



Global Distributed Storage Engineering

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# **Solutions Enabler 6.3 Certification**

**GDSE-05016-SG**

**Solutions Guide**

**Version 2.2**

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## VERSION CONTROL

| Version | Date        | Author                                    | Reviewed                    | Comments                                                                                           |
|---------|-------------|-------------------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------|
| 1.0     | Jun-30-2005 | Chris Clayton,<br>Quang Le,<br>Parul Jain |                             | SE 6.0 - First draft                                                                               |
| 1.1     | Aug-04-2005 | Chris Clayton                             | Vip Davda,<br>Scott Higgins | SE 6.0 - RFC                                                                                       |
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| 1.3     | Oct-10-05   | Chris Clayton                             | Johnie Stafford             | Corrected Typos                                                                                    |
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|         |             |                                           |                             |                                                                                                    |
|         |             |                                           |                             |                                                                                                    |

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## **Contact**

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## **Latest Versions**

It is recommended that the latest version of the document be used from the GDSE website <http://gdse.ny.smb.com>. Newer versions may include expanded scope, or comments on issues discovered after deployment.

## **Confidentiality**

This document is confidential and no part of it should be shared by EMC with any of its other customers.

# 1 Introduction

The Solutions Enabler ("SE") application from EMC allows configuration and control of the EMC Symmetrix storage arrays. It consists of commands that can be invoked via the command line, or within scripts. The Citigroup standard configuration of Solutions Enabler is installed on a SOE Solaris host that is connected to the Storage Area Network ("SAN"). The application utilizes the fibre channel transport to send commands to the array.

This document serves as a guide for implementation and use of the EMC Solutions Enabler 6.3 application within global Citigroup SAN environments. The information compiled in this document has been tested and certified by Global Distributed Storage Engineering ("GDSE").

## 1.1 Applicable Environments

SE is used to manage Symmetrix storage arrays. Certain functionality of SE 6.3 might not be available on all Symmetrix hardware types and Enginuity code levels. For a detailed compatibility analysis please refer to the EMC support matrix.

## 1.2 Release Notes

The [SE 6.3 Certification Release Notes](#) can be referenced for detailed information on the scope of the SE 6.3 certification. The Release Notes also contain important information of issues and fixes specific to SE 6.3 as well as the test results for the certification.

## 2 Certified Features of Solutions Enabler

The following features have been certified for use within Citigroup with SE 6.3. The following features in this section all require 5671 microcode or above.

### 2.1 SRDF/A Features

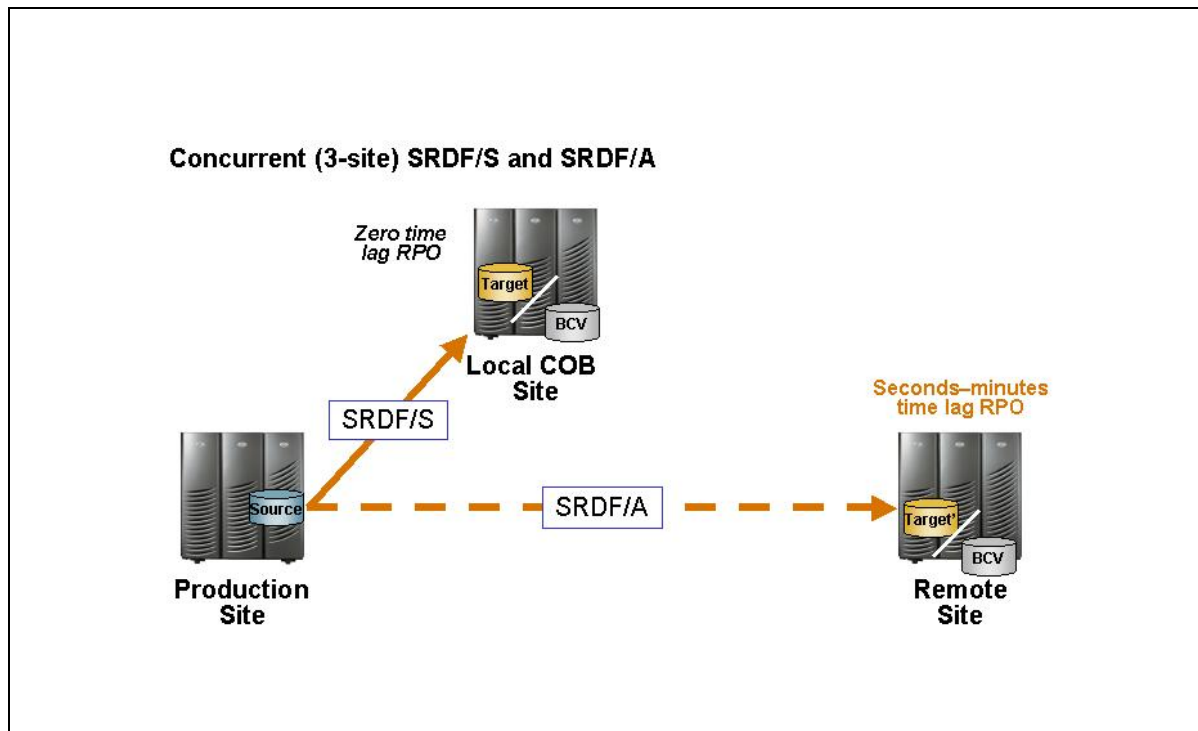
SRDF/Asynchronous (SRDF/A) is a remote mirroring solution for the Symmetrix DMX series. It uses a Delta Set architecture to maintain a consistent point-in-time target (R2) image with only a slight lag behind the source (R1) side, resulting in minimal data loss if the R1 is lost. SRDF/A allows one to configure an SRDF environment in which R1 devices transfer data to R2 devices in chunk cycles. It is suitable for Long Range Replication.

Some key features of the SRDF/A version that has now been certified are highlighted below:

#### 2.1.1 Concurrent SRDF/A and SRDF/S from a single source

This key feature provides the ability to replicate a group of devices in synchronous mode to one target site and in asynchronous mode to a tertiary site at an extended distance. The same source device can be replicated synchronously using SRDF/S mode down one link and asynchronously using SRDF/A down another.

This capability provides a limited multi-site protection capability. In the event of a primary site failure, there would be no data loss since it is synchronously replicated to a local/regional recovery site. In the event of a regional disruption, data has been simultaneously replicated to a recovery site much further away, with minimal potential data loss.



### 2.1.2 Support for multiple SRDF/A Groups

Multiple SRDF/A sessions (up to 64 depending on configuration) can be configured per DMX array. This allows applications using SRDF/A replication to be managed (e.g. failed over) independently of each other.

### 2.1.3 Availability

SRDF/A provides a consistent, restartable image at the target site *at all times*, even in the event of a production site outage that results in data loss between R1 and R2. Fast and efficient incremental failback and re-synchronization are also available with SRDF/A.

### 2.1.4 SRDF/A Write Performance

As writes do not need to be acknowledged by the remote system, there is generally negligible host application IO write response impact regardless of distance between sites (if the solution properly sized).

### 2.1.5 Dynamic Pair Operations for SRDF/A

Dynamic control operations can now be performed on SRDF/A capable devices, using the createpair, deletepair, and swap actions of the symrdf command.

### 2.1.6 SRDF/A Statistics Enhancements

Using the symstat command, you can check SRDF/A performance statistics, using the cycle, cache, and requests types in conjunction with the -reptype rdfa option.

