



**Practical Guidance:  
Transitioning from Implementation to Operations  
in a CLARiiON® Environment.**

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## Introduction

Transitioning an environment to a well managed operation is one of the most obvious facets of any new implementation. In theory, this transition should be just another well planned task that is included in the project plan. However, transition is often more of an afterthought that arises well after the project has been labeled a success, and the team has gone.

We must account for a wide range of technology from storage arrays to switches and attached hosts. There are both independent and interdependent aspects that we must consider. From the most mundane configuration details to the everyday administrative tasks, these have a direct impact on the ability to sufficiently support and maintain the Storage Area Network. With the introduction and wider adoption of technologies such as multiprotocol storage arrays, and server and storage virtualization, the Storage Area Network has evolved into an even more dynamic environment.

Many organizations have kept pace with technology but have either maintained staffing or have fallen behind. These organizations are at risk since they may lack the minimal operational foundations to properly support and maintain their Storage Area Network.

This article will present practical guidance to help your transition go smoothly. We will focus on a new implementation with specific emphasis on CLARiiON environments and provide a baseline. Existing environments should find this guidance useful in assessing their operational capability.

## Getting Started

Let's define some assumptions and expectations about the CLARiiON environment that we will be referencing throughout this discussion.

First, we are assuming that the CLARiiON storage array configuration in operation was properly designed for its intended purpose by a qualified EMC Technology Architect with input from the end user. The result of the design is documented in the Design Workbook (DWB).

Second, we are assuming that the CLARiiON storage array configuration, the SAN switches, and the attached hosts were implemented according to the Design Workbook and the appropriate best practices by a qualified EMC Implementation Engineer.

Third, we are assuming that upon completion of the design and the implementation, all appropriate documents, logon accounts, licenses and media will be turned over to the new owner.

With these assumptions in mind, let's determine what additional information is required and what optional information is available.

## **Task 1 – Access to Required & Optional Resources**

It is important to have the right resources at the beginning. Let's look at required and optional resources that can help you to complete the transitional and continued activities.

### **Required Resources**

Powerlink is one of the most critical resources available to EMC customers and partners. (<https://powerlink.emc.com>). It is EMC's central repository for product information, tools, resources, documentation, whitepapers and support. In the transitional steps from implementation to operations, and preferably while the Implementation Engineer is on site, your first task is to log onto Powerlink.

You will need to register the first time you access the site. This registration process will solicit the information required and after a verification period you will receive a user id and password via email. Once you obtain your logon information, you should visit a few key pages.

The Support page is the first area that you need to visit and verify several items. On the Support page, you will need to follow the link to the Software Downloads and Licensing page to ensure that you have appropriate access to the downloads and licenses that you are entitled to. If your licensing information is not present, you will need to register your License Activation Code (LAC). On the Licensing page, there is a link to an FAQ about how to locate and determine your LAC.

Also on the Support page, you will need to follow the Request Support link to ensure that you have proper access to submit a support case online. Although you can always request support via the 800 number provided, it is often easier to submit a support case on line. (We will cover this later on). While on the Request Support page, your last stop should be the Site Account Management page.

At the Site Account Management page, you will need to either complete the information in each category – Contacts, Contact Details, Environment Products and Environment Hosts, or update as appropriate.

