12 PM -- Performance logging ends.

1/18/2008 7:40:12 PM -- [C:\Program Files\Exchange2007\Exchange2007\DBChecksum\\_2008\\_1\\_18\\_19\\_8\\_2.blg](#) has 64 samples.

1/18/2008 7:40:13 PM -- [C:\Program Files\Exchange2007\Exchange2007\DBChecksum\\_2008\\_1\\_18\\_19\\_8\\_2.html](#) is saved.

1/18/2008 7:40:13 PM -- Verifying log checksums ...

1/18/2008 7:40:26 PM -- F:\sg1 (22 logs passed), F:\sg2 (23 logs passed), F:\sg3 (23 logs passed), F:\sg4 (22 logs passed), I:\sg5 (22 logs passed), I:\sg6 (21 logs passed), I:\sg7 (23 logs passed), and I:\sg8 (22 logs passed)

1/18/2008 7:40:26 PM -- [C:\Program Files\Exchange2007\Exchange2007\Performance\\_2008\\_1\\_18\\_17\\_1\\_21.blg](#) has 505 samples.

1/18/2008 7:40:26 PM -- Creating test report ...

1/18/2008 7:40:32 PM -- Volume G: has 0.0184 for Avg. Disk sec/Read.

1/18/2008 7:40:32 PM -- Volume H: has 0.0171 for Avg. Disk sec/Read.

1/18/2008 7:40:32 PM -- Volume F: has 0.0011 for Avg. Disk sec/Write.

1/18/2008 7:40:32 PM -- Volume F: has 0.0000 for Avg. Disk sec/Read.

1/18/2008 7:40:32 PM -- Volume I: has 0.0011 for Avg. Disk sec/Write.

1/18/2008 7:40:32 PM -- Volume I: has 0.0000 for Avg. Disk sec/Read.

1/18/2008 7:40:32 PM -- Test has 0 Maximum Database Page Fault Stalls/sec.

1/18/2008 7:40:32 PM -- Test has 0 Database Page Fault Stalls/sec samples higher than 0.

1/18/2008 7:40:32 PM -- [C:\Program Files\Exchange2007\Exchange2007\Performance\\_2008\\_1\\_18\\_17\\_1\\_21.xml](#) has 479 samples queried.

## Microsoft Exchange Server **Jetstress**

### **Streaming backup Test Result Report**

Streaming Backup Statistics - All

| Database Instance    | Database Size (MBytes) | Elapsed Backup Time | MBytes Transferred/sec |
|----------------------|------------------------|---------------------|------------------------|
| <b>Instance344.1</b> | 127601.02              | 00:40:46            | 52.17                  |
| <b>Instance344.2</b> | 127577.02              | 00:36:59            | 57.49                  |

|                      |           |          |       |
|----------------------|-----------|----------|-------|
| <b>Instance344.3</b> | 127641.02 | 00:38:03 | 55.89 |
| <b>Instance344.4</b> | 127695.02 | 00:37:23 | 56.92 |
| <b>Instance344.5</b> | 127451.02 | 00:37:33 | 56.56 |
| <b>Instance344.6</b> | 127637.02 | 00:36:46 | 57.84 |
| <b>Instance344.7</b> | 127575.02 | 00:36:26 | 58.36 |
| <b>Instance344.8</b> | 127649.02 | 00:40:51 | 52.06 |

#### Jetstress System Parameters

|                               |                        |
|-------------------------------|------------------------|
| <b>Thread count</b>           | 12 (per-storage group) |
| <b>Log buffers</b>            | 9000                   |
| <b>Minimum database cache</b> | 256.0 MB               |
| <b>Maximum database cache</b> | 2048.0 MB              |
| <b>Insert operations</b>      | 25%                    |
| <b>Delete operations</b>      | 10%                    |
| <b>Replace operations</b>     | 50%                    |
| <b>Read operations</b>        | 15%                    |
| <b>Lazy commits</b>           | 80%                    |