## 2.2 2-site SRDF/MSC

SRDF/MSC offers the ability to provide SRDF/A replication of multiple RDF groups with I/O consistency across all the groups, whilst still retaining the ability to failover individual RDF groups to deal with, for example, application server failures, without impacting the replication of other applications. MSC allows SRDF/A capable devices to be added to composite groups and enabled for consistency protection.

If one or more source (R1) devices in an SRDF/A consistency group cannot propagate data to their target (R2) devices, the MSC process suspends data propagation from all R1 devices in the consistency group, halting all data flow to the R2 targets.

### 2.2.1 Multi Session Consistency (MSC) Daemon Support

SRDF/A with MSC is supported by an RDF daemon that performs cycle-switching and cache recovery operations amongst all SRDF/A sessions in the group. It ensures that a consistent R2 data copy of the database exists at the point-in-time any interruption occurs. A composite group must be created using the RDF consistency protection option (-rdf\_consistency) and must be enabled using the symcg enable command before the RDF daemon begins monitoring and managing the MSC consistency group.

The RDF daemon maintains consistency for enabled composite groups across multiple RDF groups for SRDF/A with MSC. For the MSC option (-rdf\_consistency) to work in an RDF

consistency-enabled environment, each locally-attached host performing management operations must run an instance of the RDF daemon (storrd). Each host must also be running an instance of the base daemon (storapid).

Optionally, if the Group Naming Services (GNS) daemon is also running, it will communicate the composite group definitions back to the RDF daemon. If the GNS daemon is not running, the composite group must be defined on each host individually.

For redundant consistency protection of RDF composite groups, multiple instances of the RDF daemon should be running at the same time on separate hosts. Each host must have a common view of the composite group being monitored. All redundant daemons run simultaneously, monitoring and switching independently of each other. If one of the redundant daemons fails, the other existing daemon(s) will complete the task.

### 2.2.2 GNS Enhancements

The GNS daemon (storgnsd) can now create remote RDF mirrors for composite groups as well as device groups. For composite groups, only the standard devices are mirrored. In addition, this daemon synchronizes changes to SRDF/MSD consistency groups as it works in companion with the RDF daemon (storrd).

Also with GNS, you can now create and restore backup (shadow) files manually from the command line for attached storage array.

### 2.2.3 SRDF/MSD

Solutions Enabler Version 6.0 and above supports the creation of RDF-consistent Composite Groups managed via SRDF Multi Session Consistency (SRDF/MSD) using the - rdf\_consistency.

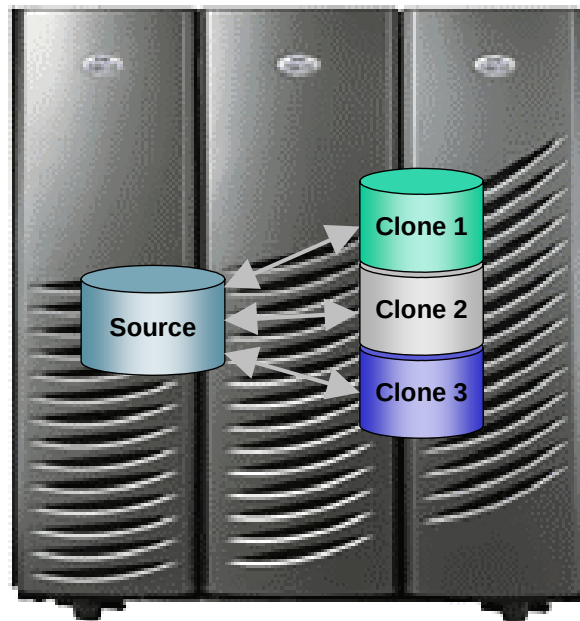
## 2.3 TimeFinder/Clone

TimeFinder/Clone software for DMX allows one to clone copies of data simultaneously on one or more target devices from a single source device within the same DMX. Data can be copied to as many as 16 target devices (depending on configuration).

TimeFinder/Clone functionality is controlled via copy sessions, which pair the source and target devices. Sessions are maintained on the DMX array and can be queried to verify the current state of the device pairs. A copy session must first be created to define and set up the clone devices. The session is then activated, enabling the target devices to be accessed by its host. When the clone is no longer needed, the session can be terminated. TimeFinder/Clone operations are controlled from the host using the `symclone` commands to `create`, `activate`, `restore`, `split`, `recreate` and `terminate` the copy sessions.

The host controlling the clones will usually be an application server and hence will need a copy of Solutions Enabler installed.

The illustration below shows a single source device with three concurrent copy or clone sessions.



Clones can be created in one of three modes:

**PreCopy** – Copying of data to the target clone begins as soon as the clone session is created.

**Copy** – Copying of data to the target clone begins only when the clone is activated

**CopyOnAccess** – Copy of data to the target clone only occurs after activation and when either data is written to the source or reads or writes take place to the target device.

It is also possible to use TimeFinder/Mirror commands (symmir) to manipulate BCV-based clones when used in clone emulation mode.

## 3 Installation Preparation

### 3.1 Host

An SOE Solaris version 8 host is required to install SE 6.3. The host should be connected to the SAN fabrics to which the Symmetrix storage arrays that are to be managed are connected.

For redundancy, there should be a minimum of two hosts managing the same set of Symmetrix storage arrays. These hosts do NOT require shared storage (clustering configuration) from the SAN; each host should have the Group Name Services enabled to share device group information. Please see [Section 5.3](#) on how the Group Name Service (GNS) is to be configured.

At least two gatekeeper devices should be zoned and masked to the host from every Symmetrix array that is to be managed. Note that gatekeeper device management is now provided by the Base daemon for all SYMAPI/CLI clients that require access to Symmetrix arrays, and for the GNS and RDF daemons. This alleviates contention when there are limited gatekeeper resources available and also eliminates the need for every client to constantly select, open, lock, and ping for an available gatekeeper device for every online function.

If SRDF/MSR is being implemented, then consult the SRDF/A Solutions Guide for additional Gatekeeper requirements.

The SE application can also be installed on hosts running business applications. The SA of such hosts would be able to use Timefinder functionality on the Symmetrix devices assigned to the host without requiring any assistance from the Storage Management Group. At this time, GDSE has only created the SE 6.3 package for Solaris 8 and HP-UX 11.11.

### 3.2 Symmetrix Security

#### 3.2.1 SYMACL Permissions

Symmetrix Host Access Control management (SYMACL) must be used with all Symmetrix to limit host access to Symmetrix control.

Before a Solutions Enabler host can issue SYMCLI commands, it should have permissions on each Symmetrix storage array's SYMACL database that it will manage.

The Solutions Enabler host should be made member of the SYMACL group called "AdminGrp" on all local and remote Symmetrix arrays that it will manage.

Refer to [DMX Solutions Guide](#) for further information on the usual standards for configuring SYMACL access control for hosts.

#### 3.2.2 VCMDB Access

Before a SAN management server can issue LUN masking commands such as symmask or symmaskdb, it must have access to the VCMDB device for each Symmetrix storage array that it will manage. Application hosts using SE to manage clones will also need to have VCMDB

access. Commands required for managing clones will fail with the following message if VC MDB access is not given to the application server:

**The gatekeeper device (while using the Base Daemon) has an error (Please see the Log file)**

Refer to document [DMX Solutions Guide](#) for further information on configuring VC MDB access for hosts.

