ETERNUS SMI-S Server version 2.1.1.0

Release Notes

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Preface

This document explains ETERNUS SMI-S Server.

Contents

1. Overview

The ETERNUS SMI-S Server is the SMI-S server for Fujitsu ETERNUS Array Series that is compliant with SMI-S v1.2. It is supplied as a Windows application and runs on Windows machine connected with ETERNUS Array in an Ethernet network. The SMI-S server works on behalf of ETERNUS Array. It receives the request from SMI-S client, converts it to the proprietary interface and redirects it to the ETERNUS Array through Ethernet interface.

The SMI-S Server is a *service* on Windows operating system. The Administrator starts and stops the SMI-S server by the activation and deactivation of the service.

2. Support Models

The ETERNUS SMI-S Server supports the following ETERNUS Array models:
- ETERNUS4000 model 400, model 600 (Firmware version V20L41 or later)
- ETERNUS8000 model 800, model 1200, model 2200 (Firmware version V20L41 or later)
- ETERNUS DX410 / DX440
- ETERNUS DX8100 / DX8400 / DX8700

3. System Requirements

The implementation model of ETERNUS SMI-S Server is called a Proxy SMI-S Server defined in SMI-S Specification. It requires another Windows server that should act as a bridge role between the SMI-S interface and the proprietary ETERNUS interface. From the SMI-S client view, the SMI-S server works on behalf of ETERNUS Array. The client does not communicate with ETERNUS Array directly.

3.1 Platform

The user shall prepare a host platform to run the ETERNUS SMI-S server program code. The minimum specification for the platform is as follows:

Operating System	:Windows 2003 Server or Windows 2008 Server
CPU	: Minimum: 1.4 GHz (x86 processor)
Memory Usage	: Minimum: 512 MB RAM(2GB recommended)
Available Disk Capacity	: 300MB

No additional hardware or software is required if the machine is ready for the above operating systems. The memory size to be required depends upon the configuration to be managed.

3.2 Network

The SMI-S server machine uses the Ethernet network for the following purposes:

a) SMI-S interface
   The ETERNUS SMI-S Server listens to the TCP port 5988 for http protocol access and port 5989 for https protocol access from the SMI-S client software.

b) ETERNUS proprietary interface
   The SMI-S server initiates the access to the TCP port 1999 on the ETERNUS to manage the Array using the ETERNUS proprietary protocol.

c) Service Location Protocol
   The SMI-S server runs the Service Location Protocol (SLP) that listens to the TCP port 427.

The administrator of the SMI-S server shall make sure that the Windows operating system and any related software like firewall permits the above accesses.

4. Prerequisite

The Administrator shall prepare the system for SMI-S environment to operate as follows.

4.1 CA Configuration

The ETERNUS Array has several modes that control the behavior of the Channel Adapter for the masking and mapping feature. The mode is setup individually for each Channel Adapter Port.

The mode name expected is model-dependent: *Host Affinity Mode. LUN Mapping Mode.*

If the setting of the channel port is not supported, the configuration is displayed on SMI-S interface but it cannot be changed. A change operation, such as expose additional logical volume, would be suppressed by the ETERNUS SMI-S Server and reply an appropriate error code to the SMI-S client.

4.2 Host Response Mode

Host Response Mode is the ETERNUS Array terminology that means the collection of settings that define how the ETERNUS Array should behave against SCSI initiator. Administrator shall setup the Host Response Mode from ETERNUSmgr. The mode includes the VPD (Vital Product data) page83 setting.

The Host Response setting should be set for each Host Platform type as specified in the Server Connection Guide for each ETERNUS array model.   SMI-S server depends on VPD83 Type3 ID to correlate the logical volume views from SCSI and SMI-S interface so if the VPD83 setting should not be modified from the default setting of Type1 + Type3 or it would impact the correlation function.

4.3 Network Configuration

The ETERNUS SMI-S Server and the ETERNUS Array communicate via Ethernet network on ETERNUS proprietary management protocol. The network port of ETERNUS Array is called as *USER port* which may be shared with other purposes not only for SMI-S feature.

