Administrator and User Guide - English

FUJITSU

FUJITSU Software BS2000

Storage Manager (StorMan) V8.0.1

Provisioning and managing virtualized storage resources

Edition April 2018

Comments… Suggestions… Corrections…

The User Documentation Department would like to know your opinion of this manual. Your feedback helps us optimize our documentation to suit your individual needs.

Feel free to send us your comments by e-mail to
manuals@ts.fujitsu.com.

Certified documentation according to DIN EN ISO 9001:2008

To ensure a consistently high quality standard and user-friendliness, this documentation was created to meet the regulations of a quality management system which complies with the requirements of the standard DIN EN ISO 9001:2008.

cognitas. Gesellschaft für Technik-Dokumentation mbH

www.cognitas.de

Copyright and trademarks

Contents

1   Introduction

1.1   Functional overview

The main scope of Storage Manager (further on referenced as StorMan) is information, monitoring, virtualization and dynamic management of storage resources:

A uniform management service for storage management, information and monitoring is provided by StorMan.

StorMan provides a common virtualization layer offering:

- Integrated Storage Management for
    - SE Manager on BS2000 SE servers
- Common and stable interfaces for
    - Integration in BS2000 (SHC-OSD)
    - standalone usage
    - Integration with server management software such as ServerView Operations Manager, openSM2, etc
- Management options for
    - Automation with prescheduled or event-triggered scripts based on StorMan's CLIs
- Encapsulation of the backend complexity of
    - Storage-vendor-specific interfaces (Fujitsu, EMC)

The following figure provides an overview of the architectural layers:
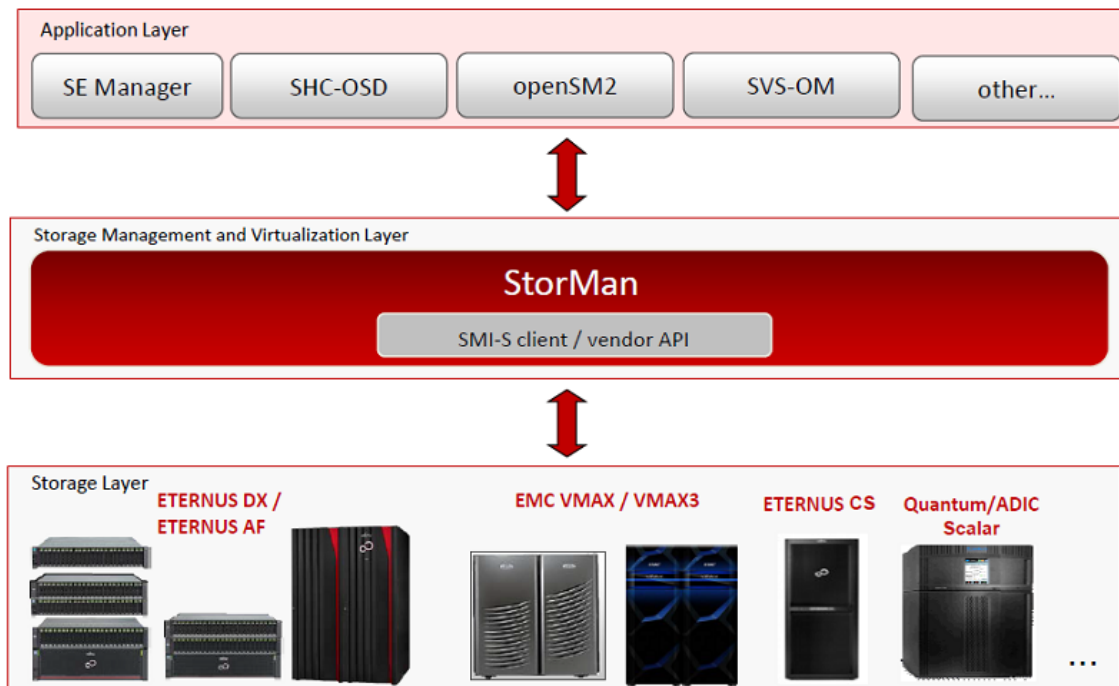
Figure 1: Overview

The base technology of StorMan is SMI-S (Storage Management Initiative Specification), the standard defined and supported by the SNIA (Storage Networking Industry Association) for storage management. However, additional to SMI-S vendor-specific APIs are used for integration.

The functionality of StorMan covers the main functions for:

- Managing and administrating storage resources (storage volumes and pools)
- Replication service: local replication (based on snap and/or clone technology) and remote replication
- Storage cluster support for ETERNUS DX/AF systems

Additionally, StorMan provides the functionality required for information and monitoring of storage arrays, namely:

- Discovery
- Information about logical and physical components
- Status monitoring
- Statistical and performance metrics

1.2   Documentation

With exception of the WebUI functions you will find a complete description of StorMan (e.g. concept, architecture, installation, CLI functions) in the StorMan manual.

For users of the WebUI the manual only contains a chapter describing the WebUI startup and basic information on using the WebUI.

The complete reference of WebUI functions you will find online in the StorMan help system which you can call context sensitive from the StorMan WebUI (refer to section "Using Help" on page 67).

Additional product information

Current information, version and hardware dependencies and instructions for installing and using a product version are contained in the associated Release Notice. These Release Notices are available at http://manuals.ts.fujitsu.com.

See the Release Notices for special information on a new release.

1.3   Documentation guide for different scenarios

For general information about StorMan refer to chapter "Functions and Architecture" on page 17.

For installation of StorMan refer to chapter "Installation" on page 45. In addition to system and software requirements use the installation section concerning your system platform.

Which other chapters are relevant for the user depends on the usage scenario.

1.3.1   Integration with BS2000

For the BS2000 product SHC-OSD the complete integration of StorMan is done by SHC-OSD internally. Refer to "SHC-OSD " manual [1] for further details.

To manage ETERNUS DX/AF storage systems by SHC-OSD from BS2000, StorMan is recommended to run on M2000 on the Management Unit (MU) of the SE server. Optionally StorMan may run on any Windows or Linux server (native or VM). The configuration of storage resources is set up via StorMan. Please refer to chapter "Setting up StorMan configurations" on page 69.

Description of the StorMan tasks:

- For configuration of storage resources to be managed by StorMan refer to chapter "Setting up StorMan configurations" on page 69.
- To provide host with resources managed by StorMan refer to chapter "Administration tasks " on page 78.

- To replicate storage devices on ETERNUS DX/AF storage systems refer to "Replication tasks" on page 81.

Description of the StorMan interfaces:

- The StorMan WebUI is recommended. For basic information about startup and using the WebUI refer to chapter "The graphical user interface – StorMan WebUI" on page 62. Please note that the complete StorMan WebUI function reference is contained in the online help system.
- For the syntax description of CLI commands refer to chapter "StorMan for programmers – CLI description" on page 91

Description of special conditions depending on the storage system:

- some functions to configure storage resources may depend on the storage system. For details refer to chapter "Provisioning tasks" on page 88.

1.3.2 Integration with server management software

For integration with server management software such as ServerView Operations Manager and performance monitoring software such as openSM2 only a subset of StorMan functions is available. This subset is delivered with the name of **StorManMonitor** and consists of the functions for information and monitoring.

StorManMonitor does not include active management functions and does not include the WebUI. As the interfaces of StorManMonitor functions are identical to the StorMan interfaces they are described as StorMan interfaces further on.

Description of the StorMan tasks:

- For configuration and discovery of storage resources to be managed by StorMan refer to chapter "Setting up StorMan configurations".

Description of the StorMan interfaces (subset for StorManMonitor):

- The following subset of CLI commands is available:

  - The CLI commands `storcfg host` and `storcfg cimom` can be used for configuration.
  - The CLI command `storcfg system -show` can be used for gathering detailed configuration and status information of the storage systems.
  - The CLI command `storstat` that provides statistical information and metrics can be used for monitoring the performance of the storage systems.
  - Additionally the CLI commands `stormandb`, `storcheck`, `storparam`, `storinfo` can be used.

  For the syntax description refer to chapter "StorMan for programmers – CLI description" on page 91.

1.3.3 "Standalone usage"

Description of the StorMan tasks:

- For configuration and administration of storage resources to be managed by StorMan refer to chapter "Setting up StorMan configurations" on page 69.
- To provide host with resources managed by StorMan refer to chapter "Administration tasks " on page 78.
- To replicate storage devices refer to chapter "Replication tasks" on page 81.
- To get statistic and performance information from storage systems and their storage devices refer to chapter "Statistics and performance tasks" on page 86. The required functions are available on the CLI.

Description of the StorMan interfaces:

- All functions are available as CLI commands. For the syntax description refer to chapter"StorMan for programmers – CLI description" on page 91.
- Additionally the StorMan WebUI is provided. For basic information about startup and using the WebUI refer to chapter "The graphical user interface – StorMan WebUI" on page 62. Please notice that the complete WebUI function reference is only contained in the online help system.

Description of special issues depending on the used storage system:

- Some functions to configure storage resources may depend on the storage system. For details refer to chapter "Provisioning tasks" on page 88.

1.3.4 Storage Management for SE servers - Integration in SE Manager

For integration with SE servers, StorMan is delivered and installed by default as an add-on pack in the SE Manager (SEM) on M2000. For further details, please refer to "Installation by the SE Manager" on page 54.

StorMan provides a complete overview of the storage resources and management options for SE servers. The StorMan WebUI is completely integrated into SEM providing StorMan's storage management functions. Therefore, on SE servers it is accessible via SEM only.

The complete StorMan functions on CLI level are reserved for SEM users with the roles 'service' or 'administrator' on M2000.

For storage management on SE servers StorMan provides specific functions on the WebUI to provide information about and monitor additional storage ressources (e.g. tape storage) and to link additional storage management software (e.g. ETERNUS SF).