### 3.3 Licensing

Citigroup does not have a blanket license agreement for all components of SE. Hence, only the license keys for basic licensed functions are bundled in the install package. The license keys for the following functionality are provided as a baseline in the default symapi\_licenses.dat file:

|                    |                                                       |
|--------------------|-------------------------------------------------------|
| BASE:              | Enables the Base component                            |
| Configuration Mgr: | Enables the Symmetrix Configuration Change component. |
| DevMasking:        | Enables the Device Masking component                  |
| DeltaMark:         | Enabled ChangeTracker                                 |
| SYMAPI Server:     | Enables the Remote SYMAPI Server (network) operations |

If you purchased any of your Symmetrix with the Citigroup “High Availability” bundle, then you will also need to install license keys for certain SRDF and TimeFinder products. See Release Notes for details of which license keys are covered by which bundles.

You will need to install any of the following additional license keys<sup>1</sup> that you obtained from EMC for your site by using the “symlmf” SYMCLI command. Alternatively, keys for an existing management server can be edited into the symapi\_licenses.dat file.

|                              |                                                  |
|------------------------------|--------------------------------------------------|
| SRDF or SRDF/Synchronous:    | Enables the SRDF component                       |
| SRDF/A:                      | Enables the SRDF/A component                     |
| SRDF/DM:                     | Enables the SRDF/Data Mover component            |
| SRDF/Consistency Groups      | Enables SRDF/Consistency Groups (needed for MSC) |
| TimeFinder/Consistency Group | Enables TF/Consistency Groups                    |
| TimeFinder/Mirror:           | Enables the TimeFinder (BCV control) component   |
| TimeFinder/Clone:            | Enables the TimeFinder (Clone control) component |

If the host is being used for SRDF/A control, refer to section “Management Server Configuration” in the document [SRDF/A Solutions Guide](#) for detailed instructions on licensing requirements.

Use of clones (either via symclone commands or via TimeFinder/Mirror Clone Emulation) requires a TimeFinder/Clone license. See the GDSE document [TimeFinder/Clone Release Notes](#) for further details on clone licensing.

<sup>1</sup> Every time one or more license keys are added, the SYMAPI server must be restarted.

## 4 Installation

### 4.1 New Installations of SE 6.3 on Solaris 8

These installation instructions are for Solaris 8 hosts that haven't had a previous version of Solutions Enabler installed. If the host does have a previous version installed, refer to the upgrade procedure in the next section of this document.

#### 4.1.1 System Requirements

Minimum amount of disk space needed: 312MB

Minimum PowerPath Version: v4.0.3

- Run the following command to get the PowerPath version on your system:

```
# powermt version
```

Verify semaphore settings in the /etc/system file (reboot required if changes are made)

```
set semsys:seminfo_semmni=600
set semsys:seminfo_semmns=600
set semsys:seminfo_semume=600
set semsys:seminfo_semmnu=600
set shmsys:shminfo_shmmax=1048576
set shmsys:shminfo_shmmni=600
```

#### 4.1.2 Pre-Installation Procedure

Before installing the Solutions Enabler software on the server, verify the following:

1. The host has SYMACL permissions on every Symmetrix storage array that it will manage.
2. The host has access to the VCMDB of every Symmetrix storage array that it will manage.

#### 4.1.3 Package Installation

1. Run the following commands to create the installation directory:

```
# mkdir /export/opt/emc
# cd /opt
# ls emc
```

2. The Solutions Enabler 6.3.1.1 package (**EMCsolen63**) for Solaris 8 is posted on the nfs share:

```
/net/stealth/export1/home1.localhost/sw/PKG/EMCsolen6.3.1.1
```

3. Run the following command in the directory where the package resides:

```
# pkgadd -d .
```

4. Enter the number for the **EMCsolen63** package at the following prompt (In this case enter 1):

The following packages are available:

- 1 EMCsolen63 Solutions Enabler 6.0 for Solaris 8  
(sparc) 6.3.1.1

Select package(s) you wish to process (or 'all' to process all packages). (default: all) [?,??,q]:

5. Enter **y** at the following prompt:

The following files are being installed with setuid and/or setgid permissions:

```
/export/opt/emc/SYMCLI/V6.3.1/daemons/storapid <setuid root>
/export/opt/emc/SYMCLI/V6.3.1/daemons/storgnsd <setuid root>
/export/opt/emc/SYMCLI/V6.3.1/daemons/storrdfd <setuid root>
/export/opt/emc/SYMCLI/V6.3.1/daemons/storwatchd <setuid root>
```

Do you want to install these as setuid/setgid files [y,n,?,q]

6. Enter **y** at the following prompt:

This package contains scripts which will be executed with super-user permission during the process of installing this package.

Do you want to continue with the installation of <EMCsolen63> [y,n,?]

7. A message stating that the installation was successful should appear at the end of the output. Enter **q** at the following prompt to exit the installation script:

Select package(s) you wish to process (or 'all' to process all packages). (default: all) [?,??,q]:

#### 4.1.4 Post-Installation Configuration

1. Set the following in the **.profile** file:

```
PATH=$PATH:/usr/storapi/bin:usr/storapi/storbin:.
MANPATH=$MANPATH:/usr/storapi/man:/usr/storapi/storman
LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/usr/storapi/shlib:.
export PATH MANPATH LD_LIBRARY_PATH
```

2. The following licenses should be in the **symapi\_licenses.dat** file in the **/var/symapi/config** directory:

**# cat symapi\_licenses.dat**

```
License Key: 7FBE-9150-E0BC-9CCD SYMAPI Feature: BASE / Symmetrix
License Key: C7B7-B992-1954-4D99 SYMAPI Feature: DeltaMark / Symmetrix
License Key: A97E-6602-DABA-9E2A SYMAPI Feature: DevMasking / Symmetrix
License Key: A936-39CD-A0FF-CDC5 SYMAPI Feature: ConfigChange / Symmetrix
```

3. If any additional licenses need to be registered, run the following command to register them:

**# symlmf**

4. Assign gatekeepers and vcm device to the server if that hasn't already been done.
5. Run the following command to build the configuration (SYMAPI) database:

```
# symcfg discover
```

## 4.2 Upgrading to SE 6.3 on Solaris 8

This upgrade procedure is for a Solaris 8 host currently running a prior version of SE.

### 4.2.1 System Requirements

Minimum amount of disk space needed: 312MB

Minimum PowerPath Version: v4.0.3

- Run the following command to get the PowerPath version on your system:

```
# powermt version
```

Verify semaphore settings in the /etc/system file (reboot required if changes are made)

```
set semsys:seminfo_semmni=600
set semsys:seminfo_semmns=600
set semsys:seminfo_semume=600
set semsys:seminfo_semmnu=600
set shmsys:shminfo_shmmax=1048576
set shmsys:shminfo_shmmni=600
```

### 4.2.2 Pre-Upgrade Procedure

These steps are required to ensure that previous Solutions Enabler configurations are preserved after the upgrade is complete.

1. Run the following command to update the configuration database:

```
# symcfg discover
```

2. Check to see if GNS is enabled on the server by looking in the options file in the /var/symapi/config directory. If not, ensure that device groups and composite groups defined on this server are restored after Solutions Enabler is upgraded. See the post-installation instructions for the procedure.

3. Stop all Solutions Enabler daemons by issuing the following command:

```
# stordaeon shutdown all
```

4. Stop the symapi server by issuing the following command:

```
# symapisrv stop
```

5. Perform a backup of the system if possible.
6. Create a backup of the VCMDB by issuing the following command:

**# symmaskdb -sid *SymmID* backup -file *BackupFilename***

7. Copy the contents of the `/var/symapi/config` and the `/var/symapi/db` directories to `/var/tmp/syampi_bk/config_old` and `/var/tmp/syampi_bk/db_old`. If an alternate location is desired, these directories should be copied to the alternate location and the location should be properly recorded for future reference.