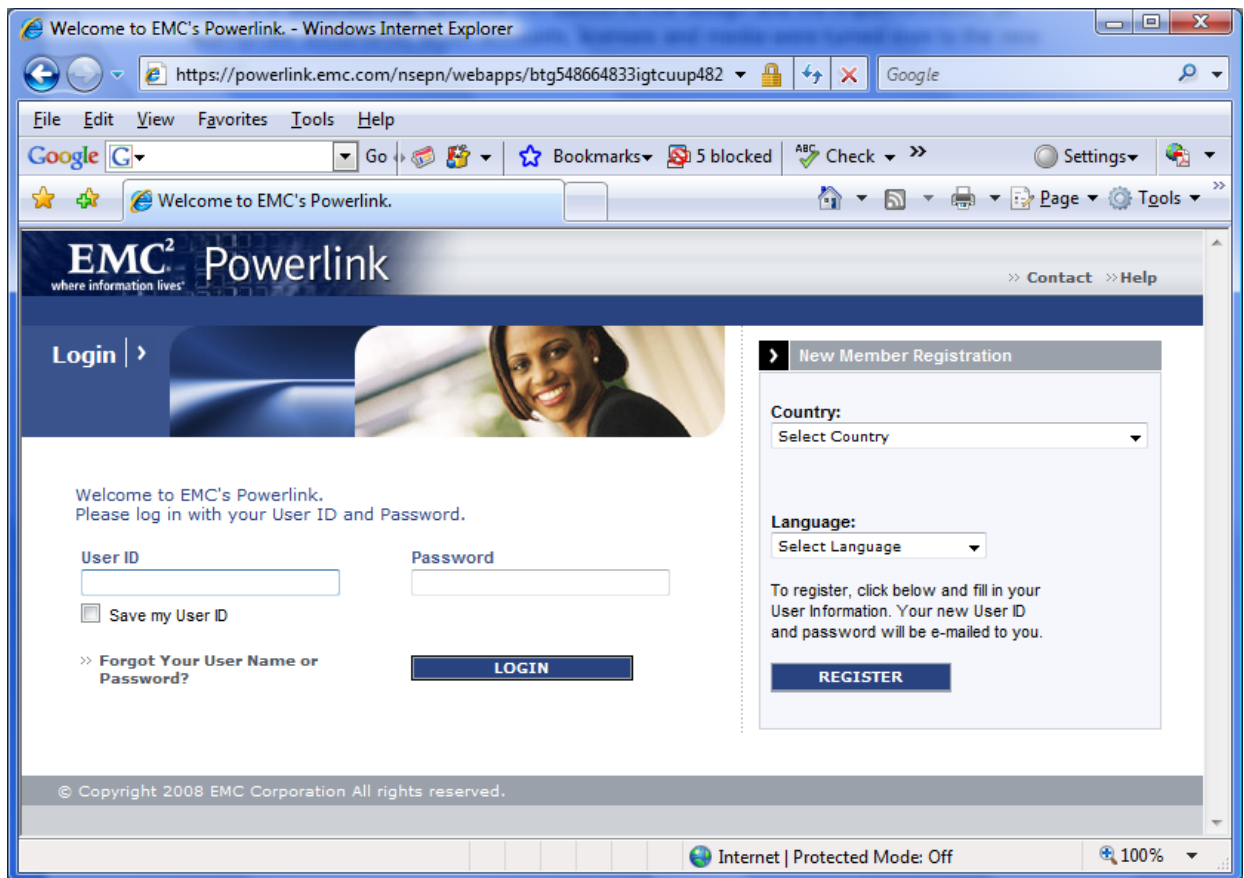


Figure 1 - Powerlink Logon Page

Once you have visited these pages, registered and updated the information, feel free to explore the site and locate resources that interest you. Later in our discussions, I will refer back to Powerlink and some specific resources that are particularly valuable. In the meantime, we will explore outside resources.

## Optional Resources

While not a 'required' step in the transition process, there are other sites with valuable resources. In later discussions, we will refer to some of the material on these sites for use in the transition and continued operation. Other sites are helpful to improve and maintain your knowledge. Where applicable, it is recommended that you register with the particular organization so as to obtain the full value of what is offered.

The Storage Networking Industry Association (SNIA), is a vendor neutral global organization that focuses solely on storage. SNIA advocates and supports storage networking education. There are a number of technical presentations that are categorized for all experience levels as well as a dictionary of storage terminology. (<http://www.snia.org/education/dictionary/>) If you are completely new to storage networking, or if you are like me and just want to keep up with all of the storage and technology changes in the industry, I encourage you to check out the SNIA site and bookmark it for later use.

Brocade is a provider of data networking solutions; they have many resources available to customers and non-customers. For Brocade customers who register their hardware using a World Wide Name (WWN), MAC Address or License Activation Key, Brocade Connect provides a host of resources, tools and information.

Cisco also maintains a website with an array of resources, tools and information for customers and non-customers. To register for customer access you will need either your purchase order or sales order number and customer number, unless you are an authorized partner or CCIE. As in the case of Brocade, the partnership with EMC allows for some of these resources to be available from Powerlink.

For both Brocade and Cisco there are valuable, freely available resources that we will discuss later. However, in order to get the full value of these resources, you should register with your particular switch vendor. For now, we have access to the resources that we will need. Let's move on to the next step in transitioning from implementation to operations.

## **Task 2 - Document, Document, Document**

Completing an acceptable level of documentation that can be consistently maintained is the next task.