The ETERNUS has the capability to filter the incoming IP packet according to the source IP address of the packet if it comes from unregistered network segment – it has different subnet address. The administrator register the subnet address on the allow list in ETERNUSmgr so that the ETERNUS SMI-S Server can communicate to the ETERNUS Array if the subnet of ETERNUS Array and the SMI-S server is different.

4.4 Authentication

Administrator shall define the shared secret of authentication for the SMI-S client to access the SMI-S server. The secret information consists of the user id and password. The SMI-S server keeps multiple sets of the User id and password. The authentication information is shared by all SMI-S clients that may access the SMI-S server.

The SMI-S client shall provide the authentication method for the Administrator to specify the information required to access the SMI-S server.

The ETERNUS SMI-S Server requires the user id and password at installation. They may be changed later by edit the configuration file – Restart of SMI-S server is required. See the section Configuration File.

4.5 Namespace

The Namespace is a keyword defined in Common Information Model (CIM) and SMI-S. It is defined as a domain of instances that ensures the unique access to the instance. The SMI-S client must present the Namespace name to access the SMI-S server. The name is a fixed string for the ETERNUS SMI-S server implementation and it is not variable.

The Namespace name is
      interop

The SMI-S client shall have the method for the administrator to specify the Namespace for each SMI-S server. The above string shall be specified for any ETERNUS SMI-S Server.

(CIM: http://www.dmtf.org/standards/cim/)

4.6 Affinity Group Name

Affinity Group is assigned any string or left to be null on ETERNUSmgr. ETERNUS SMI-S Server requires Affinity Group assigned any string name, not null. Otherwise SMI-S operations against the affinity group are restricted.

Affinity Group created by SMI-S Server is assigned any specific name automatically.

5. Installation

The installation is performed by Inno Setup.

5.1 Inno Setup

The file name of Setup program used to launch the Inno Setup is
> "**ETERNUS_smis_setup_v2.1.1.0.exe**"

The clause "v2.1.1.0" in the above is the version code and will be different for each version to be installed. The location of the Setup program is not significant. It can be invoked at any directory because the install directory will be determined by the installation program.

The following items are required for installation.

a) Install Directory
> The install directory can be specified during installation process. The default directory is the following;
>> **C:\Program Files\Fujitsu\ETERNUS SMI-S Server**

> All files are copied only under the *install directory*. No files are copied into other directories, such as the Windows system directory. See Appendix-a for directory structure detail.

5.2 Configuration File

The ETERNUS SMI-S Server has a configuration file that is used to configure the SMI-S server. The file type is an ordinal ASCII file that can be changed by any text editor. Changes to the configuration file will be reflected to the SMI-S server when the SMI-S server service is restarted.

The location of the configuration file is
> *<install_directory>* \ env \ smis_env.inf

The following is the example.

```
[Common]
DefaultPortNumber=1999
ConnectionTimeout=300
PollingInterval=300
DeviceStatusInterval=60
StorageIP=10.21.134.239
StorageIP=10.21.134.241

[LifeCycle]
PortLinkStatus=600
Session=300
SessionStatistics=300
CEStatus=60
SNMP=600
```

The file consists of several lines. Each line is setup as follows:

        <Item-name> = <value>

The item-name is the key word name defined in the following description. The value is a string separated by the space delimiter. The first column of the comment line is the character, '#'.

StorageIP

    The SMI-S server manages multiple ETERNUS arrays.

    It specifies the ETERNUS Array by IP address. The format of the IP address, e.g. "10.0.0.2", must be valid. The maximum is the number specified as MaxStorageIP.

MaxStorageIP

    It specifies the number of the maximum ETERNUS Array. If the keyword MaxStorageIP is not specified or a NULL string is specified, the default – 10 - is used. Max value is 30, and min value is 1. It does not exist immediately after installation.

PollingInterval

    It specifies the interval time to refresh the SMI-S server repository. The unit is in seconds. The SMI-S server will refresh the repository periodically for the specified interval, if the Array configuration is changed. If the keyword PollingInterval is not specified or a NULL string is specified, the default interval – 300 - is used. See also the section *7.2 Array Status Coherency* for additional information. Max value is 86400, and min value is 60.

