BROCADE

VALIDATION TEST REPORT

Cirrus Data Migration with the SolidFire SF Fibre Channel Flash Array in a Brocade FC SAN, FOS 8.0.1b

Supporting Fabric OS 8.0.1b

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Contents

Document History

Date	Part Number	Description
January 2017	53-1004963-01	Initial Release.

Introduction

The goal of this document is to demonstrate the compatibility of Cirrus DMS storage migration appliance in a Brocade FC SAN fabric running FOS v8.0.1b. This document provides a test report on the test plan executed on the Cirrus DMS appliance.

The DMS appliance is tested in a Host-Side and Storage-Side intercept mode. The testing focuses on different stress and error recovery scenarios and validating IO integrity and data integrity during and post migration.

Configure DUT and Test Equipment

Task 1. Configure Destination Storage Resources on Cirrus DMS Appliance

1. Connect the DMS "Destination Storage Resource Ports" and the Destination Storage target ports to the Brocade FC Fabric and set up FC zones between them.

```
zone:  cirrus_dms_dst_solidfire
                21:00:00:24:ff:41:14:1e; 21:00:00:24:ff:41:14:1f;
                5f:47:ac:c0:49:24:03:00; 5f:47:ac:c0:49:24:03:01;
                5f:47:ac:c0:49:24:03:08; 5f:47:ac:c0:49:24:03:09
```

2. Provision LUNs on the destination storage for migration and rescan the DMS appliance to discover the LUNs.
3. Assign the discovered LUNs as a "Migration Resource" on the Cirrus DMS appliance.

Test Configuration

DUT Descriptions

The following tables provide details about the devices under test (DUT).

TABLE 1 Cirrus Data Migration Server (DMS) Appliance

DUT ID	Model	Vendor	Description
Cirrus DMS4000	4000	CirrusData	The Cirrus DMS appliance is a data migration solution designed for the purpose of efficiently, transparently, and safely migrating data from any-to-any legacy or cloud storage. The DMS Appliance consists of two Destination FC ports and four pairs of Nexus ports for intercepting source storage.

TABLE 2 Switch

DUT ID	Model	Vendor	Description
G620-1,2	Brocade G620	Brocade	64-port 32Gb FC switch
6510-1,2	Brocade 6510	Brocade	48-port 16Gb FC switch

TABLE 3 Destination Storage

DUT ID	Model	Vendor	Description
SolidFire SF FibreChannel	SF FibreChannel	SolidFire	The SF FibreChannel array is an all-flash array setup in a clustered architecture with four storage nodes and two Fibre Channel controller nodes. Each controller node has 4x16Gb FC ports in an active-active configuration.