#### Disk Subsystem Performance

| <b>LogicalDisk</b>   | Avg. Disk sec/Read | Avg. Disk sec/Write  | Disk Reads/sec | Disk Writes/sec | Avg. Disk Bytes/Write |
|----------------------|--------------------|----------------------|----------------|-----------------|-----------------------|
| <b>Database (G:)</b> | 0.002              | 0.000                | 1681.149       | 0.062           | (n/a)                 |
| <b>Database (H:)</b> | 0.002              | 0.000                | 1677.675       | 0.054           | (n/a)                 |
| <b>Log (F:)</b>      | 0.000              | 9.93187615955473E-05 | 0.000          | 0.066           | 1151.206              |
| <b>Log (I:)</b>      | 0.000              | 0.000                | 0.000          | 0.069           | 1226.780              |

#### Host System Performance

| <b>Counter</b>                         | Average      | Minimum      | Maximum      |
|--|--------------|--------------|--------------|
| <b>% Processor Time</b>                | 13.621       | 6.650        | 16.823       |
| <b>Available MBytes</b>                | 6732.383     | 6718.000     | 6738.000     |
| <b>Free System Page Table Entries</b>  | 16751641.000 | 16751641.000 | 16751641.000 |
| <b>Transition Pages RePurposed/sec</b> | 0.000        | 0.000        | 0.000        |
| <b>Pool Nonpaged Bytes</b>             | 60690280.296 | 60616704.000 | 61214720.000 |
| <b>Pool Paged Bytes</b>                | 73767999.210 | 73551872.000 | 74526720.000 |
| <b>Database Page Fault Stalls/sec</b>  | 0.000        | 0.000        | 0.000        |

Test Log1/22/2008 9:59:26 AM -- Jetstress testing begins ...

1/22/2008 9:59:26 AM -- Prepare testing begins ...

1/22/2008 9:59:27 AM -- Attaching databases ...

1/22/2008 9:59:27 AM -- Prepare testing ends.

1/22/2008 9:59:30 AM -- Performance logging begins (interval: 30000 ms).

1/22/2008 9:59:30 AM -- Streaming backup databases ...

1/22/2008 10:40:22 AM -- Performance logging ends.

1/22/2008 10:40:22 AM -- Instance344.1 (100% processed), Instance344.2 (100% processed), Instance344.3 (100% processed), Instance344.4 (100% processed), Instance344.5 (100% processed), Instance344.6 (100% processed), Instance344.7 (100% processed), and Instance344.8 (100% processed)

1/22/2008 10:40:22 AM -- [C:\Program](#)

[Files\Exchange2007\Exchange2007\StreamingBackup\\_2008\\_1\\_22\\_9\\_59\\_27.blg](#) has 81 samples.

1/22/2008 10:40:22 AM -- Creating test report ...

## Microsoft Exchange Server **Jetstress**

### **SoftRecovery Test Result Report**

Soft-Recovery Statistics - All

| Database Instance    | Log files replayed | Elapsed seconds |
|----------------------|--------------------|-----------------|
| <b>Instance344.1</b> | 522                | 221.796875      |
| <b>Instance344.2</b> | 523                | 220.796875      |
| <b>Instance344.3</b> | 519                | 220.546875      |
| <b>Instance344.4</b> | 523                | 223.046875      |
| <b>Instance344.5</b> | 500                | 210.78125       |
| <b>Instance344.6</b> | 529                | 221.546875      |
| <b>Instance344.7</b> | 530                | 220.796875      |
| <b>Instance344.8</b> | 503                | 214.796875      |

Disk Subsystem Performance

| LogicalDisk          | Avg. Disk sec/Read | Avg. Disk sec/Write | Disk Reads/sec | Disk Writes/sec | Avg. Disk Bytes/Write |
|----------------------|--------------------|---------------------|----------------|-----------------|-----------------------|
| <b>Database (G:)</b> | 0.037              | 0.011               | 3717.791       | 38.209          | (n/a)                 |
| <b>Database (H:)</b> | 0.043              | 0.012               | 3494.980       | 38.016          | (n/a)                 |
| <b>Log (F:)</b>      | 0.001              | 0.002               | 313.473        | 10.387          | 5016.951              |
| <b>Log (I:)</b>      | 0.002              | 0.002               | 310.426        | 10.757          | 5670.800              |