DeviceStatusInterval

    It specifies the interval time to monitor the Array status. The unit is in seconds. The SMI-S server will refresh the repository when it finds that Array status changed "Error" or "Degraded". If the keyword DeviceStatusInterval is not specified or a NULL string is specified, the default interval – 60 - is used. See also the section 7.2 Array Status Coherency for additional information. Max value is 3600, and min value is 30.

DefaultPortNumber

    It specifies the number of TCP port on the ETERNUS to manage the Array using the ETERNUS proprietary protocol. If the keyword DefaultPortNumber is not specified or a NULL string is specified, the default – 1999 - is used. Max value is 65535, and min value is 0.

ConnectionTimeout

    It specifies the time-out interval to communicate with ETERNUS Array.　The unit is in seconds. If the keyword ConnectionTimeout is not specified or a NULL string is specified, the default interval – 300 - is used. Max value is 86400, and min value is 60.

[LifeCycle] section

    In this section, it specifies the lifetime interval of a cache data. The update of this cache data is not periodic, updated by the request. Therefore, each information individually has the life time. The unit is in seconds. Max value is 86400, and min value is 0. 0 means that the request to view the instance always accesses to the Array.

    PortLinkStatus

        PortLinkStatus is related to *FUJITSU_FCPort.Speed* and *FUJITSU_EthernetPort.Speed*.

        If the keyword PortLinkStatus is not specified or a NULL string is specified, the default – 600 - is used.

    Session

        Session is related to *FUJITSU_iSCSISession.*

        If the keyword Session is not specified or a NULL string is specified, the default – 300 - is used.

SessionStatistics
    SessionStatistics is related to *FUJITSU_iSCSISessionStatistics.*
    If the keyword SessionStatistics is not specified or a NULL string is specified, the default – 300 - is used.

CEStatus
    CEStatus is related to *FUJITSU_ControllerEnclosure.OperationalStatus.*
    If the keyword CEStatus is not specified or a NULL string is specified, the default – 60 - is used.

SNMP
    SNMP is related to *FUJITSU_StorageComputerSystem.Contact* and *FUJITSU_Location.* PhysicalPosition.
    If the keyword SNMP is not specified or a NULL string is specified, the default – 600 - is used.

5.3 Registration of user ID

Administrator should register the user ID of authentication for the SMI-S client to access the SMI-S server. It is necessary to start "ETERNUS SMI-S Server" service to register user ID. Perform registration of user ID using the following commands.

    cimuser -a -u username [-w password]

The user ID to register specifies the user ID registered into the Windows system.

5.4 Upgrade

The Setup program is not supporting upgrade.
Perform installation after uninstalling ETERNUS SMI-S Server, when upgrading.

5.5 Uninstall

The SMI-S server is uninstalled by using "Add or Remove Program" from the Control Panel in Windows.

The Setup program also can uninstall it by "Remove" button click.

6. Windows Service

The installer of ETERNUS SMI-S Server installs a Windows service: SMI-S Server.

6.1 ETERNUS SMI-S Server service

The SMI-S Server service is registered as following;

Name:	ETERNUS SMI-S Server
Startup Type:	Automatic

The default Startup Type is *Automatic.* This means that the service will start automatically on Windows startup. The Administrator can change it to Manual.

6.2 Control of Service

When the SMI-S service is registered, the following operations are enabled.

Start
> The service is started by the *Start* menu in *Services* in *Administrative Tools* under Windows Control Panel. The SMI-S server has a cache data for the target ETERNUS Array's configuration and status.

Stop
> The service is stopped by the *Stop* menu in *Services* in *Administrative Tools* under Windows Control Panel.

Restart
> The service is restarted by the *Restart* menu in *Services* in *Administrative Tools*. It is identical with the Stop-Start combination.

The other operations - Pause, Resume – are not available.

7. Limitation

7.1 Concurrent Operation

The ETERNUS Array does not support the concurrent management operation. Only one agent, ETERNUSmgr or SMI-S server, can manage the ETERNUS Array at a time.

ETERNUSmgr uses session based control, which remains active from login until logoff. During an active session, ETERNUSmgr locks the ETERNUS Array for exclusive change control on root userid. On the other hand, the SMI-S server only locks the ETERNUS Array while performing a change to the ETERNUS configuration. The SMI-S server can not change the ETERNUS configuration during ETERNUS is locked.