DUT Specifications

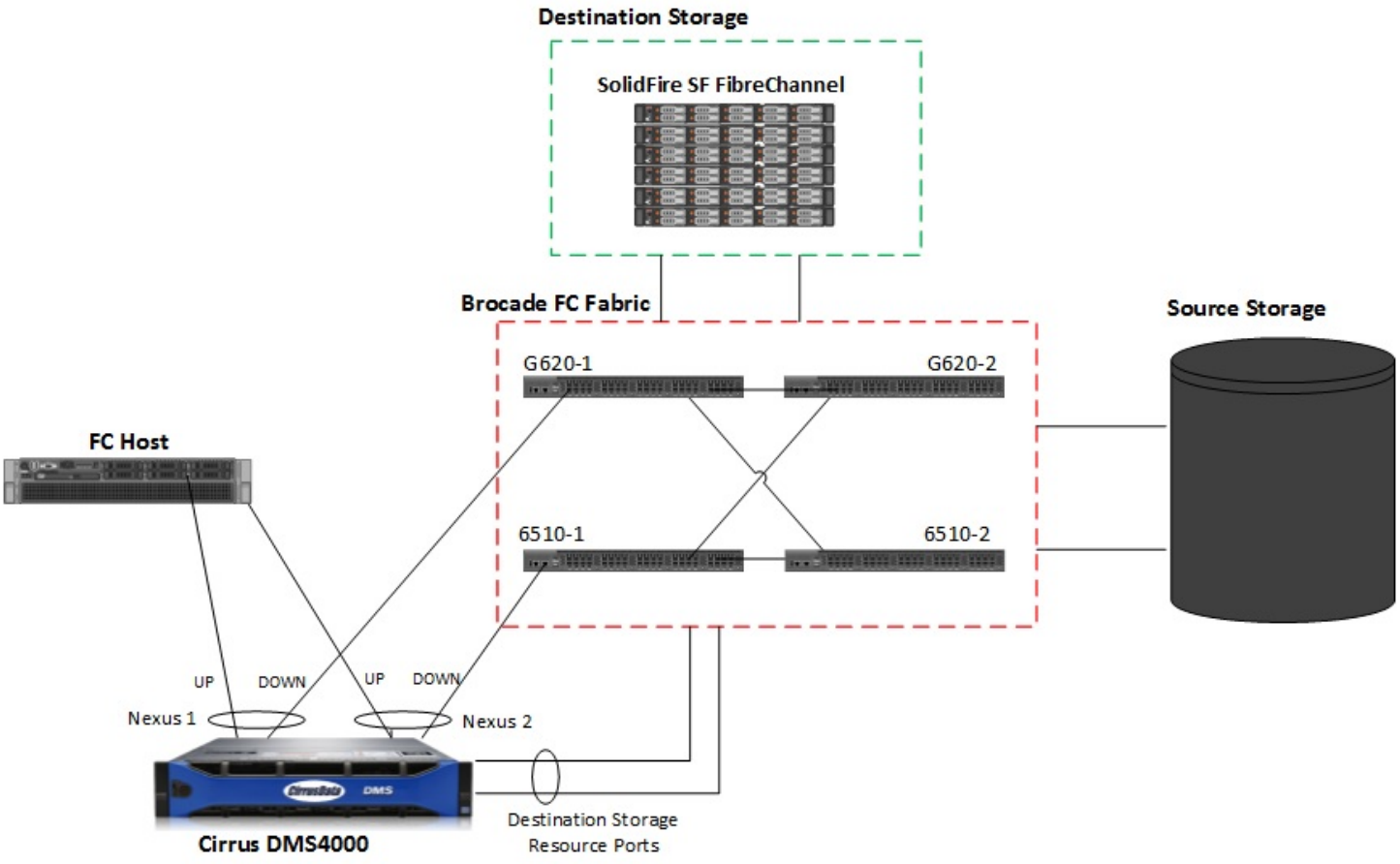
Cirrus DMS Appliance	Version
Cirrus DMS4000	4.10.4122