Host System Performance

| Counter                                | Average      | Minimum      | Maximum      |
|--|--------------|--------------|--------------|
| <b>% Processor Time</b>                | 15.132       | 10.811       | 27.237       |
| <b>Available MBytes</b>                | 4869.345     | 4535.000     | 6531.000     |
| <b>Free System Page Table Entries</b>  | 16751641.000 | 16751641.000 | 16751641.000 |
| <b>Transition Pages RePurposed/sec</b> | 0.000        | 0.000        | 0.000        |
| <b>Pool Nonpaged Bytes</b>             | 61004855.855 | 60030976.000 | 64520192.000 |
| <b>Pool Paged Bytes</b>                | 74993887.418 | 74452992.000 | 75239424.000 |
| <b>Database Page Fault Stalls/sec</b>  | 0.000        | 0.000        | 0.000        |

Test Log1/22/2008 9:59:26 AM -- Jetstress testing begins ...

1/22/2008 9:59:26 AM -- Prepare testing begins ...  
 1/22/2008 9:59:27 AM -- Attaching databases ...  
 1/22/2008 9:59:27 AM -- Prepare testing ends.  
 1/22/2008 9:59:30 AM -- Performance logging begins (interval: 30000 ms).  
 1/22/2008 9:59:30 AM -- Streaming backup databases ...  
 1/22/2008 10:40:22 AM -- Performance logging ends.  
 1/22/2008 10:40:22 AM -- Instance344.1 (100% processed), Instance344.2 (100% processed), Instance344.3 (100% processed), Instance344.4 (100% processed), Instance344.5 (100% processed), Instance344.6 (100% processed), Instance344.7 (100% processed), and Instance344.8 (100% processed)  
 1/22/2008 10:40:22 AM -- [C:\Program Files\Exchange2007\Exchange2007\StreamingBackup\\_2008\\_1\\_22\\_9\\_59\\_27.blg](#) has 81 samples.  
 1/22/2008 10:40:22 AM -- Creating test report ...  
 1/22/2008 10:40:23 AM -- [C:\Program Files\Exchange2007\Exchange2007\StreamingBackup\\_2008\\_1\\_22\\_9\\_59\\_27.html](#) is saved.  
 1/22/2008 10:40:23 AM -- Jetstress testing ends.  
 1/22/2008 10:42:25 AM -- Jetstress testing begins ...  
 1/22/2008 10:42:25 AM -- Prepare testing begins ...  
 1/22/2008 10:42:25 AM -- Attaching databases ...  
 1/22/2008 10:42:25 AM -- Prepare testing ends.  
 1/22/2008 10:42:25 AM -- Dispatching transactions begins ...  
 1/22/2008 10:42:25 AM -- Database cache settings: (minimum: 256.0 MB, maximum: 2.0 GB)  
 1/22/2008 10:42:25 AM -- Database flush thresholds: (start: 20.5 MB, stop: 41.0 MB)  
 1/22/2008 10:42:26 AM -- Database read latency thresholds: (average: 0.02 seconds/read, maximum: 0.05 seconds/read).  
 1/22/2008 10:42:26 AM -- Log write latency thresholds: (average: 0.01 seconds/write, maximum: 0.05 seconds/write).  
 1/22/2008 10:42:27 AM -- Operation mix: Sessions 12, Inserts 25%, Deletes 10%, Replaces 50%, Reads 15%, Lazy Commits 80%.  
 1/22/2008 10:42:27 AM -- Performance logging begins (interval: 15000 ms).  
 1/22/2008 10:42:27 AM -- Generating log files ...  
 1/22/2008 11:03:22 AM -- F:\sg1 (104.4% generated), F:\sg2 (104.6% generated), F:\sg3 (103.8% generated), F:\sg4 (104.6% generated), I:\sg5 (100.2% generated), I:\sg6 (106.0% generated), I:\sg7 (106.0% generated), and I:\sg8 (100.8% generated)  
 1/22/2008 11:03:23 AM -- Performance logging ends.  
 1/22/2008 11:03:23 AM -- JetInterop batch transaction stats: 10127, 10094, 10134, 10112, 10106, 10163, 10259, and 9917.  
 1/22/2008 11:03:24 AM -- Dispatching transactions ends.  
 1/22/2008 11:03:24 AM -- Shutting down databases ...  
 1/22/2008 11:03:37 AM -- Instance344.1 (complete), Instance344.2 (complete), Instance344.3 (complete), Instance344.4 (complete), Instance344.5 (complete), Instance344.6 (complete), Instance344.7 (complete), and Instance344.8 (complete)  
 1/22/2008 11:03:38 AM -- Performance logging begins (interval: 30000 ms).  
 1/22/2008 11:03:38 AM -- Verifying database checksums ...  
 1/22/2008 11:35:54 AM -- G: (100% processed), and H: (100% processed)  
 1/22/2008 11:35:55 AM -- Performance logging ends.  
 1/22/2008 11:35:55 AM -- [C:\Program Files\Exchange2007\Exchange2007\DBChecksum\\_2008\\_1\\_22\\_11\\_3\\_37.blg](#) has 64 samples.  
 1/22/2008 11:35:56 AM -- [C:\Program Files\Exchange2007\Exchange2007\DBChecksum\\_2008\\_1\\_22\\_11\\_3\\_37.html](#) is saved.  
 1/22/2008 11:35:56 AM -- Verifying log checksums ...  
 1/22/2008 11:36:58 AM -- F:\sg1 (100 logs passed), F:\sg2 (100 logs passed), F:\sg3 (100 logs passed), F:\sg4 (100 logs passed), I:\sg5 (100 logs passed), I:\sg6 (100 logs passed), I:\sg7 (100 logs passed), and I:\sg8 (100 logs passed)  
 1/22/2008 11:36:58 AM -- [C:\Program Files\Exchange2007\Exchange2007\Performance\\_2008\\_1\\_22\\_10\\_42\\_26.blg](#) has 83 samples.  
 1/22/2008 11:36:58 AM -- Creating test report ...