Anyone who has worked in information technology for any length of time is fully aware of the adage "Document, document, document". While this is a noble idea indeed, documentation is probably the largest facet of any environment yet it gets the least attention. Why? The primary reason is because documentation for most environments is a manual process that often proves cumbersome. While there are tools to help manage, monitor and document your environment, experience has proven that most organizations place the purchase of such tools on the bottom of their priority list. If you find yourself saying, "I have it documented and it's up to date!" then you are to be congratulated. For the rest of the IT world, especially those who are unable to purchase available tools, there is help.

Certainly it is extreme to think that one can document every detail of their SAN and keep it up to date with every change. There is, however, a more realistic approach using some freely available resources.

## The CLARiiON Array

The Design Workbook is a handy piece of information when the Implementation Engineer hands off the SAN. The Design Workbook has numerous details concerning the CLARiiON array layout including RAID Groups with disk, enclosure, bus and loop details, LUNs with RAID type, RAID Group, Storage Processor (SP) and Host assignments, and a full array disk layout diagram covering the RAID Groups, RAID types and LUNs. Ideally, if you were involved with the design, most if not all of the details found in the Design Workbook should be familiar. Regardless of the level of involvement, securing a copy of the Design Workbook is an imperative.

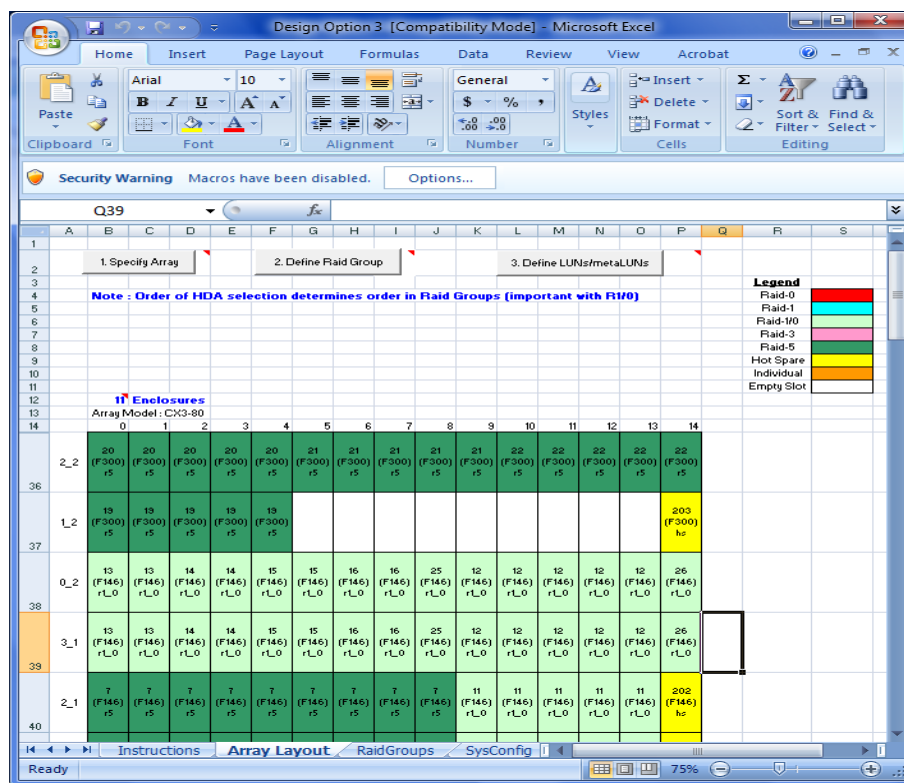


Figure 2 - DWB Array Layout

Now that we have some initial documentation concerning the layout of the CLARiiON array to support the overall documentation effort, we must turn our attention to the SAN switches and attached hosts.

## SAN Switches and Hosts

EMC Reports utility is another EMC specific documentation resource available to help document the SAN and host configurations. Also commonly referred to as the EMC Grab Utilities (depending upon your operating system), this tool collects configuration information relative to the host attachment to the CLARiiON array. As with any EMC document tool or resource, you can obtain the Grab Utilities via Powerlink.

As I mentioned previously in the Optional Resources section, the Brocade website has some particularly useful tools to help further the documentation efforts. The Brocade SAN Health tool is one of my favorite tools to use in a Brocade based SAN fabric (Connectrix B Series). This handy application is free to download and execute against your environment. Once the data capture portion is completed, the files are then submitted back to Brocade after which you will receive a complete report on the health of your SAN switches and topology information including a Visio diagram.

