



White paper

FUJITSU ETERNUS® DX200 S3 Storage Array 20,000 Mailbox Virtualized Exchange 2013 Mailbox Resiliency Storage Solution

Tested with: ESRP – Storage Version 4.0

Test Date: August 2014



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1 Overview

This document provides information on the Fujitsu ETERNUS DX200 S3 storage solution for Microsoft® Exchange Server, based on 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://technet.microsoft.com/en-us/exchange>.

2 Disclaimer

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3 Features

3.1 ETERNUS DX Series

ETERNUS DX is a system family based on a consistent design, from the entry-level models to scalable entry-level and midrange systems, culminating in the high-end storage systems. For example, the family concept includes compatible product components and functions across all models, maximum system interoperability, seamless integration of innovations, and same system management software for deployment of all models.

This family concept provides storage administrators with very efficient options for coping with growing demands, consolidating storage environments, rationalizing operations and maintenance processes. Thanks to their excellent scalability, ETERNUS DX systems can be enhanced and upgraded from one model level to the next quite easily. Moreover, various types of hard disks (SAS, Nearline SAS, and SSD) can be mixed in one system in order to balance performance and costs while optimally utilizing data center space. Interoperability serves as the basis for flexible centralized and decentralized operation concepts – because data can be replicated and copied between various models. ETERNUS DX is optimized for virtual applications, including support for VAAI¹ and VASA² for VMware and ODX³ for Hyper-V.



Figure 1 – ETERNUS DX Series

The scalable and unified Fujitsu Storage ETERNUS DX200 S3 delivers enterprise-class functionality to small and medium-sized companies and subsidiaries with an excellent price/performance ratio. It is the perfect solution when consolidating data for server virtualization, e-mail, databases and business applications as well as centralized file services. Simple, intuitive system management, highly flexible network connectivity and the option of field upgrades to higher system classes significantly reduce operational and migration costs. The ETERNUS DX family architecture lets customers benefit from software options, such as Thin Provisioning, Automated Storage Tiering and Quality of Service management even in the entry-level class. This all contributes to better business support.

¹ VAAI - vStorage APIs for Array Integration is a feature introduced in ESXi/ESX 4.1 that provides hardware acceleration functionality.

² VASA – vSphere APIs for Storage Awareness Program enables storage partners to create VMware Virtual Center providers that allow an administrator to monitor physical storage topology, capabilities, and state.

³ ODX - Windows Offloaded Data Transfer enables direct data transfers within or between compatible storage devices without transferring the data through the host computer.

ETERNUS DX S3 Features and Benefits include:

- Optional 4U high density drive enclosures (HD-DE), each holding up to 60 3.5-inch disk drives
- Automated Storage Tiering and Thin Provisioning available starting with the entry level DX100 S3
- Supports mixed combinations of SAN (FC, iSCSI, FCoE, SAS) protocols and NAS
- Additional DEs can be a combination of 2.5-inch and 3.5-inch, providing flexible configurations of HDDs and SSDs
- High scalability with the system and upgrade options to higher system-class and supports increased data at low costs of growth and ensuring investment protection
- Consistent management functions across the entire product line
- Comprehensive high-availability, quality of service and disaster resilience functions ensure predictable and reliable operation
- Extensive non-disruptive maintenance and upgrade capabilities reduce planned downtimes
- New Extreme Cache for the DX500 S3/DX600 S3 delivers up to 5.6 TB of expanded cache to maximize storage performance for high performance demands
- ETERNUS SF software provides enterprise-class functionality from the entry level to enterprise classes, and supports flexible disaster recovery for the different model classes
- Wide Striping which distributes a single volume across multiple RAID groups to improve the performance for the volume

Table 1 – ETERNUS DX200 S3 Technical Details (Block Storage Only)

