

IBM TotalStorage Proven™ program

Network Appliance V-Series Storage Virtualization System



Testing Template:

This document will be used to describe, from a technical perspective, the elements that were included as part of the IBM TotalStorage Proven testing. It is intended to give an overall picture of the technical elements of the configuration, with a brief description of the results of the testing including any specific highlights of the interoperability results.

High-level architecture/description, include a list of products that meet the compatibility requirements ("Approved Product(s)") as well as a list of the IBM storage products with which the Approved Products meet the compatibility requirements ("Qualified IBM Storage Products"):

The NetApp® V-Series, an evolution of the NetApp enterprise gFile™ product line, is a network-based virtualization solution that virtualizes tiered, heterogeneous storage arrays and provides unified SAN and NAS access to data stored in one or more Fiber Channel SAN or direct attached TotalStorage Enterprise Storage Server (ESS) Model 800 Turbo, Model 800, Model 750, Model F20, Model F10, DS4500, DS4400, DS4300 Turbo and DS4300 arrays enabling data center storage deployment for an expanded set of business solutions. The V-Series product line, consisting of the GF980, GF960, GF940, GF920, GF825 and GF270c models and clustered versions, is based on the industry-hardened Data ONTAP™ microkernel operating system that supports multiprotocol services and advanced data management capabilities for consolidating, protecting, and recovering mission-critical data for enterprise applications and users.

Testing scenario:

In the test scenarios, one or more NetApp V-Series systems were FC SAN attached and direct attached to the ESS Model 800, Model F20 and DS4000 series - Models 4500 and 4300. NAS, iSCSI and FCP protocols read from and wrote to Volumes created from the Array LUNs. Functional and exception testing was performed to ensure the robustness of the solution. Additional testing validated the broad suite of NetApp data consolidation, data management, data

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protection and business continuance solutions for use with the V-Series and IBM storage. The following illustrate sample configurations used during testing.

V-Series Switch Attached Configurations (1)

Data Access Characteristics

- Support for NAS Access
- Support for iSCSI Access
- Support for FCP Access

V-Series Characteristics

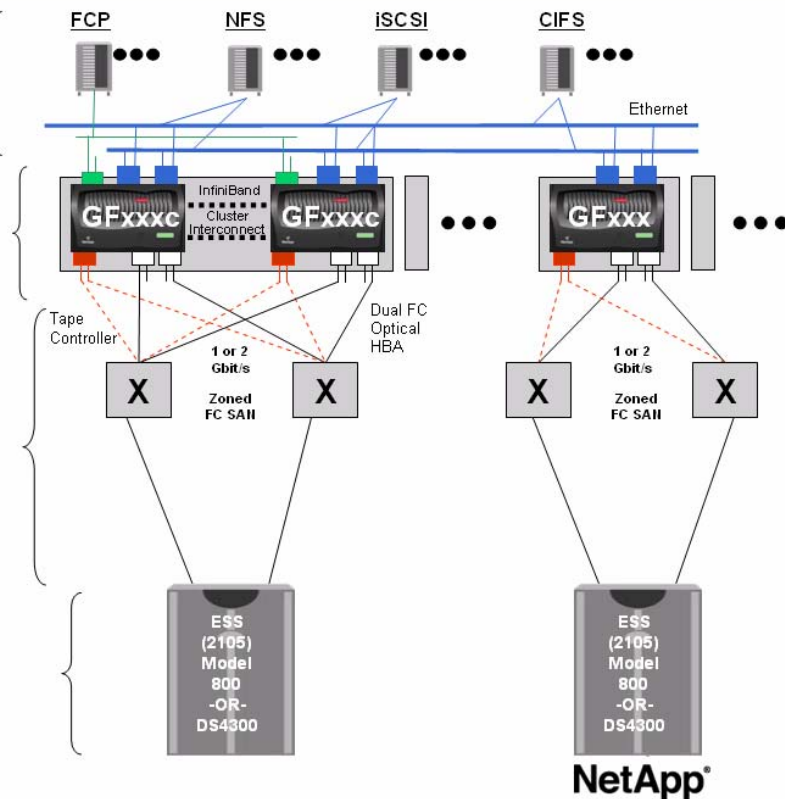
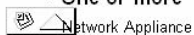
- Support for GF9xx, GF9xxc
- Support for GF825, GF825c
- Support for GF270c
- One or more; Any model
- 1 or 2 Gbit/s
- Volume within 1; across >1 array