If your environment doesn't include Brocade SAN switches, you will need to use the appropriate interface to obtain the configuration details of the switches. But you might ask where to put the information. Brocade has another documentation resource available. They have the SAN Inventory Worksheet ([http://www.brocade.com/san/files/SAN\\_inventory\\_wksheets.xls](http://www.brocade.com/san/files/SAN_inventory_wksheets.xls)) that is used as a template to inventory your SAN. It has default worksheets for Hosts, Disk Storage Devices, Tape Libraries and SAN Switches.

While the worksheet has more inventory fields than most people would be willing to complete, you are welcome to modify it for your use. For instance, it is more practical for you to document the make and model of the server rather than all of the slots contained within it. Here's an example of my personal template.



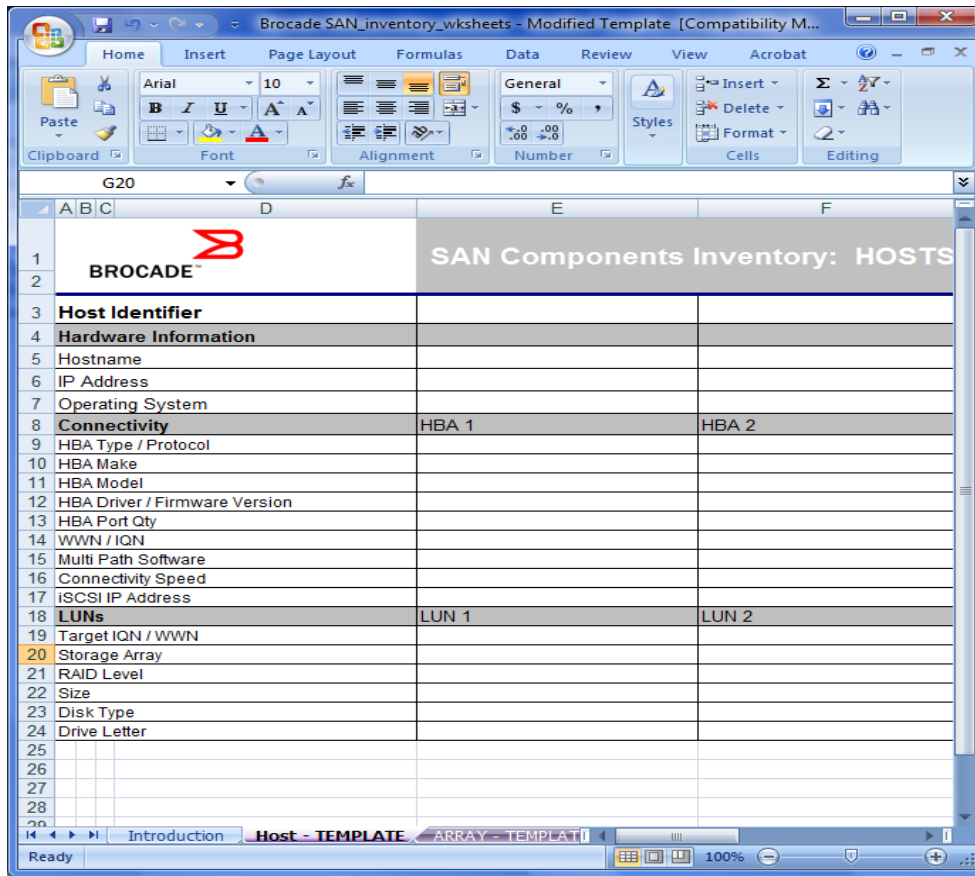
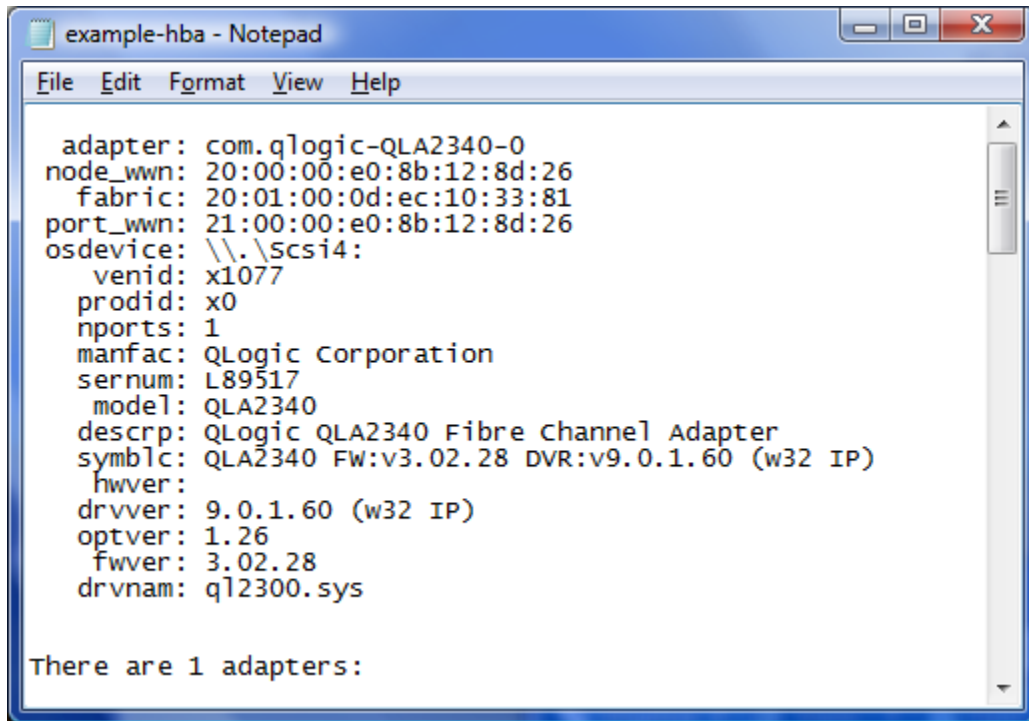