General System Information	
Control enclosures	2.5-inch Control Enclosure / 3.5-inch Control Enclosure
No. of controllers	1 or 2
No. of host interfaces	2 host interface adapters per controller with 2 ports on each for a maximum of 8 ports
Max. cache capacity	16 GB (block)
Max. no of drives	264
Max. no. of drive enclosures	10 with 2.5-inch or 3.5-inch DE, 4 with HD-DE or mixture of DEs up to Max no. Drives 2.5-inch DE contains 24 drive slots, 3.5-inch DE contains 12 drive slots, HD-DE contains 60 drive slots
Redundancies	RAID Controller (in 2-controller configuration) Fan Power supply
Supported RAID levels	0, 1, 1+0, 5, 5+0, 6
Host interfaces	Fibre Channel (16 Gbit/s, 8 Gbit/s, 4 Gbit/s, 2 Gbit/s) FCoE (10 Gbit/s) iSCSI (10 Gbit/s, 1 Gbit/s) SAS (6 Gbit/s, 3 Gbit/s)
Mixed host interfaces	Yes
Max. no. of hosts	1,024
Max. storage capacity – physical	1056 TB
Drive Type	2.5-inch, SAS, 15,000 rpm (300 GB) 2.5-inch, SAS, 10,000 rpm (1,200 GB / 900 GB / 600 GB / 300 GB) 2.5-inch, SAS (self-encrypting), 10,000 rpm (1,200 GB / 900 GB) 2.5-inch, Nearline SAS, 7,200 rpm (1 TB) 2.5-inch, SSD (800 GB / 400 GB) 3.5-inch, Nearline SAS, 7,200 rpm (4 TB / 3 TB / 2 TB) 3.5-inch, SSD (800 GB / 400 GB) HD-DE, Nearline SAS, 10,000 rpm (1.2 TB) HD-DE, Nearline SAS, 7,200 rpm (4 TB / 3 TB / 2 TB)
Note	2.5-inch drives are available only for 2.5-inch drive enclosures and 3.5-inch drives are available only for 3.5-inch drive enclosures.
Mixed 2.5-inch / 3.5-inch drive enclosures	Yes
Drive interface	Serial Attached SCSI (12 Gbit/s)
Back-end disk connectivity	1 pair of four-lane x 12 Gbit/s Serial Attached SCSI buses (SAS 3.0 wide)
Max. no. of LUNs	4,096
Max. LUN capacity	128 TB
Eco-mode	Yes
Thin Provisioning	Yes
Quality of Service	Yes

Business Continuity Features	
No. of snapshots – max	2,048
Max. no. of copy generations	512
Remote Copy functionality	Synchronous and asynchronous
Data protection features	Cache Protection, Data Block Guard, Data Encryption, Dedicated Hot Spare, Disk Drive Patrol, Global Hot Spare, Fast Recovery
Security features	HTTPS (SSL), One Time Password, RADIUS, SSH
Options	
Storage cluster	Yes
Automated Storage Tiering	Yes
Reporting function	Yes
Note	Options can be activated via ETERNUS SF Software

3.2 FUJITSU PRIMERGY® Server Systems

FUJITSU PRIMERGY server systems provide the most powerful and flexible data center solutions for companies of all sizes, across all industries and for any type of workload. This includes expandable PRIMERGY tower servers for remote and branch offices, versatile rack-mount servers, compact and scalable blade systems, as well as density-optimized scale-out servers. They provide business proven quality with a wide range of innovations, high efficiency which cuts operational cost and complexity, and provide more agility in daily operations leading to a significant business advantage.

FUJITSU Server PRIMERGY RX rack systems are versatile rack-optimized servers providing best-in-class performance and energy efficiency, and thus form the “standard” in each datacenter. PRIMERGY RX servers deliver approximately 20 years of development and production know-how resulting in extremely low failure rates which provides continuous operation and outstanding hardware availability.

3.2.1 FUJITSU PRIMERGY RX300 S8

The Fujitsu PRIMERGY RX300 S8 is a dual socket rack server, focusing on versatility and scalability. The new modular concept supports excellent expandability with up to 16 hard disk drives, up to 7 PCIe Gen 3 cards and up to 1536 GB RAM, all in one single 2U rack housing. Furthermore, the new Intel® Xeon® E5 product family delivers the top performance to ensure today’s demand while being prepared for future requirements thanks to upgrade kits as well as the cost-saving Modular LAN options. Thanks to the power supply units with 96% efficiency and the new power management resulting in lower operational costs, this 2U powerhouse is the right choice for all types of business applications and ideal for server consolidation.