#### 4.2.3 Package Installation

1. Remove the current package for SE using '**pkgrm <package name>**'.
2. Follow package installation instructions stated in the previous section for new installations.

#### 4.2.4 Post-Installation Configuration

1. If GNS was not enabled on the server, copy the backup copy of the SYMAPI database into the **`/var/symapi/db`** directory by issuing the following command:

```
# cp /var/tmp/syampi_bk/db_old/var/symapi/db/syampi_db.bin
/var/symapi/db/syampi_db.bin
```

2. Copy the old **`syampi_licenses.dat`** file back to the **`/var/symapi/db`** directory:

```
# cp /var/tmp/syampi_bk/config_old/var/symapi/config/syampi_licenses.dat
/var/symapi/config
```

3. Set the proper parameters in the **`options`** and **`daemon_options`** file in the `/var/symapi/config` directory. DO NOT replace the new files with the backup copy. Doing so will result in missing feature settings included in the new files. The old files should only be referenced to configure the new options file.
4. Set the following in the `.profile` file:

```
PATH=$PATH:/usr/storapi/bin:usr/storapi/storbin:
MANPATH=$MANPATH:/usr/storapi/man:/usr/storapi/storman
LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/usr/storapi/shlib:
export PATH MANPATH LD_LIBRARY_PATH
```

5. Run the following command to rebuild the configuration (SYMAPI) database:

```
# symcfg discover
```

### 4.3 New Installations of SE 6.3 on HP-UX 11.11

These instructions are for new installations of SE on HP-UX servers.

#### 4.3.1 System Requirements

Minimum amount of disk space needed: 360MB

Minimum PowerPath Version: v4.2

- Run the following command to get the PowerPath version on your system:

## # powermt version

### 4.3.2 Pre-Installation Procedure

Before installing the Solutions Enabler software on the server, verify the following:

1. The host has SYMACL permissions on each of the Symmetrix storage array's SYMACL database that it will manage.
2. The host should have access to the VCMDDB of each of the Symmetrix storage arrays that it will manage.

### 4.3.3 Package Installation

1. Obtain a copy of the SE 6.3.0.0 package for HP-UX 11.11 from the GDS server stealth. The name of the file is **se6300-HP-UX-9000-800-ni.tar.Z** and is posted on:

**/net/stealth.nj.smb.com/export1/home1.localhost/sw/HP-UX/hpsolen63**

2. Copy the package to the **/tmp** directory.
3. Unzip and untar the file to the **/tmp** directory. The **SYMCLI.depot** should be created in the **/tmp** directory as a result of untarring the file.
4. Run the following command:

```
# swinstall -s /tmp/SYMCLI.depot SYMCLI
```

### 4.3.4 Post-Installation Procedure

1. Set the following in the **.profile** file:

```
PATH=$PATH:/usr/storapi/bin:usr/storapi/storbin:
MANPATH=$MANPATH:/usr/storapi/man:/usr/storapi/storman
export PATH MANPATH
```

2. Create the **symapi\_licenses.dat** file in the **/var/symapi/config** directory and copy the following into that file:

```
License Key: 7FBE-9150-E0BC-9CCD SYMAPI Feature: BASE / Symmetrix
License Key: C7B7-B992-1954-4D99 SYMAPI Feature: DeltaMark / Symmetrix
License Key: A97E-6602-DABA-9E2A SYMAPI Feature: DevMasking / Symmetrix
License Key: A936-39CD-A0FF-CDC5 SYMAPI Feature: ConfigChange / Symmetrix
```

3. If any additional licenses need to be registered, run the following command to register them:

```
# symImf
```

4. Set the proper parameters in the **options** and **daemon\_options** file in the **/var/symapi/config** directory. DO NOT replace the new options file with the backup copy. Doing so will result in missing feature settings included in the new options file. The old files can be referenced to configure the parameters in the new files.

5. Assign gatekeepers to the server and vcm device to the server if that has not been done yet.
6. Run the following command to build the configuration (SYMAPI) database:

```
# symcfg discover
```

## 4.4 Upgrading to SE 6.3 on HP-UX

This procedure should be followed for HP-UX hosts running versions of SE prior to SE 6.3.

### 4.4.1 System Requirements

Minimum amount of disk space needed: 360MB

Minimum PowerPath Version: v4.2

- Run the following command to get the PowerPath version on your system:

```
# powermt version
```

### 4.4.2 Pre-Upgrade Procedure

These steps are required to ensure that previous Solutions Enabler configurations are preserved after the upgrade is complete.

8. Run the following command to update the configuration database:

```
# symcfg discover
```

9. Check to see if GNS is enabled on the server by looking in the options file in the /var/symapi/config directory. If not, ensure that device groups and composite groups defined on this server are restored after SE is upgraded. See the post-installation instructions for the procedure.

10. Stop all SE daemons by issuing the following command:

```
# stordaeomon shutdown all
```

11. Stop the symapi server by issuing the following command:

```
# symapisrv stop
```

12. Perform a backup of the system if possible.

13. Create a backup of the VCMDB by issuing the following command:

```
# symmaskdb -sid SymmID backup -file BackupFilename
```

14. Copy the contents of the /var/symapi/config and the /var/symapi/db directories to /var/tmp/syampi\_bk/config\_old and /var/tmp/syampi\_bk/db\_old. If an alternate location is desired, these directories should be copied to the alternate location and the location should be properly recorded for future reference.

#### 4.4.3 Package Installation

1. Remove the current package for SE using '**swremove <software name>**'.
2. Follow package installation instructions stated in the previous section for new installations.

#### 4.4.4 Post-Upgrade Configuration

1. If GNS was not enabled on the server, copy the backup copy of the SYMAPI database into the **/var/symapi/db** directory by issuing the following command:

```
# cp /var/tmp/symapi_bk/db_old/var/symapi/db/symapi_db.bin  
/var/symapi/db/symapi_db.bin
```

2. Copy the old **symapi\_licenses.dat** file back to the **/var/symapi/db** directory:

```
# cp /var/tmp/symapi_bk/config_old/var/symapi/config/symapi_licenses.dat  
/var/symapi/config
```

3. Set the proper parameters in the **options** and **daemon\_options** file in the **/var/symapi/config** directory. DO NOT replace the new files with the backup copy. Doing so will result in missing feature settings included in the new files. The old files should only be referenced to configure the new options file.

4. Set the following in the **.profile** file:

```
PATH=$PATH:/usr/storapi/bin:usr/storapi/storbin:.  
MANPATH=$MANPATH:/usr/storapi/man:/usr/storapi/storman  
LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/usr/storapi/shlib:.  
export PATH MANPATH LD_LIBRARY_PATH
```

5. Run the following command to rebuild the configuration (SYMAPI) database:

```
# symcfg discover
```

## 5 Additional Configuration

### 5.1 SRDF/A Specific Configuration

If the host is being used for SRDF/A control, refer to section “Management Server Configuration” in the document “**SRDF/A Solutions Guide**” [http://gdse.ny.ssmb.com/GDSE\\_docs/GDSE-05002-SG.pdf](http://gdse.ny.ssmb.com/GDSE_docs/GDSE-05002-SG.pdf) for detailed instructions on additional host configuration steps.

