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Configuring the StorageWorks Modular Data Router with Dual Fibre Channel Connections and Selective Storage Presentation

Abstract: This document:

- Discusses the features of SCSI-3 Controller Commands (SCC) Mode and Selective Storage Presentation (SSP).
- Discusses the need for large LUN support and how to enable it.
- Works through an example of configuring a single MDR to support a 16-drive ESL9326 library.

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Introduction

With the introduction of quad-port SCSI option cards and dual-port Fibre Channel (FC) option cards, it is now possible for a single Modular Data Router (MDR) to host a 16-drive ESL9326 Enterprise Tape Library. This configuration requires implementation of SCSI-3 Controller Commands (SCC) Mode and Selective Storage Presentation (SSP) within the MDR, as well as large Logical Unit Number (LUN) support on the Microsoft Windows NT and Microsoft Windows 2000 platforms.

SCSI-3 Controller Commands Mode

The SCC Mode, available with the introduction of MDR firmware revision v1170, offers an additional method for device reporting. In a typical SCSI environment, the host operating system queries each device addressable by a given host adapter. In an FC environment, such discovery methods are impractical when there are a large number of devices. The SCC Mode allows the MDR to respond to a REPORT LUNS command from the host and return a listing of all SCSI devices. The listing eliminates the need for the host to query every device. The MDR will be mapped to FC LUN 0 when using the SCC Mode.

Selective Storage Presentation

SCSI device targets are presented to an FC environment as FC LUNs. In its default configuration, the MDR presents its FC LUN mapping table to all initiators that are logged into the MDR. Known as an Open Model, a default map containing all FC LUNs is presented to all initiators. SSP provides the ability to restrict access to a given FC LUN. Using a Host Map Administrator List, access to a particular device can be granted or denied based upon that host's World Wide Name (WWN). This functionality is available in MDR firmware revision v1170 or later. If there is a map that exists for any given WWN, access will be granted based on that map regardless of the existence of a default map.

Additionally, SSP provides the ability to use multiple FC paths connected to the same FC switch or hub. In multipath configurations without SSP, the host would issue a REPORT LUNS SCSI command to each Fibre Channel port in the Modular Data Router. In turn, the MDR would report identical sets of FC LUNs behind each port back to the host, thus causing the host to believe that there were twice as many devices as actually exist. This condition is known as *device ghosting* and is common in multipath configurations. SSP allows for the creation of multiple device maps. Each Fibre Channel port or server can then be assigned a unique device map, preventing the ghosting problem and allowing the configuration to maximize the bandwidth of the Fibre Channel ports. This type of configuration is known as a Closed Model, because access to a given device is granted to a specific host; there is no default device map.

Large LUN Support

In their default configurations, Windows NT 4.0 and Windows 2000 do not support large LUN values. Specifically, these operating systems do not support LUN values greater than 7 (meaning integers 0,1,2,3,4,5,6,7 are valid). This means that without large LUN support enabled, the operating system would not correctly identify all of the tape library devices of a large library (more than eight devices, including robots, MDR, and tape drives) behind a single MDR.

Windows NT and Windows 2000 bus scan operations are performed in one of two ways. If Windows SCSIPT.SYS driver believes a device is capable of supporting a LUN space greater than seven (eight is the number of devices), the driver will issue a REPORT LUNS command to FC LUN 0. LUN 0 in turn provides an enumerated list of known devices. In the absence of evidence of large LUN support, SCSIPT sends inquiries to LUNs 0 through 7. Keys in the system registry enable or disable large LUN support.

Compaq provides a free Windows utility for making the necessary large LUN Registry modifications. In addition to the large LUN Registry entries, this utility inserts a device entry in the Registry for Windows 2000 systems. Without this second entry, each time a Windows 2000 system is booted, the New Hardware Discovery Wizard will prompt the user for installation of a device driver. The utility detects the version of the operating system and makes all of the appropriate Registry modifications, eliminating the need for the user to make manual edits.

The Large LUN utility is available in two versions: one that supports ACS version 8.5 and one that supports ACS version 8.6. ACS is the HSG80 Controller firmware found in the StorageWorks RAID Array product line. If the target system's configuration does not include a RAID Array Storage system, then either version of the Large LUN utility may be used.

