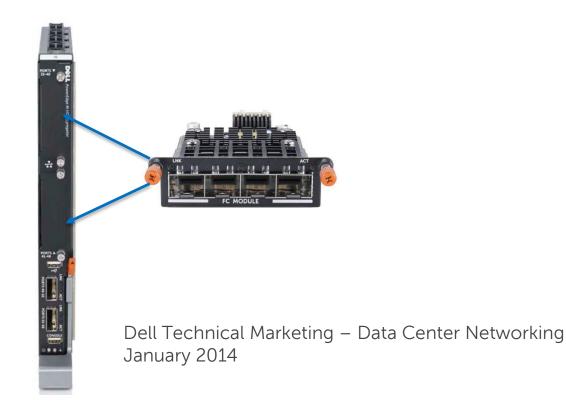


Dell Networking FC Flex IOM:

Deployment of FCoE with Dell FC Flex IOM, Brocade FC switches, and Dell Compellent Storage Array

A Dell Deployment/Configuration Guide



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Dell Networking FC Flex IOM: Deployment of FCoE with Dell FC Flex IOM, Brocade FC switches, and Dell Compellent Storage Array

Revisions

| Date | Description | Authors |
|------------|------------------------------|--------------------------|
| 01/16/2014 | Version 1 - Initial Document | Humair Ahmed, Neal Beard |



Dell Networking FC Flex IOM: Deployment of FCoE with Dell FC Flex IOM, Brocade FC switches, and Dell Compellent Storage Array

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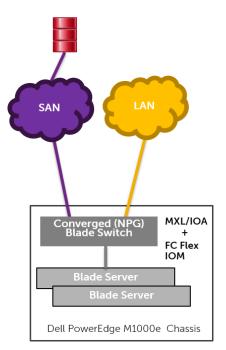


1 Executive Summary

In the "Dell Networking FC Flex IOM: Infrastructure & Network Convergence w/ FCoE" whitepaper we demonstrated and explained the movement from a traditional non-converged LAN/SAN network to a

converged LAN/SAN infrastructure and network and how the Dell MXL/IOA with Dell FC Flex IOM is an ideal solution for this transition. In addition to covering the industry trend towards IO Consolidation and network convergence, we covered the many benefits offered by FC Flex IOM which offers not only a converged networking solution but also a converged infrastructure where the FCoE-FC bridging functionality is implemented directly within the blade switch.

The Dell FC Flex IO module transforms a Dell MXL/IOA blade switch from a Ethernet-only switch to a converged switch capable of bridging between Ethernet and Fibre Channel. The FC Flex IOM moves the convergence layer from a typical dedicated ToR switch down to the blade switch via extensible IO module providing the benefits of IO consolidation such as less infrastructure hardware, less maintenance, and considerable cost savings. With its unique modular design FC Flex IOM allows end users to migrate to a converged solution and introduce FCoE functionality to the MXL/IOA blade switch at their own pace without replacing the entire switch. This benefit is unmatched in the industry. In this whitepaper we cover detailed topology and configuration examples.





Dell Networking FC Flex IOM: Deployment of FCoE with Dell FC Flex IOM, Brocade FC switches, and Dell Compellent Storage Array Deployment/Configuration Guide



2 Dell PowerEdge M1000e Overview

The PowerEdge M1000e Modular Server Enclosure solution supports up to (32) server modules, and (6) network I/O modules. The M1000e contains a high performance and highly available passive midplane that connects server modules to the infrastructure components, power supplies, fans, integrated KVM and Chassis Management Controllers (CMC). The PowerEdge M1000e uses redundant and hot-pluggable components throughout to provide maximum uptime. The chassis has the ability to house 6 x I/O modules allowing for a greater diversity of roles for all of the enclosed blade servers.

The (6) I/O slots in the back of the chassis are classified as 3 separate fabrics with each fabric containing 2 slots (A1/A2, B1/B2, C1/C2); these fabric I/O slots relate to the ports found on the server side network adaptors. The I/O modules can be used independently of each other, and each I/O module must contain the same technology. For example, fabric A is hardwired to the 2 network adaptors on the blade server mainboards, which means the I/O modules in fabric A must support Ethernet; Fabrics B and C can be used for Ethernet, Fibre Channel, or InfiniBand. Figure 2 below exemplifies the I/O modules.

Note: The networking adaptors in Fabric A have also been described as LOM's (LAN on Motherboards), and bNDC's (blade Network Daughter Card's). All of these terms describe the same device: A network adaptor that performs Ethernet/iSCSI/FCoE tasks on behalf of the Server and its operating system.

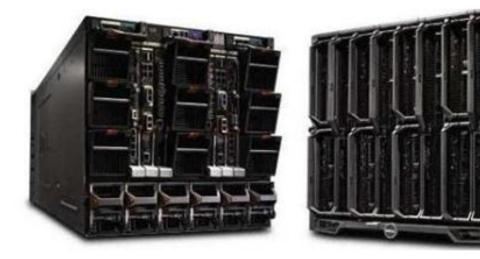


Figure 2 M1000e Front and Back View

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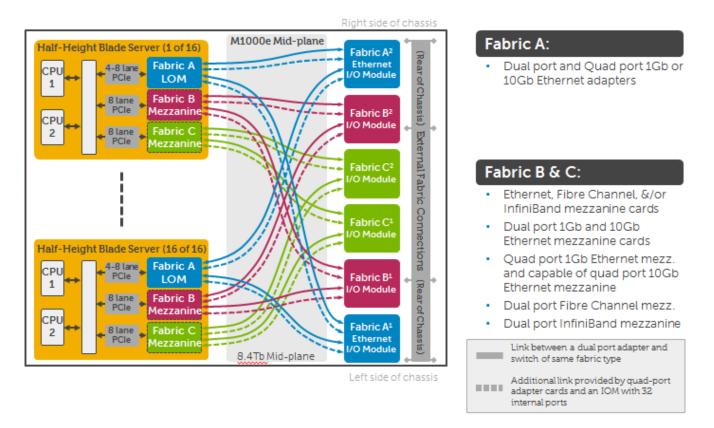


Figure 3 M1000e Midplane Dual/Quad Port Network Adaptor I/O Mappings

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2.1 Flex IO Expansion Modules (External Ports)

The Dell I/O Modules will support a combination of Flex IO Modules. The four (4) different types of Flex IO expansion modules are:

- 4-port 10Gbase-T FlexIO module (only one 10Gbase-T module can be used)
- 4-port 10Gb SFP+ FlexIO module
- 2-port 40Gb QSFP+ FlexIO module
- 4-port Fiber Channel 8Gb module

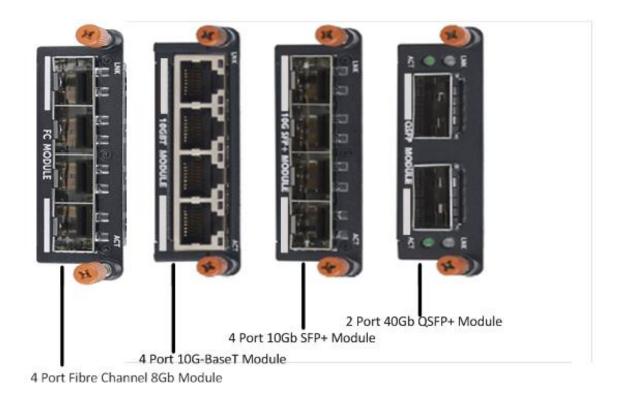


Figure 4 FlexIO expansion modules

NOTE:

8

The 4 Port Fibre Channel 8Gb module can only be used with the release of 9.3 firmware for the Dell MXL/IOA modular switches.



3 Dell FC Flex IOM and Convergence on Dell MXL/IOA Overview



The Dell FC Flex IO module provides the additional functionality to a Dell MXL/IOA blade switch to enable it to act as a NPIV Proxy Gateway (NPG) capable of bridging between Ethernet and FC. FC Flex IOM takes the convergence from the ToR down to the blade level consolidating infrastructure while still providing the benefits of network convergence and leveraging the backend FC SAN.

In NPG mode, the Dell MXL/IOA w/ FC Flex IOM does not consume a fabric Domain ID or become part of the switched fabric but instead simply acts as a gateway to the fabric by de-encapsulating FC from FCoE and forwarding the frames to the existing backend FC SAN.

NPG technology in the FC FlexIO module transparently performs a proxy fabric login (FLOGI) on behalf of the CNAs in the M1000e blade servers. With NPIV (N_Port ID Virtualization) support on the Fibre Channel switch connected to the FC Flex IOM, the respective FC Flex IOM port acts as a N_Port and is able to obtain multiple fabric addresses (FC_IDs) per request by end nodes. A FLOGi is done initially by the FC Flex IOM to the FC switch providing fabric services and then the FC Flex IOM is able to obtain addresses over the same link by converting FLOGis from the server to FDISCs (Fabric Discoveries). The FC Flex IOM initially performs a FLOGi and then it obtains additional addresses for server nodes via FDISC (Fabric Discoveries).

Fibre Channel fabric services are maintained by the FC switch that the FC FlexIO module is connected to. The features that the FC FlexIO module provides are:

- 1. Manages the FLOGI and FDISC conversion process
- 2. Manages PFC (Priority Flow Control)
- 3. Manages ETS (Enhanced Transmission Selection)
- 4. Manages FIP keep alives

9



4 Converged Network Solution – Dell PowerEdge M1000e, Dell Compellent Storage Array, Brocade FC Switch, and Dell MXL/IOA w/ FC Flex IO as NPIV Proxy Gateway

This solution demonstrates network and infrastructure convergence via Dell MXL blade switch w/ FC Flex IOM. The Dell PowerEdge M1000e chassis consists of one Dell PowerEdge M620 Blade Server with a 2-port Broadcom 57810 CNA and two Dell MXL blade switches each containing a FC Flex IO module. The gray links in Figure 5 below represent the converged traffic. The convergence takes place within the chassis and the MXL switch w/ FC Flex IOM breaks out the LAN and SAN traffic to the respective backend LAN and SAN networks. Two Dell S6000s are used for upstream LAN switches and two Brocade 6505 switches are used for the backend SAN. A Dell Compellent Storage Array is used for FC storage and consists of one SC220 storage enclosure and two SC8000s with 4 x FC ports each.

In this example 40 GbE active fiber DACs are used from the 40GbE ports on the MXL to the 40 GbE ports on the S6000, but 40 GbE copper DACs could also have been used. OM3 fiber and 8G FC optics are used to connect the FC ports from the FC Flex IOM to the FC ports on the Brocade FC switches.

This solution provides redundancy for both the LAN and the SAN. The server sees two LAN connections and two SAN connections via the 2-port CNA adapter. The Broadcom 57810 CNA is NIC teamed via 'Smart Load Balancing and Failover' and one port is made active while the other is made standby. In this setup, it is also possible to add an additional 40 GbE or 10 GbE module to the MXLs and create a VLTi link between them. Although a VLT LAG cannot be utilized down to the server CNA as FCoE is not supported over a VLT lag, VLT can still be utilized up to the S6000s if desired. A VLTi link between the MXLs can help speed-up failover as MAC/ARP tables are synced and addresses do not have to be learned upon NIC failover; however, this is not required and will consume additional ports requiring the need for an additional Flex I/O module. Also, it's important to note that the FCoE traffic is unaffected by the NIC team, and, in this setup, the mutipathing policy on the server is set to **Round Robin** so both fabric A and fabric B are active and utilized.



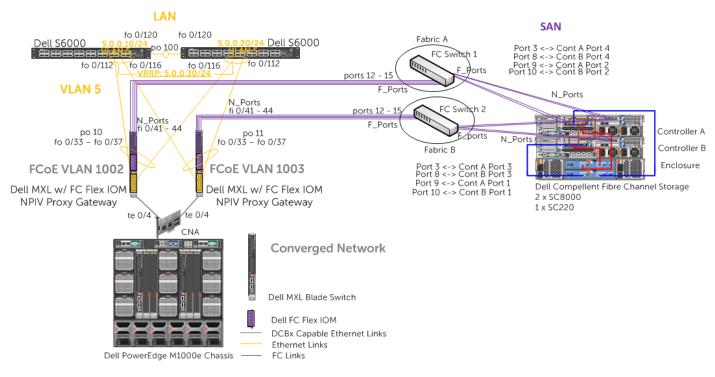


Figure 5 Dell MXL w/ FC Flex IOM acting as a NPIV Proxy Gateway and allowing for a converged infrastructure

This setup involves configuration on the CNA, server, MXL blade switches w/ FC Flex IOMs, LAN Dell S6000 switches, Brocade 6505 FC switches, and the Dell Compellent storage array. This document steps through the configuration one node at a time. Since the Dell S6000s are just providing the connectivity to the backend LAN and there is no specific configuration involved in regards to convergence, the configuration for these switches is standard LAN configuration and will not be shown. The configuration of the Broadcom 57810 CNA, Dell PowerEdge M620 server, Dell MXL blade switch w/ FC Flex IOM, Brocade 6505 FC switch, and Dell Compellent Storage array is shown below. This example demonstrates the configuration of the Broadcom 57810 CNA. To see how to configure a QLogic CNA see Section 5 of this document. Additionally, this example uses Brocade FC switches and a Dell Compellent Storage array. To see an example of Dell MXL/IOA w/ FC Flex IOM utilized with Cisco MDS switches and a EMC VNX 5300 storage array, see the "Deploying Dell Networking MXL and PowerEdge M I/O Aggregator with the FC FlexIO Module in a Cisco MDS Environment" guide.



4.1 Broadcom 57810 CNA Configuration

Broadcom offers the Broadcom BCM57810S in three formats for Dell servers: standard PCI Express, mezzanine card for Dell blade servers, and Network Daughter Card (NDC) for Dell blade servers. The Broadcom BCM57810S allows for NIC partitioning (NPAR) with up to four partitions per physical port and eight partitions total per 2-port adapter. A partition can be looked upon as a virtual port.

This example will use a Dell PowerEdge M620 blade server with a Broadcom BCM57810S CNA NDC and Microsoft Windows Server 2008 R2 Enterprise installed. By default, NPAR is not enabled and only the NIC functionality is enabled. FCoE must be manually enabled on the CNA for the virtual FCoE ports to be identified in Windows. This example uses the default 'Single Function' mode where NPAR is not utilized.