### 5.2 Enabling the SYMAPI Server

#### 5.2.1 Background

Currently, SYMCLI commands are run from a privileged (“root”) account. There are two issues with this approach:

- Servers are managed by SAs outside the storage management department, and they do not want to share the root password with storage management personnel.
- It is not possible to track what SYMCLI commands were issued by which operator if all operators use the root account.

GDSE conducted testing by using SYMCLI commands from an unprivileged UNIX account. Many SYMCLI commands failed to run.

As a temporary workaround, GDSE is proposing that the SYMAPI server be used for executing SYMCLI commands. Instead of using the libraries directly, the SYMCLI command issued from an unprivileged UNIX user account would be sent to the SYMAPI server over the TCP/IP network. The SYMAPI server, which would be running in the privileged context, would then execute the SYMCLI command and return the results over the TCP/IP connection. The SYMAPI server process and client users can be on the same host.

Running of SYMCLI commands from non-root user accounts without using the SYMAPI server will be investigated as part of Phase 2 of the SE6.0 certification project. PowerBroker is the solution being targeted.

All the SYMCLI binaries involving change functions should be accessible only by root. Each storage operator will be granted access to execute all SYMCLI commands necessary for their functions. This access will be controlled by the PowerBroker master server being managed by an independent security group, which restrict and log access of all actions performed on the control workstation. The PowerBroker implementation guide for SAN can be obtained from the GDSE website (see link in Section 7).

**NOTE:** When PowerBroker is being used to restrict and log symcli activities, all symapi server access functionalities should be disabled. It is strongly NOT recommended to enable symapi server with PowerBroker on a Control Workstation. The symapi server solution should only be implemented in environments where PowerBroker is NOT supported or cannot be deployed. Unlike PowerBroker the implementation of symapi server does not provide all the security and logging functionalities. However, it does remove the liability of providing the storage operators with a “root” account. In order to configure symapi server, the following should be true:

## 5.2.2 SYMAPI server Configuration

Note that a separate license is needed for SYMAPI server and is not covered by the Base license key. This additional key is included in the license file in the Solaris package.

This is how the SYMAPI server functionality is to be enabled:

Add the following to the `/var/symapi/config/netcnfg` file:

```
SYMAPI_SERVER      -          TCPIP      -          <this-host-IP-address>      2707      -
```

For example:

```
SYMAPI_SERVER      -          TCPIP      -          169.193.70.169      2707      -
```

This instructs SYMCLI commands to connect to the local SYMAPI server. Note you cannot use the loopback address 127.0.0.1.

To ensure that no other hosts on the TCP/IP network can use the SYMAPI server, the “nethost” file has to be configured. If it does not already exist, create the edit `/var/symapi/config/nethost` file and add:

```
<this-host-IP-address>  <username>
```

where `<username>` is the login id of an authorized member of the SAN management team.

For example:

```
169.193.70.169      cc83851
169.193.70.169      sh93900
```

Note that this allows the named users to run SYMCLI commands as if there were logged in as root.

Note that this configuration has not been tested with live-liveIPMP.

In order for the unprivileged user to stop and start storage daemons with the `stordaemon` command, you will also need to create a file called `daemon_users` in the `/var/symapi/config` directory with the following for each authorized user:

```
<username>  stor*
```

The SYMAPI server should now be started with:

```
# symapisrv -background start
```

This command should be made into a script and installed such that it is executed every time the system boots up. For example, file `/etc/rc3.d/S999emc_symapisrv` could contain

```
#!/sbin/sh
echo "Starting SYMAPI server"
/usr/symcli/bin/symapisrv -background start
exit $?
```

Only authorized storage operators should be configured to log on to the host<sup>2</sup>. Each operator should be assigned their unique user ID, such as SOE ID, to logon to the host. The user IDs so assigned should be unprivileged (non-root)<sup>3</sup>.

Each storage operator's account should be profiled with the following:

The following should be added to each user's profile file:

```
PATH=$PATH:/usr/storapi/bin;usr/storapi/storbin
MANPATH=$MANPATH:/usr/storapi/man:/usr/storapi/storman
LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/usr/storapi/shlib
SYMCLI_CONNECT=SYMAPI_SERVER
export PATH MANPATH LD_LIBRARY_PATH SYMCLI_CONNECT
```

The "SYMCLI\_CONNECT" environment variable is set to "SYMAPI\_SERVER". This will force the SYMCLI commands to use the SYMAPI server for executing the commands, instead of directly using the SYMCLI libraries<sup>4</sup>.

The command '**symcli -def**' will show if this environment variable has been set.

## 5.3 Enabling Group Name Services ("GNS")

### 5.3.1 Introduction

In a pre-SE5.5 Symmetrix environment, device group and composite group definitions are created via a locally attached host. Upon creation, the group definition is stored in the host's configuration database file. Therefore, only the host that created the group would see the group and control it. To perform control operations from another locally attached host, the group definition would have to be manually copied to other hosts.

GDSE certified GNS with the release of SE 5.5. GNS provides the ability to store device and composite group definitions in a shared repository located on each Symmetrix array, which would then automatically become visible to all hosts that are configured to run Solutions Enabler. This allows all GNS-enabled hosts to see the same group definitions across the Symmetrix environment, while sharing real-time updates to group definitions and configurations made by other hosts.

As of SE 6.0, the GNS daemon (storgnsd) can now create remote RDF mirrors for composite groups as well as device groups. For composite groups, only the standard devices are mirrored. In addition, this daemon synchronizes changes to SRDF/MSR consistency groups as it works in companion with the RDF daemon (storrdfd).

Also with SE 6.0 or above, GNS you can now create and restore backup (shadow) files manually from the command line for attached storage array.

<sup>2</sup> GDSE does not recommend sharing hosts that are used to manage storage with other applications for security reasons. At this time SYMACL can only restrict access by host, and not by individual user IDs.

<sup>3</sup> These are information security requirements. This will allow for tracking of storage operator activity with a new application that GDSE is developing.

<sup>4</sup> EMC does not support running of SYMCLI commands from an unprivileged ("non root") user account. GDSE is proposing the use of the SYMAPI server as a workaround.

The present document only covers basic GNS configuration. However, the EMC Engineering White Paper “**Using SYMCLI and GNS to propagate Group Definition to Multiple Hosts**” gives an excellent summary of GNS operations, with examples, and is recommended reading when enabling GNS.

### 5.3.2 GNS User Authentication

GNS is intended to share group definitions across multiple users and hosts in a Symmetrix environment via the host installed GNS daemons. As such, limiting permission to the GNS daemon controls access to GNS functionality. However, this type of permission control is **NOT** required in the Citigroup environment because all users logging on to the SOE host have same storage management responsibilities (and therefore need the same privileges).