Figure 2 – Fujitsu PRIMERGY RX300 S8

3.2.2 FUJITSU PRIMERGY RX600 S5

Extensive usage of IT platforms is becoming more important than ever: be it as database management system for medium or large-sized databases or as a consolidation basis to run an immensely large number of different applications using virtualization technologies, the scalable PRIMERGY RX600 S5 is in every respect a reliable server for such critical company scenarios. The ideal interaction of integrated redundancy functions with server management components results in high-level availability and consistent efficient IT production as a character feature of this server platform. The processors equipped with up to 8 state-of-the-art cores enable a unique performance boost, which however does not bear optimal dividends unless paired with other features: a correspondingly high extendable main memory capacity with up to 64 DIMMs and a very high number of performant PCI Express channels enable balanced easy modifications to meet increasing requirements. This and the continued evolution of virtualization support via Intel components (processor, I/O controller) enable a greater consolidation of servers and applications with all the market relevant virtualization solutions and excellent best-in-class efficiency.



Figure 3 – Fujitsu PRIMERGY RX600 S5

4 Solution Description

This solution shows the storage requirements for a 2013 Exchange environment with 20,000 mailboxes using Mailbox Resiliency. The solution is built using the ETERNUS DX200 S3 storage array and the PRIMERGY servers. The Exchange environment runs under Virtual Machines running on Microsoft Hyper-V. The solution is designed around the building block concept which shows the scalability of the storage array.

Each building block consists of a PRIMERGY server running Exchange in a Virtual Machine and 14 disks from the storage array configured with RAID1 redundancy. The building blocks support 5,000 mailboxes, 2,500 active and 2,500 passive, with a Mailbox size of 3 GB.

Table 2 – Mailbox Building Block

Number of Mailboxes	2,500 active and 2,500 passive
User Profile	0.10 IOPS with 20% headroom (0.12 tested)
Mailbox Size	3 GB
Drive Type and Capacity	3 TB NL SAS; 7,200 rpm
RAID Type	RAID1
Number of Drives	14 per virtual server
Mailbox Virtual Server Requirements	8 vCPUs, 96 GB RAM, 60 GB OS volume, 2 NICs
Database LUN Size (includes Log)	1,250 GB
Number of Databases	14 (7 active and 7 passive)
Number of Physical/Virtual Servers	1/1

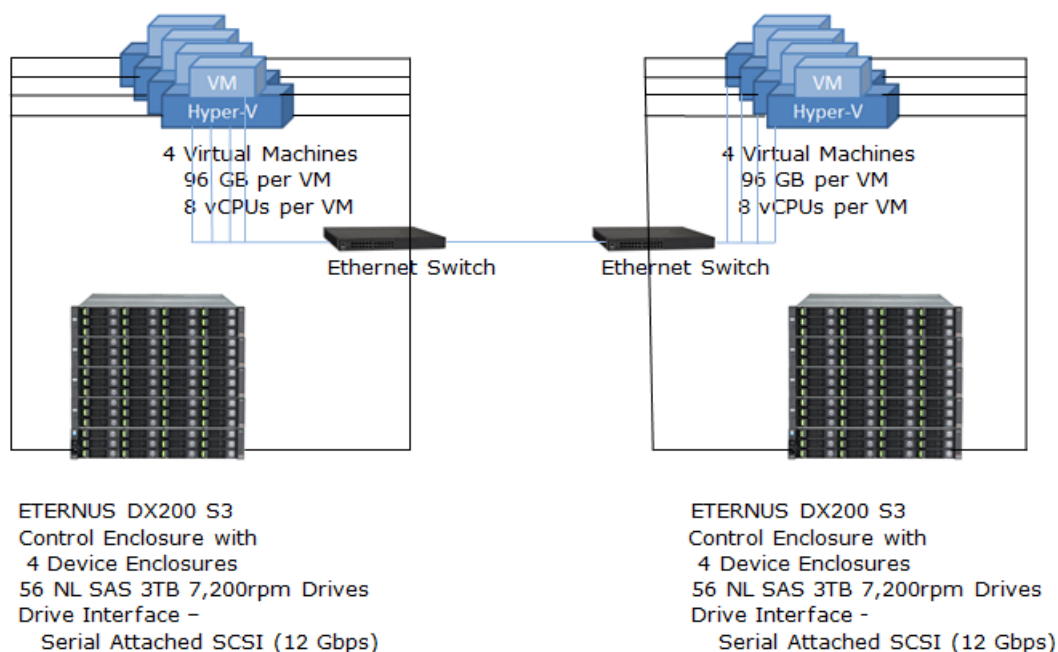


Figure 4 - Exchange Mailbox Resiliency for 20,000 Users on FUJITSU ETERNUS DX200 S3 and Microsoft Hyper-V