- 1. Install the Broadcom BCM57810 drivers and Broadcom Advanced Control Suite 4.
- Double click the Broadcom Advanced Control Suite 4 icon/shortcut in Windows. The Broadcom Advanced Control Suite 4 (Figure 6) opens. In this setup, Adapter 1 is being utilized. Note the small red x which appears next to the adapter ports. This is because the Dell MXL switches which the ports are connecting to have not yet been configured.



| Broadcom Advanced Control Suite 4 | | |
|--|---|---|
| File View Action Filter Context Tools Teams ISCSI Help I Filter: ALL VIEW Information Ite Resource Hardware | | |
| Explorer View | Information Configurations | |
| E 000 Hosts | Property | Value |
| Adapter 1: BCM57810 B0 Adapter 1: BCM57810 BCM57810 NetXtreme II 10 GigE #127 Dit [0127] Broadcom BCM57810 NetXtreme II 10 GigE (NDIS VBD Client) #127 Dit [0128] Broadcom BCM57810 NetXtreme II 10 GigE #128 [018] Broadcom BCM57810 NetXtreme II 10 GigE (NDIS VBD Client) #128 Adapter 2 Adapter 3 | Resources Bus Type Hardware ASIC Version Solution Family Firmware Version FicsE Boot Version PXE Boot Version PXE Boot Version PXE Boot Version | PCI-E (8X) BCM57810 B0 MFW1 7.6.56 FFV7.6.14 v7.6.50 v7.6.52 v7.6.53 ab displays information about connections and other k adapter. |
| BROADCOM. | | DATE |

Figure 6 Broadcom 57810 CNA adapter view in Broadcom Advanced Control Suite 4

Note: In the current configuration (Figure 6), there are two ports and only one partition per port. This is because the adapter is in Single Function mode and NPAR is not being utilized.

If NPAR is desired, configure it by clicking the **Adapter BCM57810** label, clicking the **+** symbol to the right of **Multi-function**, clicking the **Configure** button and selecting **NIC Partition** from the drop down list (Figure 7).



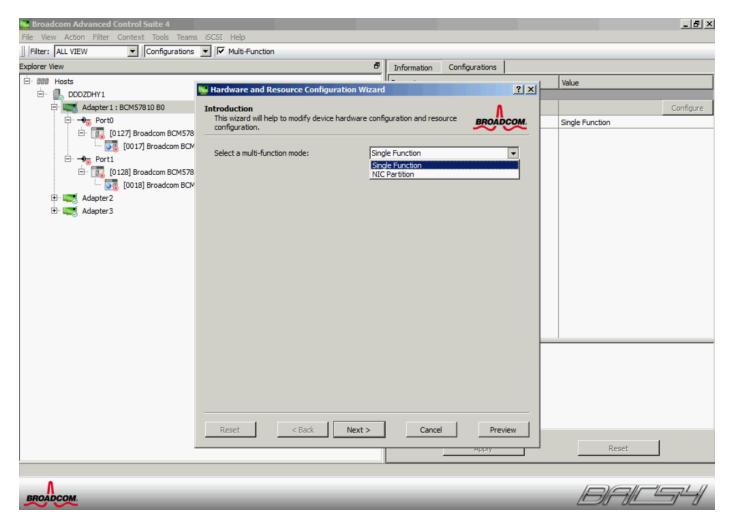


Figure 7 Default 'Single Function' mode setting on Broadcom 57810 CNA



3. Go to **Control Panel > Network and Internet > Network and Sharing Center > Change adapter settings**, The Broadcom Network Adapters are displayed. The two Broadcom 57810 CNA ports being utilized in this setup are highlighted (Figure 8).

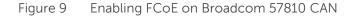
| 📴 Network Connections | | | | _ <u>8 ×</u> |
|--|-------------------------|--------------------------------------|--|------------------|
| G 🕞 🖉 🔹 Control Panel 🔹 Network and Internet 🔹 f | Network Connections 👻 | | Search Network Conne | ections 😥 |
| Organize 🔻 | | | | := - 🗊 🔞 |
| Name ^ | Status | Device Name | Connectivity | Network Category |
| 🏺 Local Area Connection | Disabled | QLogic 10GbE 2P QME8262-k Mezz | | |
| Local Area Connection 2 | Disabled | QLogic 10GbE 2P QME8262-k Mezz | | |
| Local Area Connection 3 | Disabled | Brocade 10G Ethernet Adapter | | |
| Local Area Connection 4 | Disabled | Brocade 10G Ethernet Adapter #2 | | |
| Local Area Connection 5 | Network cable unplugged | Broadcom BCM57810 NetXtreme II | | |
| Local Area Connection 6 | Network cable unplugged | Broadcom BCM57810 NetXtreme II | | |
| Local Area Connection 7 | Disabled | QLogic 10GbE 2P QME8262-k Mezz | | |
| Local Area Connection 8 | Disabled | QLogic 10GbE 2P QME8262-k Mezz | | |
| Local Area Connection 9 | Disabled | [Default Vlan] [Team - 1]: QLogic Te | | |

Figure 8 'Network Connections' view in Windows Server 2008 R2 Enterprise



- 4. Use the **Broadcom Advanced Control Suite 4** to enable FCoE by selecting the single partition under each port and clicking the **Configurations** tab on the right. Click the **+** symbol next to **Resource Reservations** and click the **Configure** button. Check the checkbox next to **FCoE** (Figure 9).
- 5. Click **Next** and then **Apply**. Repeat this step to enable FCoE on the second port.

| | vanced Control Suite 4 | | | | | | _ 8 × |
|--|--|----------------------------------|----------|-------------------------------|------------|----------|-----------|
| | Filter Context Tools Teams iSCSI Help | | | | | | |
| Filter: ALL VIEW | V 🔽 Configurations 🔽 🗹 Advance | ced 🔽 Licenses 🔽 Resource Reserv | ations | | | | |
| Explorer View | | ð | Informa | tion Configurations | Statistics | | |
| Ė- 000 Hosts | | | Property | | | Value | |
| | ZDHY1 | | + Adva | | | | |
| in the second seco | Adapter 1 : BCM57810 B0 | | | | | | |
| | Port0 | | | Click the button to configure | e | | Configure |
| | | 10 GigE #127 | | Pre-Allocated Resources | | | |
| | [0017] Broadcom BCM57810 NetXtreme | | | NDIS | | Enabled | |
| | Hardware and Resource Configuration Wiza | | ? × | TCP Offload Engine (TC |)E) | Disabled | |
| | nardware and Resource comparation with | | | ···· iSCSI Offload Engine | | Disabled | |
| ÷ – – – | Configure Resources | | ٨ | ··· FCoE | | Disabled | |
| ÷. 📖 | Modify Resources. | BROA | DCOM. | aximum TCP Offload Engin | ne (TOE) | 0 | |
| - | | ~ | \sim | aximum iSCSI Offload Eng | ine | 0 | |
| | D+0 | F | | CSI Pending Tasks Per Cor | nnection | 0 | |
| | Port 0 | Func | tion 0 | emory Consumption(%) | | 100 | |
| | Property | Value | | DE RSS | | Disabled | |
| | Protocols | | | es | | | |
| | Ethernet/Ndis | Enabled | _ | | | | |
| | iscsi | Disabled | | | | | |
| | FCoE | Enabled | | | | | |
| | Resource Reservations | | | | | | |
| | Pre-Allocated Resources | | | | | | |
| | TCP Offload Engine (TOE) | Disabled | _ | | | | |
| | Maximum TCP Offload Engine (TOE) | 0 | - | | | | |
| | Maximum iSCSI Offload Engine | 0 | _ | button to configure | | | |
| | | 100 | _ | | | | |
| | Memory Consumption(%) | | _ | | | | |
| | TOE RSS | Disabled | _ | | | | |
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| | | | | Apply | | Reset | |
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| Δ | | | | | | | |
| BROADCON | Reset < Back Ne | ext > Cancel | | | | | |



Note: As the FCoE adapter is being enabled, a message indicating the device driver was successfully installed may be displayed (Figure 10). Once complete, an virtual FCoE port will be displayed under each physical port (Figure 11).



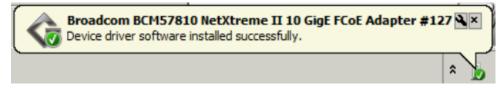


Figure 10 Windows Server 2008 R2 Enterprise detects Broadcom 57810 FCoE Adapter

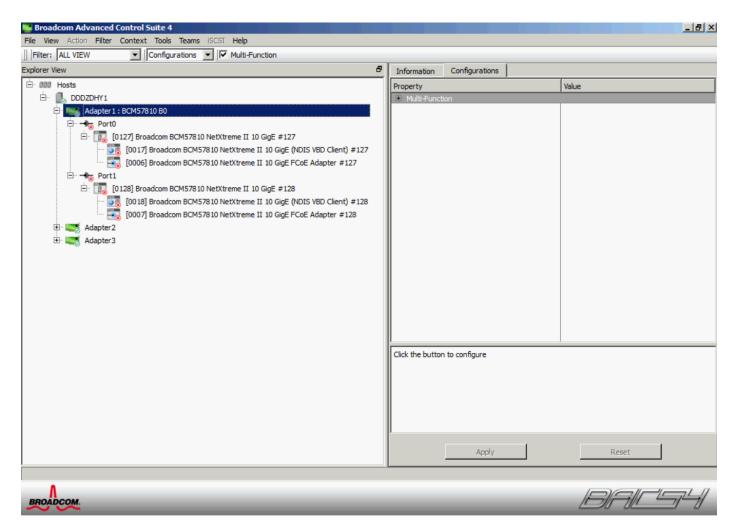


Figure 11 Broadcom 57810 CNA configured for FCoE

Since the respective FCoE settings will be pushed down from the Dell MXL switch with FC Flex IOM via

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Data Center Bridging Capability Exchange protocol (DCBX), the FCoE side requires no further configuration.

6. To configure the NIC for LAN traffic, select **TEAM VIEW** from the Filter drop down box (Figure 12).

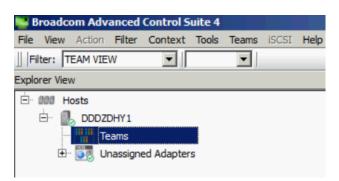


Figure 12 'Team View' in Broadcom Control Suite 4



7. Right click **Teams** and select **Create Team**. The Broadcom Teaming Wizard (Figure 13) will start.

| Broadcom Advanced Cont File View Action Filter Cor | trol Suite 4 Itext Tools Teams iSCSI Help | <u>_8×</u> |
|---|---|------------|
| Filter: TEAM VIEW | | |
| Explorer View | 6 | |
| Hosts DDDZDHY1 Teams D: D: | iii Broadcom Teaming Wizard | 1 |
| | Welcome to the Broadcom Teaming Wizard | |
| | The Broadcom Teaming Wizard will guide you through the process of creating and modifying teams and/or VLANs. To continue, click Next. To work without the wizard, click Expert Mode. | |
| | Expert Mode | |
| | Note: Current work in the Teaming Wizard will be lost when Expert Mode is clicked. | |
| | To always start in Expert Mode, check the "Default to Expert Mode on next start" checkbox. | |
| | Default to Expert Mode on next start | |
| | Cancel <back next=""> Preview</back> | |
| | | |
| | | |
| BROADCOM. | le l | ALSH |

Figure 13 Creating a NIC team with Broadcom 57810 CNA



8. Click **Next**, keep the default team name (Figure 14) and click **Next** again.

| Broadcom Advanced Cont | | | _8× |
|---|--|--|------------|
| | text Tools Teams iSCSI Help | | |
| | | | |
| Explorer View Hosts DDDZDHY1 Teams Dubzigned Ac | | 8 | |
| | iii Broadcom Teaming Wizard | | <u>? ×</u> |
| | Creating/Modifying a Team: Team Name You must assign your team a unique name. | BR | DADCOM. |
| | Enter the name for the team: | | |
| | | | |
| | Team 1 | | |
| | A team name has a maximum length of 39 charac &&V:*?<> ** | ters. The name can use any symbolic character except | |
| | Cancel < Back | Next > | iew 💼 |
| | | | |
| | | | |
| BROADCOM. | | | B/ALSH |

Figure 14 Naming the NIC team on Broadcom 57810 CNA



9. Click the radio button next to Smart Load Balancing[™] and Failover (SLB) (Figure 15), and click next.

Note: The switch will not be aware of the NIC team and no LAG configuration will be required on upstream switches.

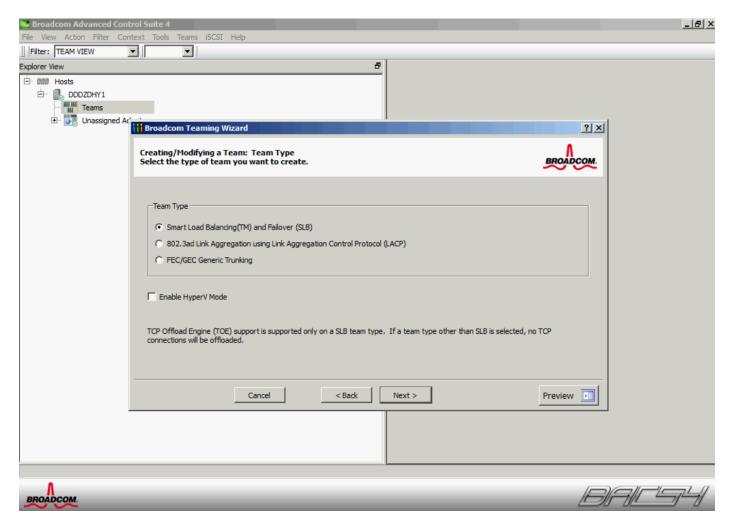


Figure 15 Selecting 'Smart Load Balancing and Failover' option for NIC teaming



10. Select one of the adapter ports to NIC team and click the **Add** button, repeat this for the second port. Both ports should now be listed under **Team Members** (Figure 16). Click **Next**.

| Broadcom Advanced Cont | ol Suïte 4 ext Tools Teams iSCSI Help | × |
|---|--|--|
| | | |
| Explorer View | 6 | |
| Hosts DDDZDHY1 Hosts DDDZDHY1 Hosts DDZZDHY1 Hosts DZ | Broadcom Teaming Wizard | <u>?</u>]X |
| | Creating/Modifying a Team: Assigning Team Members Specify which adapters to include in the team. Include adapters that you wish to set for the standby role. | BROADCOM |
| | Available Adapters TOE LSO | CO RSS samabl NDIS MTU |
| | | |
| | Add | Remove |
| | | CO RSS zamabl NDIS MTU |
| | | es Yes Yes 6.20 1500 es Yes Yes 6.20 1500 |
| | | |
| | Team Offload Capabilities: TOE, LSO, CO, RSS Te | eam MTU: 1500 |
| | Cancel < Back Ne | ext > Preview |
| | | |
| | | |
| BROADCOM. | | |

Figure 16 Broadcom teaming wizard port selection dialog for NIC teaming



11. The NIC team is completed as active-standby (Figure 17), so upon failover, the standby port will become active. Click **Next**.

| 🔚 Broadcom Advanced Con | ntrol Suite 4 | _ B × |
|--|--|---------|
| | ontext Tools Teams iSCSI Help | |
| | | |
| Explorer View Hosts DDDZDHY1 Teams E Unassigned Ac | AC III Broadcom Teaming Wizard | |
| | Creating/Modifying a Team: Designating a Standby Member Do you want to designate an available adapter as a standby member? | |
| | Optionally select if you want a standby member for the team. Do not configure a standby member. Use the following member as a standby member: [0017] Broadcom BCM57810 NetXtreme II 10 GigE (NDIS VBD Client) #127 [0017] Broadcom BCM57810 NetXtreme II 10 GigE (NDIS VBD Client) #127 [0018] Broadcom BCM57810 NetXtreme II 10 GigE (NDIS VBD Client) #128 | |
| | Cancel < Back Next > Preview | |
| | | |
| | | |
| BROADCOM. | E. | 7/1-1-1 |