Figure 3 - Modified Brocade SAN Health Worksheet

Microsoft's Fiber Channel Information Tool (fcinfo) is one final tool to assist in SAN documentation. Supporting most Emulex, LSI and QLogic HBAs, if you are unable to use the vendor specific application for your HBA or it is missing or not installed, this command line tool can quickly help you determine the World Wide Name (WWN) of the HBA(s) installed in a Microsoft Windows Server host.

For those who don't like to install any more applications on a server than needed, you can extract only the files that you need to make the tool work (see the documentation for a list) to a folder and put them on portable media such as a USB key. Run the tool on the servers and redirect the output to a text file and you have some valuable information to incorporate in the documentation. Here's an example of the output from fcinfo looking just at the details of the installed HBA.



```
example-hba - Notepad
File Edit Format View Help

adapter: com.qlogic-QLA2340-0
node_wwn: 20:00:00:e0:8b:12:8d:26
fabric: 20:01:00:0d:ec:10:33:81
port_wwn: 21:00:00:e0:8b:12:8d:26
osdevice: \\.\scsi4:
  vendor: x1077
  prodid: x0
  nports: 1
  manfac: QLogic Corporation
  sernum: L89517
  model: QLA2340
  descrp: QLogic QLA2340 Fibre Channel Adapter
  symblc: QLA2340 FW:v3.02.28 DVR:v9.0.1.60 (w32 IP)
  hwver:
  drvver: 9.0.1.60 (w32 IP)
  optver: 1.26
  fwver: 3.02.28
  drvnam: ql2300.sys

There are 1 adapters:
```

Figure 4 - HBA Output from Microsoft fcinfo

What you document in your environment is up to you. However, there are some documentation essentials that should be completed and kept current:

- CLARiiON Array – Model, FLARE version, number and type of disks, total number of attached hosts, and operating systems. (Microsoft Windows, Solaris etc.)
- SAN Switches – Make, model, code version, fabric topology, and port speed
- Hosts – Make, model, operating system, HBA type, HBA quantity, PowerPath® and NaviAgent versions and assigned LUNs

Keeping this information available and current can be of great assistance when attempting to troubleshoot a failure in your environment or plan for additional upgrades. Using the previously mentioned tools and resources to complete this information makes the tasks achievable in a respectable amount of time. Now that the SAN is documented, let's look to the heart of what most techies do on a daily basis – support and administration.

## Task 3 - SAN Administrative Tasks to Know

This task represents the hands on skills that you need to administer and support your SAN.

There are several key admin tasks that must be understood so that operations can continue without imposing undue risk to the environment. To complete these tasks, we will look at the primary EMC resource to use when working with a CLARiiON array, the CLARiiON Procedure Generator. (Proc. Gen.)

If you remember back in Task 1, the topic of Required Resources included the Powerlink website and ensuring that access was verified. As long as this task was completed properly, you will be able to logon to Powerlink and download the CLARiiON Procedure Generator. If not, you will have to gain access to Powerlink.