Destination Storage	Version
SolidFire SF FibreChannel array	8.2.0.198

Brocade Switches	Version
Brocade G620	FOS v8.0.1b
Brocade 6510	FOS v8.0.1b

Topology 1—Cirrus DMS in Host Side - Physical Intercept Mode

FIGURE 1 Cirrus DMS in Host Side—Physical Intercept Mode



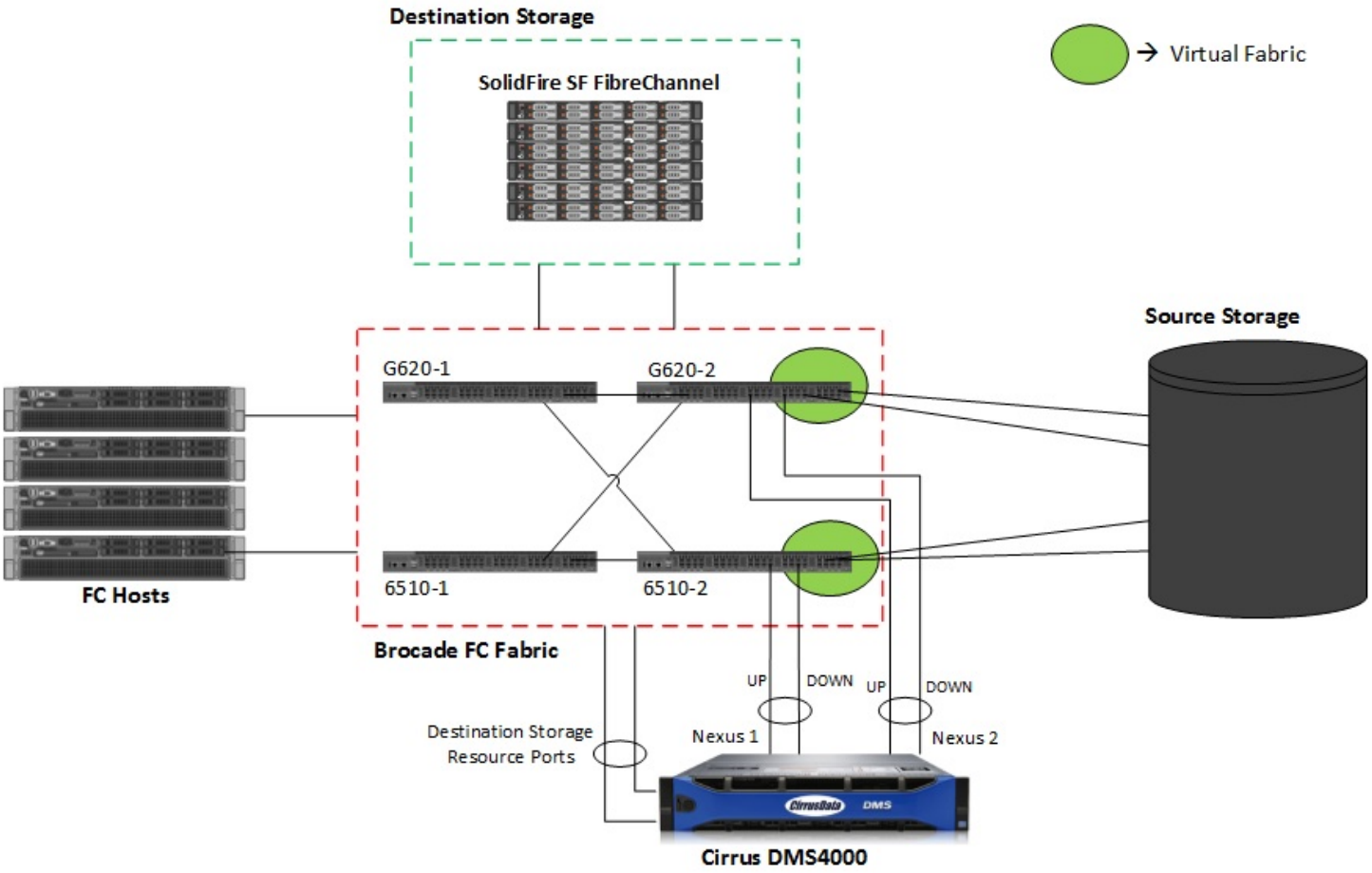
1. We assume host is configured to access LUNs on the source storage and the required zoning configuration exists in the Brocade fabric.
2. Configure DMS in "Host Side - Physical" intercept mode.
3. Insert the DMS Nexus ports in the host path and rescan the DMS appliance to auto-discover the initiator, target, and LUN from all Nexus ports.

4. After DMS insertion, the host ports login as NPIV ports on the switch.

```
B6510_066_073:root> switchshow
switchName:     B6510_066_073
switchType:     109.1
switchState:    Online
switchMode:     Native
switchRole:     Subordinate
switchDomain:   73
switchId:       fffc49
switchWwn:      10:00:00:05:33:13:95:9a
zoning:         ON (SSR)
switchBeacon:   OFF
FC Router:      OFF
FC Router BB Fabric ID: 128
Address Mode:   0
Fabric Name:    SSR
HIF Mode:       OFF

Index Port Address  Media Speed   State       Proto
==================================================
21  21   491500   id    N8      Online      FC  F-Port  1 N Port + 1 NPIV public

B6510_066_073:root> portshow 21
portIndex:  21
portName: port21
portHealth: HEALTHY

Authentication: None
portDisableReason: None
portCFlags: 0x1
portFlags: 0x20b03       PRESENT ACTIVE F_PORT G_PORT U_PORT NPIV LOGICAL_ONLINE LOGIN NOELP ACCEPT
FLOGI
LocalSwcFlags: 0x0
portType:  24.0
POD Port: Port is licensed
portState: 1    Online
Protocol: FC
portPhys:  6    In_Sync         portScn:   32   F_Port
port generation number:    2044
state transition count:    69
portId:    491500
portIfId:    43020011
portWwn:   20:15:00:05:33:13:95:9a
portWwn of device(s) connected:
21:00:00:0e:1e:1b:f1:20
        21:00:00:24:ff:4f:49:5e
Distance:  normal
portSpeed: N8Gbps
```