Figure 17 Selecting a 'stand-by' member of the NIC team



12. Broadcom LiveLink is a feature that minimizes any downtime due to spanning tree loop determination when failing-over. In this setup, the ports connected to the server will be configured as edge ports and not participate in spanning tree so this option is left at the default of disabled (Figure 18). Click **Next**.

| 👺 Broadcom Advanced Contr | ol Suite 4 | _ 8 × |
|---|---|-------|
| File View Action Filter Conte | | |
| Filter: TEAM VIEW | | |
| Explorer View | 8 | |
| Hosts DDDZDHY1 Teams Dr Signed A(| | |
| | Broadcom Teaming Wizard | |
| | Creating/Modifying a Team: Configuring LiveLink Do you want to configure LiveLink? | |
| | Configure LiveLink? | |
| | C Yes | |
| | © No | |
| | LiveLink detects loss of network connectivity beyond the switch and routes traffic only through team members that have a live link. | |
| | Cancel < Back Next > Preview I | |
| | | |
| | | |
| BROADCOM. | | |

Figure 18 Selecting 'No' for Broadcom LiveLink feature



13. Select the Add VLAN option (Figure 19) and click Next.

| Broadcom Advanced Cont | rol Suite 4 text Tools Teams iSCSI Help | | _ _ ₽ × |
|------------------------|---|------------|--------------------|
| | | | |
| Explorer View | 8 | | |
| DDDZDHY1 | | | |
| | Broadcom Teaming Wizard | <u>?</u> × | |
| | Creating/Modifying a VLAN: Configure VLAN Support Specify whether you want to create or delete a VLAN. | BROADCOM | |
| | -Manage VLAN | | |
| | C Edit VLAN | | |
| | C Skip Manage VLAN | | |
| | | | |
| | | | |
| | | | |
| | Cancel < Back Next > | Preview | |
| | | | |
| | | | |
| | | | |
| BROADCOM. | | BIFAL | |

Figure 19 VLAN configuration on NIC team



14. Enter VLAN 5 for the VLAN Name (Figure 20) and click Next.

| Broadcom Advanced Cont | rol Suite 4 text Tools Teams iSCSI Help | | _ 8 × |
|--|--|--|-------|
| | | | |
| Explorer View | | 8 | |
| ⊡- 000 Hosts □- 000 DDDDHY1 □- 000 Unassigned Ac | iii Broadcom Teaming Wizard | <u>? x </u> | |
| | Creating/Modifying a VLAN: Naming You must assign your VLAN a unique name. | BROADCOM. | |
| | Enter a name for the VLAN | | |
| | A single member SLB team will be created on instances name has a maximum length of 39 characters. The name | ; when VLAN tagging is desired on one physical interface. A VLAN me can use any symbolic character except &&\';=?<> ™ | |
| | Cancel < Back | Next > Preview | |
| | | | |
| | | | |
| BROADCOM. | | | |

Figure 20 Naming the VLAN that will be added



15. Select the **Tagged** radio button (Figure 21) and click **Next**.

| Broadcom Advanced Cont File View Action Filter Con | rol Suite 4 text Tools Teams iSCSI Help | _ 8 × |
|--|---|-------|
| | | |
| Explorer View | 8 | |
| ⊡- 000 Hosts ⊡- 000 Hosts ⊡- 0.00 DDDDDHY1 □- 0.00 Teams ⊕- 0.00 Unassigned At | iii Broadcom Teaming Wizard | |
| | Creating/Modifying a VLAN: Tagging The VLAN type must be specified. | |
| | What is the VLAN Type C Untagged Tagged | |
| | If tagged VLAN is selected, be sure the switch supports tagged VLANs.To use VLAN ID 0, select untagged radio button option. | |
| | Cancel < Back Next > Preview I | |
| | | |
| | | |
| BROADCOM. | BI AND | 754 |

Figure 21 Selecting to have the VLAN tagged on the NIC team



16. Enter **5** for the VLAN tag value (Figure 22) and click **Next**.

| Broadcom Advanced Cont File View Action Filter Con | trol Suite 4 text Tools Teams iSCSI Help | | _ 8 × |
|--|--|---|-------|
| | | | |
| Explorer View | | 8 | |
| Hosts DDDZDHY1 Hosts DDDZDHY1 Hill Teams Drassigned Ac | iii Broadcom Teaming Wizard | ? × | |
| | Toroaccom reaning wizard | | |
| | Creating/Modifying a VLAN: Tag Value Assign a VLAN tag value. | BROADCOM. | |
| | | | |
| | | | |
| | Enter the VLAN tag value: | | |
| | 5 | | |
| | VLAN tag values must be between 1 and 4094. VLAN | N tag values must match a VLAN tag on the connected switch. | |
| | Cancel < Back | Next > Preview | |
| | | | |
| | | | |
| BROADCOM. | | EK- | |

Figure 22 Selecting the correct VLAN ID



17. Since there are no other VLANs to manage in this example, select **No** (Figure 23) and click **Next**.

| Broadcom Advanced Cont | rol Suite 4 text Tools Teams iSCSI Help | _[]× |
|------------------------|---|-----------|
| | | |
| Explorer View | 8 | |
| DDDZDHY1 | | |
| y | i Broadcom Teaming Wizard | ? × |
| | Creating/Modifying a VLAN: Additional VLANs Create additional VLANs if required. | BROADCOM |
| | Do you want to manage more VLAN? | |
| | (° No | |
| | | |
| | (i) A maximum of 64 VLANs can be created: 63 tagged and 1 untagged. | |
| | Cancel < Back Next > | Preview 💿 |
| | | |
| | | |
| BROADCOM | | |

Figure 23 Confirming no other VLANs need to be added



18. Click **Finish** and then click **Yes** when prompted for confirmation (Figure 24).

| Broadcom Advanced Control Suite 4 File View Action Filter Context Tools Teams iSCSI Help | _8× |
|---|-----|
| Filter: TEAM VIEW | |
| Explorer View B | |
| Hosts DDDZDHY1 Hit Teams Unassigned At Hit Broadcom Teaming Wizard | |
| iii Broadcom Teaming Wizard | |
| Congratulations! The Teaming Wizard has finished collecting information. How would you like to proceed? | |
| Commit changes Commit changes to system and Exit the wizard Save changes and continue to manage more teams Applying the changes will temporarily interrupt the network connection. The process may take several minutes and the connection will resume afterwards. | |
| Cancel < Back Finish Preview 💽 | |
| | |
| BROADCOM | |

Figure 24 Committing the configuration for the NIC team



19. The CNA configuration for both LAN and SAN traffic is now complete. The created NIC team can be displayed by expanding the adapters under TEAM VIEW (Figure 25).

| xplorer View 🗗 Information Statistics | File View Action Filter Context Tools Teams iSCSI Help | | | |
|---|--|-------------------------|----------------|-----------|
| Hosts M Hosts M Hosts M Hosts M Ears M Kapters M Kapte | Filter: TEAM VIEW | | | |
| DDDZDHY1 Image: Constraint of the cons | Explorer View | 5 Information Statis | stics | |
| Image: Teams Image: Team 1 Image: Team 1 </td <td>Ė- 000 Hosts</td> <td>Property</td> <td></td> <td>Value</td> | Ė- 000 Hosts | Property | | Value |
| Image: Team 1 Team Type Smart Load Balancing(TM) and Fallover Image: BASP Virtual Adapters Image: Tope Times T | 🗄 🔒 DDDZDHY1 | Team Properties | | |
| Image: Substance of the second system Image: Second syst | E Teams | Team Name | | Team 1 |
| BASP Witual Adapters - Team MTU 1500 Primary Adapters - Team MTU 1500 Image: Standay Adapters - Team MTU 16.6 Image: Standay Adapters - Triver Name Basp.sys Image: Standay Adapters - Triver Version 1.6.6 Image: Standay Adapters - Triver Version 1.6.6 Image: Standay Adapters - Team MTU 1500 Image: Standay Adapters - Team MTU 1500 Image: Standay Adapters - Team MTU 1.6.6 Image: Standay Adapters - Triver Version 1.6.6 Image: Standay Adapters - Team MTU 1500 Image: Standay Adapters - Team MTU 1500 Image: Standay Adapters - Team MTU 1.6.6 Image: Standay Adapters - Team MTU - Team MTU Image: S | 🖻 🚻 Team 1 | | | |
| Image: Standby Adapters Image: Standby Adapters <td>🕂 🃂 BASP Virtual Adapters</td> <td></td> <td>Capabilities</td> <td></td> | 🕂 🃂 BASP Virtual Adapters | | Capabilities | |
| Image: Second | | | | |
| Image: Standby Adapters Image: Standby Adapters <td></td> <td></td> <td></td> <td></td> | | | | |
| Standby Adapters Standby Adapters [0017] Broadcom BCM57810 NetXtreme II 10 GigE (NDIS VBD Client) #127 Unassigned Adapters | | | | |
| Image: Team Properties | 🔤 🔯 [0018] Broadcom BCM57810 NetXtreme II 10 GigE (NDIS VBD Client) #128 | Driver Date | | 2/13/2013 |
| Unassigned Adapters | 🖃 慶 Standby Adapters | | | |
| Unassigned Adapters | [0017] Broadcom BCM57810 NetXtreme II 10 GigE (NDIS VBD Client) #127 | | | |
| Team Properties | | | | |
| Team Properties Displays information about the team. | | | | |
| Team Properties Displays information about the team. | | | | |
| Team Properties Displays information about the team. | | | | |
| Team Properties Displays information about the team. | | | | |
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| | | Team Properties | | |
| | | Displays information ab | bout the team. | |
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Figure 25 'TEAM VIEW' displaying the created NIC team



20. Go to **Control Panel** > **Network and Internet** > **Network** and **Sharing Center** > **Change adapter settings**. The Network Connections are displayed. The two Broadcom 57810 CNA ports being utilized in this setup and the virtual adapter from the NIC teaming are highlighted in Figure 26.

| Drganize 🔻 | | | |) 🖿 🛨 🔟 (|
|-------------------------|-------------------------|--------------------------------------|--------------|------------------|
| lame * | Status | Device Name | Connectivity | Network Category |
| Local Area Connection | Disabled | QLogic 10GbE 2P QME8262-k Mezz | | |
| Local Area Connection 2 | Disabled | QLogic 10GbE 2P QME8262-k Mezz | | |
| Local Area Connection 3 | Disabled | Brocade 10G Ethernet Adapter | | |
| Local Area Connection 4 | Disabled | Brocade 10G Ethernet Adapter #2 | | |
| Local Area Connection 7 | Disabled | QLogic 10GbE 2P QME8262-k Mezz | | |
| Local Area Connection 8 | Disabled | QLogic 10GbE 2P QME8262-k Mezz | | |
| Local Area Connection 9 | Disabled | [Default Vlan] [Team - 1]: QLogic Te | | |
| Local Area Connection 5 | Network cable unplugged | Broadcom BCM57810 NetXtreme II | | |
| Local Area Connection 6 | Network cable unplugged | Broadcom BCM57810 NetXtreme II | | |
| 🚇 Team 1_VLAN 5 | Network cable unplugged | BASP Virtual Adapter | | |

Figure 26 Viewing the NIC team and network connect in Windows Server 2008 R2 Enterprise

The correct IP address information now needs to be assigned to the teamed adapter.



21. Right click **Team1_VLAN5**, click **Properties**. Select **Internet Protocol Version 4 (TCP/IPv4)** and click the **Properties** button. Enter the respective IP information (Figure 27), and click the **OK** button.

| Internet Protocol Version 4 (TCP/IPv | /4) Properties | | | |
|---|---------------------|--|--|--|
| General | | | | |
| You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings. | | | | |
| O Obtain an IP address automatical | ly | | | |
| □ Use the following IP address: | | | | |
| IP address: | 5.0.0.3 | | | |
| Subnet mask: | 255 . 255 . 255 . 0 | | | |
| Default gateway: | 5 . 0 . 0 . 30 | | | |
| C Obtain DNS server address autor | natically | | | |
| □ Use the following DNS server add | resses: | | | |
| Preferred DNS server: | 10 . 11 . 0 . 1 | | | |
| Alternate DNS server: | 10 . 11 . 0 . 2 | | | |
| Validate settings upon exit | Advanced | | | |
| | OK Cancel | | | |

Figure 27 Configuring the NIC team interface with the correct IP information

The next step is to configure the Dell MXL switch w/ FC Flex IOM.

4.2 Dell MXL w/ FC Flex IOM Configuration

Below is the full configuration for the Dell MXL w/ FC Flex IOM for both fabric A and fabric B. Note, VLT is employed between the Dell S6000s down to the MXLs; this configuration provides active-active links of a port-channel that has members going to two separate switches for redundancy purposes.

Configuration steps:

1. Create the VLT Domain and LACP LAG up to the VLT (Enable RSTP as a best practice for configuring VLT).



- 2. Configure port to the CNA as a hybrid port. Create a LAN VLAN and tag it to both the **tengigabitethernet 0/4** interface going to the respective CNA and port channel going up to VLT.
- 3. Enable FC capability
- 4. Create DCB Map and configure the priority-based flow control (PFC) and enhanced transmission selection (ETS) settings for LAN and SAN traffic. Priorities or Class of Service (CoS) are mapped to priority groups using the **priority-pgid** command. In this example, priorities 0, 1, 2, 4, 5, 6, and 7 are mapped to priority group 0. Priority 3 is mapped to priority-group 1.
- 5. Create FCoE VLAN
- 6. Next, create a FCoE MAP so FCoE traffic is mapped to the respective VLAN. The FCoE MAP is applied to both the **tengigabitethernet 0/4** interface going to the respective CNA port and to the FC interface connecting to the FC switch. Note, on MXL/IOA w/ FC Flex IOM, FCoE is always mapped to priority 3.
- 7. Apply DCB map to downstream interface going to server.
- 8. Configure uplink failure detection.

The same procedure is repeated for the Dell MXL blade switch w/ FC Flex IOM connecting to fabric B. Note a different **fc-map** and FCoE VLAN should be used for each fabric.

Especially important to note is the fact that the same Ethernet port on the MXL where the FCoE MAP is applied is also untagged on the default VLAN 1. This is needed because the FIP protocol communicates over the default VLAN to discover the FCoE VLAN. The LAN traffic is tagged on VLAN 5.