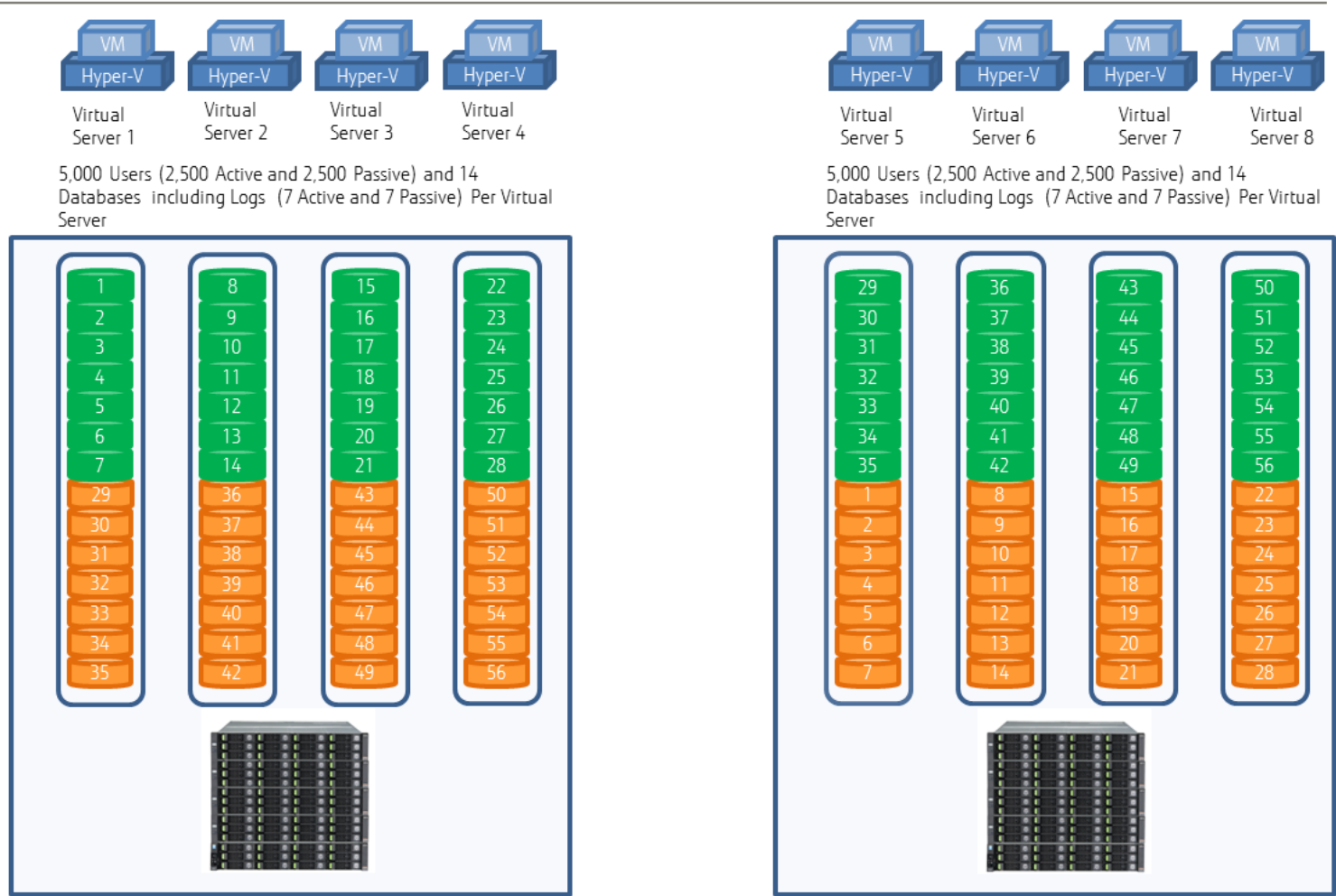


Figure 5 - Exchange Server Database Configuration

Figure 5 shows the active and passive databases supported by each virtual server. The active mailboxes are green. The passive mailboxes are orange. Using Mailbox Resiliency, a virtual machine backs up the active databases of another virtual machine.