### 5.3.3 Configuring GNS

If the daemon\_options file does not already exist, copy the template README.daemon\_options file to /var/symapi/config/daemon\_options and edit. The following options should be set:

| Option                                      | Description                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| storgnsd:autorestart=enable                 | Make use of the watchdog mechanism to automatically restart the daemon if it crashes.                                                                                                                                                                                                                                                                                |
| storgnsd:gns_device_poll_interval=15        | The interval, in seconds, at which to poll locally-attached Symmetrix arrays for group changes.                                                                                                                                                                                                                                                                      |
| storgnsd:gns_device_remote_poll_interval=60 | The interval, in seconds, at which to poll remotely-attached Symmetrix arrays for group changes.                                                                                                                                                                                                                                                                     |
| storgnsd:gns_rmtarr_update_interval=1000    | Interval in seconds to use to check for group changes that need to be propagated to remote Symmetrix arrays. The default is 60 seconds.                                                                                                                                                                                                                              |
| storgnsd:gns_symsdiscover_interval=600      | The interval, in seconds, at which to check for Symmetrix configuration changes.                                                                                                                                                                                                                                                                                     |
| storgnsd:gns_ppath_poll_interval=60         | The interval, in seconds, at which to check whether PowerPath definitions need to be updated.                                                                                                                                                                                                                                                                        |
| storgnsd:gns_shadow_file=enable             | If set to enable, the daemon automatically maintains backup copies of GNS data for locally attached Symmetrix arrays. These backups, maintained on the local disk, are automatically restored to the GNS repository on an array if the daemon detects that a repository has been erased (for example, in the event of a power failure under Enginuity 5x67 or 5x66). |

### 5.3.4 Using GNS

To instruct SYMCLI to use GNS instead of the local SYMAPI database, edit the `/var/symapi/config/options` file, and uncomment the following line:

```
SYMAPI_USE_GNS=ENABLE
```

GNS daemon `storgnsd` will need restarting.

Stop the daemon with the command

```
# stordaeon shutdown storgnsd
```

The GNS daemon is started automatically when a SYMCLI command that manipulates groups, such as `symdg`, is issued.

Alternatively, the daemon can be started manually via the `stordaeon` command line utility as follows:

```
# stordaeon start storgnsd
```

In addition, the daemon can be set to start automatically every time the local host is booted using the following command line:

```
# stordaeon install storgnsd -autostart
```

Pre-starting the daemon, either manually or via the automatic option, is useful because the daemon may take a while to initially construct its cache — depending on the number of groups and Symmetrix arrays it has to load.

If the daemon is stopped for some reason, it can optionally be restarted automatically by an internal Solutions Enabler watchdog mechanism. A combination of the watchdog mechanism and the auto-start option described above can be used to ensure that the daemon is always running.

Any existing group definitions should now be imported to GNS with the following commands:

```
# symdg activateall  
# symcg activateall
```

To see if a group has been imported successfully, you can use the `symdg show DgName` or `symcg show CgName` commands. The output should have “Device Group in GNS : Yes” added to it.

GNS is now ready for use. Group definitions can now be created, edited or deleted as before with `symdg` and `symcg` SYMCLI command. All modifications will automatically be applied to the GNS database on the Symmetrix. The local database will not be used.

The GNS daemon (`storgnsd`) can now create remote RDF mirrors for composite groups as well as device groups. For composite groups, only the standard devices are mirrored. In addition, this daemon synchronizes changes to SRDF/MSR consistency groups as it works in companion with the RDF daemon (`storrd`). This is covered in a separate subsection.

### 5.3.5 Group Name Collisions

Each GNS daemon attempts to ensure that group names are unique (relative to a group type). It is possible, however, for duplicate named groups to occur. For example, it is possible for two different groups to be created with the same name on different Symmetrix arrays. A subsequent reconfiguration could then allow the GNS daemon to see both groups. If a GNS daemon detects duplicate group names, it returns a state flag informing clients of this fact and modifies the group names to be unique by attaching a numeric suffix. For example, duplicate device groups with the name MyDG could be modified in the following way:

```
MyDG#12345678
MyDG#87654321
```

While in this state (duplicate names), the only operations permitted on them are those that can be used to resolve the name conflict: group rename and delete (with the -force flag). For example:

```
# symdg delete MyDG#12345678 -force
# symdg rename MyDG#87654321 MyDG
```

### 5.3.6 GNS Backup and Restore

GNS group definitions are stored within the each individual Symmetrix array. These definitions can be lost if a Symmetrix is completely re-initialized or power is lost on a Symmetrix running Enginuity 5x66 or 5x67. A GNS daemon can be configured to automatically backup and restore GNS data from individual arrays. When backup is enabled, the daemon will write an image of the GNS group information to the host's local disk each time it makes a change or it notices a change made from another locally attached host. These backups are maintained as separate per-Symmetrix files and named SymmID.shadow within the /var/symapi/gns/ directory on the host machine<sup>5</sup>.

Automatic backup of the GNS database should be enabled by setting the storgnsd:gns\_shadow\_file=enable option in the /var/symapi/config/daemon\_options file.

As of SE6.0, you can also now create and restore backup (shadow) files manually from the command line for attached storage array. For example:

```
# /usr/symcli/daemons/storgnsd backup -sid <SID>
# /usr/symcli/daemons/storgnsd restore -sid <SID>
```

Note, however, that automatic backups and manual backups write to the same shadow file. Consequently, if you want to preserve a manual backup made at a particular time, you should make a copy of the shadow file (/var/symapi/gns/SID.shadow) after the manual backup is completed.

### 5.3.7 GNS remote Mirroring

As of the SE 6.0 release, GDSE is supporting mirroring of RDF Group Definitions in a Remote Symmetrix Array.

<sup>5</sup> Because the maintenance of numerous backup images can impact performance, it is recommended that you do not enable it on all GNS daemons. Typically, it is recommended that you configure a maximum of 2 GNS daemons to maintain backups for each Symmetrix array that may hold GNS data.

With remote mirroring, GNS will automatically maintain a mirrored group definition on the remote Symmetrix array. This mirroring of groups converts a local RDF1 type group to a remote RDF2 type group, and vice versa. Also local BCVs are converted to remote BCVs and vice versa.

When changes are made to the local group definition, GNS automatically propagates corresponding change to the remote group definition, keeping the two groups synchronized. The remote mirrored group has the same name as the local group and has a mirror image of its contents, bar those elements that are swapped such as the RDF type.

To enable mirroring of an RDF group definition, set the following option in the GNS daemon options file.

```
storgnsd:gns_remote_mirror=enable
```

By default, mirrored groups are read-only and cannot be modified or renamed. The default behaviour is recommended at this time.

Note that propagation of group definitions is controlled by the daemon\_options file entry

```
storgnsd:gns_device_remote_poll_interval=60
```

Hence, it may take a minute or so before the definition is visible at the remote site.

***GNS remote mirroring is not supported for device groups containing Concurrent SRDF devices.***

For further information on remote mirroring, refer to the EMC Engineering White Paper “**Using SYMCLI and GNS to propagate Group Definition to Multiple Hosts**”.

## 6 Best Practices

### 6.1 SRDF/A

SRDF/A Best Practice is a very large subject in itself and is not covered in any detail in the present document. A separate SRDF/A Solutions Guide, and other related documents, are available on the GDSE website. These documents also cover Best Practice for SRDF/MSD and the RDF daemon, Concurrent RDF and Dynamic RDF.

The Solutions Guide covers:

- Preparation for an SRDF/A implementation
- 2-site SRDF/A configuration (with or without SRDF/MSD) and operational procedures
- 3-site Concurrent SRDF configuration and operational procedures

|                        |                                                                                                                                                                                                               |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SRDF/A Solutions Guide | <a href="http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/stdsdocs/05002-sg.pdf">http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/stdsdocs/05002-sg.pdf</a>         |
| SRDF/A Release Notes   | <a href="http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/releasenotes/05002-rn.pdf">http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/releasenotes/05002-rn.pdf</a> |
| SRDF/A Evaluation      | <a href="http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/stdsdocs/05002-e.pdf">http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/stdsdocs/05002-e.pdf</a>           |

### 6.2 TimeFinder/Clone

TimeFinder/Clone has its own set of Best Practice documentation and is not covered in any detail in the present document.

|                                  |                                                                                                                                                                                                               |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TimeFinder Clone Solutions Guide | <a href="http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/releasenotes/05008-rn.pdf">http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/releasenotes/05008-rn.pdf</a> |
| TimeFinder Clone Release Notes   | <a href="http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/releasenotes/05008-rn.pdf">http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/releasenotes/05008-rn.pdf</a> |

### 6.3 Volume Logix Support

The Volume Logix commands vcmfind and fpath have been replaced with symmask, symmaskdb and symcfg commands. All scripts utilizing Volume Logix commands must be converted to these new commands. Please refer to “**EMC Solutions Enabler Symmetrix Device Masking CLI Version 6.0 Product Guide**” for guidance on Volume Logix command conversion. Equivalent commands have also been summarized from this guide in Appendix A of the present document.