Dell MXL Configuration (Fabric A)

/* Enable RSTP (Enabled due to VLT config on S6000s) */

- > enable
- > config terminal
- > protocol spanning-tree rstp
- > no disable
- > exit

/* Configure Manangement Interface */

> interface management 0/0> ip address 10.11.129.166/20

> no shut

/* Create LACP LAG for connecting to VLT LAG down from S6000s */

- > interface range fortyGigE 0/33 37
- > port-channel-protocol LACP
- > port-channel 10 mode active
- > no shutdown
- > exit

/* Create LAN VLAN and tag interfaces */

- > interface port-channel 10
- > switchport
- > no shutdown
- > exit
- > interface tengigabitethernet 0/4
- > portmode hybrid
- > switchport
- > no shutdown
- > exit

> interface vlan 5

- > tagged tengigabitethernet 0/4
- > tagged port-channel 10
- > exit

/* Enable FC capability */

> feature fc

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Dell MXL Configuration (Fabric A) cont.

/* Create DCB MAP */

- > dcb-map SAN_DCB_MAP
- > priority-group 0 bandwidth 60 pfc off
- > priority-group 1 bandwidth 40 pfc on
- > priority-pgid 0 0 0 1 0 0 0 0
- > exit

/* Create FCoE VLAN */

> interface vlan 1002 > exit

/* Create FCoE MAP */

> fcoe-map SAN_FABRIC_A
> fabric-id 1002 vlan 1002
> fc-map 0efc02
> exit

/* Apply FCoE MAP to interface */

> interface range fibreChannel 0/41 - 44
> fabric SAN_FABRIC_A
> no shutdown
> exit

/* Apply FCoE MAP and DCB MAP to interface */

- > interface tengigabitethernet 0/4
- > dcb-map SAN_DCB_MAP
- > fcoe-map SAN_FABRIC_A

/* Make server port an edge-port */

> spanning-tree rstp edge-port > exit

/* Configure Uplink Failiure Detection */

- > uplink-state-group 1
- > downstream TenGigabitEthernet 0/4
- > upstream Port-channel 10
- > downstream auto-recover
- > end

> write

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Dell MXL Configuration (Fabric B)

/* Enable RSTP (Enabled due to VLT config on S6000s) */

- > enable
- > config terminal
- > protocol spanning-tree rstp
- > no disable
- > exit

/* Configure Manangement Interface */

> interface management 0/0> ip address 10.11.129.167/20

- > ip address 10.11.129.1
- > no shut

/* Create LACP LAG for Connecting to VLT LAG down from S6000s */

- > interface range fortyGigE 0/33 37
- > port-channel-protocol LACP
- > port-channel 11 mode active
- > no shutdown
- > exit

/* Create LAN VLAN and tag interfaces */

- > interface port-channel 11
- > switchport
- > no shutdown
- > exit
- > interface tengigabitethernet 0/4
- > portmode hybrid
- > switchport
- > no shutdown
- > exit

> interface vlan 5

- > tagged tengigabitethernet 0/4
- > tagged port-channel 11
- > exit

/* Enable FC capability */

> feature fc

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Dell MXL Configuration (Fabric B) cont.

/* Create DCB MAP */

- > dcb-map SAN_DCB_MAP
- > priority-group 0 bandwidth 60 pfc off
- > priority-group 1 bandwidth 40 pfc on > priority-pgid 0 0 0 1 0 0 0 0
- > priority-pgid 0 0 > exit

/* Create FCoE VLAN */

> interface vlan 1003
> exit

/* Create FCoE MAP */

> fcoe-map SAN_FABRIC_B
> fabric-id 1003 vlan 1003
> fc-map 0efc03
> exit

/* Apply FCoE MAP to interface */

> interface range fibreChannel 0/41 - 44
> fabric SAN_FABRIC_B
> no shutdown
> exit

/* Apply FCoE MAP and DCB MAP to interface */

- > interface tengigabitethernet 0/4> dcb-map SAN_DCB_MAP
- > fcoe-map SAN_FABRIC_B

/* Make server port an edge-port */

> spanning-tree rstp edge-port > exit

/* Configure Uplink Failiure Detection */

- > uplink-state-group 1
- > downstream TenGigabitEthernet 0/4
- > upstream Port-channel 11
- > downstream auto-recover
- > end
- > write

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4.3 Dell Compellent Storage Array Configuration

The Dell Compellent Storage Center controllers are used to support various I/O adapters including FC, iSCSI, FCoE, and SAS. A Dell Compellent Storage Center consists of one or two controllers, FC switches, and one or more enclosures. In the current example, two Compellent SC8000 controllers, one Compellent SC220 enclosure, two FC switches, and one 4-port FC HBA card on each Compellent controller is used for the SAN network. The FC switches provide robust connectivity to servers, allowing for the use of multiple controllers and redundant transport paths.

SAS enclosures hold disks for data storage and connect to the controllers through back-end ports via SAS cables; you can see how the SC220 enclosure and controllers are cabled together in Figure 5 prior in this document.

To keep the diagram uncluttered yet detailed, the only connections not shown are the **eth0** ports on each controller connecting to the management network and the **eth1** port on each controller connecting to the **eth1** port on the other controller. The **eth0** connection supports system login and access for the software. It's used to send emails, alerts, SNMP traps, and Phone Home data. The **eth1** connection is used for dedicated Inter-Process Communication (IPC) between controllers in a dual-controller Storage Center. There is no default gateway for **eth1** and it does not need to be set. See the "CT-SC040 and SC8000 Connectivity Guide" and "Compellent Storage Center System Setup Guide" to get started on cabling and configuring your Compellent storage array.

In this example setup, two SC8000 controllers and one SC220 disk enclosure have been cabled together. There are two paths available from the server to the FC switches and four paths available from each FC switch to the Compellent storage array.

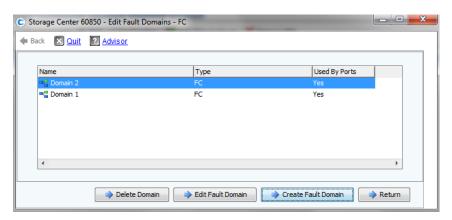
1. During initial configuration of the Compellent Storage Center, a disk pool labeled **Pool_1** was created consisting of seven 300 GB drives. The total disk space is 1.64 TB; this can be seen in the screen shot of the **Storage Center System Manager** GUI as shown below in Figure 28.



| DØLL (| Compellent | Storage Center 60850 | | | | | |
|-------------------|--|---|--|--|--|--|--|
| 🜔 Storage Manager | 🛟 Storage Management 🔍 View 🎲 Refresh 🛟 Help | | | | | | |
| Properties 🤱 | 🜊 Properties 🚨 Configure My Volume Defaults | | | | | | |
| Storage Center 6 | | Storage Center 60850 | | | | | |
| 🖻 🍣 Disks | Storag | ge Summary as of Apr 18, 2013 02:25:15 PM | | | | | |
| | | | | | | | |
| | | | | | | | |
| 0 | | GR | | | | | |
| | | | | | | | |
| 🔊 0 | | Status: Normal | | | | | |
| | | Total disk space: 1.64 TB | | | | | |
| Controllers | 1-06 | Used disk space: 1.44 GB (0.09%) | | | | | |
| |) III | Free disk space: 1.64 TB (99.91%) | | | | | |
| 🕀 🍈 SN 60851 | | More Details. | | | | | |
| | | MOTE Details | | | | | |
| Enclosures | | | | | | | |
| | eme | | | | | | |
| E Users | cina (| | | | | | |
| | | | | | | | |

Figure 28 Storage Center System Manager GUI displays disk pool "Pool_1" with 1.64 TB free space

- Since there are two fabrics, fabric A and fabric B, two fault domains are created. Domain 1 is already created by default and all the FC ports are currently in domain 1. To create another domain, click Storage Management on the top left of the webpage and then select System > Setup > Configure Local Ports.
- 3. Next, click the **Edit Fault Domains** button at the bottom right of the dialog box.
- 4. On the next dialog box click the Create Fault Domain button on the lower right of the dialog box. In the Name field type a name for the new domain. In this case, the name Domain 2 was used. Make sure FC is selected in the Type field and click Continue. Figure 29 below shows a sceenshot of the created second domain.







5. Now, navigate back to the **Configure Local Ports** dialog and select the appropriate domain to put each port in. Each fabric should be in its own Domain; below all ports going to fabric A are put in Domain 1 and all ports going to fabric B are put in Domain 2.

| FC ISCSI | SAS | | | | | | | | | | |
|------------------------|---------------|-----------|-------------|-------------------|------------------|------------|---------|-----------------|-----------------|------------|----------------|
| Controller | Status | Slot/Port | Purpose | Fault Domain | World Wide Name | User Alias | Speed | Initiator Count | Target Count | Both Count | Enclosure |
| J SN 60850 | Down | 3/1 | Unknown | I <none></none> | 5000D31000EDB20D | | Unknown | 0 | 0 | 0 | No |
| J SN 60850 | Down | 3/2 | Unknown | I <none></none> | 5000D31000EDB20E | | Unknown | 0 | 0 | 0 | No |
| J SN 60850 | Down | 4/1 | Unknown | I <none></none> | 5000D31000EDB209 | | Unknown | 0 | 0 | 0 | No |
| J SN 60850 | Down | 4/2 | Unknown | I <none></none> | 5000D31000EDB20A | | Unknown | 0 | 0 | 0 | No |
|) IIII SN 60850 | Down | 4/3 | Unknown | ↓ <none></none> | 5000D31000EDB20B | | Unknown | 0 | 0 | 0 | No |
|) P SN 60850 | Down | 4/4 | Unknown | ↓ <none></none> | 5000D31000EDB20C | | Unknown | 0 | 0 | 0 | No |
| JIII SN 60850 | Up | 5/1 | Front End | Domain 2 | 5000D31000EDB205 | | 8 Gbps | 1 | 3 | 3 | No |
| JIII SN 60850 | Up | 5/2 | Front End | Domain 1 | 5000D31000EDB206 | | 8 Gbps | 1 | 3 | 3 | No |
|) III SN 60850 | Up | 5/3 | Front End | Domain 2 | 5000D31000EDB207 | | 8 Gbps | 1 | 3 | 3 | No |
|) III SN 60850 | Up | 5/4 | S Front End | ↓ Domain 1 | 5000D31000EDB208 | | 8 Gbps | 1 | 3 | 3 | No |
|)# SN 60851 | Down | 3/1 | Unknown | _ [<none></none> | 5000D31000EDB225 | | Unknown | 0 | 0 | 0 | No |
|) SN 60851 | Down | 3/2 | Unknown | I <none></none> | 5000D31000EDB226 | | Unknown | 0 | 0 | 0 | No |
| J SN 60851 | Up | 5/1 | Front End | Domain 2 | 5000D31000EDB221 | | 8 Gbps | 1 | 3 | 3 | No |
|) IFF SN 60851 | Up | 5/2 | Front End | ↓ Domain 1 | 5000D31000EDB222 | | 8 Gbps | 1 | 3 | 3 | No |
|) SN 60851 | Up | 5/3 | S Front End | Domain 2 | 5000D31000EDB223 | | 8 Gbps | 1 | 3 | 3 | No |
|) P SN 60851 | Up | 5/4 | S Front End | ↓ Domain 1 | 5000D31000EDB224 | | 8 Gbps | 1 | 3 | 3 | No |
| • | | | | | | | | | | | |
| | e: Virtual Po | | | | | | | ault Domains | Edit Virtual Po | | Reset Defaults |

Figure 30 Assigning ports on Compellent Storage to respective Fault Domains

Note: If you get a warning that paths are not balanced, navigate to the left-hand pane, right click **Controllers** and select **Rebalance Local Ports**.

Next, a server object needs to be created and the respective FC ports have to be selected to be used by the server object.

6. Right click **Servers** on the left pane and select **Create Server**.

In Figure 31 below, you can see a server object named "Finance_Server" was created that includes both of the virtual FCoE ports on the CNA card; the storage array sees the ports as FC ports.



| DØLL | Compellent | | Storage | e Center 60850 | | | | | |
|---|--|---------------|----------------|--------------------------------|--------------------|-------------------|---|--|---|
| Ċ Storage Mana | 🐑 Storage Management 🔍 View 📫 Refresh 🤣 Help | | | | | | | | |
| Stephenetics | 🤳 Map Volume to Serve | er <i>ವ</i> R | emove Mappings | from Server 🙀 Add HBAs to Se | rver 🙀 Remove HB | As from Server | 😻 Create Virtual Server 🛛 🖶 Convert to Virtual Server | 🧨 Move to Folder 💢 Delete 🛛 🎯 Create Boot Volume 🍓 | Create Volumes 🔛 Apply Replay Profile to Volumes |
| | s ance_Data_Compellent | Ę | Finance | e_Server | | | | | |
| ⊞ Replay ⊞ Replay | | Ger | neral Server | HBAs Connectivity Mappin | g Volumes | Charts | | | |
| Servers | | 0 | Refresh Si | et Update Frequency 👒 Find 🏾 🔍 | Scroll Setting 🛛 🙀 | Add HBAs to Serve | er 🛛 💥 Remove HBA | | |
| 🔂 Marketi ∃& Disks | ing_Server | Тур | e Server F | Port | Status | Connectivity | Port Information | | Connected Controller Ports |
| | |)## | FC 200190E | 311CCCE539 | | Connected | Port Id: 020F01, Symbolic Port Name: Broadcom I | Port1 pWWN 20:01:90:b1:1c:cc:e5:39, Node Name: 2000908 | 5000D31000EDB221, 5000D31000EDB240, 5000D31000EDB20 |
| 9 - W Controllers - W Controllers - O Endosures - W Radis - C Remote Systems - E Users | |) a | FC 200190E | 311CCCE26A | Up | Connected | Port Id: 010F01, Symbolic Port Name: Broadcom i | Port0 pWWN 20:01:90:b1:1c:cc:e2:6a, Node Name: 2000906 | 5000D31000ED8224, 5000D31000ED8238, 5000D31000ED820 |

Figure 31 Added Dell PowerEdge Server HBAs to 'Server Object' on Dell Compellent Storage Array

The next step is to enable mulipathing on Windows Server 2008 R2 Enterprise.

7. Navigate to Start > Administrative Tools > Server Manager > Features > Add Features and select Multipath I/O.

You can see in Figure 32 below that the **Multipath I/O** feature has been installed.