Description of the StorMan tasks:

- For information and monitoring of storage ressource of SE servers please refer to the StorMan online help.

- For configuration and administration of storage resources to be managed by StorMan refer to chapter "Setting up StorMan configurations" on page 69.
- To provide hosts with resources managed by StorMan refer to "Administration tasks " on page 78.
- To replicate storage devices refer to chapter "Replication tasks" on page 81.

Description of StorMan interfaces:

- The StorMan WebUI is completely integrated into the SEM and is launched from the SEM. For basic information about startup and using the WebUI refer to chapter "The graphical user interface – StorMan WebUI" on page 62. Please note that the complete StorMan WebUI function reference is contained in the online help system.
- All CLI commands are available for users with roles 'service' and 'administration'. For the syntax description refer to chapter "StorMan for programmers – CLI description" on page 91.

For the specific installation and deinstallation tasks on M2000 please refer to chapter "Installation by the SE Manager" on page 54 and "Uninstalling StorMan from M2000" on page 60.

1.4　Notational conventions

The following fonts and symbols are used in this manual to indicate different types of information:

Font/Symbol	Indicates	Example
`AaBbCc123`	System outputs are written in this typewriter font.	`http port   5988`
`AaBbCc123`	Commands entered by the user are written in typewriter font bold	
Italic text	Program interface functions and menus are written like this.	Select the menu *Add new host*
" "	Manual, chapter and section titles are enclosed by double inverted commas.	See chapter 3, "Installation"
►	The enter symbol indicates an action that the operator must perform (e.g. enter something on the keyboard).	► Click the *Attach* button.
	Indicates warnings.	
	Indicates important information about product operation.	

The following fonts and symbols are used in the CLI syntax description:

Font/Symbol	Indicates	Example
`AaBbCc123`	Syntax elements of function call are written in this typewriter font.	`storcfg`
`Italic text`	Variables are written in this typewriter font	*function* or *hostname*
`{}`	Braces enclose alternatives; one of the possible values shown within the braces must be entered.	`{-name `*`host`*`	-ip `*`ip`*`}`
`|`	A bar serves to separate alternative parameters or values.	`-name `*`hostname`*`	-ip `*`ip`*
`[ ]`	Square brackets enclose optional parameters, i.e parameters which may be omitted.	`[ -interface `*`type`*` ]`
`[,…]`	This entry after a value signifies that a list of values can be specified.	`-addip `*`ip`*`[,...]`

2 Functions and Architecture

2.1 Functional structure

From the structural point of view, StorMan consists of multiple functional components:

- Storage information and monitoring
- Storage provisioning
- Statistics and performance monitoring
- Storage system based replication functions
- Storage cluster (for ETERNUS DX/AF storage)

These components can be used separated or combined depending on the scenarios.

2.1.1 Storage information and monitoring

The storage information and monitoring features supported are those required for information and for monitoring storage arrays mainly for integration purposes, namely:

- Discovery
- Information about logical and physical components
- Monitoring of status

These features are implemented by the CLI.

StorMan supports information and monitoring features for following storage systems:

Storage system	Vendor
ETERNUS DX60/80/90 S2	Fujitsu
ETERNUS DX100/200/500/600/8700 S3	Fujitsu
ETERNUS DX100/200/500/600 S4	Fujitsu
ETERNUS AF650 / AF650 S2 / AF250 S2	Fujitsu
ETERNUS DX410/440/8700 S2	Fujitsu
Symmetrix VMAX [*)	EMC Corporation
EMC VMAX3 [*)	EMC Corporation

*) no StorMan Monitor support (SVS-OM)

2.1.2   Storage provisioning

The storage provisioning functionality of StorMan covers

- Managing and administrating storage resources (storage volumes and pools) in a virtualization layer
- Information about server access to storage volumes (LUN masking)

These features are provided by StorMan's WebUI
(see the chapter "The graphical user interface – StorMan WebUI" on page 62)

and as CLI for automation support in scripts
(see the chapter "StorMan for programmers – CLI description" on page 91).

StorMan supports the storage provisioning features for following storage systems:

Storage system	Vendor	Supported connectivity type
ETERNUS DX410/440/8700 S2	Fujitsu	FC
ETERNUS DX500/600/8700 S3	Fujitsu	FC
ETERNUS DX500/600 S4	Fujitsu	FC
ETERNUS AF650 / AF650 S2	Fujitsu	FC
Symmetrix VMAX	EMC Corporation	FC
EMC VMAX3	EMC Corporation	FC

2.1.3   Statistics and Performance

The statistics and performance features supported are required for monitoring storage arrays as used by openSM2.

StorMan supports the statistics and performance features for following storage systems:

Storage system	Vendor
ETERNUS DX410/440/8700 S2	Fujitsu
ETERNUS DX100/200/500/600/8700 S3	Fujitsu
ETERNUS DX100/200/500/600 S4	Fujitsu
ETERNUS AF650 / AF650 S2 / AF250 S2	Fujitsu
Symmetrix VMAX	EMC Corporation
EMC VMAX3	EMC Corporation

2.1.4 Replication

The replication service features cover the information and management of local and remote mirroring functions implemented in the storage systems and based on volume level replication.

These features are provided by StorMan's WebUI
(see the chapter "The graphical user interface – StorMan WebUI" on page 62)

and as CLI for automation support in scripts
(see the chapter "StorMan for programmers – CLI description" on page 91).

Local Replication

The Local Replication service covers the information and management of local mirroring functions used e.g. by SHC-OSD to integrate ETERNUS DX/AF storage systems in BS2000.

The Local Replication Service features support the management of the following functions:

- Local mirroring based on full volume copies and mirrors (clones)
- Local mirroring based on pointer based technologies (snaps)

StorMan supports the following storage systems:

Storage system	Vendor	Local replication type
ETERNUS DX410/440/8700 S2	Fujitsu	Clones (mirror) and Snaps
ETERNUS DX500/600/8700 S3	Fujitsu	Clones (mirror + copy) and Snaps
ETERNUS DX500/600 S4	Fujitsu	Clones (mirror + copy) and Snaps
ETERNUS AF650 / AF650 S2	Fujitsu	Clones (mirror + copy) and Snaps

Remote Replication

The Remote Replication service covers the information and management of remote mirroring functions used e.g. by SHC-OSD to integrate ETERNUS DX storage systems in BS2000.

The Remote Replication service features support the management of the following function:

- Remote mirroring based on full volume copies

StorMan supports the following storage systems:

Storage system	Vendor	Remote replication mode
ETERNUS DX410/440/8700 S2	Fujitsu	Synchronous
ETERNUS DX500/600/8700 S3	Fujitsu	Synchronous/ Asynchronous
ETERNUS DX500/600 S4	Fujitsu	Synchronous/ Asynchronous
ETERNUS AF650 / AF650 S2	Fujitsu	Synchronous/ Asynchronous
Symmetrix VMAX	EMC Corporation	Synchronous
EMC VMAX3	EMC Corporation	Synchronous

2.1.5   Storage Cluster

The Storage Cluster features cover the information and management of the ETERNUS DX/AF feature 'Storage Cluster Option.

These features are provided by StorMan's WebUI
(see the chapter "The graphical user interface – StorMan WebUI" on page 62).

and as CLI for automation support in scripts
(see the chapter "StorMan for programmers – CLI description" on page 91). Please refer to ETERNUS SF documentation for the full range of Storage Cluster configuration and management.

The Storage Cluster features of StorMan support the following functions:

- Detailed information and monitoring of storage clusters
- Manual failover and failback functions for storage clusters

StorMan supports the following storage systems:

Storage system	Vendor
ETERNUS DX500/600/8700 S3	Fujitsu
ETERNUS DX500/600 S4	Fujitsu
ETERNUS AF650 / AF650 S2	Fujitsu

2.2 Logical structure for storage management

StorMan supports an abstract interface with a set of management functions. The StorMan caller specifies the objects of storage management, e.g. the storage volumes (identified by their storIDs).

2.2.1 Virtualization layer

The virtualization layer is a core part of StorMan. It administers the storage resource descriptions (configuration data) specific for each storage product. The virtualization provides a single interface for different kinds of storage.

Repository

A repository is required for consistent administration of the mapped resource descriptions. StorMan uses its own internal repository.

Configuration data

Administration is divided into 2 layers:

- Configuration layer

  This layer handles the storage configuration. The StorMan administrator defines the StorMan managed storage pools containing a subset of volumes of a specific storage system. Further on these storage pools are just called **pools** to differentiate them from the notion of storage pools used internally by storage systems.

  In its simplest form, each pool identified by its unique pool ID describes a complete storage system in the StorMan configuration (e.g. an ETERNUS DX storage system identified by its serial number with a subset of volumes configured in this storage system). Each pool description contains general pool attributes and storage system- and volume-related attributes.

- Dynamic layer

  The storage volumes of a pool are represented by a unique storage identifier (storID). Their attributes and status of the provisioning are kept in the dynamic layer for each volume. These includes the LUN of the storage volume, its current size, currently connected servers, its harbouring pool, etc. The storage identifier is created during storage volume assignment to the pool and deleted after de-assignment.

An administration interface (WebUI) to configure and manage the Virtualization Layer's configuration data offers basic management functions (e.g. adding, removing, modifying and displaying pools and storage volumes). Storage provisioning information and replication functions are also available on the WebUI.

StorMan managed pools are configured based on the results of a discovery of one or more storage systems.

2.2.2 Storage layer

The storage layer incorporates the implementation of underlaying interfaces for the management function, initially following the SMI-S approach.

StorMan functions are transformed into the corresponding interface calls, called by StorMan accordingly. According to their registration StorMan will call the corresponding vendor-specific SMI-S Providers.