Topology 2—Cirrus DMS in Storage Side - Logical (Multi-Target) Intercept Mode

FIGURE 2 Cirrus DMS in Storage Side—Logical Intercept Mode



1. We assume hosts are configured to access LUNs on the source storage and the required zoning configuration exists in the Brocade fabric.
2. Configure DMS in "Storage Side - Logical (Multi-Target)" intercept mode. In this mode, the DMS insertion method uses WWPN impersonation (spoofing) to transparently redirect the I/O through the DMS. Upon successful interception, the Upstream port spoofs the Storage Target port of the Source Storage and the Downstream port spoofs the Host Initiator ports.
3. Connect the DMS Nexus Upstream and Downstream ports to the same switch as the source storage targets ports. Figure 2 shows Nexus 1 connected to 6510-2 and Nexus 2 connected to G620-2; with the source storage ports evenly distributed across the two switches for redundancy.
4. Configure a Virtual Fabric on Brocade switch and move the Downstream Nexus ports and the source storage target ports to the VF and zone them together.

5. Perform the below steps on both 6510-2 and G620-2 from Figure 2.

   a) Enable Virtual Fabric and create Logical Switch.

```
G620_066_224:FID128:root> fosconfig --enable vf
WARNING:  This is a disruptive operation that requires a reboot to take effect.
All EX ports will be disabled upon reboot.
Would you like to continue [Y/N]: Y
VF has been enabled.  Your system is being rebooted.

G620_066_224:FID128:root> fosconfig --show
FC Routing service:             disabled
Virtual Fabric:                 enabled

G620_066_224:FID128:root> lscfg --create 60
A Logical switch with FID 60 will be created with default configuration.
Would you like to continue [y/n]?: y
About to create switch with fid=60. Please wait...
Logical Switch with FID (60) has been successfully created.

Logical Switch has been created with default configurations.
Please configure the Logical Switch with appropriate switch and protocol settings before
activating the Logical Switch.

G620_066_224:FID128:root> setcontext 60

G620_066_224:FID128:root> switchdisable

G620_066_224:FID128:root> configure

Configure...

  Fabric parameters (yes, y, no, n): [no] y

    Domain: (1..239) [1] 60
    CTRL-D

WARNING: The domain ID will be changed. The port level zoning may be affected

switch_60:FID60:root> switchenable
```

   b) Add Nexus Downstream port to the Virtual Fabric.

```
switch_60:FID60:root> lscfg --config 60 -port 17
This operation requires that the affected ports be disabled.
Would you like to continue [y/n]?: y
Making this configuration change.  Please wait...
Configuration change successful.
Please enable your ports/switch when you are ready to continue.

switch_60:FID60:root> portenable 17
```

   c) Create zones to allow Nexus downstream port to connect to storage targets. Zones need to be created before moving the storage target ports into the Virtual Fabric.

```
switch_60:FID60:root> zonecreate --peerzone “dms_src_storage” -principal “60,17” -members
“60,20; 60,21”

switch_60:FID60:root> cfgcreate DMS_2, "dms_src_storage"

switch_60:FID60:root> cfgenable DMS_2
```

