



Configuring PowerEdge FX2 for FCoE with VMware

Technical Note by:

Todd Mottershead

SUMMARY

FCoE is an effective option for customers who wish to reduce cabling and yet desire the performance and security of Fiber Channel based storage.

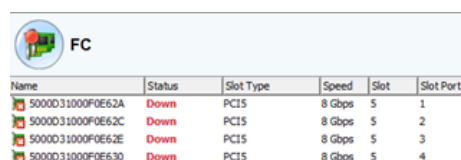
Competitive solutions often require subject matter expertise to establish DCB handshaking between the nodes and the switch but FX2 based systems have been designed to make this process as simple as possible by embedding FCoE support with many NIC's and designing the IO Modules to automatically accept DCB configuration information from the switch. Because of this, configuring FCoE requires a minimum amount of effort with an FX2 based system.

Background

Fibre Channel over Ethernet (FCoE) has emerged as an important connection methodology for SAN access and FX2 based systems have been designed for full operability with FCoE. As with any solution, configuration is required on the node, the switch and the SAN but the design of FX2 makes this configuration simple. FX2 offers a wide range of connection options for FCoE and can be configured with the Ethernet Pass-Through module, the FN410S IO Module, the FN410T IO Module or the FN2210S IO Module. This paper will outline the steps necessary to configure an FX2 system for FCoE operation using the FN410S IO Module with a Dell EMC S5000 switch and a Dell EMC Compellent SC8000 SAN.

SC8000 SAN Configuration

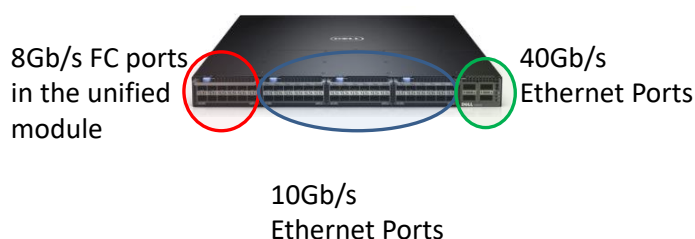
Since the SAN will be connected via Fibre Channel (FC), no special configuration is required. From the perspective of the SAN, it will only detect that it is negotiating with a Fibre Channel switch and will not be aware that FCoE is being used as the transport. Prior to switch configuration, the SAN will report that all FC links are down as shown below:



Name	Status	Slot Type	Speed	Slot	Slot Port
5000D31000P0E62A	Down	PCI5	8 Gbps	5	1
5000D31000P0E62C	Down	PCI5	8 Gbps	5	2
5000D31000P0E62E	Down	PCI5	8 Gbps	5	3
5000D31000P0E630	Down	PCI5	8 Gbps	5	4

S5000 Switch Configuration

The S5000 switch was chosen for this example, because it offers a "unified port module" that allows it to act as a Fibre Channel to FCoE gateway. Other technologies are available to accomplish this step but the S5000 was used in this example for its ease of configuration.



In this example, we will use 4 of the 8Gb/s FC ports for connection to the SAN and 4 of the 10Gb/s ports for connection to the FX2 system. Once the basic setup for the switch is accomplished (establishing a management IP address and assigning an administrator password), enabling FCoE requires the following steps:



- 1) Enable Fibre Channel. This can be accomplished from an SSH console connected to the IP address of the switch by entering the following commands:

```
S5000_1 # config
S5000_1(conf) # feature fc
S5000_1(conf) # fc switch-mode fabric-services
```

- 2) Create the DCB map using the following commands. In this example, the switch will work to provide a minimum of 40% of the bandwidth available for FCoE and will enable priority flow control for that traffic. Additional QoS adjustments can be made to the dcb-map as appropriate for each customer's unique requirements. Also note that after typing the first couple of characters, the tab key can often be used to auto-fill the configuration information.

```
S5000_1 (conf) # dcb-map SAN_DCB_MAP - note that "SAN_DCB_MAP" is an example
S5000_1 (conf-dcbmap-SAN_DCB_MAP) # priority-group 0 bandwidth 60 pfc off
S5000_1 (conf-dcbmap-SAN_DCB_MAP) # priority-group 1 bandwidth 40 pfc on
S5000_1 (conf-dcbmap-SAN_DCB_MAP) # priority-pgid 0 0 0 1 0 0 0 0
S5000_1 (conf-dcbmap-SAN_DCB_MAP) # exit - return to the config prompt
```

- 3) Create the dedicated VLAN

```
S5000_1 (config) # interface vlan 1000 - note that the vlan number can be chosen by the customer
```