The Large LUN utility is available on the documentation CD located in the Enterprise Backup Solution Software Solution Kit, or it can be downloaded from the Compaq website at www5.compaq.com

Example Configuration of Selective Storage Presentation

Assume there are two Windows NT servers, `nt_server1` and `nt_server2`. You will be connecting an ESL9326 Tape Library (robot plus 16 tape drives) to a single MDR with dual Fibre Channel ports and two quad-port SCSI modules. All devices are interconnected through an FC SAN switch.

The MDR will be configured so that the robot and tape drives 0 through 7 will be accessible by way of FC port 1, and tape drives 8 through 15 will be accessible by way of FC port 2. Since you do not want any new servers using the default device map, we will create a Closed Map configuration and eliminate the default device map.

1. The first task is to create aliases for the two servers. Server World Wide Names are available from the MDR with the command:

```
AMC>showHosts
Port Number      : 1
World Wide Name -
  Node Name      : 50:05:08:B3:00:00:00:32
  Port Name      : 50:05:08:B3:00:00:00:32
Source ID        : 0x000001
Status           : Enabled
Operation Mode   : Fibre Channel Target
Host World Wide Name -
  Host Node Name : F1:05:08:50:89:89:DB:FA
  Host Port Name : F1:05:01:50:89:89:DB:FA
Is Currently Logged In : Yes
Source ID        = 0x000003
Operation Mode   = Fibre Channel Initiator
Host World Wide Name -
  Host Node Name : F1:05:08:50:89:89:DB:D9
  Host Port Name : F1:05:01:50:89:89:DB:D9
Is Currently Logged In : Yes
Source ID        = 0x000002
Operation Mode   = Fibre Channel Initiator
```

Once the WWNs are known, the aliases can be created.

```
AMC>setAlias F1:05:08:50:89:89:DB:FA nt_server1
The alias of port f1:05:08:50:89:89:db:fa is set to nt_server1.
```

```
AMC>setAlias F1:05:08:50:89:89:DB:D9 nt_server2
The alias of port f1:05:08:50:89:89:db:d9 is set to nt_server2.
```

2. After creating the aliases, device maps need to be created for the first server for each FC port. The simplest method is to use the `CreateMap` command, which copies the default map, then simply delete the FC LUNs that are not needed. The `CreateMap` command will be run twice; once for each FC port. After the maps are created for the first server, these maps will be copied to the second server. This will eliminate the need to manually edit both sets of maps.

```
AMC>createMap nt_server1 1
A host map is created for host nt_server1 at Port 1
```

```
AMC>createMap nt_server1 2
A host map is created for host nt_server1 at Port 2
```

- View the contents of the first server's device map, which is identical to the default map.

```
AMC>ShowFCScsiMap nt_server1 1
The Host Map for Host nt_server1 at Port 1:
Device#   SCSI Bus#   SCSI Target ID   SCSI LUN   Type
0         0           0                 0          0x0C (MDR SCC Device)
1         5           1                 0          0x08 (Library Robot)
2         5           2                 0          0x01 (Tape Drive)
3         5           3                 0          0x01
4         6           2                 0          0x01
5         6           3                 0          0x01
6         7           2                 0          0x01
7         7           3                 0          0x01
8         8           2                 0          0x01
9         8           3                 0          0x01
10        9           2                 0          0x01
11        9           3                 0          0x01
12        10          2                 0          0x01
13        10          3                 0          0x01
14        11          2                 0          0x01
15        11          3                 0          0x01
16        12          2                 0          0x01
17        12          3                 0          0x01
```

- Our desired configuration is to have the library robot and the first eight tape drives on port 1, so we will remove FC LUNs 10 through 17. Port 2 will provide access for the second set of eight tape drives, so we will need to remove FC LUNs 1 through 9.