Standardization: SMI-S

SMI-S is SNIA's standard in the domain of storage management.

The main functions for storage management used by StorMan are defined in SMI-S and provided by storage vendors (e.g. Fujitsu, EMC).

Vendor specific interfaces

StorMan additionally supports vendor specific interfaces for storage systems and/or functions not supporting SMI-S. Therefor StorMan incorporates proprietary interfaces of storage vendors (e.g. CLIs or SNMP) in its storage layer, e.g. to monitor Tape Storage on SE servers.

2.3   Architecture

2.3.1   General

The following chapter covers the main lines of StorMan's architecture. The core part, i.e. the StorMan server, incorporates the virtualization layer and the storage specific layer.
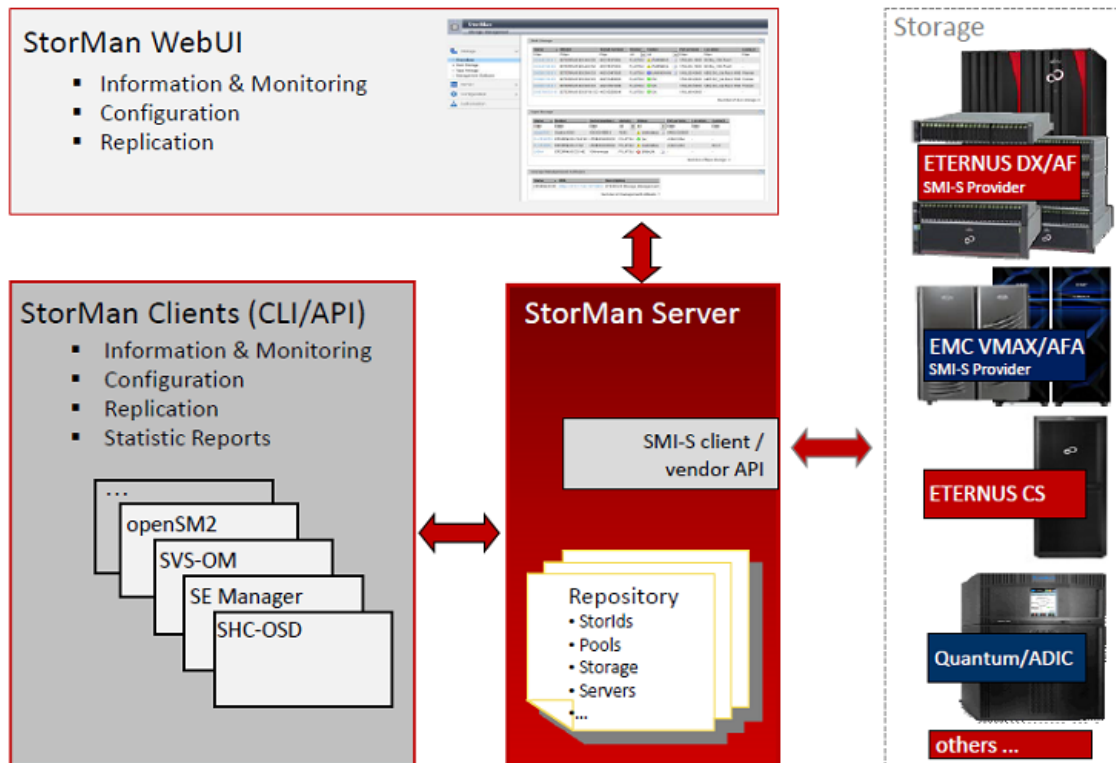
Figure 2: Architecture

The functions on the StorMan client side are provided as CLIs (Command language interfaces) and graphical interface (WebUI).

The StorMan server is installed and runs as a service on one or more servers of the configuration depending on caller and storage application requirements.

The StorMan client resides on the same server as the calling application and provides the management functions implemented by the StorMan server. The calling application is not aware of the communication between the StorMan client and StorMan server. Therefore StorMan client and StorMan server can be installed on the same server or on different servers connected by LAN.

2.3.2   Authorization

The StorMan server runs on its hosting server as a service with administrator rights.

The administration WebUI connects to the server that hosts the StorMan server on port number 4178. This port was assigned to StorMan by the Internet Assigned Numbers Authority (IANA).

2.3.2.1   StorMan User

Access to the StorMan server can be controlled by assigning a userid and password managed by StorMan using the CLI `storauth`.

Stand alone

For StorMan stand alone configurations StorMan is initially installed without access authorization. After defining the first StorMan user, an authorization is required to access StorMan. This applies also after StorMan update installations.

If a userid and password protection is set, for any call from CLI the combination of userid and password must be specified. To access the WebUI, user and password must be specified in the login screen.

FUJITSU BS2000 SE Servers

On FUJITSU BS2000 SE servers the StorMan WebUI is accessed directly from SE Manager for all authorized users. All users with SE Manager roles Administrator and Service are allowed to access StorMan additionally defined as a StorMan user. The authorization for StorMan functions depends on the StorMan user and roles assignment managed by StorMan. The Storman users admin and service are defined by default during StorMan installation.

CLI calls are allowed on the MU for authorized users with the roles Service or Administrator, without additional specification of StorMan user and password.

The StorMan user administration manages the StorMan roles to control the storage management.

2.3.2.2   StorMan Role Concept

Storage management requires the possibility to define and control the access and management of storage ressources and configurations. In typical scenarios storage resources are shared and /or partitioned between different parties with different authorizations storage management.

The StorMan role concept provides the following functions:

- Define different StorMan users to manage specific storage resources by assigning specific roles.

- At least one administrator is empowered for all functions and all resources.
- The StorMan user and role management is reserved for the administrator.
- The administrator assigns roles to each user authorizing for a specific level of storage administration and specific storage resources (storage pools).

Three predefined StorMan roles are supported.

2.3.2.3 StorMan Roles

The StorMan role enables a StorMan user for a specific task. The following predefined StorMan roles can be assigned to a StorMan user.

- Storage Administrator (StorAdmin) - This is the most powerful StorMan role for the storage administrator. The owner of this role is enabled for all available StorMan functions and all existing StorMan pools including the management of StorMan users and their role assignments.
- Pool Administrator (PoolAdmin) – This is the StorMan role for administrators of specific storage resources (StorMan pools). The functions are applicable for (one or multiple) StorMan pools as defined by the storage administrator.
- Information (Info) – This is the StorMan role to show and monitor activities on the storage configuration in a datacenter. The owner is authorized for the complete information functionality of StorMan including performance and statistical data. The role does not authorize for any changes or modifications.

The StorMan roles consist of a defined and fixed set of StorMan authorizations.

The following overview shows the assignment of StorMan authorizations to StorMan roles.

StorMan Authorization Name	StorMan Role		
	StorAdmin	PoolAdmin	Info
StorMan settings and parameters	X		
StorMan user management	X		
Storage complete configuration	X		
Storage complete management (e.g. storage cluster, replication,…)	X		
Pool specific configuration	X	X	
Pool specific management (e.g. replication)	X	X	
Statistical and performance data	X	X	X
Information and monitoring	X	X	X

2.3.2.4 Role Concept of SE Management Unit (MU) and StorMan Roles

The role concept of SE Management Unit (MU) defines an overall role 'Administrator'. Only users with this role are authorized for StorMan calls. The StorMan specific assignment of users, roles and pools is done by StorMan. Every SE Manager user (except the default users service and admin) must first be defined and authorized in StorMan's user administration to get access to StorMan. The final authorization of the caller is done by StorMan internally, according to the StorMan role and pools assigned to the StorMan user.

2.3.2.5 Access to the SMI-S Providers

Access to the SMI-S providers and the managed storage systems is normally restricted to authorized personnel and protected by user and password combinations as defined for the specific storage system.

2.3.3 Communication and security

The core communication is based on socket connections between StorMan client and StorMan server. Using the CLI functions the communication handling is encapsulated in the CLI call, terminated by defined return codes.

The WebUI applications can be called from any workstation within the LAN.

The communication between CLI and StorMan server as well as between StorMan WebUI and StorMan server is secured by SSL encryption.

The communication between SHC-OSD and StorMan server is optionally secured by SSL encryption, depending on the setting in SHC-OSD parameter file.

The communication between StorMan and the SMI-S providers is

- Secured by SSL encryption for EMC (https port 5989)
- Not encrypted for ETERNUS DX/AF (http port 5988)

2.3.4 Repository

Configuration data is contained in an internally consistent repository.

The repository is located in the following directory:

- `%PROGRAMFILES%\Fujitsu\StorMan\repository` (Microsoft Windows)
- `/var/opt/SMAWstor/StorMan/repository` (Linux, M2000)

There is no access for the user to view or modify the repository.

2.3.5 Error handling

Management tasks are critical for the calling application. A stable reaction and detailed return information are guaranteed for the caller of StorMan functions terminated with errors or timed out by the called storage system.

An internal logging function logs all activities of the StorMan server in a specific log file. The log files are primarily used for diagnostic purposes for StorMan.

2.4 High availability

High availability has to be provided by all components of a storage configuration: StorMan server, StorMan client and SMI-S providers.

StorMan server

The StorMan server is designed as a single server and can therefore be considered as a single point of failure for Storage Management.

High availability is provided in the following way:

- The StorMan server is automatically restarted on the same server in case of failure.
- A second redundant StorMan server can be set up to take over requests from the StorMan clients.

To support integration (e.g. into SE Manager on SE Servers) StorMan provides functions to start and stop the StorMan server and a check function to check the status of the StorMan server (e.g. via SE Manager or service CLI on M2000).

For SE Server the Management Cluster is supported as StorMan is installed and running on each Management Unit.