- 4) Configure an FCoE map

```
S5000_1 (conf) # fcoe-map default_full_fabric
S5000_1 (conf-fcoe-default_full_fabric) # fabric-id 1000 vlan 1000 - fabric-id should match the vlan chosen
S5000_1 (conf-fcoe-default_full_fabric) # fc-map 0efc01
```

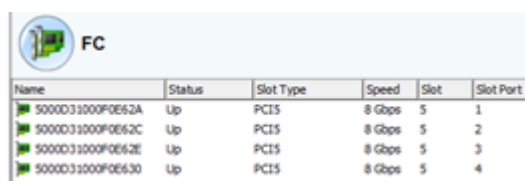
Optional - Configure the FC Zone database on the switch to pass all traffic for testing. This option should be turned off for production and instead, the zone database on the switch should be configured with all WWN addresses.

```
S5000_1 (conf-fcoe-default_full_fabric) # fc-fabric
S5000_1 (conf-fmap-default_full_fabric-fcfabric) # default-zone-allow all
S5000_1 (conf-fmap-default_full_fabric-fcfabric) # exit - return to the default_full_fabric prompt
S5000_1 (conf-default_full_fabric) # exit - return to the config prompt
```

- 5) Configure the FC ports (ports 0/0-0/3 in this example) for connection to the SAN

```
S5000_1 (conf) # interface range fibreChannel 0/0-3
S5000_1 (conf-if-range-fi-0/0-3) # fabric default_full_fabric
S5000_1 (conf-if-range-fi-0/0-3) # no shutdown
S5000_1 (conf-if-range-fi-0/0-3) # exit - return to the config prompt
```

At this point, the SAN interface should indicate that all 4 FC ports are active as shown in the graphic below



Name	Status	Slot Type	Speed	Slot	Slot Port
S5000D31000F0E62A	Up	PCIS	8 Gbps	5	1
S5000D31000F0E62C	Up	PCIS	8 Gbps	5	2
S5000D31000F0E62E	Up	PCIS	8 Gbps	5	3
S5000D31000F0E630	Up	PCIS	8 Gbps	5	4

- 6) Enable the FX2 connected Ethernet ports

```
S5000_1 (conf) # interface range tengigabitEthernet 0/12-15
S5000_1 (conf-if-range-te-0/12-15) portmode hybrid - configure the port to accept both tagged and untagged VLAN's
S5000_1 (conf-if-range-te-0/12-15) dcb-map SAN_DCB_MAP - assign the dcb-map
S5000_1 (conf-if-range-te-0/12-15) fcoe-map default_full_fabric - assign the fcoe-map
S5000_1 (conf-if-range-te-0/12-15) no shutdown - enable the port
```



At this point, the SAN and the switch are ready to present storage to the FX2 systems. More advanced switch configuration details as well as configuration of 3rd party switches can be found in the document at the following link: http://en.community.dell.com/techcenter/networking/m/networking_files/20440793