To delete the unwanted LUNS from each port's device map, use the SetFcScsiMap command as follows:

```
AMC>setFcSCSIMap nt_server1 1
set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 10
Entry with FC LUN 10, SCSI Bus 9, Target ID 2, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 11
Entry with FC LUN 11, SCSI Bus 9, Target ID 3, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 12
Entry with FC LUN 12, SCSI Bus 10, Target ID 2, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 13
Entry with FC LUN 13, SCSI Bus 10, Target ID 3, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 14
Entry with FC LUN 14, SCSI Bus 11, Target ID 2, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 15
Entry with FC LUN 15, SCSI Bus 11, Target ID 3, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 16
Entry with FC LUN 16, SCSI Bus 12, Target ID 2, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 17
Entry with FC LUN 17, SCSI Bus 12, Target ID 3, SCSI LUN 0 was removed!
```

```

AMC>setFcSCSIMap nt_server1 2
set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 1
Entry with FC LUN 1, SCSI Bus 5, Target ID 1, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 2
Entry with FC LUN 2, SCSI Bus 5, Target ID 2, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 3
Entry with FC LUN 3, SCSI Bus 5, Target ID 3, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 4
Entry with FC LUN 4, SCSI Bus 6, Target ID 2, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 5
Entry with FC LUN 5, SCSI Bus 6, Target ID 3, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 6
Entry with FC LUN 6, SCSI Bus 7, Target ID 2, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 7
Entry with FC LUN 7, SCSI Bus 7, Target ID 3, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 8
Entry with FC LUN 8, SCSI Bus 8, Target ID 2, SCSI LUN 0 was removed!

set new entry (Y), delete entry (D), show map (S), stop (N)? d
Fibre Channel LUN to be deleted: 9
Entry with FC LUN 9, SCSI Bus 8, Target ID 3, SCSI LUN 0 was removed!

```

5. Use the ShowFCScsiMap command to display the resulting device maps for nt_server1 port 1 and port 2 as follows:

```

AMC>ShowFCScsiMap nt_server1 1
The Host Map for Host nt_server1 at Port 1:
Device#   SCSI Bus#   SCSI Target ID   SCSI LUN   Type
0         0           0                 0          0x0C
1         5           1                 0          0x08
2         5           2                 0          0x01
3         5           3                 0          0x01
4         6           2                 0          0x01
5         6           3                 0          0x01
6         7           2                 0          0x01
7         7           3                 0          0x01
8         8           2                 0          0x01
9         8           3                 0          0x01

```

```

AMC>ShowFCScsiMap nt_server1 2
The Host Map for Host nt_server1 at Port 2:
Device#   SCSI Bus#   SCSI Target ID   SCSI LUN   Type
0         0           0                 0          0x0C
10        9           2                 0          0x01
11        9           3                 0          0x01
12        10          2                 0          0x01
13        10          3                 0          0x01
14        11          2                 0          0x01
15        11          3                 0          0x01
16        12          2                 0          0x01
17        12          3                 0          0x01

```

- Now that a set of device maps have been created for nt_server1, copy them to nt_server2 (and any subsequent servers). Use the CopyMap command as follows:

```
AMC>CopyMap nt_server1 1 nt_server2 1
Map for nt_server2 at port 1 created.
```

```
AMC>CopyMap nt_server1 2 nt_server2 2
Map for nt_server2 at port 2 created.
```

- Finally, no other server should have access to the tape libraries. This means a closed model is desired. The model will be set to closed, and the default map will be cleared. In a closed model, if a server does not have its own device map, access to the tape libraries is denied. Additionally, as new devices are added to the MDR, they will no longer be added to the default map since the model is closed. However, the devices are available (seen through the command showScsiDevices) and maps can be created or copied from an existing server's maps.

```
AMC>setMapUpdateModel closed
The Default Map Update model is set to CLOSED model.
```

```
AMC>clearFcSCSIMap
The default map is to be cleared. Are you sure? (Y/N) y
Map Entries in the default map are deleted.
```

Modular Data Router Port Numbering

Figure 1 and Figure 2 show bus ordering for MDR firmware revision v1170 and later. Devices attached to the MDR will be discovered on a per module basis, beginning with the lowest numbered bus.

Figure 1 shows bus ordering for an MDR with Quad Port SCSI modules.

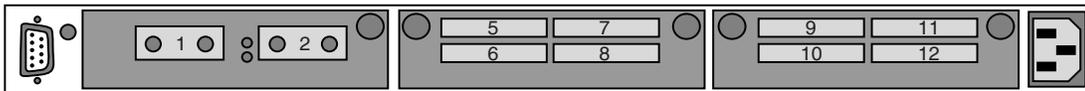


Figure 1: MDR Port numbering with Quad Port SCSI modules

Figure 2 shows bus ordering for an MDR with Dual Port SCSI modules.



Figure 2: MDR Port numbering with Dual Port SCSI modules