   d) Add storage target ports to the Virtual Fabric.

```
switch_60:FID60:root> lscfg --config 60 -port 20-21
This operation requires that the affected ports be disabled.
Would you like to continue [y/n]?: y
Making this configuration change.  Please wait...
Configuration change successful.
```

```
Please enable your ports/switch when you are ready to continue.

switch_60:FID60:root> portenable 20-21
```

e) Virtual Fabric configuration summary.

```
switch_60:FID60:root> switchshow
switchName:     switch_60
switchType:     162.0
switchState:    Online
switchMode:     Native
switchRole:     Principal
switchDomain:   60
switchId:       fffc3c
switchWwn:      10:00:c4:f5:7c:41:1b:15
zoning:         ON (DMS_2)
switchBeacon:   OFF
FC Router:      OFF
HIF Mode:       OFF
Allow XISL Use: ON
LS Attributes:  [FID: 60, Base Switch: No, Default Switch: No, Address Mode 0]

Index Port Address  Media Speed   State       Proto
==================================================
  17  17   3c0000   id    N8      Online      FC  F-Port  1 N Port + 6 NPIV public
  20  20   3c1000   id    N16     Online      FC  F-Port  10:00:8c:7c:ff:24:9c:00
  21  21   3c1100   id    N16     Online      FC  F-Port  10:00:8c:7c:ff:24:9c:01


switch_60:FID60:root> cfgactvshow
Effective configuration:
 cfg:   DMS_2
 zone:  dms_src_storage
                00:02:00:00:00:02:00:01
                60,17
                60,20
                60,21

switch_60:FID60:root> portshow 17
portIndex:  17
portName: port17
portHealth: HEALTHY

Authentication: None
portDisableReason: None
portCFlags: 0x1
portFlags: 0x20b03       PRESENT ACTIVE F_PORT G_PORT U_PORT NPIV LOGICAL_ONLINE LOGIN NOELP
ACCEPT FLOGI
LocalSwcFlags: 0x0
portType:  26.0
POD Port: Port is licensed
portState: 1    Online
Protocol: FC
portPhys:  6    In_Sync         portScn:   32   F_Port
port generation number:    20
state transition count:    5

portId:    3c0000
portIfId:    4302002d
portWwn:   20:11:c4:f5:7c:41:1b:15
portWwn of device(s) connected:
        21:00:00:0e:1e:1b:f1:20
        10:00:8c:7c:ff:14:e0:01
        10:00:8c:7c:ff:4f:ca:01
        21:00:00:0e:1e:1b:f1:21
        10:00:8c:7c:ff:14:e0:00
        10:00:8c:7c:ff:4f:ca:00
        21:00:00:24:ff:4f:49:5d
Distance:  normal
portSpeed: N8Gbps
```

f) Nexus upstream port state in the default switch.

```
G620_066_224:FID128:root> switchshow
switchName:     G620_066_224
switchType:     162.0
switchState:    Online
switchMode:     Native
switchRole:     Subordinate
switchDomain:   224
switchId:       fffce0
switchWwn:      10:00:c4:f5:7c:41:1b:14
zoning:         ON (SSR)
switchBeacon:   OFF
FC Router:      OFF
Fabric Name:    SSR
HIF Mode:       OFF
Allow XISL Use: OFF
LS Attributes:  [FID: 128, Base Switch: No, Default Switch: Yes, Address Mode 0]
……
18  18   e01200   id    N8      Online      FC  F-Port  1 N Port + 2 NPIV public

G620_066_224:FID128:root> portshow 18
portIndex:  18
portName: port18
portHealth: HEALTHY

Authentication: None
portDisableReason: None
portCFlags: 0x1
portFlags: 0x20b03       PRESENT ACTIVE F_PORT G_PORT U_PORT NPIV LOGICAL_ONLINE LOGIN NOELP
ACCEPT FLOGI
LocalSwcFlags: 0x0
portType:  26.0
POD Port: Port is licensed
portState: 1    Online
Protocol: FC
portPhys:  6    In_Sync         portScn:   32   F_Port
port generation number:    396
state transition count:    36

portId:    e01200
portIfId:    4302002a
portWwn:   20:12:c4:f5:7c:41:1b:14
portWwn of device(s) connected:
        10:00:8c:7c:ff:24:9c:00
        10:00:8c:7c:ff:24:9c:01
        21:00:00:24:ff:4f:49:5c
Distance:  normal
portSpeed: N8Gbps
```

Test Cases

The following test cases are designed to verify both basic and advanced functionality features between the Brocade FC fabric, Cirrus DMS migration appliance (DUT), storage arrays and host devices, to stress all devices and confirm successful error recovery.