SAN Characteristics

- Switch Manufacturer
 - Brocade 3x00/12000
 - McDATA 32xx, 4x00, 6xxx
 - Cisco 95xx, 92xx, 91xx
- Topology
 - 2 Separate SANs
 - Single Switch Level
- Shared switch with host/tape
- 1 or 2 Gbit/s
- Redundant Path
- Multi Mode Fibre

Storage Array Characteristics

- ESS Model 750, 800, 800 Turbo, F10, F20
- DS4300, DS4300 Turbo, DS4400, DS4500 w/EXP7xx
- Shared Ports
- One or more



V-Series Switch Attached Configurations (2)

Data Access Characteristics

- Support for NAS Access
- Support for iSCSI Access
- Support for FCP Access

V-Series Characteristics

- Support for GF9xx, GF9xxc
- Support for GF825, GF825c
- Support for GF270c
- One or more; Any model
- 1 or 2 Gbit/s
- Volume within 1; across >1 array

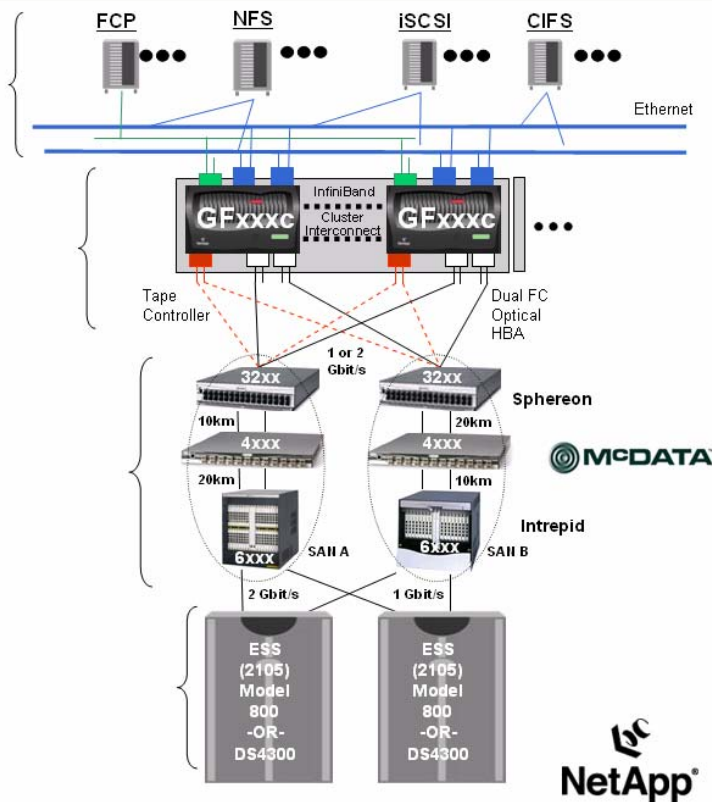
SAN Characteristics

- Switch Manufacturer
 - McDATA 32xx, 4x00, 6xxx
- Topology
 - 2 Separate SANs
 - Up to Three Switch Levels
 - Up to 30km (V-Series to array)
- Shared switch with host/tape
- 1 or 2 Gbit/s
- Redundant Path
- Multi Mode / Single Mode Fibre

Storage Array Characteristics

- ESS Model 750, 800, 800 Turbo, F10, F20
- DS4300, DS4300 Turbo, DS4400, DS4500 w/EXP7xx
- Shared Ports
- One or more

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V-Series Switch Attached Configurations (3)