Administrator shall keep in mind that no one login into ETERNUSmgr with root privilege when change the configuration through SMI-S interface.

7.2 Array Status Coherency

The SMI-S server has a repository that keeps the Array status of the target ETERNUS Array. The repository is a cache for quick response against the query from the SMI-S client.

The repository is created when the Windows service of SMI-S server starts at first connection with ETERNUS Array and is refreshed in the following cases. There is no specific method to cause the refresh manually

a) Periodic update
   There is two interval timers for periodic update - one is to monitor the Array configuration is changed and the other is to monitor the Array status changed "Error" or "Degraded". The timer value may be changed in Configuration file – keyword *PollingInterval* and *DeviceStatusInterval*. .

b) Request processing
   The SMI-S server refreshes the repository during the request processing that would change the Array configuration. e.g. Create RAID group request. The refresh, following a command that changes the ETERNUS configuration, ensures that the SMI-S client receives the most up-to-date Array view.

The Administrator shall note the reflection of current status or configuration may be delays up to the respective interval times.

7.3 Channel Type

The SMI-S server supports FC (Fibre Channel) and iSCSI-CA(iSCSI - Channel Adapter). The iSCSI-RA(iSCSI - Remote Adapter) is not supported, and it is not visible on the SMI-S interface.

The Fibre Channel Adapter has the mode, Remote Adapter mode, for the Remote Mirroring feature over the Fibre Channel protocol. The adapter in Remote Adapter mode is called FC-RA (Fibre Channel - Remote Adapter). FC-CA and FC-RA are identical physical component. The difference is the microcode that is loaded.

The FC-RA can not be used for host I/O processing. The SMI-S server will reject any masking and mapping request against an FC-RA port with an appropriate error reply code to the SMI-S client. There is no method to distinguish the FC adapter modes on SMI-S interface. So, the Administrator shall note the masking and mapping operation might fail due to the FC mode if the Array's configuration has the FC-RA port for the Remote Mirroring feature enabled.

7.4 Restricted Operations for masking and mapping

When ETERNSU SMI-S server manages ETERNUS Array configured by ETERNUSmgr, some operations for masking and mapping function might be restricted to keep the integrity because the ETERNUS management model can not be expressed full functionally in SMI-S management model. The ETERNUS SMI-S server should suppress the operations that might corrupt the model integrity, and reply specific error code to SMI-S client that SMI Specification defines as vendor unique code.

The operation that might be restricted on SMI-S interface is to expose and unexpose the logical volume. The detail and condition to suppress the operations is described in *Administrators Guide*.
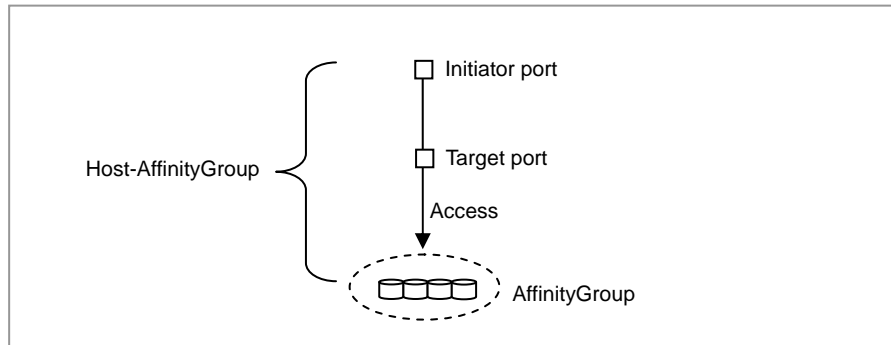
7.5 RAID Consolidation

The logical volume on RAID consolidation is visible on SMI-S interface, but can not be created.

7.6 Supported RAID Type

ETERNUS SMI-S Server supports all RAID types supported by managed ETERNUS Array.

7.7 Masking and Mapping

7.7.1 AffinityGroup and Host-AffinityGroup

"AffinityGroup" and "Host-AffinityGroup setting" are concepts to manage the masking and mapping function in ETERNUS RAID system. AffinityGroup is a set of logical volumes and volume number mapping information. Host-AffinityGroup setting binds an AffinityGroup to an initiator port on a target port. The masking and mapping function is realized by AffinityGroup and Host-AffinityGroup setting in ETERNUS RAID system.