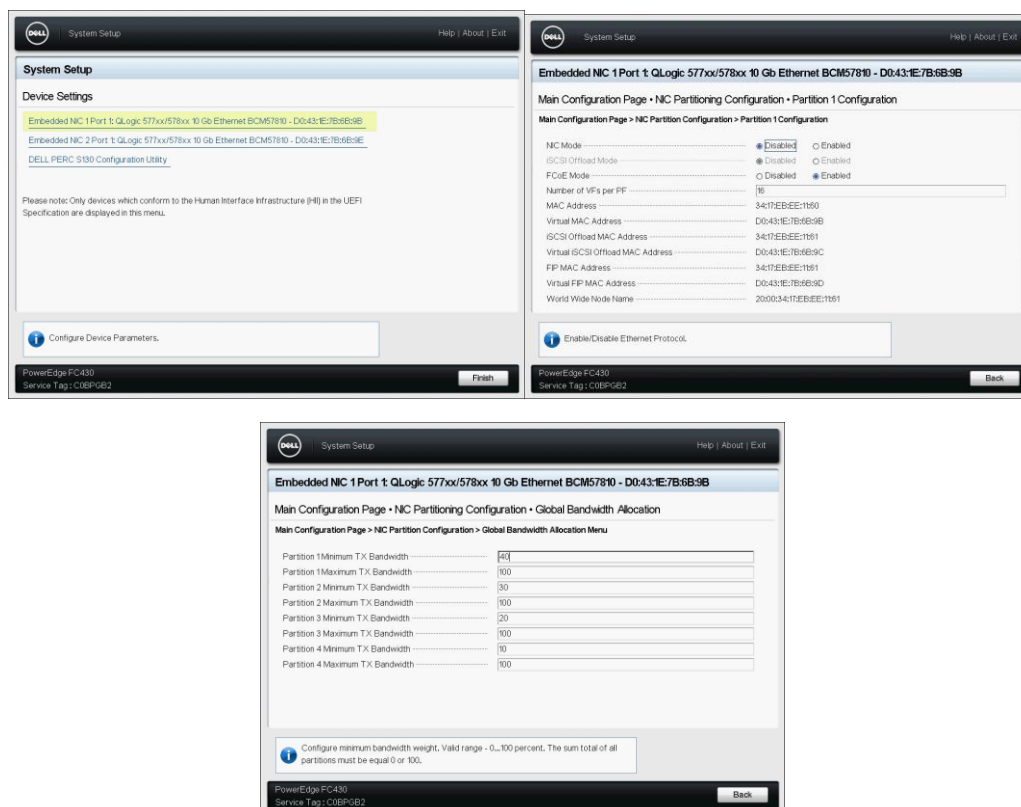
Configuration of FX2

FX2 systems natively support FCoE with minimal configuration required. The IO Modules (IOM) in FX2 are preset to automatically accept configuration information from the switch and to pass FCoE traffic to and from the node. To simplify this even further, the FN410S default configuration will allow all VLAN's to pass so no work is necessary to enable the FCoE VLAN on the IO Module.

Note, if the customer is utilizing advanced features like "stacking" or VLT, the VLAN's established on the switch for FCoE will need to be manually added to the Server facing ports in the FN410S as described in the document at the link above.

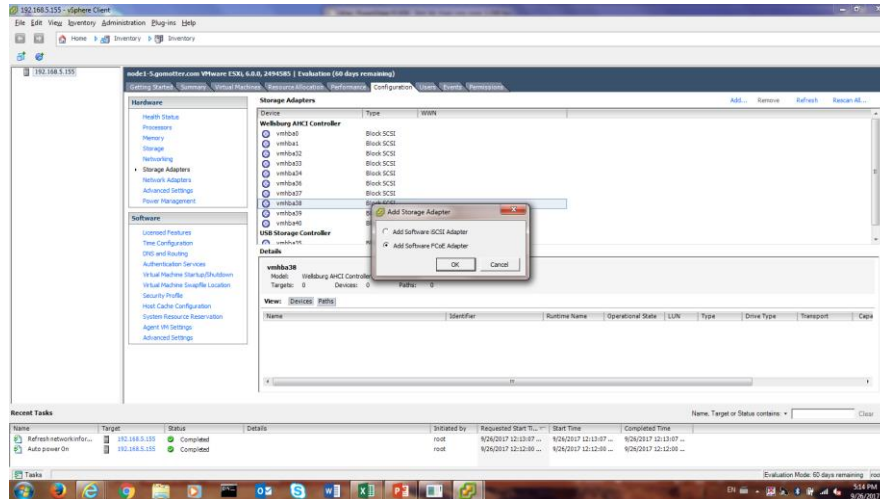
To enable FCoE, each node requires only that the Network Interface Card (NIC) be configured and that the software driver is loaded.

Configuring the NIC requires the user to access the setup at time of boot and to enable FCoE. The example below illustrates a configuration where NPAR has been used to partition the NIC into four transports with partition #1 then configured for FCoE offload and 40% of the bandwidth guaranteed to FCoE through the Global Bandwidth settings (for details on these settings refer to the document at the following link: http://en.community.dell.com/techcenter/extras/m/white_papers/20444588). These settings should be established for both internal NIC's to create 2 separate SAN fabrics.