Data Access Characteristics

- Support for NAS Access
- Support for iSCSI Access

V-Series Characteristics

- Support for GF9xx, GF9xxc
- Support for GF825, GF825c
- One or more; Any model
- 1 or 2 Gbit/s
- Volume within 1; across >1 array
- MetroCluster

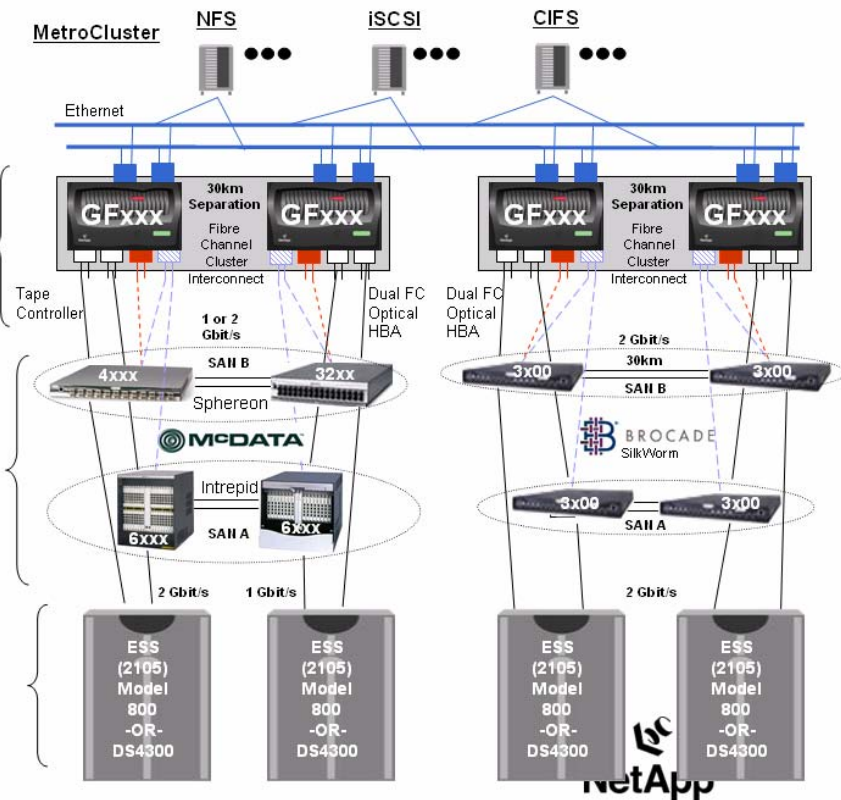
SAN Characteristics

- Switch Manufacturer
 - McDATA 32xx, 4x00, 6xxx
 - Brocade 3800/3200
- Topology
 - 2 Separate SANs
 - One Switch Level
 - Up to 30km between sites
- Shared switch with host/tape
- 1 or 2 Gbit/s
- Redundant Path
- Multi Mode / Single Mode Fibre

Storage Array Characteristics

- ESS Model 750, 800, 800 Turbo
- ESS Model F20, F10
- DS4300, 4300 Turbo, 4400, 4500 w/ EXP7xx
- Shared Ports
- One or more

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V-Series Direct Attached Configurations