A Mailbox Building Block consists of a virtual server and 14 disks. Each virtual server can be configured with dedicated RAID groups (Figure 6). However, with an odd number of RAID groups this results in a minor imbalance on the backend paths. Distributing the passive databases across a different set of RAID groups balances the backend load (Figure 7). The Restore Volume is Wide Striped across the 7 RAID groups.

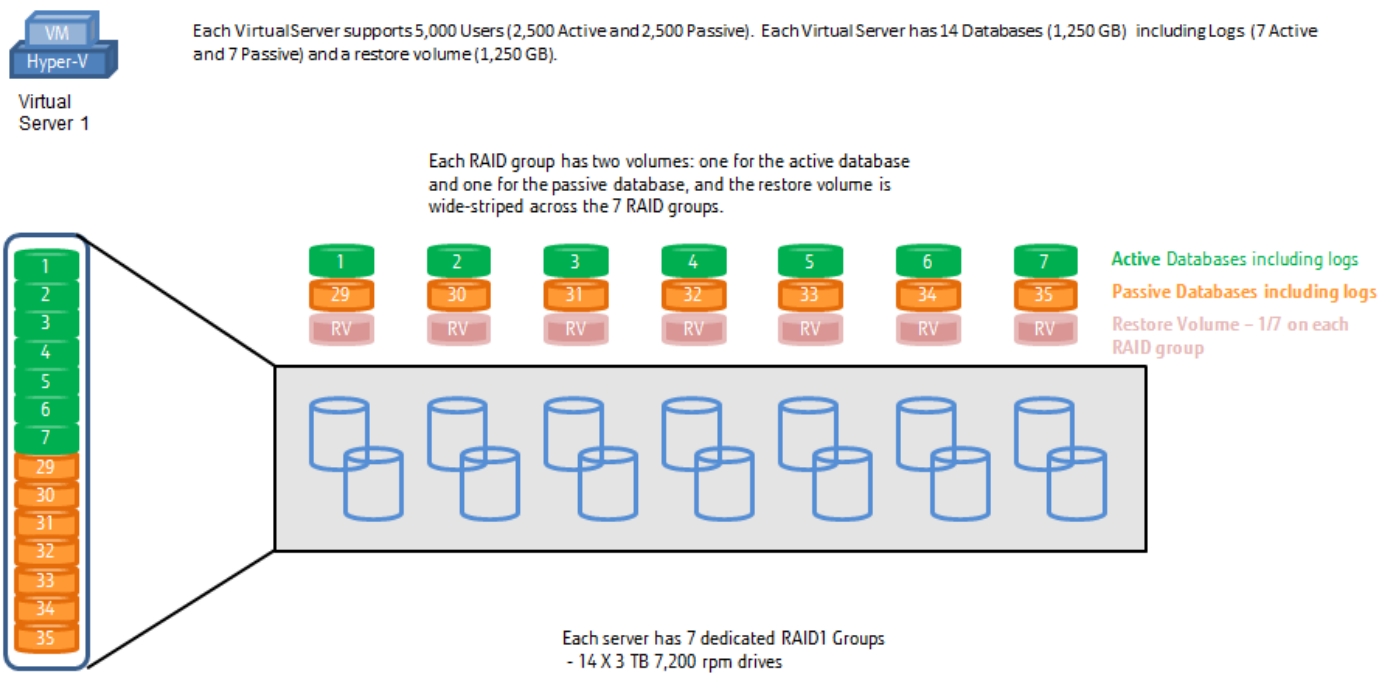


Figure 6 - Virtual Server Storage Configuration

Figure 7 shows Virtual Server 1 using a set of 7 RAID groups for its active databases and a different set of 7 RAID groups for the passive databases. Another virtual machine would use the first set of 7 RAID groups for its passive databases and the second set of 7 RAID groups for its active databases. This balances the backend accesses. When an uneven number of Mailbox Building Blocks are added to an ETERNUS storage array, the existing LUNs can be easily moved using the ETERNUS RAID Migration feature.