1.	**Cirrus DMS in Host Side—Physical Intercept Mode**
1.1	Physical and Logical Login with Zoning and LUN Mapping
1.2	Host Device IO Integrity and Path Recovery
1.3	Host Device IO Integrity—Congested Fabric
1.4	Host Device LUN Migration—Data Integrity
1.5	Host Device LUN Migration—Congested Fabric
1.6	Host Device LUN Migration—Port Toggles
1.7	Host Device LUN Migration—Switch Offline
2.	**Cirrus DMS in Storage Side—Logical Intercept Mode**
2.1	Physical and Logical Login with Zoning and LUN Mapping
2.2	Storage Device IO Integrity and Path Recovery
2.3	Storage Device IO Integrity—Congested Fabric
2.4	Storage Device LUN Migration—Data Integrity
2.5	Storage Device LUN Migration—Congested Fabric
2.6	Storage Device LUN Migration—Port Toggles
2.7	Storage Device LUN Migration—Switch Offline

1. Cirrus DMS in Host Side—Physical Intercept Mode

1.1 Physical and Logical Login with Zoning and LUN Mapping

Test Objective

1. Verify host device login to switch and name-server with all supported speed settings.
2. Verify host to LUN access exists with valid zoning.
3. Run read/write/mix IO and verify IO integrity with DMS in IO path.

Test Results

PASS. Speed negotiation, device login, and connectivity verified.

PASS. Host has read/write access to presented LUNs.

PASS. All I/O completed without errors.

1.2 Host Device IO Integrity and Path Recovery

Test Objective

1. Validate multipath host-to-LUN IO integrity with write/read/verify testing.
2. Perform cable pulls/port-toggles and validate IO integrity and path recovery with DMS in IO path.

Test Results

PASS. I/O fails over to remaining active paths and recovers when disrupted path is restored.

1.3 Host Device IO Integrity—Congested Fabric

Test Objective

1. From all available initiators, start a mixture of read/write/verify traffic with random data patterns continuously to all their targets.
2. Configure fabric and devices for maximum link and device saturation.
3. Verify no host application failover or unexpected change in I/O throughput occurs.

Test Results

PASS. All I/O completed without errors.

1.4 Host Device LUN Migration—Data Integrity

Test Objective

1. Start Host device LUN migration to provisioned destination storage LUNs from DMS.
2. Verify migration completes successfully and validate data integrity of destination LUNs using MD5 checksum check and internal DMS block level device check.

Test Results

PASS. All migration sessions completed successfully.

PASS. All destination LUNs passed data integrity checks.

1.5 Host Device LUN Migration—Congested Fabric

Test Objective

1. From all available initiators, start a mixture of read/write/verify traffic with random data patterns continuously to all their targets.
2. Configure fabric and devices for maximum link and device saturation.
3. Start Host device LUN migration to provisioned destination storage LUNs from DMS.

4. Verify migration completes successfully and validate data integrity on destination LUNs.

Test Results

PASS. All migration sessions completed and passed disk verification.

PASS All fabric I/O completed without errors.

1.6 Host Device LUN Migration—Port Toggles

Test Objective

1. With a DMS migration in process, perform a sequential port toggle on the source and destination storage target ports, host initiator ports and DMS Nexus ports in the fabric.
2. Verify migration session recovers and completes successfully.
3. Validate data integrity on destination LUNs.

Test Results

PASS. All migration sessions completed.

PASS. All destination LUNs passed disk verification.

1.7 Host Device LUN Migration—Switch Offline

Test Objective

1. With a DMS migration in process, sequentially toggle each switch in the fabric by performing switch disable/enable and switch reboots.
2. Verify migration session recovers and completes successfully.
3. Validate data integrity on destination LUNs.