For BS2000 configurations with SHC-OSD multiple StorMan servers can be configured to support an automatic failover of StorMan servers.

StorMan Client

The StorMan client is not critical for high availability as it can easily switch is access to a secondary StorMan server in the LAN (e.g. in case of BS2000 configurations with SHC-OSD).

SMI-S Provider

SMI-S providers are implemented as proxy or embedded providers.

For SMI-S providers running in proxy mode, high availability can be achieved by configuring a redundant provider and integration with clustering software.

Multiple SMI-S proxy providers can be configured in StorMan to manage one storage system. The StorMan server will automatically select an available SMI-S provider to control

the storage system, thus assuring a consistent view of the configuration when changing the SMI-S provider usage.

Embedded SMI-S providers (e.g. ETERNUS DX/AF storage arrays) run directly on the storage array and are therefore available as long as the storage array.

Proprietary interfaces of storage vendors

Supported proprietary interfaces of storage vendors (e.g. Tape Storage monitoring) are bundled with the StorMan server. High availability therefore depends on the HA of the StorMan server.

3 System requirements

3.1 Hardware

3.1.1 Server

StorMan supports following servers:

- All current PRIMERGY servers as StorMan clients and StorMan servers

ℹ️ For storage arrays managed by a proxy SMI-S provider (as there are EMC Symmetrix VMAX and optionally EMC VMAX3), a server with IP connectivity is required to host the CIM server (SMI-S provider). Additionally the server requires FC connectivity to the managed storage arrays.

3.1.2 Storage

ETERNUS DX / AF Storage

StorMan supports ETERNUS DX / AF storage based on the embedded SMI-S provider.

StorMan V8.0 supports the information and monitoring functions for:

- ETERNUS DX DX60 S2 as of FW V20L16
- ETERNUS DX DX60 S3 as of FW V10L80
- ETERNUS DX DX80 S2 and DX90 S2 as of FW V10L64
- ETERNUS DX410/DX440 S2 and DX8700 S2 as of FW V10L64
- ETERNUS DX100/DX200/DX500/DX600 S3 as of FW V10L70 / V10L71
- ETERNUS DX100/DX200/DX500/DX600 S4 as of FW V10L80 / V10L81
- ETERNUS DX8700 S3 as of FW V10L70
- ETERNUS AF650 / AF650 S2 as of FW V10L80
- ETERNUS AF250 / ETERNUS DX60/DX100/DX200 S4 as of FW V10L70

StorMan V8.0 supports the replication service functions for

- ETERNUS DX410/DX440 S2 and DX8700 S2 as of FW V10L64
- ETERNUS DX500/DX600 S3 as of FW V10L70 / V10L71
- ETERNUS DX100/DX200/DX500/DX600 S4 as of FW V10L80 / V10L81
- ETERNUS DX8700 S3 as of FW V10L70
- ETERNUS AF650 / AF650 S2 as of FW V10L80

StorMan V8.0 supports the storage cluster functions for

- ETERNUS DX500/DX600 S3 as of FW V10L70 / V10L71
- ETERNUS DX100/DX200/DX500/DX600 S4 as of FW V10L80 / V10L81
- ETERNUS DX8700 S3 as of FW V10L70.
- ETERNUS AF650 / AF650 S2 as of FW V10L80

EMC Storage

StorMan V8.0 supports the information and monitoring function for SAN connected storage of EMC Corporation, namely the Symmetrix VMAX, EMC VMAX3 / VMAX All Flash products as supported by Solutions Enabler/SMI-S provider V8.4.

> For further details of supported Symmetrix models, please refer to the EMC Support Matrix (ESM) available at on the manufacturer's website.

StorMan V8.0 supports replication service functions for the Symmetrix VMAX models.

StorMan V8.0 does **not** support the information and monitoring functions for integration with ServerView for EMC VMAX3 and Symmetrix VMAX storage.

3.2 Software

3.2.1 General requirements

The following x64 platforms are supported:

- Microsoft Windows Server 2008
- Microsoft Windows Server 2012
- Microsoft Windows Server 2016
- SuSe Linux Enterprise Server (SLES) 11 SPx
- SuSe Linux Enterprise Server (SLES) 12 SPx
- Red Hat Enterprise Linux (RHEL) 6.x
- Red Hat Enterprise Linux (RHEL) 7.x
- M2000 V6.1, V6.2

On the specific platform the StorMan WebUI additionally requires (please see "Installing the StorMan WebUI (stand-alone mode only)" on page 50):

- Web Server (e.g. Apache or IIS) must be configured

3.2.2 Additional software requirements

Further on the following software packages are necessary:

3.2.2.1 SMI-S Provider in 'embedded' Mode

SMI-S providers running in embedded mode are installed and available directly on the Storage Processor. No additional software has to be installed. The embedded SMI-S providers have to be enabled on the Storage System.

Currently embedded SMI-S providers are available for the following storage arrays:

- ETERNUS DX / AF
- EMC VMAX3 / VMAX All Flash

ETERNUS DX / AF storage

As the SMI-S provider for ETERNUS DX / AF storage is 'embedded', it is delivered by default with the storage array and part of the FW. It must be enabled on the storage system.

Namespace

The interop name space for the provider is the default name space.

```
interop
```

Access to CIM-OM

Access to the CIM-OM is restricted to authorized users as described in the Fujitsu ETERNUS SMI-S Provider Release Notes.

Statistical and Perfomance data

For ETERNUS as of DX S3 / AF the SMI-S option 'Performance Information' must be enabled.

The following applies for ETERNUS DX S2 only:

PMCC must be installed and the installation path has to be set in `smserver.ini` using parameter `PMCC_InstallationFolder`.

On Linux systems the permissions for execution of PMCC CLI "`stxpmonitor`" must be allowed for user "`storman`" (e.g. by `chmod a+x /opt/FJSVstxp/bin/stxpmonitor`). This step is not required for StorMan on MU of a SE server.

The access data from PMCC to the storage system must be defined in StorMan using the StorMan WebUI or CLI:

```
storcfg system -mod -system <system name> -statuser <user> -statpwd <pwd>
```

EMC VMAX3 / VMAX All Flash storage

EMC VMAX3 / VMAX All Flash support the function 'eManagement'. This includes the embedded SMI-S provider for EMC VMAX3 / VMAX All Flash. StorMan may use this option to access the SMI-S provider.

SMI-S Provider V8.4 is part of EMC Solutions Enabler V8.4 and Unisphere for VMAX V8.4.

For further details on support, please refer to the EMC Support Matrix (ESM) and to EMC Solutions Enabler V8.4. Release Notes available on the manufacturer's website.

3.2.2.2   SMI-S Provider in Proxy Mode

EMC Storage

Symmetrix VMAX, EMC VMAX3 / VMAX All Flash support the management via the SMI-S provider for Symmetrix VMAX EMC VMAX3 / VMAX All Flash in proxy mode as of V8.4.

- SMI-S Provider V8.4 is part of EMC Solutions Enabler V8.4 and Unisphere for VMAX V8.4.

  For further details on support, please refer to the EMC Support Matrix (ESM) and to EMC Solutions Enabler V8.4. Release Notes available on the manufacturer's website.

  The following operating systems are supported (as of EMC Support Matrix):

  - Microsoft Windows Server 2008 R2 and 2012 R2 Windows Enterprise Edition
  - Red Hat Enterprise Linux (RHEL) 5.x, 6.x, 7.x
  - SuSe Linux Enterprise Server (SLES) 11, 12

- An FC connection for the SMI-S provider is required to support EMC storage arrays in proxy mode.

3.2.3   Installation and start of EMC SMI-S Provider

Installation instructions are part of the EMC Release Notes. If the EMC products EMC Solutions Enabler and/or Unisphere for VMAX are already installed, the SMI-S provider as a part of these packages is already installed and available.

The server hosting a SMI-S provider in proxy mode has to be connected to the EMC Storage by FibreChannel and requires configured gatekeeper volumes as described in the Release Notes.

Access to the SMI-S provider is restricted to https port (default 5989).

Access is restricted to authorized users as described in the EMC Release Notes. Please specify the user and password when adding the specific SMI-S provider (CIM-OM) to the StorMan configuration (command `storcfg cimom –add … -cimuser … -cimpwd`).

4 Functions for FUJITSU BS2000 SE Servers

4.1 Storage Support for SE server

4.1.1 Overview

4.1.1.1 Storage Type and functional levels

StorMan supports Storage Management for SE Servers for the following categories:

- Disk Storage
- Tape Storage
- Linkage to Storage Management Software

The functional level of the support is different depending on the storage type and the available interfaces.