Data Access Characteristics

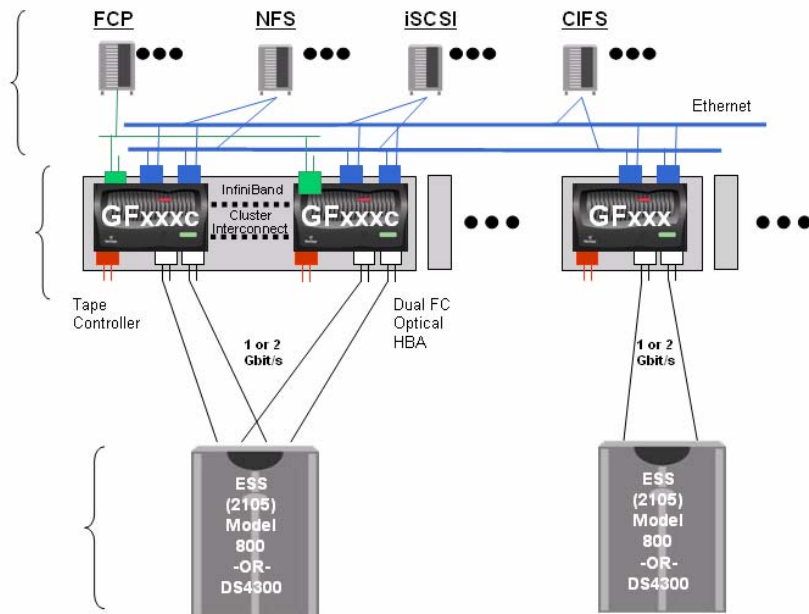
- Support for NAS Access
- Support for iSCSI Access
- Support for FCP Access

V-Series Characteristics

- Support for GF9xx, GF9xxc
- Support for GF825, GF825c
- Support for GF270c
- One or more; Any model
- 1 or 2 Gbit/s
- Volume within 1; across >1 array

Storage Array Characteristics

- ESS Model 750, 800, 800 Turbo, F10, F20
- DS4300, DS4300 Turbo, DS4400, DS4500 w/EXP7xx
- One or more



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Testing level achieved: **Comprehensive**

- Standard: The standard test consists of elements like install, configuration, load, exercise I/O, and backup/restore testing.
- **Comprehensive**: Comprehensive testing would include the standard testing in addition to a much higher level of integration and failure testing. In either case, these tests are customized for the specific product(s) being tested, and in consultation with the participant.
- The level is determined by IBM based on the test plan and results.

Include any specific test cases that go beyond the standard or comprehensive levels.

NetApp performed months of testing to ensure basic and advanced functionality operated as expected and exception testing to ensure proper operation under various failure modes. IBM determined that the NetApp testing qualified for Comprehensive certification.

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Test Environment:

The NetApp test environment consisted of GF9xx, GF825 and GF270c servers running Data ONTAP 7.0x connected directly as well as through fibre channel switches to IBM storage arrays that included IBM ESS Model 800, Model F20, DS4400 and DS4300 arrays. Various clients, running Solaris, Linux, Windows, etc., mounted volumes created from storage array LUNS and then accessed (read/wrote) data within the volumes using protocols such as NFS, CIFS, HTTP, iSCSI and FCP.

Testing included network stress and storage stress tests while injecting errors (mostly in the storage areas). In a clustered configuration, V-Series failover was executed continuously under the same conditions.

NetApp performed testing across all areas of product functionality. Features such as multi-protocol access using NFS, CIFS, and iSCSI and workload balancing using SnapMover were exercised to provide data consolidation solutions. Features such as clustering and multipath IO were exercised to provide high availability solutions. Features such as Snapshot, SnapRestore, tape backup, and disk-to-disk backup were exercised to provide data protection solutions. Features such as MetroCluster and SyncMirror were exercised to provide site failover and storage array failure solutions. In addition, features such as LAN, WAN and MAN replication were exercised to provide business continuity solutions. The combination of features and optional software products when used with the gFiler solution enable proven, simple and reliable data management capabilities in IBM storage array environments. The complete listing of optional software products follow.

V-Series Software	Link
NFS, CIFS, HTTP, FTP, WebDAV Protocols	http://netapp.com/products/software/ontap.html http://netapp.com/solutions/nas.html
iSCSI Protocol	http://www.netapp.com/solutions/iscsi-technology.html
FCP Protocol	http://netapp.com/solutions/fcsan.html
ApplianceWatch	http://netapp.com/products/software/appliancewatch.html
Clustered Failover	http://netapp.com/products/software/clustered.html
DataFabric Manager (DFM)	http://netapp.com/products/software/datafabric.html
FilerView	http://www.netapp.com/products/gateway/filerview.html
FlexVol and FlexClone	http://netapp.com/products/software/flex.html
MetroCluster	http://netapp.com/products/software/metrocluster.html
MultiStore	http://netapp.com/products/software/multistore.html
Single Mailbox Recovery for Exchange	http://netapp.com/products/software/smbr.html
SnapDrive	http://netapp.com/products/software/snapdrive.html
SnapLock Enterprise	http://netapp.com/products/software/snaplock.html
SnapManager for Microsoft Exchange	http://netapp.com/products/software/snapmanager-exchange.html
SnapManager for Microsoft SQL	http://netapp.com/products/software/snapmanager-sql.html