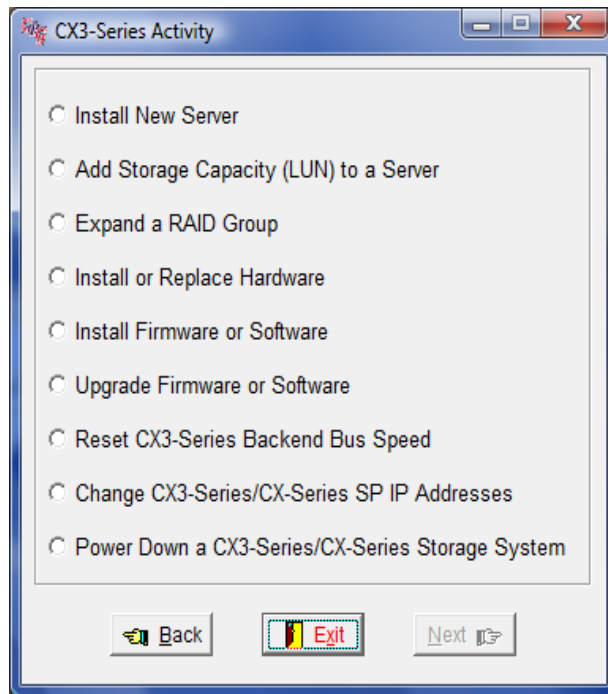
### Procedure Generator

The CLARiiON Procedure Generator details most of the routine tasks that are required to administer the SAN, with some exceptions. It does not cover SAN switch tasks and host / operating system specific tasks not directly related to the CLARiiON. Once the CLARiiON Procedure Generator has been downloaded and installed, it is only valid for use for a specific time period, at which point you will be directed to download a new copy.



Figure 5 - EMC CLARiiON Procedure Generator

Upon starting the application and clicking the Next button, choose your array type. For nearly all new installations, you should select the CX3 series. If you have an older model of CLARiiON, select the appropriate radio button and click next. If you are unsure, select the CLARiiON Naming Conventions button for an explanation of each type or just refer back to the SAN inventory documentation. Upon clicking the next button, you will see a list of activities to choose from.



**Figure 6 - CLARiiON Procedure Generator CX3 Activities**

Select the appropriate activity from the activity selection screen. Then click Next, the Procedure Generator will prompt for several specific parameters that it needs to develop the procedure. Once you have made your choices, the Procedure Generator will create a documented procedure in Microsoft Word format and prompt for a filename. By default, it stores these documents in the Procdoc folder of the installation directory.

While the Procedure Generator documents very detailed and lengthy procedures (a test of the Install New Server activity resulted in 26 pages), they are valuable to implement changes the correct way and include relative information such as screenshots when needed.

You must know these administrative tasks that are referenced in many of the procedures:

- Installation of EMC Powerpath, NaviAgent – Used for host to array communications, path load balancing and redundancy
- Determination of Connectivity Status on the CLARiiON array – Used to determine proper communication between Host and CLARiiON
- LUN Creation
- Storage Groups – Used to assign LUNs to Hosts
- EMC Reports Utility / EMC Grab Utility – Used to gather host specific configuration information

The Procedure Generator accounts for numerous tasks that are required to properly administer the CLARiiON environment. However, there are additional administrative tasks to continue a smooth transition.

### **Navisphere<sup>®</sup> Manager**

The Navisphere Manager is the central interface for many, if not all, CLARiiON array tasks. Access it via your web browser and logon to perform the required tasks. Your logon information should be provided during the hand-off from the Implementation Engineer.

Once logged in, you will notice several task wizards. Some common tasks that have wizards include Storage Management used to allocate, assign and expand LUNs. Using these wizards will assist you while you develop advanced skills.

Please see following page.