## 6.4 VCMDb Database Backup

The database should be backed up every day with the following command:

```
# symmaskdb -sid SymmID -file BackupFileName backup
```

The backup should be automated through the cron, and the resulting file should be sent to tape using standard backup procedures for servers.

For example, the following crontab entry would backup the vcldb of Symmetrix 1227 to a file /var/tmp/vcldb\_1227\_<day-of-week> at 03:00 each day. This gives the ability to roll back several days if required.

```
00 03 * * * symmaskdb -sid 1227 -file /var/tmp/vcldb_`/usr/bin/date +%1227_` backup
```

## 6.5 Heterogeneous Server Support

In instances where all FA ports are already utilized or it is otherwise not practical to dedicate a FA to one or more HP-UX hosts, heterogeneous support should be utilized to share the FA with AIX, Solaris or Windows hosts.

The HP-UX server uses Volume Set Addressing, which requires the 'V' bit to be set on the FA port. With heterogeneous masking capability, the 'V' bit will be associated with the host WWN instead of the FA port. To add a HP-UX host to a FA port that is serving other host types, use the following command for each HP-UX WWN:

```
# symmask [-sid SymmID] -wwn <WWN of the HP-UX server> \
    set heterogeneous on HP_UX -dir <FA> -p <port>
```

No changes are required to the BIN file<sup>6</sup> to enable heterogeneous masking for a host. Also, there is no impact to existing hosts that are connected to that FA.

## 6.6 LUN Offset

The HP-UX host can only use LUNs that have octal addressing. LUNs with 8 through F in the last digit of their address cannot be seen by the HP-UX host. To make these LUNs visible to the HP-UX host, an offset can be programmed. There can be only one offset per host.

For example, if a FA port is being shared between a Solaris and HP-UX host through heterogeneous masking, and the Solaris host has been masked the LUNs with logical addressing 1 through 10 (hex), LUNs 11 (hex) to 0F (hex) can be masked to the HP-UX host by using an offset of 11 (hex). When an offset of 11 (hex) is used, the LUN addressed as 11 (hex) would appear as LUN 0 to the HP-UX host.

No changes are required to the BIN file to enable LUN offset for a host. Also, there is no impact to existing hosts that are connected to that FA.

<sup>6</sup> The addressing of the LUNs behind the FA port must be compatible with the HP-UX host. The 'V' bit does not translate addressing. This issue can also be addressed in a limited way by the use of the LUN offset feature.

The process for setting the LUN Base/Offset Skip adjustment using symmask can be found in the document “**EMC Solutions Enabler Symmetrix Device Masking CLI Product Guide**”

## 6.7 BIN file reconfiguration with Symconfigure

Historically, the standard for BIN file changes has been to request the change through the vendor. The vendor uses the SymmWin application from the service processor to validate and implement these changes.

GDSE has certified the Symconfigure SYMCLI command, which allows for BIN file changes to be made by Citigroup personnel from a SE 5.5 or later host. This is expected to reduce the time and cost for a BIN file change. With more control over the process, Citigroup can make more frequent changes to the configuration leading to improved utilization.

Symconfigure should be used in conjunction with the meta and hyper volume standard defined in the DMX best practices document (see the references section for the location of this document) to configure the storage array. For custom sized LUNs, Symconfigure can be used to combine one or more 8GB hyper volumes into a stripe set. The command should also be used to change front end port bit settings, for configuring the SCSI 3 persistent reservation bit on a device, and assigning or removing a BCV etc.

For a complete list of certified functionality, please see [Appendix B](#).

During testing in the lab, GDSE found that symconfigure could occasionally be very slow and sometimes it can even fail. Most of the problems were found to be non-fatal, and can be recovered by re-issuing the command. The problems are related to the communication between the array and the service processor; all symconfigure commands are processed on the service processor. If a site is running into such problems, they should ask the vendor to update the service processor hardware and software to the most current version.

No examples of symconfigure usage are given in the present document. The key documentation for symconfigure which any user must familiarize themselves with is the EMC Engineering White Paper **“Using the SYMCLI Configuration manager”** which contains a very good introduction with many examples.

## 7 References

### 7.1 Key Documentation

| Document                                                                                       | Location                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EMC documentation</b>                                                                       |                                                                                                                                                                                                               |
| EMC Solutions Enabler V6.3.1 Release Notes P/N 300-004-275                                     | Available from EMC                                                                                                                                                                                            |
| Engineering White Paper: EMC Solutions Enabler Symmetrix Device Masking CLI Product Guide      | Available from EMC                                                                                                                                                                                            |
| Engineering White Paper: Using the SYMCLI Configuration Manager                                | Available from EMC                                                                                                                                                                                            |
| Engineering White Paper: Using SYMCLI and GNS to Propagate Group Definitions to Multiple Hosts | Available from EMC                                                                                                                                                                                            |
|                                                                                                |                                                                                                                                                                                                               |
| <b>GDSE documentation</b>                                                                      |                                                                                                                                                                                                               |
| Solutions Enabler 6.3 Release Notes                                                            | <a href="http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/releasenotes/06056-rn.pdf">http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/releasenotes/06056-rn.pdf</a> |
| EMC Symmetrix DMX Solutions Guide                                                              | <a href="http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/stdsdocs/03038-sg.pdf">http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/stdsdocs/03038-sg.pdf</a>         |
| SRDF/A Solutions Guide                                                                         | <a href="http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/stdsdocs/05002-sg.pdf">http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/stdsdocs/05002-sg.pdf</a>         |
| SRDF/A Release Notes                                                                           | <a href="http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/releasenotes/05002-rn.pdf">http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/releasenotes/05002-rn.pdf</a> |
| SRDF/A Evaluation                                                                              | <a href="http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/stdsdocs/05002-e.pdf">http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/stdsdocs/05002-e.pdf</a>           |
| TimeFinder Clone Solutions Guide                                                               | <a href="http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/stdsdocs/05008-sg.pdf">http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/stdsdocs/05008-sg.pdf</a>         |
| TimeFinder Clone Release Notes                                                                 | <a href="http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/releasenotes/05008-rn.pdf">http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/releasenotes/05008-rn.pdf</a> |
| Powerbroker Implementation for SAN                                                             | <a href="http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/stdsdocs/05006-s.pdf">http://engineering.ti.citigroup.net/gdse/products/platforms/symmetrix/stdsdocs/05006-s.pdf</a>           |

## 7.2 Relevant Solutions Enabler 6.0 Documentation Set

The following EMC documents describe the usage of the certified components of Solutions Enabler 6.0.