- Active management support for Disk Storage as provided by StorMan
- Information and monitoring for Tape Storage and Disk Storage based on proprietary, vendor specific interfaces as integrated by StorMan
- Listing of unmanaged storage systems by StorMan registration for any storage without administration interface or not supported by StorMan

4.1.1.2 Supported Storage Systems

The following table shows the Storage System support in StorMan V8.0:

Storage Model / Series	Vendor	Type	SE Location	StorMan Interface	Comment
ETERNUS DX60 / DX80 / DX90 S2	FUJITSU	Disk	intern / extern	SMI-S	Information and monitoring
ETERNUS DX4x0 S2	FUJITSU	Disk	intern / extern	SMI-S	Active management
ETERNUS DX 8700 S2	FUJITSU	Disk	extern	SMI-S	Active management

Storage Model / Series	Vendor	Type	SE Location	StorMan Interface	Comment
ETERNUS DX60 / DX100 / DX200 S3 / AF250	FUJITSU	Disk	intern / extern	SMI-S	Information and monitoring
ETERNUS DX60 / DX100 / DX200 S4	FUJITSU	Disk	intern / extern	SMI-S	Information and monitoring
ETERNUS DX500 / DX600 / DX8700 S3 / AF650	FUJITSU	Disk	intern / extern	SMI-S	Active management
ETERNUS DX500 / DX600 S4 / AF650 S2	FUJITSU	Disk	intern / extern	SMI-S	Active management
ETERNUS JX40 / JX40 S2	FUJITSU	Disk	Intern	CLI	Information and monitoring if connected to SU x86
ETERNUS LT40/60 S2	FUJITSU	Tape	intern / extern	CLI	Information and monitoring; SNMP support
ETERNUS CS HE / CS8000 / CS50 / CS800	FUJITSU	Tape	Intern / extern	CLI	Information and monitoring; proprietary CLI as of V5.1
EMC VMAX3 / VMAX AFA Series	EMC	Disk	extern	SMI-S (embedded or proxy mode)	Active management
Symmetrix VMAX Series	EMC	Disk	extern	SMI-S (proxy mode)	Active management
Scalar i500/i2k/i6k/10k	Quantum	Tape	extern	CLI	Information and monitoring; SNMP support

4.1.2   Active Management

Active Management for storage systems is supported as documented. Extensions for new HW models and FW versions are provided.

The management instances (e.g. SMI-S provider) for storage systems must be registered first by CLI `storcfg cimom –add` or by the StorMan WebUI specifying the storage model.

4.1.3 Information and Monitoring

4.1.3.1 Common Aspects

For SE servers (on the MU) StorMan provides flexible and generic support of additional Storage Systems based on vendor specific storage interfaces.

The storage systems to be monitored have to be registered in StorMan first.

This can be done by WebUI specifying the model of the Storage system together with its access data.

4.1.3.2 Specific Aspects for monitored Storage Systems

The following chapters describe the storage specific support for SE servers on the Management Unit (MU).

- **Support for ETERNUS CS**

  StorMan provides information and monitoring functions for ETERNUS CS HE, ETERNUS CS8000, ETERNUS CS800 and ETERNUS CS50 storage systems as of CS V5.1 based on the CLI of ETERNUS CS.

  The registration in StorMan is done for each monitored ETERNUS CS system via WebUI.

  For registration of the system the IP address, user and password are required.

- **Support for ETERNUS LT40/60 S2**

  StorMan provides information and monitoring functions for ETERNUS LT40/60 S2 storage systems based on SNMP V1 or SNMP V3 on ETERNUS LT. The registration in StorMan is done for each ETERNUS LT system via WebUI.

  For registration of the system the IP address is required.

  With SNMP V1 additionally the community name is required (default: public).

  With SNMP V3 additionally the combination user/pwd has to be specified.

- **Support for Quantum Scalar Tape Libraries**

  StorMan in SEM environment provides information and monitoring functions for Quantum Scalar Tape Libraries based on SNMP. They currently support SNMP V1, but are encouraging SNMP V3 usage for new models. The following models are supported:

  - Quantum Scalar i2k / i6k
    - with SNMP V1 by community name (default: publicCmtyStr)
  - Quantum Scalar i500

- with SNMP V3 (default user: admin) or V1 (must be enabled on the library, default: publicCmtyStr)

- with SNMP V3 (default user: admin) or V1 (must be enabled on the library, default: publicCmtyStr)

- Quantum Scalar 10k

  - with SNMP V1 by community name (default: public)

The registration in StorMan is done for each system via WebUI.

For registration of the system the IP address and the SNMP community name are required.

- Support Quantum Scalar i500

  - with SNMP V3: by user/pwd

  - with SNMP V1: by community (default: publicCmtyStr)

- Support Quantum Scalar i2k / i6k
  - with SNMP V3: by user/pwd

  - with SNMP V1: by community (default: publicCmtyStr)

- Support Quantum Scalar 10K
  - with SNMP V1: by community (default: public)

- **Support for ETERNUS JX40 / JX40 S2**

  ETERNUS JX40 / JX40 S2 disk storage on SU x86 and AU only connects directly via SAS.

  No LAN access is required for ETERNUS JX management. Information about the ETERNUS JX40 / JX40 S2 is only available directly for SU x86 via the MU.

  ETERNUS JX40 / JX40 S2 connected to AUs are not supported.

  No StorMan registration is required for ETERNUS JX systems. StorMan discovers them by default.

4.1.4   Listing of unmanaged Storage Systems

StorMan provides the option to list storage systems in the StorMan WebUI Storage System Overview. No monitoring or management is provided for these systems, just static information is maintained in the StorMan repository, to deliver a complete view of the storage environment.

Functions to add/remove/modify/show storage systems to StorMan repository are provided for this purpose.

Unmanaged storage systems register by WebUI.

4.1.5 Linkage to Storage Management Software

For SE server StorMan is able to maintain links to Storage Management SW in its repository. Storage Management SW can be registered and unregistered in StorMan for this purpose. This function provides easy and direct access to external Storage Management SW from the StorMan WebUI.

The functions are provided by WebUI.

4.2 StorMan add-on pack for the Management Unit

4.2.1 StorMan as M2000 add-on pack

4.2.1.1 Definition

On SE server StorMan is defined as add-on pack of M2000 for the Management Unit (MU) to assure independent installation and deinstallation.

StorMan is delivered as part of the SW delivery of SE servers as independent media. However, the version is decoupled from M2000 versions. This is mandatory to assure an independent StorMan Support for new Storage HW/FW versions and features.

The installation of StorMan is mandatory on M2000. However, StorMan may be temporary not installed (e.g. during upgrade installation) or not available (stopped).

The SEM (SE Manager) functions for add-on packs handle installation / de-installation of StorMan via SEM. StorMan does not require specific activation; it is automatically active after successful installation.

SEM as of M2000 V6.2 additionally provides functions to start, stop and display the status of add-on packs including StorMan. Please refer to "Operation and Administration" manual [3] .

SEM checks the installation and availability of StorMan to activate/deactivate WebUI calls for the Storage Management (URLs in SEM). The name of the add-on pack in M2000 is STORMAN.

4.2.1.2 StorMan Authorization on M2000

StorMan has its own authorization and role concept. When running on M2000, StorMan adapts to the authorization concept of M2000.

StorMan authorization on M2000 depends on the access:

- CLI access is supported for users with role Service or Administrator on MU with full access to StorMan CLI according to StorMan user and role settings. Predefined M2000 user 'service' and 'admin' have full CLI access without additional authorization check in StorMan. These predefined users cannot be modified or removed.

- WebUI access is controlled on 2 levels.
    - SEM users are accepted by StorMan only if the users are also defined as StorMan users.
    - During StorMan installation the SEM users 'service' and 'admin' are defined as StorMan users by default with StorMan role StorAdmin. StorMan users 'service' and 'admin' cannot be modified or removed when running on M2000. Therefore a primary access to StorMan is possible for these users. Further StorMan users can be assigned and managed afterwards.
    - The range of supported functions and manageable storage resources for authorized users are controlled by the StorMan internal authorization and role concept.
    SEM users must be defined as StorMan users with an assigned StorMan role before they can access StorMan.

A StorMan role enables a StorMan user for a specific task. The following predefined StorMan roles can be assigned to a StorMan user.

- **Storage Administrator (StorAdmin)**
  This is the StorMan role for the storage administrator. The owner of this role is enabled for all features required to set up and maintain StorMan including the management of StorMan users and their roles.

  The owner of this role is also enabled for the complete storage management to create StorMan pools and assign volumes to StorMan pools.

- **Pool Administrator (PoolAdmin)**
  This is the StorMan role for administrators of specific storage resources (StorMan pools). The functions are applicable on explicitly assigned (one or multiple) StorMan pools and their assigned volumes.

- **Information (Info)**
  This is the StorMan role to show and monitor activities on the storage configuration in a data center. The owner of this role is enabled for the complete information functionality of StorMan including performance and statistical data, but no authorization for any changes or modification.

4.2.1.3   PMCC support as part of add-on pack StorMan

PMCC is required for ETERNUS DX S2 systems only.

ⓘ   Therefor the following chapter is required for ETERNUS DX S2 systems only.

StorMan needs PMCC of FUJITSU to provide statistical and performance data for ETERNUS DX S2 storage systems.

On M2000 the suitable PMCC version is packed and delivered together with StorMan as part of the StorMan add-on pack.

StorMan V8.0 supports PMCC V2.5.

Preconditions

The collection of statistical data is started/stopped either by StorMan (caller openSM2 or StorMan CLI) or via the ETERNUS DX WebUI. No other instance should use PMCC in parallel except of AST management via ETERNUS SF.

To provide the PMCC output data, StorMan creates a data subdirectory for every single ETERNUS DX System in path: `/var/opt/SMAWstor/StorMan/pmcc/<storage name>`.

Network Conditions:
Open the firewall between StorMan server (on MU) and the ETERNUS DX for the following port numbers. On MU this is set up in M2000 up by default.

No.	Target device	Port number / protocol	Connection direction at start
1	ETERNUS DX	1999/tcp	From the performance information acquisition server to ETERNUS Disk storage system
2	ETERNUS DX	1372/tcp	The Maintenance-Secure connection from the performance information acquisition server to ETERNUS
3	ETERNUS DX	22/tcp	The Maintenance-Secure connection from the performance information acquisition server to ETERNUS

Installation / De-installation

PMCC rpm (FJSVstxp-2.5.0-0) installs automatically during StorMan add-on pack installation (before StorMan installation).

PMCC rpm (FJSVstxp-2.5.0-0) de-installs automatically during StorMan add-on pack de-installation (after StorMan de-installation).

The installation requires 142 MB disk capacity for installation and additionally up to 25 MB for each monitored ETERNUS DX System (PMCC V2.5).