Test Results

PASS. All migration sessions completed.

PASS. All destination LUNs passed disk verification.

2. Cirrus DMS in Storage Side—Logical Intercept Mode

2.1 Physical and Logical Login with Zoning and LUN Mapping

Test Objective

1. Verify storage device login to switch and name-server with all supported speed settings.
2. Verify host to LUN access exists with valid zoning.
3. Run read/write/mix IO and verify IO integrity with DMS in IO path.

Test Results

PASS. Speed negotiation, device login, and connectivity verified.

PASS. Host has read/write access to presented LUNs.

PASS. All I/O completed without errors.

2.2 Storage Device IO Integrity and Path Recovery

Test Objective

1. Validate multipath host-to-LUN IO integrity with write/read/verify testing.
2. Perform cable pulls/port-toggles and validate IO integrity and path recovery with DMS in IO path.

Test Results

PASS. I/O fails over to remaining active paths and recovers when disrupted path is restored.

2.3 Storage Device IO Integrity—Congested Fabric

Test Objective

1. From all available initiators, start a mixture of read/write/verify traffic with random data patterns continuously to all their targets.
2. Configure fabric and devices for maximum link and device saturation.
3. Verify no host application failover or unexpected change in I/O throughput occurs.

Test Results

PASS. All I/O completed without errors.

2.4 Storage Device LUN Migration—Data Integrity

Test Objective

1. Start storage device LUN migration to provisioned destination storage LUNs from DMS.
2. Verify migration completes successfully and validate data integrity of destination LUNs using MD5 checksum check and internal DMS block level device check.

Test Results

PASS. All migration sessions completed successfully.

PASS. All destination LUNs passed data integrity checks.

2.5 Storage Device LUN Migration—Congested Fabric

Test Objective

1. From all available initiators, start a mixture of read/write/verify traffic with random data patterns continuously to all their targets.
2. Configure fabric and devices for maximum link and device saturation.
3. Start source storage device LUN migration to provisioned destination storage LUNs from DMS.
4. Verify migration completes successfully and validate data integrity on destination LUNs.

Test Results

PASS. All migration sessions completed and passed disk verification.

PASS All fabric I/O completed without errors.

2.6 Storage Device LUN Migration—Port Toggles

Test Objective

1. With a DMS migration in process, perform a sequential port toggle on the source and destination storage target ports, host initiator ports and DMS Nexus ports in the fabric.
2. Verify migration session recovers and completes successfully.
3. Validate data integrity on destination LUNs.

Test Results

PASS. All migration sessions completed.

PASS. All destination LUNs passed disk verification.

2.7 Storage Device LUN Migration—Switch Offline

Test Objective

1. With a DMS migration in process, sequentially toggle each switch in the fabric by performing switch disable/enable and switch reboots on the physical and virtual fabric switch.
2. Verify migration session recovers and completes successfully.
3. Validate data integrity on destination LUNs.

Test Results

PASS. All migration sessions completed.

PASS. All destination LUNs passed disk verification.

Test Conclusions

- Achieved 100% pass rate on all the test cases in the SFR qualification test plan. Testing was conducted with the Cirrus DMS appliance in "Host-Side Physical" and "Storage-Side Virtual" intercept modes.
- Testing focused on data migration, fabric interruptions during data migration, fabric performance during data migrations, migration performance in a congested fabric and data integrity after migration.
- The Cirrus DMS appliance worked seamlessly with the Brocade FC fabric when connected in the Host-Side Physical and Storage-Side Virtual intercept modes.
- The Cirrus DMS appliance was not tested in the Storage-Side Physical mode, since it requires the source storage target ports being intercepted to support Fibre Channel Loop connectivity.
- The Cirrus DMS Host-Side Physical intercept mode requires a physical tap into the data path from host to storage and requires minimal configuration.
- The Cirrus DMS Storage-Side Virtual intercept mode utilizes the Brocade Virtual Fabric and NPIV features and can be used to migrate multiple storage simultaneously.