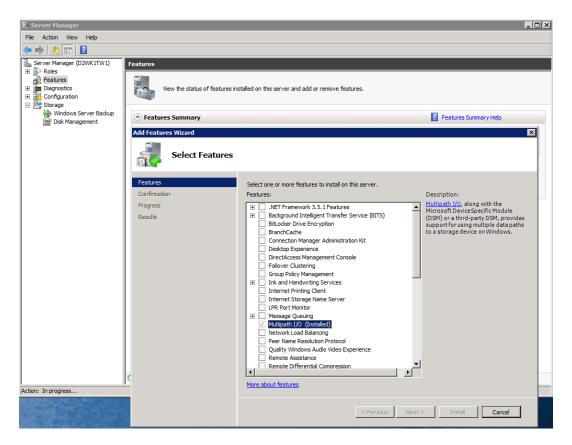


Figure 32 Installing Windows Server 2008 R2 Enterprise Multipath I/O feature

8. Navigate to Start > Control Panel > MPIO and click the Add button. When prompted for a Device Hardware ID, input COMPELNTCompellent Vol and click the OK button. The system will need to be restarted for the changes to take effect. Figure 33 displays the COMPELNTCompellent Vol text that you should see on the MPIO Devices tab in MPIO Properties once the system is brought back up.



| Image: Control Panel + All Control Panel Items + Earch Control Panel Adjust your computer's settings View by: Small icons + Adjust your computer's settings View by: Small icons + Action Center Image: Control Panel AutoPlay Image: Control Suite 4 Image: Credential Manager Image: Credential Manager Image: Cr | Image: Search Control Panel Terms | | | | | | |
|---|---|--|--|--|--|--|--|
| Image: Programs and Features Image: Programs and Features | Control Panel • All Con | trol Panel Items 👻 | ✓ Gos Search Control Panel | | | | |
| Image: Credential Manager Image: | Adjust your computer's settings | | View by: Small icons 🔻 | | | | |
| ^C Credential Manager ^C Date and Time ^C To add support for a new device, click Add and enter the Vendor and ^C Devices Manager ^C Devices and Printers ^C To add support for a new device, click Add and enter the Vendor and ^C Devices Manager ^C Devices and Printers ^C To add support for a new device, click Add and enter the Vendor and ^C Devices Center ^C Folder Options ^C To enove support for currently MPIO'd devices, select the devices and then click Remove. ^C Mouse ^C Mouse ^C Phone and Modem ^C Programs and Features ^C Region and Language ^{Device} Hardware Id ^C Mouse ^C System ^D Dell ^D Devices: ^C Notification Area Icons ^C Region and Language ^D Ell ^D Device ^C Sound ^C System ^D Ell ^D Device ^C Windows Firewal ^C Windows Lindate ^D Dell | 🏲 Action Center | administrative Tools | MPIO Properties | | | | |
| To add support for a new device, dick Add and enter the Vendor and Product Ids as a string of a characters followed by 16 Anacters. Multiple Devices can be specified using semi-colon as the delimiter. To add support for currently MPIO'd devices, select the devices and then click Remove. Internet Options Mouse Phone and Modem Programs and Features Region and Language Programs and Features Sound To System DeLL Mouse Firewal | AutoPlay | Intersection Control Suite 4 | MPIO Devices Discover Multi-Paths DSM Install Configuration Snapshot | | | | |
| Vendor 8Product 16 Add Remove More about adding and removing MPIO support OK Cancel | Constant of the second | Image: Contract of the second state of the second stat | Product Ids as a string of 8 characters followed by deliniter. To remove support for currently MPIO'd devices, select the devices and then dick Remove. Devices: Device Hardware Id COMPELINTCompetent Vol DELL MD3000 DELL MD3000 DELL MD3000 DELL MD32xx DELL MD32xx DELL MD36xxf DELL MD36xxf DELL MD36xxi Vendor & Product 16 Add Remove More about adding and removing MPIO support | | | | |

Figure 33 Installing Windows Server 2008 R2 Enterprise Multipath I/O for Compellent array

Next, create a volume and map it to a server object so the respective server can write to the FC storage array.

9. Simply right click Volumes on the left-hand pane and select Çreate Volume to get started. During the process, you will be asked to select a Replay Profile; this is simply asking you how often snapshots/recovery points of the storage volume should be taken. A snapshot/recovery point allows you to revert a volume back to a certain point in time (for example if files are accidentally deleted). In Figure 34 below, you can see that a 20 GB volume named Finance_Data_Compellent has already been created. Figure 35 displays the dialog box where you can select a Replay Profile.



| 🕽 Storage Management 🔍 View 📫 | Refresh 🛟 Help | |
|--|--|---|
| 💐 Properties 🥜 Map Volume to Serv | er 🧐 Map Volume to Remote System 🍃 Remove Mappings fi | rom Volume 🔯 Expand Volume ⊳ Replay 🧏 Create Boot From SAN Co |
| Storage Center 60850 Storage Comparison Volumes Finance_Data_Compellen Do IBR Replay Profiles | Finance_Data_Compellent | |
| Servers | General Mapping Copy/Mirror/Migrate R | eplays Replay Calendar Statistics Charts |
| B-∻ Disks B-∜ Controllers `` Controllers `` Controllers B ♥ Enclosures | Name: Finance_Data_Compellent Size: 20 GB | Index: 1 Serial Number: 0000edb2-00000003 |
| Racks Remote Systems Jugers | Folder: Disk Folder: Pool_1 | Volume Type: Dynamic Write Storage Type: Redundant - 2 MB |
| | Status: Up (active on controller 'SN 608 | 50°) |
| | Replay Profiles: Daily Storage Profile: Recommended (All Tiers) | |
| | Cache Settings | |
| | Write Cache Enabled: Yes Read Cache Enabled: Yes | Write Cache Status: Up Read Cache Status: Up |
| | Volume Statistics Read | Write |
| | Number of Requests: 1373 Number of Blocks: 135434 Number of Errors: 0 | 1248 178433 0 |
| | Date Created: 04/18/2013 11:55:24 AM Date Updated: 04/18/2013 11:55:24 AM | Created By: Admin Updated By: Admin |
| | | |

Figure 34 Created 20 GB "Finance_Data_Compellent" volume on Compellent array



| C Stor | age Center 60850 - Create Volume | and the second | and the local | |
|--------|--|-----------------|--------------------|------------------|
| | ck 💟 Quit 😰 Advisor | | | |
| | Select the Replay Profiles to be used for this vol | ume: | | |
| | Selected Replay Profiles | Replay Creation | | |
| | Sample | Serial | | |
| | 📝 🔛 Daily | Serial | | |
| | | | | |
| | | | | |
| | | | | |
| | < | | | P. |
| | Schedule | | Expiration | |
| | 🔛 Daily at 12:01 AM | | 1 week | |
| | | | | |
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| | | | | |
| | | | | • |
| | | | Create a Ne | w Replay Profile |
| | | | <u>oreate a ne</u> | |
| | | | | |
| | | | | |

Figure 35 Confirming to keep the default value for 'Replay Profiles'

- 10. The last step in configuring the Dell Compellent Storage Center array is mapping the newly created volume to the server. Once you create the volume, you will be asked if you want to map it to a server object. You can do it at this time or later. If mapping the volume to a server object later, on the left-hand pane under Storage > Volumes, simply right click on the volume you just created and select Map Volume to Server. You can then select the respective server object that you created prior.
- 11. As soon as the FCoE adapter on the Windows server detects storage available for it, it will be detected in the Windows disk management administration tool after performing a disk scan. To perform a disk scan, right click **Disk Management** on the left-hand pane and select **Rescan Disks**. You must right click the detected virtual disk and initialize it. Below in Figure 36, you can see the disk (Disk 1) has already been initialized and formatted as **NTFS**.



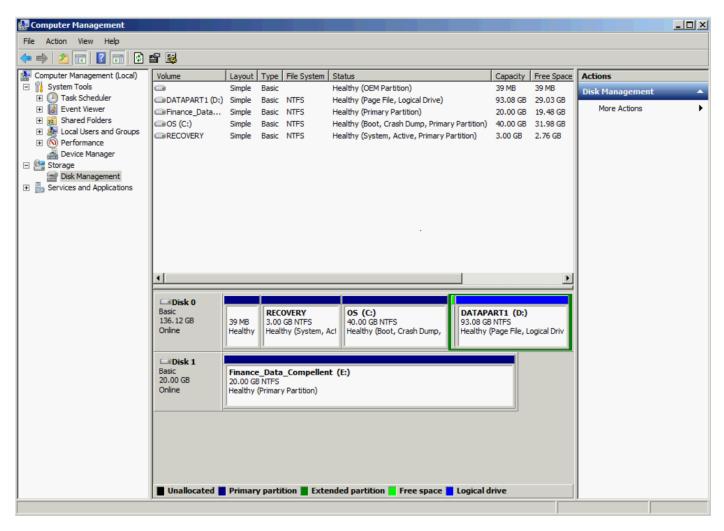


Figure 36 Initialized and formatted virtual disk within Windows Server 2008 R2 Enterprise

Note: The volume on the Compellent storage array displays in Windows just like a typical hard drive. Other than enabling FCoE on the CNA, no special configuration was needed.



| 🖳 Computer | | | | |
|-----------------------------|---|---|-------------------------|----------|
| Computer • | | | ▼ 🚱 Search Computer | 1 |
| Organize 🔻 AutoPlay Propert | ties System properties Uninstall or chang | e a program Map network drive Open C | Control Panel | |
| 🔶 Favorites 📥 • H | ard Disk Drives (3) | | | |
| Desktop | OS (C:) | DATAPART1 (D:) | Finance_Data_Compellen | t (E:) |
| Downloads | 31.9 GB free of 39.9 GB | 29.0 GB free of 93.0 GB | 19.4 GB free of 19.9 GB | |
| | | | | |
| Documents | | | | |
| J Music | | | | |
| Pictures | | | | |
| Videos | | | | |
| Computer | | | | |
| S (C:) | | | | |
| Finance_Data_Com | | | | |
| | | | | |
| Finance_Data_Comp | pellent (E:) Space used: Space free: 19.4 GB | Total size: 19.9 GB File system: NTFS | | |

Figure 37 Remote storage on Compellent as seen in Windows as drive 'E:'

Compellent SC8000 Load Balancing Policy Options:

The Compellent SC8000 controller uses Microsoft Multipath I/O (MPIO) for load balancing over ports. Microsoft MPIO is a framework that allows administrators to configure load balancing and failover processes for FC and iSCSI connected storage devices. You can configure load balancing to use up to 32 independent paths from the connected storage devices. The MPIO framework uses Device Specific Modules (DSM) to allow path configuration. For Windows Server 2008 and above, Microsoft provides a built-in generic Microsoft DSM (MSDSM) and it should be used. For Windows Server 2003 only, Dell Compellent provides a DSM.

A load balance policy is used to determine which path is used to process I/O. Once the Compellent volume has been created and mapped accordingly, as will be demonstrated shortly, to see the selected MPIO policy in Windows Server 2008 R2 Enterprise navigate to **Start > Administrative Tools > Computer Management**. On the left-hand pane navigate to **Computer Management > Storage > Disk Management** and right click the disk created on the Compellent storage array and select **Properties**. Next, select the **Hardware** tab, click the **Properties** button at the bottom right, and select the **MPIO** tab. Figure 38 below displays what you should see. Note, for Windows Server 2008, the default MPIO Policy is **Round Robin**.

The Dell Compellent SC8000 will only support Round Robin or Fail Over Only MPIO policies. The other



policies require Asymmetric Logical Unit Access (ALUA) support on the array and additional support through a DSM.

| 💭 Computer Management | | | | | | _ 🗆 × |
|-----------------------------|---|---|--|--|--|---|
| File Action View Help | | | | | | |
| 🗢 🔿 🔰 🖬 🚺 | X 🖆 🖻 🍳 😼 | | | | | |
| Computer Management (Local) | Volume | Layout Type File | | | Capacity Fi | Actions |
| | | Simple Basic Simple Basic NTF ent (T-) Simple Basic NTF Simple Basic NTF Simple Basic NTF Basic NTF Basic NTF Simple Basic NTF | Healthy (OE Healthy (Parissing of the second of the secon | | | |
| | 20.00 GB 20.0 Online Heal UCD-ROM 0 DVD (E:) No Media | ance_Data_Compellent (1 0 GB NTFS thy (Primary Partition) | | This device has the following r Path Id 77100010 77100011 770f0011 770f0011 770f0011 70f00011 To edit the path settings for the path and click Edit. To apply the path settings and click Apply. More information about MPIO | Path State Active/Op Active/Op Active/Op Active/Op Active/Op e MPIO policy, sele | ttimized timized ttimized ttimized |
| | Unallocated Prin | nary partition 📕 Extende | d partition 📕 Free | | | OK Cancel |

Figure 38 Checking MPIO settings in Windows Server 2008 R2 Enterprise

Additionally, there are two IO connection options available with the Dell Compellent Storage Center that allow multiple paths to be presented to the servers: **Legacy Ports** and **Virtual Ports**. You will be asked which one you would like to use when initially setting-up the Compellent Storage Center and configuring the FC IO cards. See the "Storage Center 6.2 System Setup Guide" for more information on initial setup of the Dell Compellent Storage Center.

In legacy mode, front-end IO ports (in this case FC ports) are broken into primary and reserve ports based on a fault domain. The reserve port is in a standby mode until a primary port fails over to the reserve port. In terms of MPIO, this requires twice the IO ports to enable multiple paths. For redundancy, a primary port connects to one controller, and the reserved port in that fault domain connects to the other controller. While this is a highly robust failover solution, it requires a large number of ports.

Dell Compellent introduced virtual ports in Storage Center 5.0. Virtual ports allow all front-end IO ports to be virtualized. All FC ports can be used at the same time for load balancing as well as failover to



another port. Although a virtual disk can still only be written to from the controller that owns the disk, virtual ports allow for better performance in terms of failover as the virtual connection can simply be moved to another physical port in the same fault domain. To use virtual ports, all FC switches and HBAs must support N_Port ID Virtualization (NPIV). See the "Dell Compellent Storage Center Microsoft Multipath IO (MPIO) Best Practices Guide" for more information on multipathing with Microsoft Windows Server 2008 R2 Enterprise.

4.4 Brocade 6505 FC Switch Configuration

Note, the Brocade 6505 FC switch has not been configured yet and connectivity from the server to the Compellent Storage Array is good. The reason for this is because, by default, the Brocade FC switch allows all devices to see and communicate with each other. However, this is not best practice.

Access control on a switched SAN fabric can be provided by the fabric itself via zoning. By creating zones, the fabric can be partitioned so that only specific devices can see and talk to each other. This is somewhat analogous to VLANs on a LAN. However, unlike VLANs, zones typically consist of very few devices such as one initiator and a few targets.

Best practice for zoning is to create a separate zone for each path that the host can see. This minimizes external chatter and when something changes all nodes won't be notified of the change. If there are few nodes connected and to minimize configuration and maintenance, some may prefer to group multiple WWPNs going to the same destination within one zone. Below, one zone is created for the FCoE port going to all four ports of the storage. Note the World Wide Port Number (WWPN) of the end node ports are used in the zoning configuration. We also could have created four zones – one per FCoE port and storage port combination.

The two FC switches being used are Brocade 6505s and the zoning configurations are below. The WWPNs starting with **20** are the virtual FCoE port WWPNs and the other WWPNs are for the Compellent storage array. In this example, the WWPN of the CNA virtual FCoE port is being utilized. When working with network adaptors that provide a MAC address as well as a World Wide Port and Node name, it's important to understand where these addresses originate. The M1000e chassis has a feature called Flexaddressing which allows for a virtual MAC address/WWPN to be linked to a server, therefore, if the CNA/adapter is changed later, zoning or configuration on switches does not need to be modified. For more information on this feature and how to implement it see Section 6 "M1000e FlexAddress enablement" of this document.