Figure 7 - Virtual Storage Distributed Storage Configuration

Links to WHQL certifications for Fujitsu servers and storage used in this solution:

[WHQL Certification - ETERNUS DX200 S3 With ETERNUS Multipath Driver](#)

[WHQL Certification - ETERNUS DX200 S3 With Microsoft DSM](#)

[WHQL Certification - PRIMERGY RX300 S8](#)

[WHQL Certification - PRIMERGY RX600 S5](#)

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, 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 system, please refer to Microsoft's [Troubleshooting Microsoft Exchange Server Performance](#).

4.1 Targeted Customer Profile

This solution is targeted for mid- to large-range customers with the ability to scale up as their demands grow. The solution as presented includes:

- 20,000 Mailboxes
- Mailbox quota 3 GB
- User I/O profile: 150 messages sent/received or 0.10 IOPS per mailbox (0.12 IOPS tested to include a 20% headroom)
- 24X7 Background Database Maintenance

- Mailbox Resiliency provided by Exchange Data Availability Group (DAG)

4.2 Tested Deployment

The tested environment simulates a failover condition where half of the configuration is offline. This shows the solution supporting the entire performance requirements in the worst case scenario. In the tested case all of the passive databases of the DAG are active.

Table 3 – Simulated Exchange Configuration

Number of Exchange mailboxes simulated	20,000
Number of Database Availability Groups (DAGs)	1
Number of servers/DAG	8 (4 tested)
Number of active mailboxes/server	2,500 (during normal operations) and 5,000 (tested during failover)
Number of databases/host	14 - 7 active and 7 passive during normal operations (tested all 14 active)
Number of copies/database	2
Number of mailboxes/database	357
Simulated profile: I/O's per second per mailbox (IOPS, include 20% headroom)	0.12 IOPS
Database LUN size	1,250 GB
Log LUN size	Included in Database LUN
Total database size for performance testing	4 X 7 X 1 TBs = 28 TB Active Databases 4 X 7 X 1 TBs = 28 TB Passive Databases

**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.

Table 4 – Storage Hardware

Storage Connectivity (Fiber Channel, SAS, SATA, iSCSI)	Fibre Channel (8 Gbps)
Storage model and OS/firmware revision	ETERNUS DX200 S3 with firmware V10L20 WHQL Certification - ETERNUS DX200 S3 With ETERNUS Multipath Driver
Storage cache	16 GB of cache (8 GB per CM) Write cache is mirrored. The usable cache varies between 16 GB (100% read cache) to 8 GB (100% write cache) depending on the current workload.
Number of storage controllers	2
Number of storage ports	8
Maximum bandwidth of storage connectivity to host	16 Gbps (2 X 8 Gbps)
Switch type/model/firmware revision	Direct attach (no FC switch)
HBA model and firmware	Emulex LPe12002 10.0.720.0 (1 in each for 2 Virtual Servers) QLogic QLE2560 9.1.11.28 (1 in each for 2 Virtual Servers)
Number of HBAs/host	1
Host server type	PRIMERGY RX300 S8 and PRIMERGY RX600 S5
Server type	2 X PRIMERGY RX300 S8 2 X Intel® Xeon® CPU E5-2650 v2 @ 2.60GHz 128 GB RAM 2 X PRIMERGY RX600 S5 4 X Intel® Xeon® CPU X7550 @ 2.00 GHz 128 GB RAM WHQL Certification - PRIMERGY RX300 S8 WHQL Certification - PRIMERGY RX600 S5

Please use the [Exchange 2013 Server Role Requirements Calculator](#) to estimate the mailbox server CPU and memory requirements for your planned Exchange 2013 implementation.

Table 5 - Storage Software

HBA driver	QLogic - Storport Miniport 9.1.11.28 Fiber Channel Emulex - Storport Miniport 2.74.214.004
Execution Throttle – QLogic	32
HBA Queue Target - Emulex	0
HBA Queue Depth - Emulex	32
Multi-Pathing	ETERNUS Multipath Driver V2.0 L20 (DSM for Microsoft MPIO)
Host OS	Windows® 2012 R2 DataCenter (6.2.9200.0)
ESE.dll file version	15.00.0516.026
Replication solution name/version	N/A

Table 6 - Storage Disk Configuration (Database/Log Disks)

Disk type, speed and firmware revision	ST3000NM0023, 7,200 rpm, MS0D
Raw capacity per disk (GB)	2,734
Number of physical disks in test	56
Total raw storage capacity (GB)	153,119 (2,734 * 56)
Disk slice size (GB)	1,250 GB – Active Database 1,250 GB – Passive Database 178.6 GB per RAID group – Restore Volume
Number of slices per LUN or number of disks per LUN	1 per Database 7 Restore Volume Restore Volume is Wide Striped across 7 RAID groups
RAID level	RAID1
Total formatted capacity (GB)	75,000
Storage capacity utilization	49% Total Formatted Capacity / Total Raw Capacity
Database capacity utilization	75% Total Database Capacity / Total Formatted Capacity

5 Best Practices

Exchange 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 2013 best practices on storage design, please visit: <http://technet.microsoft.com>.