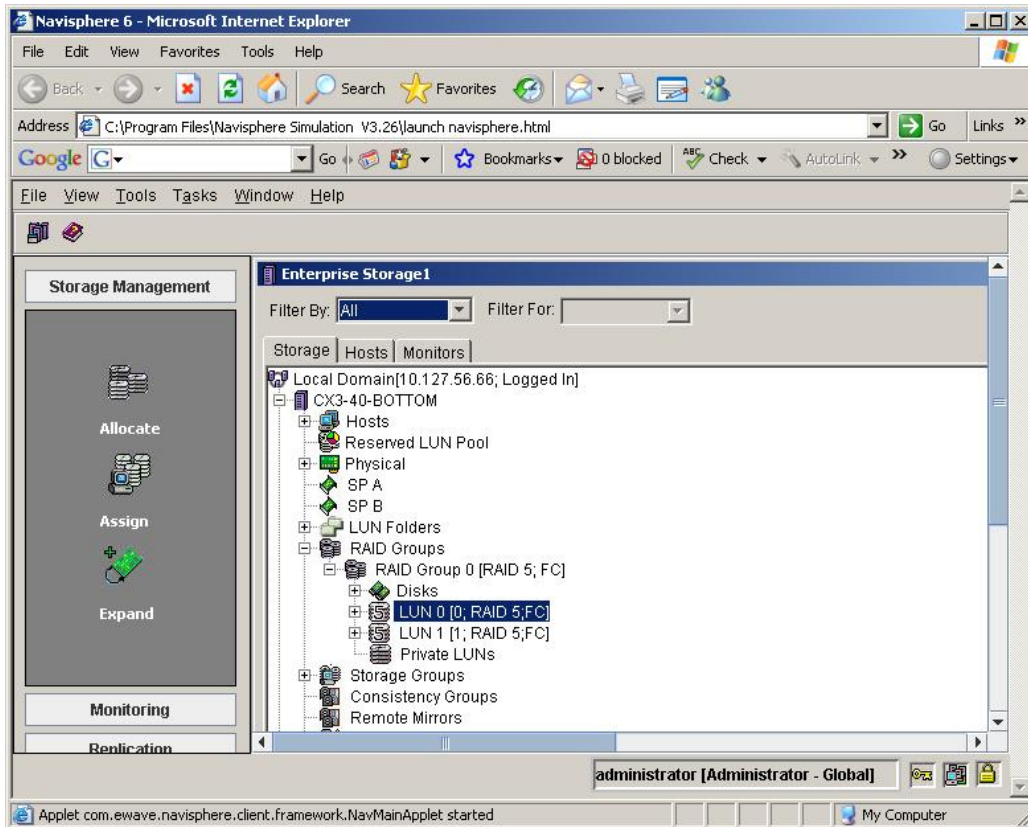


Figure 7 - Navisphere Manager

RAID Group creation and management are other required tasks. While there isn't currently a wizard to create or manage a RAID Group, the Navisphere Manager contains a comprehensive help interface that provides details. Likewise, it provides guidance on RAID Group types and numbers of disks to use.

The generation and retrieval of SP Collect files is one last critical task in administering the CLARiiON. SP Collect files are used to help EMC support personnel to troubleshoot your issue.

## Admin Guides & Other Documentation

The final set of admin tasks involves the SAN switches that tie the SAN components together.

When discussing SAN switches and the related admin tasks, you should focus solely on those basic tasks to keep the SAN, the attached CLARiiON array(s) and hosts functional and manageable.

More specifically, those basic tasks include:

- Port Configuration and Allocation
- Device and or Zone Aliases
- Zone Sets and Zoning
- Switch Configuration Backups

If neither the CLARiiON procedure generator nor Navisphere manager have specific task details concerning your particular SAN switch, you should download and review the appropriate SAN switch documentation for your hardware.

## Admin Task Summary

While the resources to perform the required tasks are in varying locations, in order to be successful you need to know:

- CLARiiON Administration via Navisphere Manager
  - Create RAID Groups
  - Create, Assign, Migrate & Expand LUNs
  - Create Storage Groups
  - Determine Host Connectivity Status
  - Generate and Retrieve SP Collect Files
- SAN Switch Administration
  - Configure and Allocate Switch Ports
  - Create Device and or Zone Aliases
  - Create Zone Sets and Zones
  - Backup the Switch Configuration
- Host Administration
  - Install and Configure HBAs
  - Install PowerPath & Navisphere Agent
  - Run the EMC Reports / EMC Grab Utilities
- How to download and use the CLARiiON Procedure Generator
- How to log onto Powerlink and submit a support case

## Task 4 - Practical Best Practices to Implement

Here are some practical best practices that will keep your SAN operating correctly.

### Hot Spares

By design, the CLARiiON array is redundant in many areas. Hot spares are sometimes ignored. Usually there are two extremes, too few hot spares or too many. The best practice for hot spares is to have at least one drive for every thirty in the array for each type. (Fiber Channel, Serial ATA etc.)