The following directories are used:

- Program directory: `/opt/FJSVstxp`

- Environment setup directory: `/etc/opt/FJSVstxp`

- Data directory: `/var/opt/FJSVstxp`

Normally the PMCC installation directory `PMCC_InstallationFolder` must be set in StorMan configuration file `smserver.ini`. On M2000 this is not necessary as the PMCC CLI `stxpmonitor` is linked to the command path at installation time (`PMCC_InstallationFolder` remains an empty string).

4.2.2   Interaction of StorMan with M2000

SE Server Information in StorMan

StorMan in M2000 automatically configures the SUs and MUs with their FC HBA information in its repository for SE servers. Based on this information StorMan is able to inform about the server to storage connections of the SE Server Units and to provide both a storage oriented and a server oriented view on the storage resources.

AUs on the SE server are also automatically configured in StorMan configuration. However the FC HBA information is not available, it may be updated and maintained manually later on.

The SE server information is provided automatically during StorMan add-on pack installation. The information can be updated anytime by WebUI.

4.2.3 Logging

StorMan as add-on pack supports the logging concept in M2000. Please refer to MU / SEM documentation for details.

StorMan logging is enabled by default.

4.2.3.1 System Logging

StorMan currently does not use the system logging in `/var/system/messages`.

4.2.3.2 SE Audit Logging

In M2000 StorMan supports the SE Audit logging. Significant changes initiated by StorMan WebUI or CLI are logged as component 'StorMan'.

The following StorMan actions are logged:

- start / stop StorMan → done by M2000 as centralized function
- add / modify / remove StorMan accounts and roles
- add / remove / modify Storage instances
- add / remove / modify Storage systems
- create / terminate / modify replication pairs
- add / remove / modify server
- add / remove / modify pools
- add / remove / modify volumes (to / from pools)

4.2.3.3 SE Event Logging

In M2000 StorMan supports the SE Event logging. Significant storage related events detected by StorMan are logged as component 'StorMan'.

The following events are logged:

- start / stop StorMan → done by M2000 as centralized function
- errors during StorMan start
- storage Management Instance added / removed
- changing of the Storage Management Instance status
- storage system added / removed
- changes of the storage status
- changes of storage cluster status and phase

4.2.3.4   StorMan Logging

StorMan uses its proprietary StorMan Logging facility in
`/var/opt/SMAWstor/StorMan/log/` for diagnostic purpose. The logging level is set by
CLI and/or StorManWebUI.

StorMan supports a maximal retention time for logging files. It is defined in the inititalization
file `smserver.ini`.

The parameter `TraceFileMaxAge` defines the number of days that the log files are kept.
The default value when running in M2000 is `TraceFileMaxAge = 90` (means 90 days).

Example:

    `TraceFileMaxAge = 7` means 7 days

The effect of the parameter:

- StorMan log-files are zipped when reaching the size of 100 MB or latest when changing
  the date.
- All log-files and zip-files with content older than the number of days specified by
  `TraceFileMaxAge` are removed (i.e. all files starting with `stormanTrace*`).

4.2.4   Network considerations

4.2.4.1   StorMan client to StorMan server connections

StorMan client to server connections support socket connections with IPv6 and IPv4 in
secure and none secure mode.

The communication on M2000 is secure (openssl encryption) by default.

WebUI connections to M2000 are secured via https.

4.2.4.2   Connections from StorMan server to Internal and External Storage

Common

For the CIMOM (SMI-S provider) configuration in StorMan the IP-Address together with
authentication data is specified. StorMan supports IPv4 and IPv6. The network connection
itself between M2000 and Storage System is not relevant for StorMan. However, the
firewall settings must allow the access.

Internal Storage

Internal Disk Storage
- ETERNUS DX / AF series
  have one full LAN management port (MNT). Therefore connection to both private and public network is not possible in parallel (Additional service port e.g. for AIS connect is available).

  There are 2 options (recommended option 2):
    - Option 1: Connect to internal Control LAN:

      No management access from public Admin LAN is possible. Therefore the complete management must be done by SE Administrator only

    - Option 2: Connect to public Admin LAN:

      Management access via public Admin LAN only and by SE Administrator (StorMan)
- ETERNUS JX 40 / JX40 S2: no connection / no LAN management interface

Internal Tape Storage
- ETERNUS LT40 series
  have one LAN management port. There are 2 options:
    - Connect to private Management Network:

      No management access from public Admin LAN. Therefore the complete management must be done by SE Administrator only

    - Connect to public Management Network:
      Management access via public Admin LAN only and by SE Administrator (StorMan)

External Storage

All external Storage (Disk and Tape) must be accessible via public Admin LAN.

5   Installation

5.1   Installing StorMan on Linux

You have to be logged in as `root`. Enter the following command to install StorMan:

`rpm -i StorMan-<version>.<platform>.rpm`

- See the readme file for the correct version.
- 64 bit support is provided by <platform> = x86_64.
- Use -iv or -ivv for extended information.
- A StorMan userid is created during installation. This userid is normally called `storman`. The password is locked. Only if a userid `storman` already exists a user `storman1` is created.

If an earlier version of StorMan is already installed, it must be deinstalled first. Please refer to section "Uninstalling StorMan" for information on deinstallation.

5.1.1   Starting and stopping the StorMan service

Upon startup, storman reads its configuration file. The server is configured to listen on port 4178.

Once the server has started and performed some initialization activities, it will listen for and answer requests from clients.

The StorMan service is configured to start automatically and restarts automatically in case of failures.

StorMan is installed as a service and started automatically in run level 2, 3 and 5.

As root it can be started | stopped | monitored manually by calling "`/etc/init.d/storman start | stop | status`".

To check if StorMan is running, enter in a command shell:

`storcheck`

For StorMan server access from the network, the firewall has to open access to port 4178.

5.2 Installing StorMan on Windows

ⓘ An installed previous version of StorMan must be deinstalled first. Please refer to section "Uninstalling StorMan" on page 59 for information on deinstallation.

Perform the following steps to install StorMan:

1. Log in with "administrator" rights.

2. Execute

   `StorMan_Setup-<version>-<platform>.exe`

   64 bit version <platform> = x64 is required.

3. Select the installation language and click *OK*:

   StorMan

   Please select the installation language from the following list:

Deutsch	Deutsch (Deutschland)
English	Englisch (USA)
日本語	Japanisch (Japan)