7.7.2 View
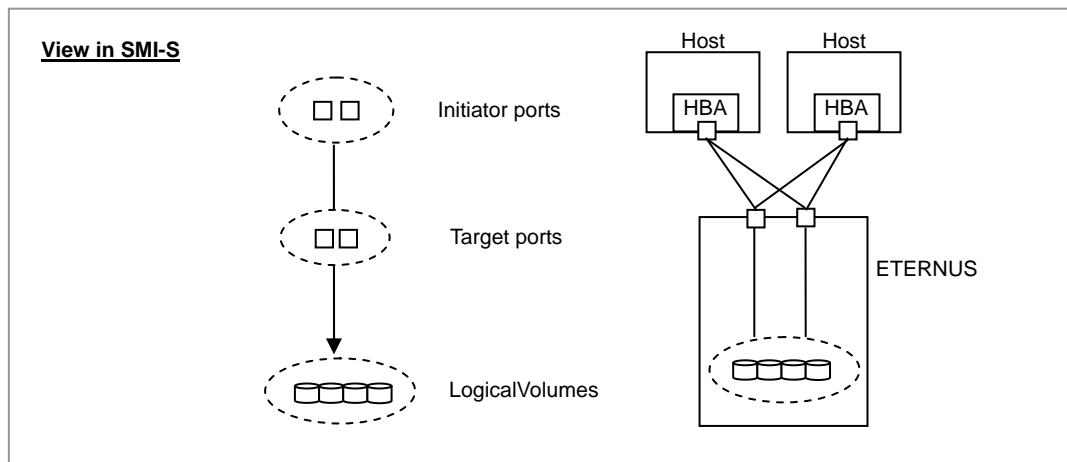
The SMI-S specification defines "view" as key concept to manage the masking and mapping function. The view consists of a set of the following items and represents logical volumes reported by SCSI REPORT LUNS command from any initiator port through any target port in the view.

    a)   List of initiator ports
   b)   List of target ports
    c)   List of logical volumes

Each initiator/target port and logical volume can be shared by multiple views, but any initiator and target port pair never be shared by multiple views.

7.7.3 SCSI Protocol Controller (SPC)
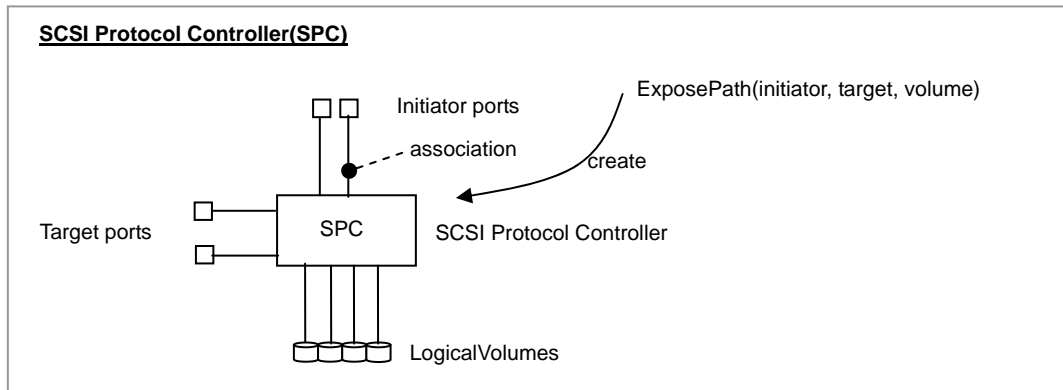
The method *ExposePath* is defined in SMI-S specification as a function to create view.