### File System Alignment

Although well documented, issues concerning file system alignment are often missed. This can have an adverse affect on hosts where the I/O requirements are high including clusters, databases, email servers and servers hosting virtual machines. The issue involves Intel based systems where unless the file system is explicitly offset using an operating system tool, the file system will not be aligned with the CLARiiON LUN. Locate the current version of Best Practices for FLARE XX on Powerlink for details and make it standard procedure in your SAN.

### Zoning

Though the steps of implementing zoning are different among SAN switch vendors, a few basic concepts remain constant. It is imperative to implement aliases prior to going too far with zones and zone sets. Aliases are friendly names for the World Wide Names that appear in the SAN fabric. Implementing aliases for all SAN attached devices greatly reduces the opportunity for error and confusion. The caveat is that since it is a manual task, it must be manually updated. Worse than not having aliases is having a SAN full of incorrect aliases.

### Getting Support

When you need to open a support case, it is best to provide as much detail as possible to resolve the issue quickly. Either while opening the support case or just prior to opening it, generate and retrieve an SP Collect from each storage processor. Run the Grab Utilities as well if it is affecting a specific host.

## Task 5 – Understanding Common Technical Pitfalls

Even having followed the tasks outlined to this point, there are some common pitfalls that you can avoid. This task involves educating yourself on some commonly encountered errors.

### Connectivity Status

Connectivity status is often overlooked. Great care should be taken to physically verify connectivity status when dealing with an issue related to host access to the CLARiiON. If the Registered and Logged In columns of the connectivity status window read No, stop and determine the reason and correct it. Connectivity status may be the root cause of your problem.



Pay particular attention to connectivity status:

- Before and after FLARE upgrades.
- Intermittent or full loss of connectivity to the CLARiiON
- Repeatedly trespassed LUNs occur

## Switch Zone Sets & Zoning

Zone sets and zoning can go hand in hand with, or often cause connectivity status issues.

Verifying the physical connectivity of the host to the SAN switch is one of the easiest ways to determine where the problem may lie. Depending upon the switch vendor, this may be accomplished via graphical topology map or a command line output. Either way, as in the case of connectivity status, physically verify connectivity.

When creating and editing zones:

- Ensure that changes to the zone(s) have been applied to the active zone set
- Place one host port in a zone with one CLARiiON port to ensure ease of administration and troubleshooting
- Ensure that when hosts are removed from the SAN, their zones are removed in a timely manner

## Miscellaneous Pitfalls

Both technical and procedural items are other common issues that are easily resolved.

For clustered hosts, ensure that an AgentID.txt file is created with the appropriate host information and stored in the Navisphere Agent installation directory. Failure to do so will cause the host to have a status of Unregistered in Navisphere Manager.

For additions, moves and changes, be sure to remove any unneeded configurations including Zones, Storage Groups and LUNs. Failure to do so can cause confusion when troubleshooting an issue or attempting to make additional changes such as adding hosts or assigning LUNs.

## Conclusion

The guidance provided, although not a single resource for your CLARiiON array or SAN, should give you a solid foundation. It is not intended as a replacement for hands-on experience or training. It is, however, practical guidance for understanding how to transition your environment into an acceptable operational mode. I would encourage you to use this guidance as a stepping stone and supplement it with the appropriate training and support to move your operational capabilities to the next level.

## Resources

- Powerlink – <https://powerlink.emc.com>
  - CLARiiON Procedure Generator
  - Knowledgebase & Support
  - Best Practices for FLARE XX
- Brocade & Brocade Connect – <http://www.brocade.com>
  - SAN Health Utility
  - SAN Inventory Worksheets
  - Support
  - SAN Administrator's Bookshelf
- Cisco – <http://www.cisco.com>
  - MDS Cookbook
  - Support
- SNIA – <http://www.snia.org>
  - Education
  - Dictionary
- Microsoft – <http://www.microsoft.com/downloads>
  - Fiber Channel Information tool (fcinfo)

## About the Author

Tim Gibbs is a Senior Systems Engineer for Sycom Technologies in Richmond, VA where he specializes in storage networking and server virtualization. He has approximately 9 years of IT experience and holds numerous certifications including EMCIEe – CLARiiON Solutions, VMware Certified Professional on VI3 and MCSE – Windows Server 2003. He currently is pursuing his MBA at Strayer University and holds a Bachelor of Science degree from Strayer.