1/22/2008 11:36:59 AM -- Volume G: has 0.0184 for Avg. Disk sec/Read.  
1/22/2008 11:36:59 AM -- Volume H: has 0.0167 for Avg. Disk sec/Read.  
1/22/2008 11:36:59 AM -- Volume F: has 0.0011 for Avg. Disk sec/Write.  
1/22/2008 11:36:59 AM -- Volume F: has 0.0007 for Avg. Disk sec/Read.  
1/22/2008 11:36:59 AM -- Volume I: has 0.0010 for Avg. Disk sec/Write.  
1/22/2008 11:36:59 AM -- Volume I: has 0.0006 for Avg. Disk sec/Read.  
1/22/2008 11:36:59 AM -- Test has 0.199596292897341 Maximum Database Page Fault Stalls/sec.  
1/22/2008 11:36:59 AM -- Test has 4 Database Page Fault Stalls/sec samples higher than 0.  
1/22/2008 11:36:59 AM -- [C:\Program Files\Exchange2007\Exchange2007\Performance\\_2008\\_1\\_22\\_10\\_42\\_26.xml](#) has 82 samples queried.  
1/22/2008 11:36:59 AM -- [C:\Program Files\Exchange2007\Exchange2007\Performance\\_2008\\_1\\_22\\_10\\_42\\_26.html](#) is saved.  
1/22/2008 11:37:02 AM -- Performance logging begins (interval: 4000 ms).  
1/22/2008 11:37:02 AM -- Recovering databases ...  
1/22/2008 11:40:46 AM -- Performance logging ends.  
1/22/2008 11:40:46 AM -- Instance344.1 (221.796875), Instance344.2 (220.796875), Instance344.3 (220.546875), Instance344.4 (223.046875), Instance344.5 (210.78125), Instance344.6 (221.546875), Instance344.7 (220.796875), and Instance344.8 (214.796875)  
1/22/2008 11:40:46 AM -- [C:\Program Files\Exchange2007\Exchange2007\SoftRecovery\\_2008\\_1\\_22\\_11\\_36\\_59.blg](#) has 55 samples.  
1/22/2008 11:40:46 AM -- Creating test report ...