It requires initiator/target ports and logical volumes as parameters and reply one or several SPC (SCSIProtocolController) that is an architecture element to keep relationship between each item. Each initiator/target port and logical volume has a relationship called *association* to SPC.
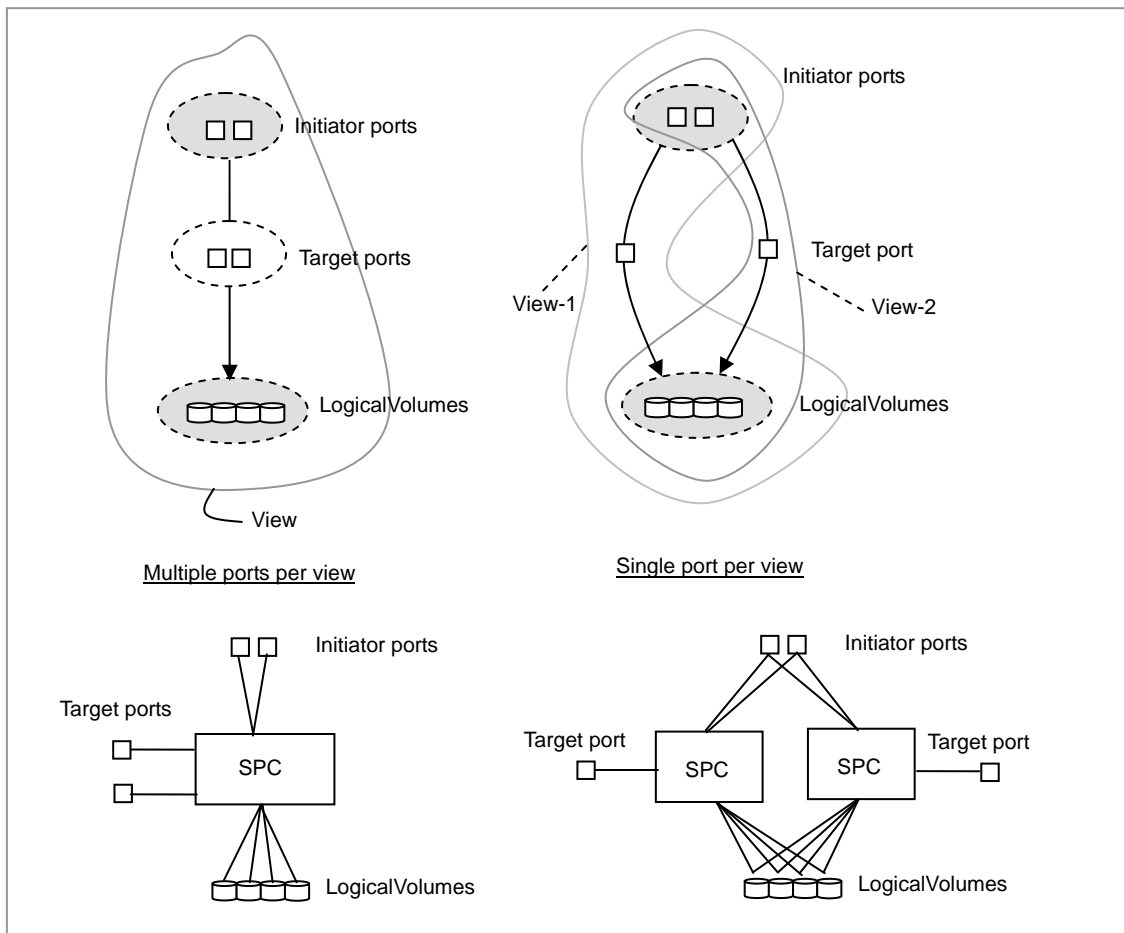
SMI-S sever implementation has an option for SPC –Single port per view. It means that a SPC can be related to only one target port. In single port per view, the view specified by ExposePath may be split into multiple views for each target port when multiple target ports are specified, and creates multiple SPCs.

As ExposePath method processing, ETERNUS SMI-S server creates one Affinity Group that consists of

logical volumes specified by ExposePath method and then binds the AffinityGroup to each initiator port on each target port by Host-AffinityGroup setting. One AffinityGroup corresponds to multiple views.

7.7.4 Operation
   SMI-S specification defines the following use cases as operations to the view that must be supported at least by any SMI-S server. The view may be created by SMI-S server or ETERNUSmgr.
   1. Add/Remove initiator port in a view
   2. Add/Remove target port in a view
   3. Add/Remove logical volume in a view

The case 1 and 2 corresponds to ETERNUS RAID configuration scheme in straightforward. So, there is no restriction and no need of special consideration for the operation. SMI-S server performs Host-AffinityGroup setting for the specified initiator/target port.