5.1 Core Storage

The Fujitsu ETERNUS DX family offers a range of configuration options for maximizing performance in any environment. For the Exchange environment we found that RAID1 provides the best performance. However, we do support Thin Provisioning which has slightly less performance for this environment but allows easier configuration. The following is a list of the best practices for configuring an Exchange environment on the ETERNUS array. For a more detailed look at the ETERNUS array features please visit our website at <http://www.fujitsu.com/global/products/computing/storage/disk/eternus-dx/index.html>.

- With Windows 2008R2 and above Diskpart is no longer needed to align sector boundaries. With Windows 2003 Diskpart should be used to align the volumes initial sector to 64 KB.
- All database and log volumes should be formatted with NTFS using a cluster size of 64 KB.
- Best practice is to isolate I/O for Exchange from any other I/O on the array. Therefore, the Exchange database and logs should reside on isolated RAID Groups on the array
- It is no longer necessary in Exchange 2013 to separate the database and log I/O, therefore a single volume can be used for both database and log capacity.
- Higher performance can be achieved using RAID1 groups for the Exchange data. It is recommended that each RAID1 group contains 1 active database (and log) and 1 passive database (and log).
- The ETERNUS array can be enabled to gather performance data for volumes, ports, disks and other components on the array. This data can be used to troubleshoot any performance issues that may occur.

5.2 Virtual Server

When using virtual servers for the Exchange environment we can use either passthrough disks under Hyper-V or Virtual Fibre. When using Virtual Fibre under Hyper-V you must have a FC switch environment so that the FC HBA can use NPIV, whereas using passthrough disks allows direct connection of the Hyper-V servers to the storage array. In this testing we have used direct connection and passthrough disks, although the results would have been similar when using Virtual Fibre. Below is a list of the best practices for configuring the virtual servers:

- When using passthrough disks for the virtual servers, each Hyper-V host should have 2 FC ports attached to the storage to provide redundancy.
- When using Virtual Fibre connection for the virtual servers each virtual server should have 2 FC ports attached to the storage to provide redundancy.
- Each volume that the virtual server uses for Exchange data should be formatted with an NTFS partition using a Cluster Size of 64 KB.
- Install the Fujitsu ETERNUS multipath driver for optimal reliability either on the Hyper-V host or the virtual server depending on the environment
- Install the latest hotfixes and drivers for the OS and HBAs.
- Connection to an FC port on each of the ETERNUS Controller Modules (CMs) provides:
 - Redundancy for any path failures
 - Allows concurrent firmware upgrades
 - Distribution of load across both ETERNUS CMs
 - The preferred access to LUNs is automatically distributed across CMs by the assignment of CMs during RAID group creation

6 Backup strategy

This solution does not cover the backup strategy. However Fujitsu does offer an Exchange backup and recovery feature that integrates the ETERNUS storage arrays hardware copy functions with VSS (Volume Shadow Copy Services).

7 Contact for Additional Information

FUJITSU AMERICA, INC.

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Telephone: 800 831 3183 or 408 746 6000

Website: <http://solutions.us.fujitsu.com>

Contact Form: <http://solutions.us.fujitsu.com/contact>

Have a question? Email us at: AskFujitsu@us.fujitsu.com

8 Test Result Summary

This section provides a high level summary of the ESRP Storage Program test results. Detailed test results can be viewed by selecting the embedded links to the files containing the complete test results.

The ESRP – Storage Version 4.0 uses Jetstress 2013 to verify that the storage design meets the required disk performance and capacity requirements. Jetstress simulates an Exchange disk I/O load on a server to verify the performance and stability of a disk subsystem before it is placed in production. Jetstress is not designed to test server CPU and memory configuration. Microsoft Exchange Load Generator is a simulation tool to measure the impact of MAPI, OWA, ActiveSync, IMAP, POP and SMTP clients on Exchange servers.