1. Fabric A Brocade FC Switch Zoning Configuration

| > zonecreate financeServer1_p1_test, "20:01:90:b1:1c:cc:e2:6a; 50:00:d3:10:00:ed:b2:3b; 50:00:d3:10:00:ed:b2:3d; 50:00:d3:10:00:ed:b2:41; 50:00:d3:10:00:ed:b2:43" |
|---|
| <pre>> cfgcreate zoneCfg_test,"financeServer1_p1_test"</pre> |
| > cfgenable zoneCfg_test |
| > cfgsave |
| |

On the fabric A FC switch you can see the WWPN of the server FCoE port is **20:01:90:b1:1c:cc:e2:6a** and the WWPNs of the storage ports are **50:00:d3:10:00:ed:b2:3b**, **50:00:d3:10:00:ed:b2:3d**, **50:00:d3:10:00:ed:b2:41**, and **50:00:d3:10:00:ed:b2:43**. This zoning configuration is allowing all four storage ports to communicate only to each other and the server virtual FCoE port.

The zoning configuration can be confirmed with the **zoneshow** command.

```
Brocade_6505_1:admin> zoneshow
Defined configuration:
        zoneCfg_test
 cfg:
                financeServer1_p1_test
 zone: financeServer1_p1_test
                20:01:90:b1:1c:cc:e2:6a; 50:00:d3:10:00:ed:b2:3d;
                50:00:d3:10:00:ed:b2:43; 50:00:d3:10:00:ed:b2:3b;
                50:00:d3:10:00:ed:b2:41
Effective configuration:
       zoneCfg_test
 cfg:
        financeServer1_p1_test
 zone:
                20:01:90:b1:1c:cc:e2:6a
                50:00:d3:10:00:ed:b2:3d
                50:00:d3:10:00:ed:b2:43
                50:00:d3:10:00:ed:b2:3b
                50:00:d3:10:00:ed:b2:41
```

Brocade_6505_1:admin>

Figure 39 Displaying zoning configuration on fabric A Brocade FC switch



2. Fabric B Brocade FC Switch Zoning Configuration

| > zonecreate financeServer1_p2_test, "20:01:90:b1:1c:cc:e5:39; 50:00:d3:10:00:ed:b2:3a; 50:00:d3:10:00:ed:b2:3c; 50:00:d3:10:00:ed:b2:40; 50:00:d3:10:00:ed:b2:42" |
|---|
| > cfgcreate zoneCfg_test, "financeServer1_p2_test" |
| > cfgenable zoneCfg_test |
| > cfgsave |
| |

On the fabric B FC switch you can see the WWPN of the server FCoE port is **20:01:90:B1:1C:CC:E5:39** and the WWPNs of the storage ports are **50:00:d3:10:00:ed:b2:3a**, **50:00:d3:10:00:ed:b2:3c**, **50:00:d3:10:00:ed:b2:40**, and **50:00:d3:10:00:ed:b2:42**.

The zoning configuration can be confirmed with the **zoneshow** command.

```
Brocade_6505_2:admin> zoneshow
Defined configuration:
cfg:
        zoneCfg_test
                financeServer1_p2_test
zone:
        financeServer1_p2_test
                20:01:90:b1:1c:cc:e5:39; 50:00:d3:10:00:ed:b2:3a;
                50:00:d3:10:00:ed:b2:3c; 50:00:d3:10:00:ed:b2:40;
                50:00:d3:10:00:ed:b2:42
Effective configuration:
        zoneCfg_test
cfg:
        financeServer1_p2_test
zone:
                20:01:90:b1:1c:cc:e5:39
                50:00:d3:10:00:ed:b2:3a
                50:00:d3:10:00:ed:b2:3c
                50:00:d3:10:00:ed:b2:40
                50:00:d3:10:00:ed:b2:42
```

Brocade_6505_2:admin>

Figure 40 Displaying zoning configuration on fabric B Brocade FC switch



To observe that the storage ports and FCoE ports are logged into the fabric, you can use the **nsshow** command on the Brocade FC switch. A small capture of the output of this command is shown below.

Brocade_6505_1:admin> nsshow ł Type Pid (N 010300; PortName NodeName TT 3;50:00:d3:10:00:ed:b2:08;50:00:d3:10:00:ed:b2:00; na COS TTL(sec) FC4s: FCP PortSymb: [90] "Compellent Port QLGC FC 8Gbps; Slot=05 Port=04 in Controller: SN 60850 of Storage Center: " NodeSymb: [47] "Compellent Storage Center: Storage Center 60850" Fabric Port Name: 20:03:00:05:33:d3:f2:4f Permanent Port Name: 50:00:d3:10:00:ed:b2:08 Port Index: 3 Share Area: No Device Shared in Other AD: No Redirect: No Partial: No 010301; 3;50:00:d3:10: FC4s: FCP 3;50:00:d3:10:00:ed:b2:3d;50:00:d3:10:00:ed:b2:01; na N PortSymb: [110] "Compellent Port QLGC FC 8Gbps; Slot=05 Port=04 in Controller: SN 60850 of Storage Center: Storage Center 60850" NodeSymb: [47] "Compellent Storage Center: Storage Center 60850" Fabric Port Name: 20:03:00:05:33:d3:f2:4f Permanent Port Name: 50:00:d3:10:00:ed:b2:08 Port Index: Share Area: No Device Shared in Other AD: No Redirect: No Partial: No

Figure 41 'nsshow' command output on fabric A Brocade FC switch



You can also see the node WWPN by looking at what is logged in on the physical port as shown in Figure 42 below.

Brocade_6505_1:admin> portshow 15 portIndex: 15 portName: port15 portHealth: HEALTHY Authentication: None portDisableReason: None portCFlags: 0x1 portFlags: 0x1 portFlags: 0x24b03 P. LocalSwcFlags: 0x0 portType: 24.0 POD Port: Port is licensed PRESENT ACTIVE F PORT G PORT U PORT NPIV LOGICAL ONLINE LOGIN NOELP LED ACCEPT FLOGI portState: 1 Online Protocol: FC portScn: 41572 portPhys: 6 In_Sync 32 F_Port port generation number: 25 state transition count: portId: 010£00 portIfId: 4302000f portWwn: 20:0f:00:05:33:d3:f2:4f portWwn of device(s) connected: 20:01:90:b1:1c:cc:e2:6a 20:2c:d0:67:e5:a7:b0:80 Distance: normal portSpeed: N8Gbps FEC: Inactive LE domain: O FC Fastwrite: OFF Interrupts: 0 Link_failure: 5 Frjt: 0 Unknown: 55 Loss_of_sync: 11 Fbsy: п Lli: 214 Loss_of_sig: 12 Proc_rqrd: 1925 Protocol_err: 0 Invalid_word: 22317 Timed_out: п Rx_flushed: Π Invalid_crc: 1281 п Delim_err: Tx unavail: 498 0 0 Free_buffer: Address_err: 13 0 Overrun: Lr in: Suspended: 0 Lr_out: 3 Parity_err: 0 Ols_in: 0 2_parity_err: 0 01s_out: 13 CMI_bus_err: 0

Port part of other ADs: No Brocade_6505_1:admin>

Figure 42 'portshow 15' command output on fabric A Brocade FC switch



Another useful FC switch command to check what ports are connected is **switchshow**.

| Brocade_6505_1:admin> switchshow switchName: Brocade_6505_1 switchType: 118.1 switchState: Online switchMode: Native switchRole: Principal switchDomain: 1 switchId: fffc01 switchId: fffc01 switchWwn: 10:00:00:05:33:d3:f2:4f zoning: ON (zoneCfg_test) switchBeacon: OFF FC Router: OFF FC Router BB Fabric ID: 1 Address Mode: O Index Port Address Media Speed State Proto | | | | | | | |
|--|--------|------------------|--------------|------------|----------------------|----------|---------------------------------|
| | | | | | | | |
| | | | | | | | |
| 0 | 0 | 010000 | id | N16 | No_Light | FC FC | |
| 1 2 | 1 2 | 010100 010200 | id id | N16 N16 | No_Light No_Light | FC | |
| 2 | 3 | 010200 | id | NB | Online | FC | |
| 4 | 4 | 010400 | id | N16 | In_Sync | FC | |
| 5 | 5 | 010500 | | N16 | No Module | FC | |
| 6 | 6 | 010600 | | N16 | No_Module | FC | |
| 7 | 7 | 010700 | | N16 | No Module | FC | |
| 8 | 8 | 010800 | id | N8 | Online | FC | |
| 9 | 9 | 010900 | id | N8 | Online | FC | |
| 10 | 10 | 010a00 | id | N8 | Online | FC | L |
| 11 | 11 | 010600 | id | N8 | No_Light | FC | |
| 12 | 12 | 010c00 | id | N8 | Online | FC | F-Port 20:29:d0:67:e5:a7:b0:7d |
| 13 | 13 | 010d00 | id | N8 | Online | FC | F-Port 20:2a:d0:67:e5:a7:b0:7e |
| 14 | 14 | 010e00 | id | N8 | Online | FC | F-Port 1 N Port + 1 NPIV public |
| 15 | 15 | 010£00 | id | N8 | Online | FC | F-Port 1 N Port + 1 NPIV public |
| 16 | 16 | 011000 | | N16 | No_Module | FC | |
| 17 | 17 | 011100 | | N16 | No_Module | FC | l • |
| 18 | 18 | 011200 | | N16 | No_Module | FC | 1 • |
| 19 | 19 | 011300 | id | N16 | No_Light | FC | |
| 20 | 20 | 011400 | | N16 | No_Module | FC | |
| 21 | 21 | 011500 | | N16 | No_Module | FC | |
| 22 | 22 | 011600 | | N16 | No_Module | FC | |
| _ 23 | 23 | 011700 | | N16 | No_Module | FC | · |
| Broca | de_65 | 505_1:adm | 1 n > | | | | |
| | | | | | | | |

Figure 43 'switchshow' command output on fabric A Brocade FC switch



4.5 Verification on the Dell MXL w/ FC Flex IOM

 To see information on NPIV devices logged into the fabric, use the show npiv devices command on the Dell MXL switch as shown below. Note the FCoE MAC is 0e:fc:02:01:0f:01 (the FCoE Map + FC_ID as expected).

Dell_MXL_A1#show npiv devices

| ENode[0]: | | |
|--------------|---|-------------------------|
| ENode MAC | : | 90:b1:1c:cc:e2:6a |
| ENode Intf | : | Te 0/4 |
| FCF MAC | : | d0:67:e5:a7:b0:80 |
| Fabric Intf | : | Fc 0/44 |
| FCOE Vlan | : | 1002 |
| Fabric Map | : | SAN_FABRIC_A |
| ENode WWPN | : | 20:01:90:b1:1c:cc:e2:6a |
| ENode WWNN | : | 20:00:90:b1:1c:cc:e2:6a |
| FCoE MAC | : | Oe:fc:02:01:0f:01 |
| FC-ID | : | 01:0f:01 |
| LoginMethod | : | FLOGI |
| Secs | : | 9438 |
| Status | : | LOGGED_IN |
| Dell_MXL_A1# | ŧ | |
| | | |

Figure 44 'show npiv devices' command output on fabric A Dell MXL switch

2. To see currently active FCoE VN_Port sessions, use the **show fip-snooping sessions** command.

| Dell MXL Al#show fip-snooping sessions | | | | | | | | | |
|--|------------|-------------------|----------|------|-------------------|----------|-------------------------|-------------------------|--|
| Enode MAC | Enode Intf | FCF MAC | FCF Intf | VLAN | FCoE MAC | FC-ID | Port WWPN | Port WWNN | |
| | | | | | | | | | |
| 90:b1:1c:cc:e2:6a Dell_MXL_A1# | Te 0∕4 | d0:67:e5:a7:b0:80 | Fc 0/44 | 1002 | 0e:fc:02:01:0f:01 | 01:0f:01 | 20:01:90:b1:1c:cc:e2:6a | 20:00:90:b1:1c:cc:e2:6a | |

Figure 45 'show fip-snooping enode' command output on fabric A Dell MXL switch

3. To see all FCoE end-node (ENodes) , use the **show fip-snooping enode** command.

| Dell_MXL_A1#show fi | p-snooping enode | | | |
|-----------------------------------|------------------|-------------------|------|----------|
| Enode MAC | Enode Interface | FCF MAC | VLAN | FC-ID |
| | | | | |
| 90:b1:1c:cc:e2:6a Dell_MXL_A1# | Te 0/4 | d0:67:e5:a7:b0:80 | 1002 | 01:0f:01 |

Figure 46 'show fip-snooping enode' command output on fabric A Dell MXL switch



4. To see a list of configured fcoe-maps, use the **show fcoe-map brief** command.

| Dell_MXL_A1#show | fcoe-map brief | | | | | |
|------------------|----------------|---------|--------|--------------|--------------|------------|
| Fabric-Name | Fabric-Id | Vlan-Id | FC-MAP | FCF-Priority | Config-State | Oper-State |
| SAN_FABRIC_A | 1002 | 1002 | Oefc02 | 128 | ACTIVE | UP |
| Dell_MXL_A1# | | | | | | |

Figure 47 'show fcoe-map brief' command output on fabric A Dell MXL switch

5. To see more detailed information on a given fcoe-map, use the **show fcoe-map <FCoE_MAP_NAME>** command. Notice below, the priority mapped to FCoE by default is **3**.

Dell_MXL_A1#show fcoe-map SAN_FABRIC_A

| Fabric Name | SAN_FABRIC_A |
|---|--------------|
| Fabric Id | 1002 |
| Vlan Id | 1002 |
| Vlan priority | 3 |
| FC-MAP | Nefc02 |
| FKA-ADV-Period | 8 |
| Fcf Priority | 128 |
| Config-State | ACTIVE |
| Oper-State Members | UP |
| Fc 0/41 Fc 0/42 Fc Te 0/9 Te 0/4 Dell_MXL_A1# | 0/43 Fc 0/44 |

Figure 48 'show fcoe-map SAN_FABRIC_A' command output on fabric A MXL switch



5 Dell IOA w/ FC Flex IOM Configuration

This example uses a similar topology as shown prior except instead of using the Dell MXLs in the Fabric A blade slot, the Dell IOAs with FC Flex IOMs in the Fabric B slot of the M1000e chassis are used. Another difference from the prior example in Section 4 is that instead of the Broadcom 57810 NDC CNA in the Fabric A slot of the server, the QLogic QME8262-k mezzanine CNA adapter inserted in the Fabric B slot of the server is used.

5.1 Dell QLogic QLE8262 CNA Configuration

The below shows an example of how to configure the QLogic QME8262-k mezzanine CNA adapter from the **QConvergeConsole** CLI management application.

QLogic offers CNAs in three formats for Dell 12G servers: QLE8262 standard PCI Express, QME8262-k mezzanine for Dell blade servers, and QMD8262-k for the Dell Network Daughter Card. The Dell QLogic QME8262-k mezzanine CNA allows for up to four partitions per physical port and eight partitions total per 2-port adapter. A partition can be looked upon as a virtual port.