| <b>EMC Solutions Enabler Documentation</b>                                     |  |
|--------------------------------------------------------------------------------|--|
| EMC Solutions Enabler Installation Guide                                       |  |
| EMC Solutions Enabler Symmetrix CLI Quick Reference                            |  |
| EMC Solutions Enabler Symmetrix CLI Command Reference                          |  |
| EMC Solutions Enabler Symmetrix Base Management CLI Product Guide              |  |
| EMC Solutions Enabler Symmetrix Device Masking CLI Product Guide               |  |
| EMC Solutions Enabler Symmetrix Access Control CLI Product Guide               |  |
| EMC Solutions Enabler Symmetrix TimeFinder Family CLI Product Guide            |  |
| EMC Solutions Enabler Symmetrix SRDF Family CLI Product Guide                  |  |
| EMC Solutions Enabler Symmetrix Secure Erase CLI Product Guide                 |  |
| EMC Solutions Enabler Symmetrix Change Tracker CLI Product Guide               |  |
| EMC Solutions Enabler Symmetrix Configuration Change CLI Product Guide         |  |
| <b>Engineering White Papers</b>                                                |  |
| Using SYMCLI to Obtain Symmetrix Configuration Information                     |  |
| Using SYMCLI to Attach, Query, and Verify with TimeFinder Family Products      |  |
| Using SYMCLI to Set Up TimeFinder/Mirror BCV Pairs                             |  |
| Using SYMCLI to Set Up TimeFinder/Mirror Multiple BCVs and Concurrent BCVs     |  |
| Using SYMCLI to Perform TimeFinder/Mirror Control Operations                   |  |
| Using SYMCLI to Perform Consistent Splits with the TimeFinder Product Family   |  |
| Using SYMCLI to Perform TimeFinder/Clone Operations                            |  |
| Using SYMCLI to Query and Verify with SRDF Family Products                     |  |
| Using SYMCLI to Perform Control Operations with SRDF Family Products           |  |
| Using SYMCLI to Implement RDF Consistency Protection with SRDF Family Products |  |
| Using SYMCLI to Perform Device Masking                                         |  |
| Using SYMCLI to Administer Symmetrix Access Control                            |  |
| Using the SYMCLI Configuration Manager                                         |  |
| Using SYMCLI to Measure Volume Changes with Change Tracker                     |  |
| Using SYMCLI and GNS to Propagate Group Definitions to Multiple Hosts          |  |

## 8 Appendix A: Volume Logic Conversion

| VCM command                     | SYMCLI command                                                       |
|---------------------------------|----------------------------------------------------------------------|
| vcmfind [-r]                    | symmask discover hbas [-rename]                                      |
| fpath lshbawwn                  | symmask list hbas                                                    |
| fpath lshosts -d                | symmask -sid list logins                                             |
| fpath adddev -d [-w -u] -f -r   | symmask -sid [-wwn -awwn] -dir -p add devs <r>                       |
| fpath rmdev -d [-w -u] -f -r    | symmask -sid [-wwn -awwn] -dir -p remove devs <r>                    |
| fpath chgname -d -w -n          | symmask -sid -wwn rename < awwn>                                     |
| fpath clrwwn -d [-w -u]         | symmask -sid [-wwn -awwn] delete                                     |
| fpath swaphba -d [-w -u] -n     | symmask -sid [-wwn -awwn] replace < awwn>                            |
| fpath chgattr -d -h             | symmask -sid [-wwn -awwn] -dir -p set visibility <on off>            |
| fpath chgattr -d -s -v          | symmask -sid [-wwn -awwn] -dir -p set lockdown <on < fcid> off>      |
| fpath chgattr -d -l -o -b       | symmask -sid [-wwn -awwn] -dir -p set lunoffset <on < offset> off>   |
| fpath chgattr -d -m -c          | symmask -sid [-wwn -awwn] -dir -p set heterogeneous <on < host> off> |
| fpath refresh -d                | symmask -sid refresh                                                 |
| fpath lsdb -d                   | symmaskdb -sid list database                                         |
| fpath lsbackup -o               | symmaskdb -file list database                                        |
| fpath lshbavols [-d -o] [-w -u] | symmaskdb -sid [-wwn -awwn] list devs                                |
| fpath initdb -d                 | symmaskdb -sid -file init                                            |
| fpath backupdb -d               | symmaskdb -sid -file backup                                          |
| fpath restoredb -d              | symmaskdb -sid -file restore                                         |
| fpath lshostdev                 | sympd list -sid                                                      |
| fpath lssymmdev -d              | symcfg list -sid -FA all -address                                    |
| fpath lssymmfas -d              | symcfg list -sid -FA all                                             |
| fpath lsstatus -d               | symcfg list -sid -v                                                  |

## 9 Appendix B: Certified symconfigure functionality

| Activity                                                   | SYMCLI command                                                                                                                      |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Verify Symmetrix is ready for configuration change         | symconfigure verify -sid <i>SymmID</i>                                                                                              |
| Check for free physical disk space to configure            | symconfigure list -freespace [-units CYLINDERS MB]<br>-sid <i>SymmID</i>                                                            |
| Create BCV devices.                                        | create dev count=<# of devices>, size=<# of cylinders>, emulation=FBA, config=BCV;                                                  |
| Create meta BCV device                                     | form meta from dev <metahead>, config=<metatype>, stripe_size=<stipesize [cyl]>;<br>add dev <device range> to meta <metahead>;      |
| Dissolve meta BCV.                                         | dissolve meta dev <i>SymDevName</i> ;                                                                                               |
| Remove BCV devices                                         | delete dev < <i>SymDevName</i> range>;                                                                                              |
| Create RDF device                                          | create dev count=<# of devices>, size=<# of cylinders>, emulation=FBA, config=RDF1, remote_config=RDF2, ra_group=<RA group number>; |
| Enable dynamic RDF configurations.                         | set symmetrix dynamic_rdf = enable;                                                                                                 |
| Convert static RDF to dynamic RDF                          | convert rdf dev <i>SymDevName</i> [: <i>SymDevName</i> ] to dynamic;                                                                |
| Map device to FA.                                          | map dev <i>SymDevName</i> to dir<br><i>director_num:port_number</i> target= <i>tid</i> ,<br>lun= <i>LunNum</i>                      |
| Unmap a device from FA.                                    | unmap dev <i>SymDevName</i> [: <i>SymDevName</i> ] from<br>dir <i>director_num:port_number</i> ;                                    |
| Change device emulation from FBA to CELERRA_FBA            | set device <i>SymDevName</i><br>emulation= <i>EmulationType</i> ;                                                                   |
| Change vcmdb_restrict_access metric                        | set symmetrix vcmdb_restricted_access =<br>Enabled;                                                                                 |
| Set SRDF/A Cycle time for an RDF group                     | set ra group <n>, minimum_cycle_time=X;                                                                                             |
| Set SRDF/A Priority for an RDF group                       | set ra group <n>, session_priority=X;                                                                                               |
| Set SRDF/A Cache utilization for whole Symmetrix           | set symmetrix rdfa_cache_percent=X;                                                                                                 |
| Enable dynamic RDF configurations.                         | set symmetrix dynamic_rdf=enable;                                                                                                   |
| Create meta device                                         | form meta from dev <i>SymDevName</i> ,<br>config=MetaOption, count=member_count;                                                    |
| Change front end port bit settings                         | set port DirectorNum:PortNum<br>HP_UX=enable;                                                                                       |
| Change SCSI 3 persistent reservation bit setting on device | set dev <i>SymDevName</i> [: <i>SymDevName</i> ]<br>attribute=[NO]device_attr;                                                      |