The case 3 requires special consideration because an AffinityGroup may be shared by multiple views. The operation to add/remove logical volume to a view is converted by SMI-S server to the add/remove operation against an AffinityGroup. If the target AffinityGroup corresponds to multiple views, the change will be reflected to the other views.

7.7.5 Requisite of SMI-S Client
   It is implementation specific how SMI-S client models the "view" and how shows SPC friendly name. SMI-S client may not look SPC friendly name at all because the support of SPC friendly name is optional for Array in SMI-S specification.

If SMI-S client does not present SPC friendly name, Administrator can never identify which views are related on an AffinityGroup.

7.7.6 Summary
   AffinityGroup is a basic unit to expose logical volume in ETERNUS RAID system. It is that one AffinityGroup is used repeatedly for Host-AffinityGroup setting in multiple target ports configuration.

ETERNUS SMI-S server presents views per target port to SMI-S client. When SMI-S client issues a request to add a logical volume to the view, ETERNUS SMI-S server adds the logical volume to the AffinityGroup underlying the view. It has side effect to other views sharing the AffinityGroup.

Appendix-a: Directory Structure

The following is the structure under the install directory of the SMI-S server.

```
install directory
    ├── bin
    ├── data
    ├── env
    ├── logs
    ├── repository
    ├── trace
    │
```
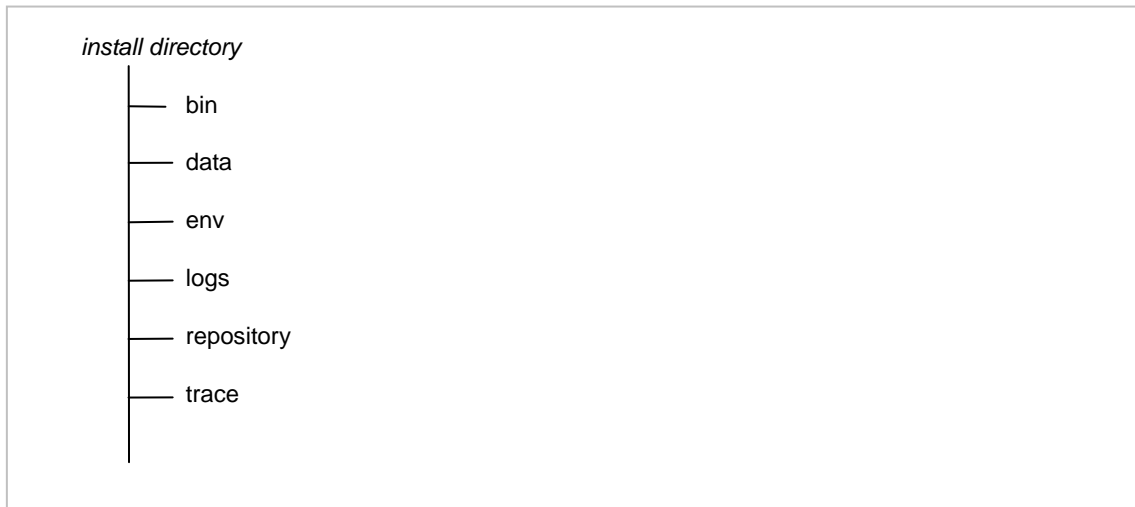
Directory: *install directory*
> The root directory of the SMI-S server system. The directory path is specified during installation sequence by Administrator. The installer does not copy any files into other directory. All files that consist of the ETERNUS SMI-S server are located under the *install directory*.

Directory: bin
> The major part of ETERNUS SMI-S Server. The SMI-S server consists of two parts – CIMOM (CIM Object Manager) and Provider.

Directory: repository
> The repository of classes and instances.

Directory: data
> The cache data for the target ETERNUS Array's configuration and status.

env
> There is a configuration file to configure SMI-S server under this directory. This 'smis_env.inf' is a generic ASCII file to be edited by any appropriate editor, e.g. notepad tool on Windows.

Directory: logs
> The SMI-S server makes internal log files under this directory.

Directory: trace
> The SMI-S server makes internal trace file under this directory.