This example displays Dell QLogic QME8262-k mezzanine CNA configuration in Microsoft Windows Server 2008 R2 Enterprise. By default, only the NIC functionality is enabled. FCoE must be manually enabled on the CNA for the virtual FCoE ports to be identified in Windows. The configuration of the CNA for FCoE is shown in Figures 48 - 51.

1. Once the Dell QLogic QME8262-k mezzanine CNA drivers and **QConvergeConsole** CLI are installed, double click the **QConvergeConsole** CLI shortcut in Windows and configure the CNA as shown below in Figure 51.

You can see that **function 6** on **port 1** and **function 7** on **port 2** have been configured to handle FCoE, **function 0** on **port 1** and **function 1** on **port 2** have been configured to handle LAN traffic, and the other partitions have been disabled.



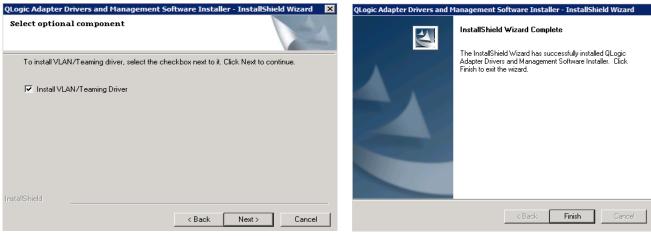


Figure 49 QLogic QLE8262 CNA Configuration

```
QConvergeConsole

CLI - Version 1.1.0 (Build 9)

Main Menu

1: Adapter Information

2: Adapter Configuration

3: Adapter Updates

4: Adapter Diagnostics

5: Adapter Statistics

6: NIC Partitioning (NPAR) Information

7: NIC Partitioning (NPAR) Configuration

8: Refresh

9: Help

10: Exit
```

```
Figure 50 Dell Qlogic QLE8262 CNA QConvergeConsole screen
```



```
Please Enter Selection: 7
    QConvergeConsole
    CLI - Version 1.1.0 (Build 9)
NIC Partitioning (NPAR) Configuration Selection
1: NPAR Configuration
     (p or 0: Previous Menu; m or 98: Main Menu; ex or 99: Quit)
    Please Enter Selection: 1
    QConvergeConsole
    CLI - Version 1.1.0 (Build 9)
NIC Partitioning (NPAR) Configuration
1: Change PCI Function Personality
     (p or 0: Previous Menu; m or 98: Main Menu; ex or 99: Quit)
    Please Enter Selection: 1
    QConvergeConsole
    CLI - Version 1.1.0 (Build 9)
NIC Partitioning (NPAR) Port Configuration Selection
CNA Model QME8262 SN: RFE1314H60191
  1. Port
              1
                    6 [Type: FCoE ] [WWPN: 20-01-90-B1-1C-CC-E5-76] Online
0 [Type: NIC ] [MAC Address: 90:B1:1C:CC:E2:6C] Link Up
       Function
       Function
  2. Port
              2
                    7 [Type: FCoE ] [WWPN: 20-01-90-B1-1C-CC-E5-77] Online
1 [Type: NIC ] [MAC Address: 90:B1:1C:CC:E2:6D] Link Up
       Function
       Function
    (p or 0: Previous Menu; m or 98: Main Menu; ex or 99: Quit)
Please Enter Selection: _
```

Figure 51 Dell Qlogic QLE8262 CNA FcoE/NPAR Configuration

Creating a NIC Team

Since the NICs and HBAs are seen as virtual ports, you can treat them as separate entities and create a NIC team with the virtual CNA NIC ports. In Figures 51 - 54, you can see the two virtual NIC ports are NIC teamed using 'Failsafe Team'.

In this example, Windows Server 2008 R2 Enterprise is the operating system used.

 To create a NIC team on the virtual NIC ports navigate to Control Pane > Network and Internet > Network and Sharing Center > Change adapter settings and right click one of the ports you wish to put in a NIC team. Click Properties. Click the Configure button. Next, click the Team Management tab as shown in Figure 52.



| General | Advanced Management | Information Team Management | Statistics | Diagnostics | Support er Management |
|--|--|---|------------------|----------------------|--------------------------|
| Teams and A | | | Team Data | | OGIC |
| ⊖ Othe | jic Adapters QLogic 10GbE 2F QLogic 10GbE 2F er Vendor Adapter TEAM#Team_1-E | 2 QME8262-k Mezz 2 QME8262-k Mezz # s procade 10G Etheme procade 10G Etheme | | | |
| | | | | | |
| <u>د (</u> | | | | | |
| nclude any pl using this tool Creating Te | e left shows the r hysical adapters o cams | network devices current In the machine as well a ler and select "Create T | as the teams and | virtual adapters con | figured |
| Network To The box on the include any pl sing this tool | e left shows the r hysical adapters o cams | n the machine as well a | as the teams and | virtual adapters con | figured |

Figure 52 'Team Management' tab of port properties

3. Now right click on the **Teams** folder and click **Create Team**. Choose the type of NIC teaming you desire. In this example we will demonstrate with **Failsafe Team**. Next, select the ports to add to the NIC team and select the primary adapter. The rest of the settings we leave as default. Figure 53 displays the virtual port NIC team with two virtual NIC ports as members.



| Create Team |
|--|
| Team Name Team - 1 |
| |
| Failsafe Team ACF ACF ACF ACF ACF |
| O 802.3ad Static Team O Passive LACP |
| O 802.3ad Dynamic Team |
| O Switch Independent Load Balancing |
| Select Adapters To Add: |
| TEAM#Team_1-Brocade 10G Ethernet Adapter #2 |
| TEAM#Team_1-Brocade 10G Ethernet Adapter |
| QLogic 10GbE 2P QME8262-k Mezz #2 |
| QLogic 10GbE 2P QME8262-k Mezz |
| |
| |
| |
| Static MAC Address Failback Delay(Seconds) |
| Use default MAC Address |
| |
| Select Preferred Primary Adapter |
| QLogic 10GbE 2P QME8262-k Mezz |
| Failback type |
| O None O Preferred Primary O Auto Select |
| Create Team - Select Team Type - Select Adapters - Select a MAC address or Use a default one |
| Select a MAC address of Ose a default one Select a 'Preferred Primary Adapter' for the team If 'Preferred Primary Adapter' is selected, choose a failback type |
| Advanced OK Cancel |

Figure 53 NIC teaming virtual NIC ports with Failsafe Team



| Logic 10GbE 2 | P QME8262-k | Mezz Properties | | | | | ļ |
|--|---|--|----------|---------------|-----------|--------------|------------|
| General | Advanced | Information | ি্স | atistics | Diagn | ostics | Support |
| NIC Partition | Management | Team Management | | Driver I | Details | Power | Management |
| Teams and A | dapters: Team - 1 Virtual Adapte Default V Physical Adapter QLogic 1 ic Adapters r Vendor Adapter TEAM#Team_1-1 | lan oters DGbE 2P QME8262+ DGbE 2P QME8262+ | -Team | Data | | | DGIC |
| include any pl using this tool Creating Te | e left shows the r hysical adapters o ams | network devices curren on the machine as well der and select "Create " | as the f | teams and vir | tual adap | oters config | ured |
| | | Done | | | Ready | | |
| | | | | ОК | _ | | |

Figure 54 Dell QLogic QLE8262 adapter propertise displaying the created NIC team

As far as the network configuration for the LAN, since **Failsafe Team** is utilized, there is no special configuration that needs to be done on the IOA switches. You can simply have one link going to each IOA switch with one port in **active** mode and the other in **standby** mode.

4. In this example, the LAN traffic is on VLAN 5. You can easily tag the NIC team with VLAN 5 by right clicking the VLAN name, selecting **Modify VLAN**, and entering the respective VLAN as shown below.



| General Advanced Information Statistics Diagnostics Support NIC Partition Management Team Management Driver Details Power Management Image: Comparison of the comparison of th | ogic 10GbE 2. | P QME8262-k | Mezz Properties | | | | | |
|--|--|---|---|----------|-------------|----------|--------------|---------------|
| Teams and Adapters Teams and Adapters Teams and Adapters Teams and Adapters Teams and Adapters Teams 1 Teams 1 Te | General | Advanced | | ្រៃ | tatistics | Di | agnostics | Support |
| Teams and Adapters: Vitual Data Image: Teams 1 Properties Image: Other Vendor Adapters Default Vian Image: Other Vendor Adapters Other Vendor Adapters Image: Other Vendor Adapters Vian Name Image: Other Vendor Adapters Vian Name Image: Other Vendor Adapters Vian Id Image: TEAM#Team_1-Brocade 10G Etheme Vian Type Image: Other Vendor Adapters Vian Id Image: TEAM#Team_1-Brocade 10G Etheme Vian Type Image: Other Vendor Adapters Vian Type Image: TEAM#Team_1-Brocade 10G Etheme OK Cancel OK Van Type Image: Tagged Image: Other Vendor Adapters OK Image: Other Vendor Adapters OK Image: TEAM#Team_1-Brocade 10G Etheme OK Mow to OK Cancel Network Topology The box on the left shows the network devices currently present on this system. These devices onfigured using this tool. Treating Teams Open Ready | NIC Partition | Management | Team Management | | Driver | Detail | s Powe | er Management |
| How to Network Topology The box on the left shows the network devices currently present on this system. These devices include any physical adapters on the machine as well as the teams and virtual adapters configured using this tool. Creating Teams Right-click on the "Teams" folder and select "Create Team" to create a new team on the unteamed Done Ready | NIC Partition | dapters: ns Team - 1 Virtual Adapter Physical Adapter QLogic 1 QLogic 1 ic Adapters r Vendor Adapter TEAM#Team_1-F | Team Management rs lan oters DGbE 2P QME82624 DGbE 2P QME82624 rs Brocade 10G Etheme | - Virtua | Al Data | Detail | S Powe | |
| Network Topology The box on the left shows the network devices currently present on this system. These devices include any physical adapters on the machine as well as the teams and virtual adapters configured using this tool. Creating Teams Right-click on the "Teams" folder and select "Create Team" to create a new team on the unteamed Done | - Herrite | | | <u> </u> | | | | |
| , , , , | Network To The box on th include any ph using this tool. Creating Te | e left shows the r nysical adapters o ams | on the machine as well | as the | teams and v | irtual a | dapters conf | igured |
| OK Cancel Help | | | Done | | | Rea | ady | |
| | | | | | ОК | | Cancel | Help |

Figure 55 Tagging the NIC team with VLAN 5

The NIC team will now show in Windows as a new virtual adapter as shown in Figure 56 and Figure 57.









Figure 57 NIC team virtual adapter as seen in 'Device Manager' in Windows

5.2 Dell IOA w/ FC Flex IOM Configuration

5.2.1 Default Configuration

If only layer 2 functionality is required, FC Flex IOM can be used with the Dell IOA blade switch to provide Ethernet-FC bridging capability instead of the Dell MXL blade switch which also provides advanced layer 3 functionality. In addition, in the default **standalone** mode, the Dell IOA blade switch requires zero-touch configuration. Simply insert the blade switch into the Dell M1000e chassis and it functions as a NPIV Proxy Gateway switch with the default configuration provided. The below topology is slightly different than the topology shown prior with the MXL blade switches. The main difference is that instead of the Dell MXLs in Fabric A, we are now using the Dell IOAs in Fabric B of the M1000e chassis, we are also using the QLogic QME8262-k mezzanine CNA adapter inserted in the Fabric B slot of the server.

Note, by default, all uplink ports on a Dell IOA are part of the Port Channel 128 LAG. All 40 GbE ports are in quad mode (10 GbE mode) and also part of the Port Channel 128 LAG. In such a configuration, the upstream LAN switches should be configured correctly for the Port Channel 128 LAG consisting of 10 GbE ports. In such a configuration, a possible design may be such as the below. Here VLT can still be employed on the S6000s down to the IOA for the LAN traffic. This gives an extra level of switch-level redundancy for the ToR. In this configuration, the LAN connection from the server is active/standby while the SAN connection is active/active and utilizing a **round-robin** multipathing policy.



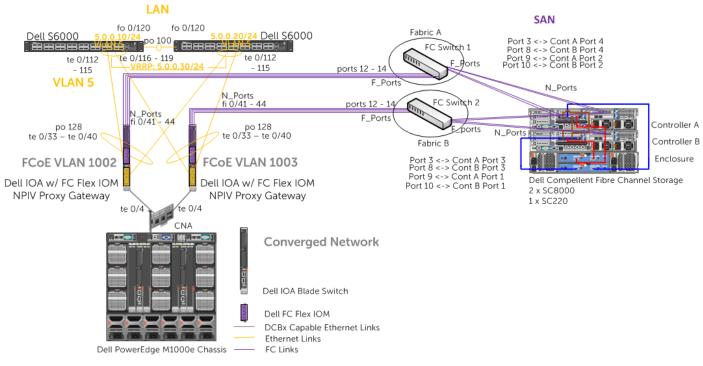


Figure 58 Dell IOA w/ FC Flex IOM acting as a NPIV Proxy Gateway and allowing for a converged infrastructure

By simply inserting the Dell IOA blade switch w/ FC Flex IOM into the Dell M1000e chassis, you can see below that the end-node is able to log into the SAN A fabric without any configuration needed. In default **standalone** mode, the Dell PowerEdge M I/O Aggregator requires zero-touch configuration in terms of setting up the environment for FCoE. By default it is already preconfigured for NPIV Proxy Gateway when the FC Flex IO Module is detected. Also by default, all uplink ports are lagged together via LACP in **port-channel 128**. In figure 58 above, since we are using the two included 40 GbE ports on each IOA up to the S6000s. Ports **tengigabitethernet 0/33** – **tengigabitethernet 0/40** are the ports that are being utilized to connect to the S6000 via 40 GbE cable. In this example 40 GbE active fiber DACs are used but 40 GbE copper DACs could also have been used. OM3 fiber and 8G FC optics are used to connect the FC Flex IOM to the FC ports on the Brocade FC switches.

The IO Aggregator is meant to be used for ease of deployment. All interfaces are tagged on all VLANs and untagged on the default VLAN. For this reason, since all DCB and FCoE configuration is also applied by default, there is no configuration needed on the Dell IOA. If it is desired to change the VLAN settings, the Chassis Management Controller (CMC) GUI can be employed.

It should be noted that the IOA has uplink failure detection by default, so if the upstream connectivity is down, the IOA automatically disables the port connecting to the server – **tengigabitethernet 0/4** in this case. This is done for proper failover upon upstream connectivity failure. Because of all the



preconfiguration already applied by default, once the server is configured properly, the IOA will automatically function as a FCoE NPIV Proxy Gateway. For the Dell, MXL setup in figure 5 prior in this document, we manually applied much of the same configuration such as uplink-failure detection.