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Server	
SnapMirror	http://netapp.com/products/software/snapmirror.html
SnapMover	http://netapp.com/products/software/snapmover.html
SnapRestore	http://netapp.com/products/software/snaprestore.html
SnapValidator	http://netapp.com/products/software/snapvalidator.html
SnapVault	http://netapp.com/products/software/snapvault.html
SyncMirror	http://netapp.com/products/software/syncmirror.html
Virtual File Manager	http://netapp.com/products/software/vfm.html

The V-Series Specification sheet lists additional hardware features supported. The V-Series Specification sheet is located at the following link:
<http://netapp.com/ftp/v-series-specs.pdf>

Test Configuration:

Data ONTAP 7.0x release level was tested with GF980, GF980c, GF960, GF960c, GF940, GF940c, GF920, GF920c, GF825, GF825c and GF270c systems. The required firmware and drivers for the various networking, storage, tape and cluster interconnect adapters are bundled with Data ONTAP 7.0x. See the appropriate sections in the Specifications sheet (<http://netapp.com/ftp/v-series-specs.pdf>) for a complete listing including the supported Brocade and McDATA Fibre Channel switch/director components and firmware levels.

NetApp has certified various System Management, Data Consolidation, Data Availability, Data Protection, Business Continuity and Storage Management solutions with Data ONTAP 7.0x and the V-Series product line. See the software sections in the Specifications sheet (<http://netapp.com/ftp/v-series-specs.pdf>) for a complete listing.

Tape devices supported with Data ONTAP 7.0x are in the specification sheet and at http://www.netapp.com/solutions/data_protection_devices.html. Backup software products are at http://www.netapp.com/solutions/data_protection_matrix.html and Fibre Channel TapeSAN Backup solutions are at <http://www.netapp.com/osn/info/config.html>. Virtual Tape Library (VTL) solutions are at: http://www.netapp.com/osn/info/config_vtl.html.

Test Results:

Between May 14, 2004 and January 21, 2005 all tests were completed and passed successfully.

To ensure the solution follows the NetApp philosophy of simplicity, NetApp created guides that provide configuration rules and best practices. NetApp created the gFiler Integration Guide for IBM® Storage that describes what a V-Series system is, supported platforms, configuration rules for LUNs and ports, and configuration and installation information that is specific to the storage

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system. NetApp also created a gFiler Gateway Series Software Setup, Installation, and Management Guide that describes how to perform initial setup and installation of Data ONTAP software on a new V-Series system and tasks for managing the V-Series systems on an ongoing basis, for example, managing volumes and LUNs. Both documents along with the entire complement of Data ONTAP and platform manuals ship with each V-Series system. The NetApp on the Web (NOW) Customer Satisfaction website also contains all documents. In addition, NetApp and IBM Global Services have jointly developed an integration service for this solution.

Support Contacts:

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Americas (North Carolina)		
Global Support Center - Durham, NC, USA Network Appliance 627 Davis Drive, Suite 200 Durham, NC 27713 (Delivery) Morrisville, NC 27560 (Mailing)	0700 - 1900 EST	Phone: 919-991-0556
Europe, Middle East, Africa		
Global Support Center - Hoofddorp, Netherlands Network Appliance BV Scorpius 2 2132 LR Hoofddorp The Netherlands	0700 - 1900 CET	Phone: +31-(0)23-567 9600 (main)

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