   OK
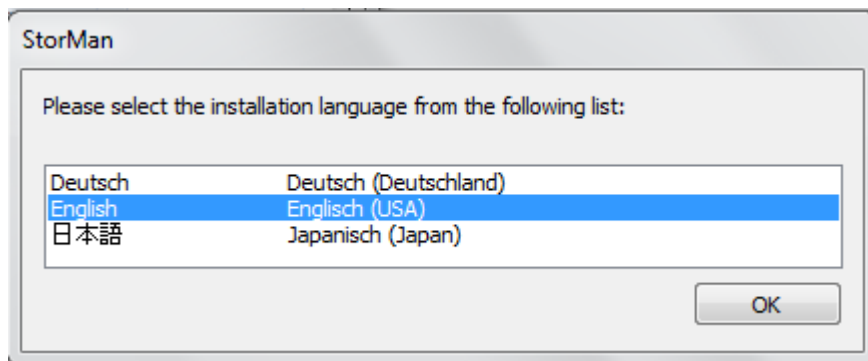
4. Click *Next* in the Installation Welcome window:
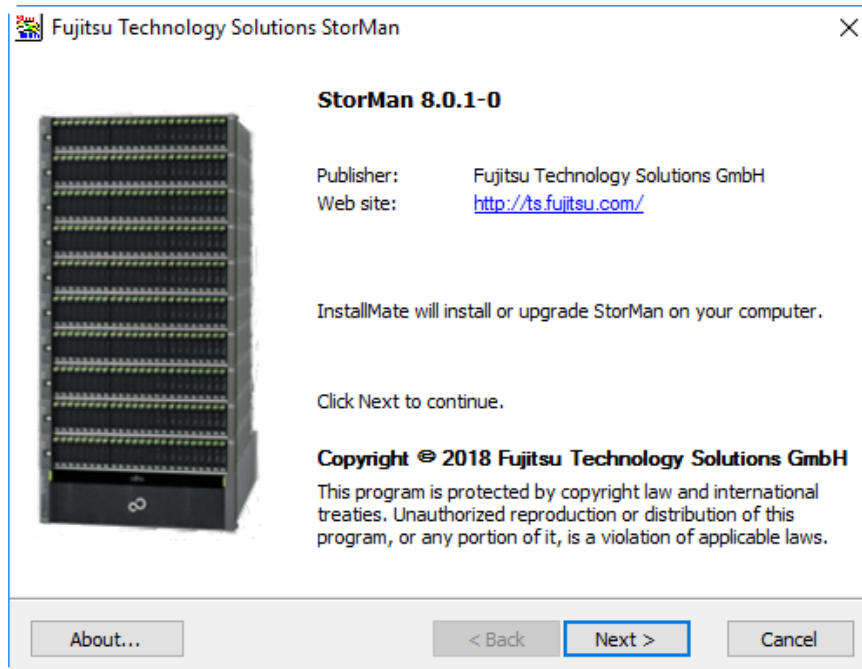
5. Select *I agree to these terms and conditions* in the License Agreement window and click *Next*:
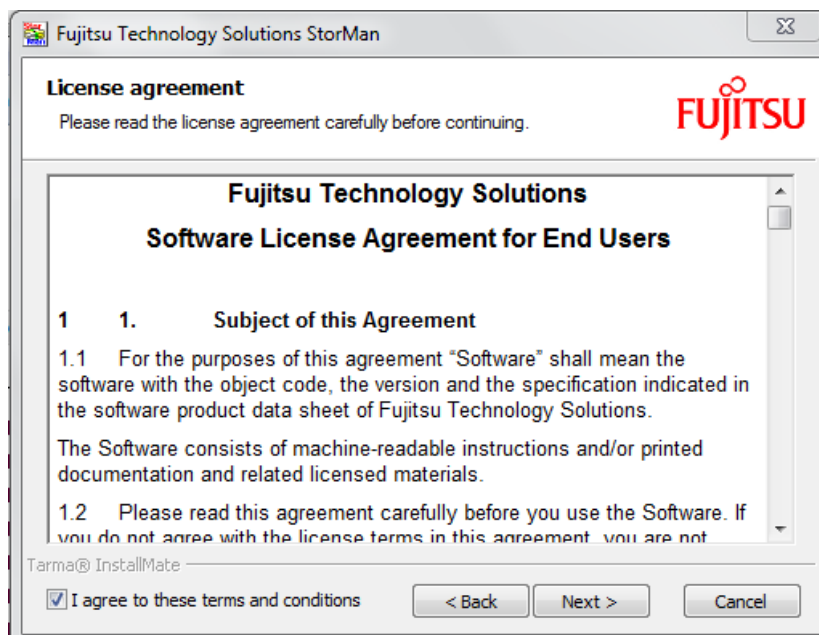
6. Specify the installation folder if you need to change the default values. Afterwards click *Install*.
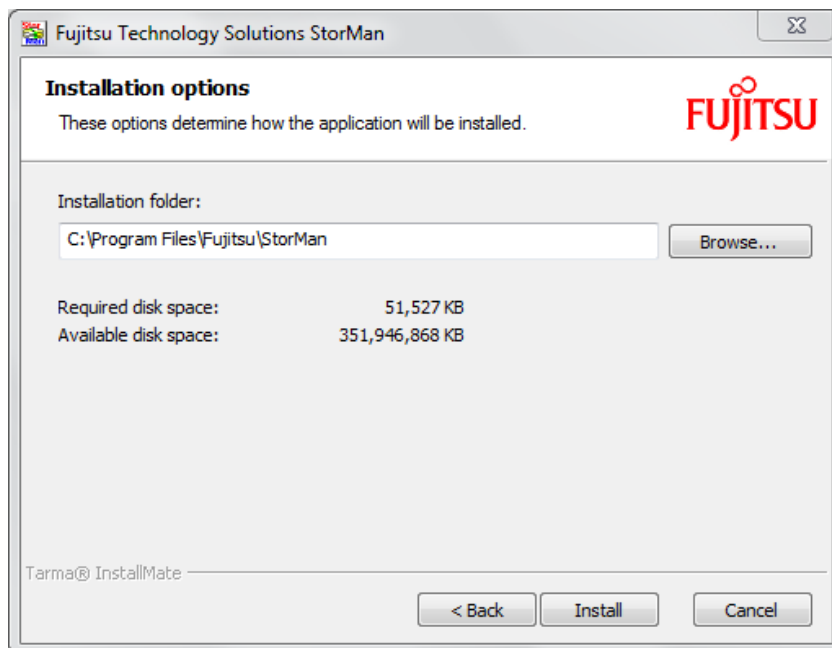
The following screen shows that installation has been successful completed:
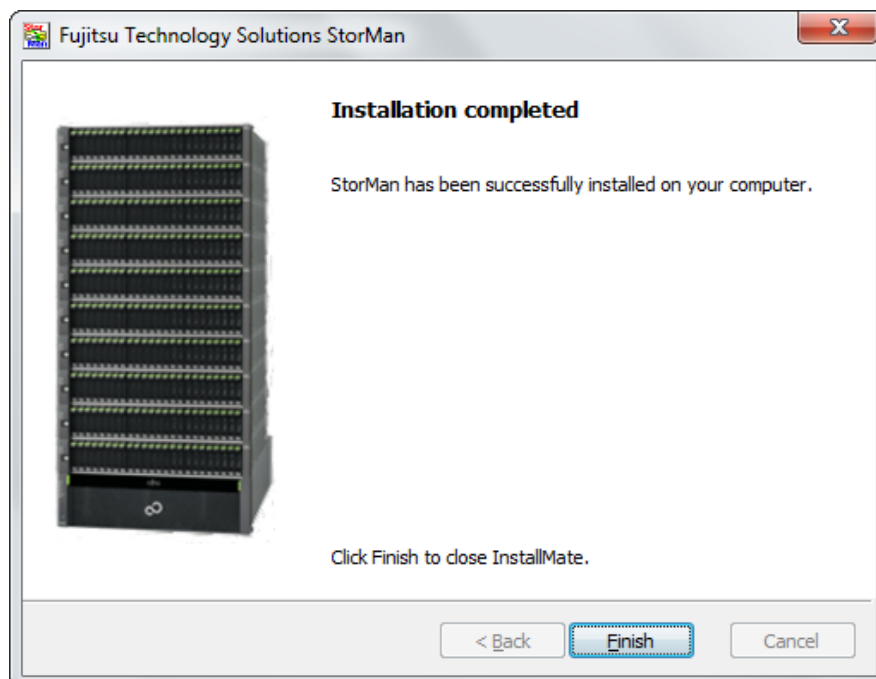
5.2.1 Starting and stopping the StorMan service

Upon startup, storman reads its configuration file. The server is configured to listen on port 4178.

Once the server has started and performed some initialization activities, it will listen for and answer requests from clients.

The StorMan service is configured to start automatically as a Windows service.

To start or stop StorMan on Windows systems use the service manager.

To check if StorMan is running, check Windows services for "StorMan Service" or enter in a command shell:

```
storcheck
```

For StorMan server access from the network, the firewall has to open access to port 4178.

5.3 Installing the StorMan WebUI (stand-alone mode only)

5.3.1 Server Requirements

- Installed and configured web server software (Apache, Microsoft IIS, etc.)
- Secured web server configuration with SSL/TLS

  Windows Server:
  see https://support.microsoft.com/en-gb/help/324069/how-to-set-up-an-https-service-in-iis

  SLES 11:
  see https://www.suse.com/documentation/sles11/book_sle_admin/data/sec_apache2_ssl.html

  SLES 12:
  see https://www.suse.com/documentation/sles-12/book_sle_admin/data/sec_apache2_ssl.html

- Installed PHP 5.3 or higher

5.3.2 Installing StorMan WebUI

The StorMan WebUI is delivered as a zip-file. After installation the zip-file is contained in the installation directory:

```
<path_of_installation_dir>/StorMan/WebUI/WebUI.zip
```

(e.g. for Linux: `/opt/SMAW/SMAWstor/StorMan/WebUI/WebUI.zip`)

1. Remove all files and folders of previous installed StorMan WebUI under document root directory of webserver or configured virtual host.
2. Extract StorMan zip-file `WebUI.zip` into the document root directory of webserver or configured virtual host.

Example for Windows Server:

1. If exist, delete the folder of previous installed StorMan WebUI in your IIS web server document root directory.
2. Extract all files and subdirectories from zip-file `WebUI.zip` (e.g. `C:\Program Files\Fujitsu\StorMan\StorManUI\WebUI.zip`) and copy the unzipped folder into your IIS web server document root:
3. Open file explorer and navigate to `C:\Program Files\Fujitsu\StorMan\StorManUI\`.
4. Right click on `WebUI.zip`.

5. Click *Extract all...* in context menu.

6. Rename target folder name "WebUI" to "StorMan" in the opened "Extract Compressed Folders" wizard.

7. Click *Extract* in opened "Extract Compressed Folders" wizard.

8. Move or copy the created StorMan folder to your document root of the IIS web server.

Example 1 for Linux:

1. If exist, remove the directory of previous installed StorMan WebUI in your apache web server document root directory:

   ```
   rm -rf /srv/www/htdocs/StorMan
   ```

2. Create a StorMan directory in your document root directory of the apache web server:

   ```
   mkdir -p /srv/www/htdocs/StorMan
   ```

3. Extract all files and subdirectories from zip-file `WebUI.zip` (e.g. `/opt/SMAW/SMAWstor/StorMan/WebUI/WebUI.zip`) into the StorMan directory under your document root directory:

   ```
   cd /srv/www/htdocs/StorMan
   unzip /opt/SMAW/SMAWstor/StorMan/WebUI/WebUI.zip
   ```

4. Adapt `LOG_PATH` in StorMan WebUI configuration file (see)

Example 2 for Linux (extend apache config):

1. If exist, remove the directory of previous installed StorMan WebUI

   ```
   rm -rf /opt/SMAW/SMAWstor/StorMan/WebUI/storman
   ```

2. Extract all files and subdirectories from zip-file `WebUI.zip` (e.g. `/opt/SMAW/SMAWstor/StorMan/WebUI/WebUI.zip`) into `/opt/SMAW/SMAWstor/StorMan/WebUI/storman`:

   ```
   mkdir -p /opt/SMAW/SMAWstor/StorMan/WebUI/storman
   cd /opt/SMAW/SMAWstor/StorMan/WebUI/storman
   unzip /opt/SMAW/SMAWstor/StorMan/WebUI/WebUI.zip
   ```

3. Create `/etc/apache2/conf.d/StorMan.conf` file with following content:

   ```
   Alias /storman "/opt/SMAW/SMAWstor/StorMan/WebUI/storman"
   <Directory /opt/SMAW/SMAWstor/StorMan/WebUI/storman>
        Order Allow,Deny
      Allow from All
   </Directory>
   ```

5.3.3   Directory Permissions

All directories of StorMan WebUI have to be accessible (for read and execute) by web server process user. Further more, write permissions are needed for the following directories:

- `.../webui/assets/` (on the basis of installed StorMan WebUI toplevel directory)
- LOG_PATH

  Windows: `.../log/` (on the basis of installed StorMan WebUI toplevel directory)

  Linux: `/var/opt/SMAWstor/StorMan/log/WebUI/`

5.3.4   Configure the StorMan WebUI

Configuration settings for the StorMan WebUI are contained in the `config.php` file.