By simply inserting the Dell IOA blade switch w/ FC Flex IOM into the Dell M1000e chassis, you can see below that the end-node is able to log into the SAN A fabric without any configuration needed.

| Dell_IOA_B1#show fip-snooping enode | | | | | | | | | |
|-------------------------------------|-----------------|-------------------|------|----------|--|--|--|--|--|
| Enode MAC | Enode Interface | FCF MAC | VLAN | FC-ID | | | | | |
| | | | | | | | | | |
| 90:b1:1c:cc:e5:76 Dell_IOA_B1# | Te 0/4 | d0:67:e5:ac:ac:ae | 1002 | 01:0f:01 | | | | | |

Figure 59 'show fip-snooping enode' command output on fabric A IOA switch

By checking the **running-config** of the Dell IOA switch, the default configuration can be seen. The proper LACP, FCoE, and uplink failure detection configuration is already present by default so no further configuration needs to be done. Below, some relevant default configuration is shown in regards to DCB and FCoE. **Programmable-mux** mode can also be used if a manual configuration via CLI for specific requirements such as multiple upstream LAGs or multiple FC fabrics is needed. See section '5.2 Programmable-mux mode' for more information.

```
dcb-map SAN_DCB_MAP
  priority-group 0 bandwidth 30 pfc off
  priority-group 1 bandwidth 30 pfc off
  priority-group 2 bandwidth 40 pfc on
  priority-pgid 0 0 0 2 1 0 0 0
```

Figure 60 DCB map configuration on fabric A IOA switch

fcoe-map SAN_FABRIC description SAN_FABRIC fc-map OefcOO fabric-id 1002 vlan 1002

Figure 61 FCoE map configuration on fabric A IOA switch



```
interface TenGigabitEthernet 0/4
mtu 12000
portmode hybrid
switchport
auto vlan
dcb-map SAN_DCB_MAP
fcoe-map SAN_FABRIC
!
protocol lldp
advertise management-tlv management-address system-name
no shutdown
```

Figure 62 Server connecting port configuration on fabric A IOA switch

```
interface TenGigabitEthernet 0/33
mtu 12000
dcb-map SAN_DCB_MAP

port-channel-protocol LACP
port-channel 128 mode active

protocol 11dp
advertise management-tlv management-address system-name
no advertise dcbx-tlv ets-reco
dcbx port-role auto-upstream
no shutdown
```

Figure 63 Port-channel member interface configuration on fabric A IOA switch

```
interface Port-channel 128
mtu 12000
portmode hybrid
switchport
fip-snooping port-mode fcf
no shutdown
link-bundle-monitor enable
```

Figure 64 Port-channel interface configuration on fabric A IOA switch



```
interface FibreChannel 0/41
 fabric SAN_FABRIC
no shutdown
I
interface FibreChannel 0/42
 fabric SAN_FABRIC
no shutdown
I
interface FibreChannel 0/43
 fabric SAN_FABRIC
no shutdown
I
interface FibreChannel 0/44
 fabric SAN_FABRIC
no shutdown
I
interface FibreChannel 0/45
 fabric SAN FABRIC
no shutdown
I
interface FibreChannel 0/46
 fabric SAN FABRIC
no shutdown
I
interface FibreChannel 0/47
 fabric SAN_FABRIC
no shutdown
I
interface FibreChannel 0/48
 fabric SAN_FABRIC
no shutdown
```

Figure 65 FC interface configuration



5.2.2 Programmable-mux mode

It's also possible to deploy Dell IOA w/ FC Flex IOM using **Programmable-mux** mode. This allows for cli configuration of the IOA similar to the MXL. This mode can be useful if you want to customize the configuration based on specific requirements such as multiple upstream LAGs or multiple FC fabrics. To set the IOA to **programmable-mux** mode use the **stack-unit <unit-number> iom-mode programmable-mux** command from config mode as shown further below in Figure 66. Once set to **programmable-mux** mode, a reload will be required and configiuration will no longer be automated and will be required via the CLI similar to that which was done in the MXL configuration in Section 4.2 "Dell MXL w/ FC Flex IOM Configuration."

```
Dell_IOA_B1(conf)#stack-unit 0 iom-mode ?programmable-muxProgrammable Mux modestackStack modestandaloneStandalone modevltVlt mode
```

Figure 66 IOA mode options

5.3 Verification on the Dell IOA w/ FC Flex IOM

To see information on NPIV devices logged into the fabric, use the **show npiv devices** command on the Dell IOA switch as shown below. Note the FCoE MAC is **0e:fc:00:01:0f:01** (the FCoE Map + FC_ID as expected).



| | | - |
|--------------|---|-------------------------|
| ENode[0]: | | |
| ENode MAC | : | 90:b1:1c:cc:e5:76 |
| ENode Intf | : | Te 0∕4 |
| FCF MAC | : | d0:67:e5:ac:ac:ae |
| Fabric Intf | : | Fc 0/44 |
| FCOE Vlan | : | 1002 |
| Fabric Map | : | SAN_FABRIC |
| ENode WWPN | : | 20:01:90:b1:1c:cc:e5:76 |
| ENode WWNN | : | 20:00:90:b1:1c:cc:e5:76 |
| FCoE MAC | : | Oe:fc:OO:O1:Of:O1 |
| FC-ID | : | 01:0f:01 |
| LoginMethod | : | FLOGI |
| Secs | : | 242 |
| Status | : | LOGGED_IN |
| Dell_IOA_B1# | ¥ | |

Dell_IOA_B1#show npiv devices

Figure 67 'show npiv devices' command output on fabric A IOA switch

To see currently active FCoE VN_Port sessions, use the **show fip-snooping sessions** command.

| Dell_IOA_B1#show fip-snooping sessions | | | | | | | | | |
|--|------------|-------------------|----------|------|-------------------|----------|-------------------------|-------------------------|--|
| Enode MAC | Enode Intf | FCF MAC | FCF Intf | VLAN | FCoE MAC | FC-ID | Port WWPN | Port WWNN | |
| | | | | | | | | | |
| 90:b1:1c:cc:e5:76 Dell IOA B1# | Te 0/4 | d0:67:e5:ac:ac:ae | Fc 0/44 | 1002 | 0e:fc:00:01:0f:01 | 01:0f:01 | 20:01:90:b1:1c:cc:e5:76 | 20:00:90:b1:1c:cc:e5:76 | |

Figure 68 'show fip-snooping sessions' command output on fabric A IOA switch

To see all FCoE end-node (ENodes), use the **show fip-snooping enode** command.

| Dell_IOA_B1#show fip-snooping enode | | | | | | | | | |
|-------------------------------------|-----------------|-------------------|------|----------|--|--|--|--|--|
| Enode MAC | Enode Interface | FCF MAC | VLAN | FC-ID | | | | | |
| | | | | | | | | | |
| 90:b1:1c:cc:e5:76 Dell IOA B1# | Te 0/4 | d0:67:e5:ac:ac:ae | 1002 | 01:0f:01 | | | | | |

Figure 69 'show fip-snooping enode' command output on fabric A IOA switch

To see a list of configured fcoe-maps, use the **show fcoe-map brief** command.

| Dell_IOA_B1#show | fcoe-map brief | | | | | |
|------------------|----------------|---------|--------|--------------|--------------|------------|
| Fabric-Name | Fabric-Id | Vlan-Id | FC-MAP | FCF-Priority | Config-State | Oper-State |
| SAN_FABRIC | 1002 | 1002 | 0efc00 | 128 | ACTIVE | UP |
| Dell_IOA_B1# | | | | | | |

Figure 70 'show fcoe-map brief' command output on fabric A IOA switch



To see more detailed information on a given fcoe-map, use the **show fcoe-map <FCoE_MAP_NAME>** command. Notice below, the priority mapped to FCoE by default is **3**.

Dell_IOA_B1#show fcoe-map SAN_FABRIC

SAN_FABRIC 1002 Fabric Name Fabric Id Vlan Id 1002 Vlan priority FC-MAP 3 0efc00 FKA-ADV-Period 8 Fcf Priority 128 Config-State ACTIVE **Oper-State** UP Members Fc 0/41 Fc 0/42 Fc 0/43 Fc 0/44 Fc 0/45 Fc 0/46 Fc 0/47 Fc 0/48 Te 0/2 Te 0/6 Te 0/4 Dell_IOA_B1#

Figure 71 'show fcoe-map SAN_FABRIC' command output on fabric A IOA switch



6 M1000e FlexAddress enablement

When working with network adaptors that provide a MAC address as well as a World Wide Port and Node name, it's important to understand where these addresses originate. The M1000e chassis has a feature called Flexaddressing which allows for a virtual MAC address/WWPN to be linked to a server, therefore, if the CNA/adapter is changed later, zoning or configuration on upstream switches does not need to be modified.

Flexaddressing is a pool of 208 MAC's and 64 WWN contained on an SD card that can either be added at the Dell factory to the M1000e's chassis management controller (CMC) or to an existing M1000e CMC at a datacenter via a customer kit. Referring to Figure 72 below, enabling Flexaddressing is facilitated by:

| is Management oller | | | | | | | | | | Supp | oort About Log O |
|-------------------------------------|--------------------------|---|---------------------------|----------------------------------|---------------------------------------|--------------|-----------------------------------|---------------------------------|--------------|-------|---|
| Prope | perties | Setup Power Troub | eleshooting Up | odate | | | | | | | |
| | RAC | VLAN First Boot Device | Slot Names | FlexAddress | Remote Fil | le Share P | rofiles | | | | |
| uroller | ploy | FlexAddress | | | | | | | | | • • • |
| dC-M710HD-1 | ip to: Se | elect Fabrics for Chassis-Assig | ned WWN/MACs | Select Slots for | r Chassis-Ass | signed WWN/M | ACs | | | | |
| | Instructio | ons | | | | | | | | | |
| | - 0 | Chassis assigned WWN/MACs s | | | | | | | | | |
| | | Note: The affected server(s) mus | | | | | ply to the server in the | e main slot. | | | |
| T-05 T-06 T-07 SLOT-07a Se | ■ N | Note: The affected server(s) mus | t be powered off pri | ior to any change | | | ply to the server in th | e main slot. | | | ▲ Back to top |
| 7a Se 420-4 7c | ■ N | | t be powered off pri | ior to any change | | | ply to the server in the Fabric-C | | | iDRAC | |
| Se | ■ N | Note: The affected server(s) mus | t be powered off pri | ior to any change Fat | es to this prop | | | 0 | | iDRAC | |
| 20-4 Se 5 20-4 | • N Select F | Note: The affected server(s) mus abrics for Chassis-Assign Fabric-A | ed WWN/MACs | ior to any change Fat | es to this prop bric-B | | Fabric-C | 0 | | | |
| Se | • N Select F | Note: The affected server(s) mus | ed WWN/MACs | ior to any change Fat | es to this prop bric-B | verty. | Fabric-C | C E KR Enabled | | | ement |
| | N Select F Select S Slot | Note: The affected server(s) mus abrics for Chassis-Assigned Fabric-A Gigabit Ethernet Slots for Chassis-Assigned Name | ed WWN/MACs WWN/MACs Modd | ior to any change Fat 2011 | es to this prop bric-B 0 GbE KR | Present | Fabric-C | E KR Enabled F Select / E | Deselect All | | ement A Back to top Current State |
| | N Select F Select S Slot | Note: The affected server(s) mus | ed WWN/MACs WWN/MACs Modd | ior to any change Fat | es to this prop bric-B 0 GbE KR | verty. | Fabric-C | C E KR Enabled | Deselect All | | ement |

Figure 72 FlexAddress Enablement

- 1. Enter CMC's IP address
- 2. Click on Server Overview
- 3. Click on Setup
- 4. Click on FlexAddress
- 5. Choose to enable FlexAddressing to be either Fabric based or Slot based



Note: When the FlexAddress feature is deployed for the first time on a given server, it requires at least one powerdown and power-up sequence of the server for the FlexAddress feature to take effect. Certain network configurations may require refreshing of network tables, such as ARP tables on IP switches and routers in order for new MAC/WWNs to be logged in.

| Chassis Controller Location Server Overview Location 1 Podc.Mr70HD-1 2 Podc.Mr70-0 3 SL07-03 4 SL07-04 5 SL07-05 6 SL07-06 | Fabric Management 10 GbE KR 10 GbE KR | | Enabled |
|---|--|----------------|---|
| Chassis Overview Chassis Controller Server Overview PodC-Mf20-2 PodC-Mf20-2 SLOT-03 SLOT-03 SLOT-03 SLOT-05 SLOT-05 SLOT-06 Fabric C | Management 10 GbE KR | | v |
| Chassis Controller Location Server Overview Location 1 PodC.M710HD-1 12 PodC.M620-2 3 SLOT-03 4 SLOT-04 5 SLOT-05 6 SLOT-06 | Management 10 GbE KR | | Enabled |
| 1 PodC-Mf20-2 IDRAC 2 PodC-M620-2 Fabric A 3 SLOT-03 Fabric B 5 SLOT-05 Fabric C 6 SLOT-06 Fabric C | Management 10 GbE KR | | v |
| 2 PodC-M620-2 Fabric A 3 SLOT-03 Fabric B 4 SLOT-04 Fabric B 5 SLOT-05 Fabric C 6 SLOT-06 Fabric C | 10 GbE KR | | |
| 3 SLOT-03 Fabric A 4 SLOT-04 Fabric B 5 SLOT-05 Fabric C 6 SLOT-06 Fabric C | | | |
| 5 SLOT-05 6 SLOT-06 | 10 GbE KR | | * |
| 6 SLOT-06 | | | ✓ |
| | 10 GbE KR | | ¥ |
| Tol SLOT-07a Tol PodA.M420-4 Tc SLOT-07c Tc SLOT-07c Filter: All Locations y All Fabrics y | | FlexAddress: I | Back to to Enabled |
| 8 localhost. Location Fabric | Server-Assigned | Chassis-Ass | igned |
| 9 SLOT-09 10 Extension of 9 Slot 1 iDRAC Management | F0:4D:A2:6E:F9:E6 | ✓ 14:FE:B5:8E: | :5B:D0 |
| 10 EXCEPTION OF 9 | 00:10:18:A7:FE:F0 | ✓ 14:FE:B5:8E: | :5B:D1 |
| 12 Extension of 4 iSCSI | 00:10:18:A7:FE:F1 | ✓ 14:FE:B5:8E: | :5B:D2 |
| 13 Extension of 5 14 Extension of 6 FCoE-FIP | 00:10:18:A7:FE:F1 | ✓ 14:FE:B5:8E: | :5B:D3 |
| | 20:01:00:10:18:A7:FE:F1 | 20:01:14:FE: | B5:8E:5B:D3 |
| 15 Extension of 7 FCoE-WWN | | | |

To check that FlexAddressing is enabled:



- 1. Click on Server Overview
- 2. Click on Properties
- 3. Click on WWN/MAC
- 4. WWN/MAC Addresses section FlexAddress: Enabled should be visible. Chassis-Assigned should have check marks next to each address.

Once FlexAddress has been confirmed as enabled, it's a simple matter of matching up the MAC or WWN of the network adaptor with the Server Slot and the Fabric that it is in.