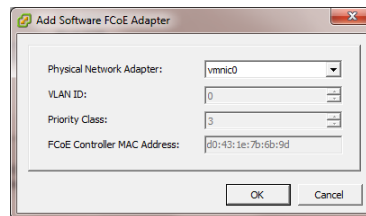




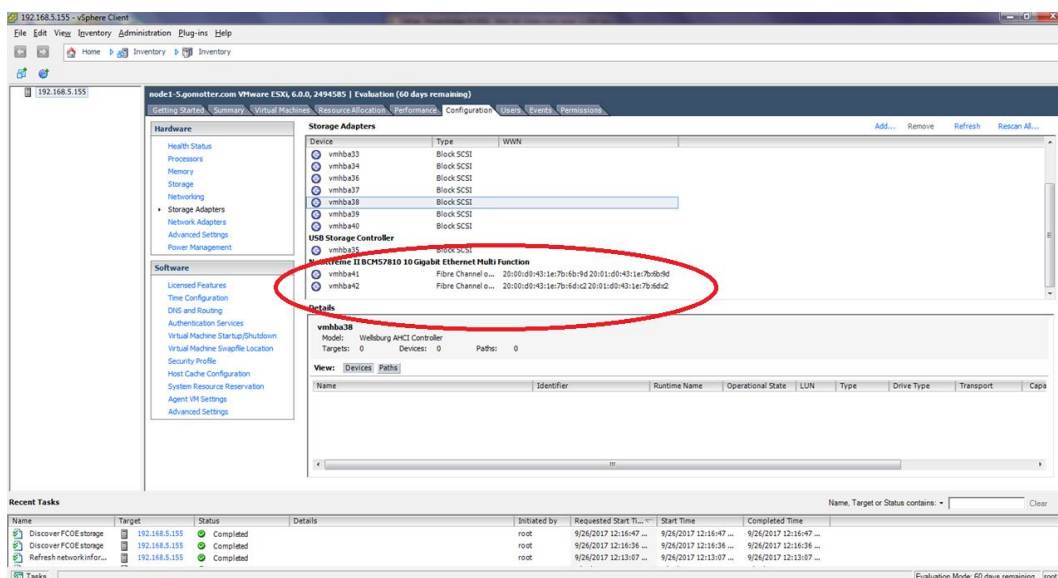
Next, the software driver must be loaded in vSphere. This can be accomplished in the Storage Adapter menu by clicking “add” and choosing the “add Software FCoE adapter”. The correct NIC partition will be automatically detected and chosen by vSphere.



Since two FCoE NIC's were created, vSphere will confirm which device is being setup

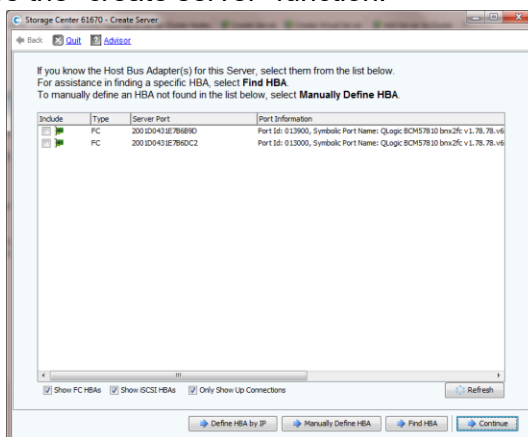


Repeat this step to enable the second FCoE adapter. When complete, both FCoE adapters should be displayed in the vSphere Storage Adapters window as shown below.

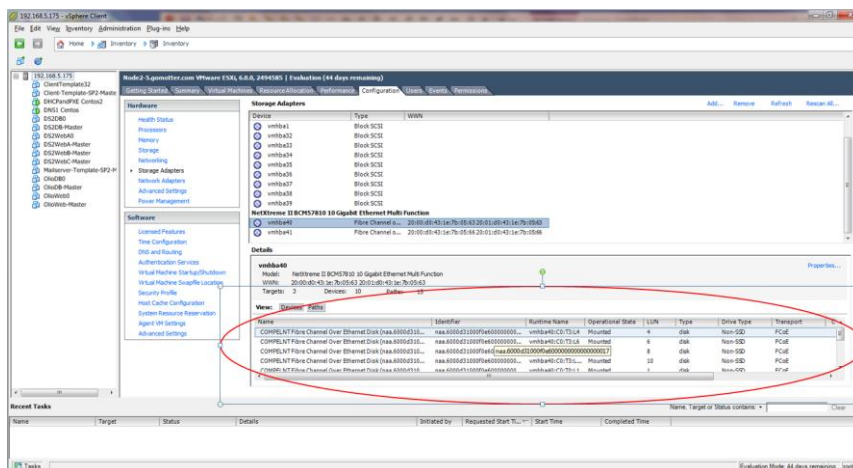




At this point the system is configured and the switch will enable full communication between the FX2 nodes and the SAN. Before a LUN can be mounted, the Storage Administration console will need to be used to map the new Server to the SAN. On the Compellent SAN, the new adapters just created will be presented to the administrator when they use the “create server” function.



Once this step is complete, a rescan of the storage in vSphere will present all available LUN's to the Server.



Conclusion

PowerEdge FX2 represents one of the most flexible computing solutions available today. Dell EMC Engineers have worked to simplify the installation to make for the integration into existing environments as simple and easy as possible.

When deployed with FCoE, FX2 requires a minimum of cables, no dedicated or specialized adapters and no special software to operate. In this environment, connection to the SAN is as simple as attaching Ethernet cables, performing some simple configuration of the NIC and loading of a software driver.