8.1 Reliability

Reliability tests run 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 will be analyzed for integrity after the stress test to ensure no database/log corruption.

Results:

1. No errors reported in the saved event log file
2. No errors reported in the checksum process for the database and log files

Please refer to the attachments to this document for the detailed results of the Database Checksum and Log Checksum Tests.

8.2 Storage Performance Results

The Primary Storage performance testing is designed to exercise the storage with maximum sustainable Exchange type of I/O for 2 hours. The test is to show 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 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.

Table 7 shows the sum of I/Os across Storage Groups and the average latency across all Storage Groups on a per server basis.

Table 7 - Individual Server Metrics

Database I/O	ESRP1	ESRP2	ESRP3	ESRP4
Targeted IOPS	600	600	600	600
Achieved IOPS	823	802	800	811
Database Disks Reads/sec	566	552	551	558
Database Disks Writes/sec	258	250	249	253
Average Database Disk Read Latency (ms)	16.26	16.25	15.77	15.95
Average Database Disk Write Latency (ms)	1.94	1.98	1.80	1.95
Transaction Log I/O	ESRP1	ESRP2	ESRP3	ESRP4
Log Disks Writes/sec	183	177	177	180
Average Log Disk Write Latency (ms)	0.51	0.54	0.36	0.36

Please refer to the attachments to this document for the detailed results of the Performance Test.

Table 8 shows the sum of I/Os and the average latency across all the servers in the tested environment. This solution was designed with a target of 2,400 Exchange Server 2013 Disk Transfers per second for 20,000 users. The results are 35% over the requirement for this solution; the requirements already include 20% overhead recommended by Microsoft. This solution has 837 IOPS of reserve throughput capacity to handle times of heavier than planned client load.

Table 8 - Aggregate Performance Across All Servers

Database I/O	
Targeted Database Disks Transfers/sec	2400
Database Disks Transfers/sec	3237
Database Disks Reads/sec	2227
Database Disks Writes/sec	1010
Average Database Disk Read Latency (ms)	16.06
Average Database Disk Write Latency (ms)	1.92
Transaction Log I/O	
Log Disks Writes/sec	716
Average Log Disk Write Latency (ms)	0.4

8.3 Database Backup/Recovery Performance

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

The Database Read-only Performance test measures the maximum rate at which databases could be backed up via VSS. The following table shows the average rate for a single database file, for a single server and total for the test environment.

Table 9 - Database Read-only Performance

Database Read Operations	
MB read/sec per database	109
MB read/sec total per server	1535
MB read/sec total for test environment (4 servers)	6142

Please refer to the attachments to this document for the detailed results of the Database Backup Test.

The Transaction Log Recovery/Replay Performance test measures 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.

Table 10- Transaction Log Recovery/Replay Performance

Transaction Log Recovery	
Average time to play one Log file (sec)	3.5

Please refer to the attachments to this document for the detailed results of the Soft Recovery Test.

9 Conclusion

This document is developed by Fujitsu America, Inc., 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. A 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.

The testing of this solution demonstrates the following:

- The Fujitsu DX200 S3 storage array has the performance and capacity requirements to easily handle a Microsoft Exchange environment with the ability to scale up to 20,000 mailboxes while maintaining Storage Resiliency through Exchange's Data Resiliency Groups.
- The Fujitsu PRIMERGY Servers are an excellent choice for hosting either a Virtual Exchange environment or a Physical Exchange environment.
- The building-block approach to designing an Exchange environment provides scalability options to your Exchange designs.

As this solution shows, Fujitsu recommends the building-block approach when designing an Exchange 2013 environment. This solution uses 8 building blocks to deliver an Exchange environment that supports 20,000 mailbox users with average IOPS of 0.10 and a mailbox size of 3 GB. Each building-block supports 2,500 active users and an additional 2,500 passive users providing mailbox resiliency through Exchanges DAG. The testing shows that even with half of the environment offline and allowing for a 20% overhead in the IOPS for each user the solution can still provide an additional 35% overhead in performance to handle periods of unplanned extraordinary high client load and to accommodate future growth. Additional scalability for future growth is provided by the DX200 S3 support of up to 264 disk drives and field model upgrades.

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