The configuration file is stored in the toplevel directory of the installed StorMan WebUI (for Linux e.g. `/srv/www/htdocs/StorMan/config.php`).

Any changes of the configuration file must conform to the PHP syntax rules.

5.3.4.1   Parameter SESSION_TIMEOUT

`SESSION_TIMEOUT` specifies the time-out period in minutes for a logged in StorMan WebUI user.

After defined period of inactivity, the user session will expire.

A value equal 0 will disable session expiration.

```
* default:    24
```

5.3.4.2   Parameter AUTO_UPDATE

`AUTO_UPDATE` specifies the update cycle value and determines how many seconds will elapse before the display is updated.

A value equal or less 10 will disable automatic update.

```
* default:    60
```

5.3.4.3 Parameter PROTECTED_PATH

`PROTECTED_PATH` specifies the path where StorMan WebUI read only files reside.

The defined path should NOT be writeable by web server process user.

```
* default:    __DIR__ . '/_protected'
```

5.3.4.4 Parameter STORMAN_PATH

`STORMAN_PATH` specifies the path of the StorMan CLI directory.

The defined path must exist and have to be accessible by the web service user.

```
* default windows:   'C:\Program Files\Fujitsu\StorMan\bin'
* default linux:     '/opt/SMAW/SMAWstor/StorMan/bin'
```

5.3.4.5 Parameter LOG_PATH

`LOG_PATH` specifies the path of log files generated and updated by the StorMan WebUI.

The defined path must exist and have to be writeable by the web server process.

```
* default windows:   __DIR__ . '\log'
* default linux:     '/var/opt/SMAWstor/StorMan/log/WebUI'
```

5.4 Installing StorMan on M2000

StorMan is part of the official delivery for SE servers. Therefore it will be ready installed at delivery of the SE server. StorMan is available as an add-on pack of the SE server and can be managed and upgraded independently.

The following steps have to be performed in case of an update installation only.

In M2000 the complete StorMan installation (StorMan server and WebUI) runs automatically as an add-on pack for M2000. Installation can be performed using the SE Manager.

Refer to "Operation and Administration" manual [3] .

5.4.1 Installation by the SE Manager

The SE manager provides the management functions for add-on packs in the "Update" tab of the "Hardware > Server > Service" menu:

As first step start "Upload add-on package" to upload the StorMan software from from the StorMan CD, a local or a network drive to M2000. The name of the StorMan iso image delivered for M2000 is:

```
MV.STORMAN-<version>.iso
```

If you are uploading from the StorMan CD, you may find the StorMan iso image in directory …/M2000. After the upload is completed the add-on pack STORMAN-<version> is displayed and the installation of StorMan can be started by clicking the Install icon.

After successful installation the SE Manager displays the add-on pack with the status "installed".

If an earlier version of StorMan is already installed, it must be deinstalled first. Please refer to section "Uninstalling StorMan".

5.4.2 Postinstallation steps

After successful installation the complete features of StorMan are ready available. If required the StorMan user and their roles have to be defined or adjusted.

5.4.3   Starting and stopping the StorMan service

The StorMan service is configured and started automatically by installation.

Upon startup, storman reads its configuration file. The server is configured to listen on port 4178. Starting and stopping StorMan is supported by SEM as of M2000 V6.2 via the *Hardware → Units → <unit> (MU) → Service* menu. Please refer to "Operation and Administration" manual [3] .

StorMan can also be started manually via CLI under an administrator or service account.

To start or stop StorMan on M2000 enter:

```
rcmng start storman

rcmng stop storman
```

To check if StorMan is running, enter:

```
storcheck
```

5.5   StorMan configuration file

Configuration settings for the StorMan server are contained in the `smserver.ini` file. It is the basic configuration file.

5.5.1   Configuration file on Linux systems and M2000

On Linux systems `smserver.ini` is stored in the following directory:

```
/var/opt/SMAWstor/StorMan/config
```

The file `smserver.ini` is the basic configuration file.

The settings in the StorMan configuration file can be modified by the WebUI or CLI `storparam` for users with role service or administrator. No direct changes in the configuration file are supported.

5.5.2   Configuration file on Windows systems

On Windows systems `smserver.ini` is located in the StorMan installation directory and can be modified directly via an editor or by WebUI / CLI:

```
%PROGRAMFILES%\Fujitsu\StorMan\config (as the default)
```

5.5.3   Content of configuration file

The file is the same on all platforms and initialized as follows:

```
[StorMan]
#
#======================================================================
# StorMan server initialisation file: smserver.ini
#======================================================================
#
#
# ----- StorMan parameters ---------------------------------------
#
# -- Timeout value for connect to CIMOMs in seconds:
# value range: <1 - 6000>
# default value: 10
#CIMOMConnectTimeOut = 10
#
# -- Timeout value for StorMan client calls in seconds:
# value range: >= 0, 0 indicates unlimited
# default value: 600
#ClientCallTimeOut = 600
#
#
# -- support of authorization:
# values:
# 0 authorization disabled
# 1 authorization necessary, show allowed
# 2 authorization necessary, for show too
# default value: 2
#AuthorizationLevel = 2
#
#
# ----- Eternus statistic ---------------------------------------
#
# -- PMCC installation folder
# necessary for retrieving performance data
#PMCC_InstallationFolder = C:\Program Files\ETERNUS-PMCC
#
# -- PMCC interval time
# interval time for pmcc to store data in seconds
# default value: 180
#PmccIntervalTime = 180
#
# -- Refreshtime for Eternus statistics in seconds:
```

```
# value range: <30 - 6000>
# default value: 240
#StatisticRefreshTime = 240
#
# -- Number of refreshes without statistic retrieval before stop:
# value range: <0 - 6000>
# 0 means no stop
# default value: 4
#NumRefresh4Stop = 4
#
#
# ----- Trace Levels ----------------------------------------------
#
# -- maximum level to trace
# values:
#  <0 trace all
#  0  trace severe errors only
#  1  trace errors too
#  2  trace even warnings
#  3  trace information
#  4  trace debug
#  5  trace extended debug
# default value: 4
#Debug = 4
#
# -- maximum number of days to preserve traces
# default value: 0 means unlimited
#TraceFileMaxAge = 0
#
# -- trace communication:
# only for enabled debugging (MaxTraceLevel >= 4)
# values:
#  0  trace off
#  1  trace tcp/ip
#  2  trace messages
#  4  trace cim tcp/ip
#  8  trace cim messages
#  add the values to enable the traces
# default value: 0
#DebugCom = 0
#
# -- trace communication and debugging info of worker threads
# values:
#  0  trace off
#  1  trace worker
#  2  trace system updater
```

```
#  4  trace mirror updater
#  8  trace CIMOM status updater
# 16  trace statistics collector
# 32  trace main thread
# 64  trace indication handler
# 128 trace script updater
# 256 trace volume updater
# 512 trace cluster updater
#  add the values to enable/disable the traces
# default value: 0
#TraceWorker = 0
```

Some parameters can be modified by using WebUI or the `storparam` command as described in section :

> All entries in the configuration file are optimized for StorMan and care should be taken if they are changed by CLI or direct editing. In particular, entries not mentioned here should not be changed.
>
> Files signed with `*.orig` are default backup files.

6 Uninstalling StorMan

6.1 Uninstalling StorMan from Linux

To uninstall StorMan enter:

```
rpm -e StorMan
```

There are backup files and configuration files which are not removed as part of the uninstall process:

- In the directory `/var/opt/SMAWstor/StorMan/config/` the configuration file `smserver.ini` is not removed.
- In the directory `/var/opt/SMAWstor/StorMan/backup/` all backup files are not removed to make sure that your data is not lost with the deinstallation.
- In the directory `/var/opt/SMAWstor/StorMan/repository/` the StorMan repository containing the complete configuration managed by StorMan is not removed.
- In the directory `/var/opt/SMAWstor/StorMan/log/` the StorMan logging files are not removed.

If you are sure that you do not need these files any longer, delete the directory `/var/opt/SMAWstor/StorMan/` manually.

6.2 Uninstalling StorMan from Windows

To uninstall StorMan, use the Windows software deinstallation utility.

There are backup files and configuration files which are not removed as part of the uninstall process (default paths below):

- In the directory `%PROGRAMFILES%\Fujitsu\StorMan\config\` the configuration file `smserver.ini` is not removed.
- In the directory `%PROGRAMFILES%\Fujitsu\StorMan\backup\` all backup files are not removed to make sure that your data is not lost with the deinstallation.
- In the directory `%PROGRAMFILES%\Fujitsu\StorMan\repository\` the StorMan repository containing the complete configuration managed by StorMan is not removed.
- In the directory `%PROGRAMFILES%\Fujitsu\StorMan\log\` the StorMan logging files are not removed.

If you are sure that you do not need these files any longer, delete the directory `%PROGRAMFILES%\Fujitsu\StorMan\` manually.

6.3   Uninstalling of StorMan WebUI

Remove the files or the symbolic link described in section "Installing the StorMan WebUI (stand-alone mode only)" on page 50" from the Web Server document root.

6.4   Uninstalling StorMan from M2000

The SE manager provides the management functions for add-on packs in the *Update* tab of the *Hardware → Units → <unit> (MU) → Service* menu.

To uninstall StorMan on M2000 use these features (refer to SE Manager help and the "Operation and Administration" manual [3]).

Uninstallation removes the complete CLI and WebUI features of StorMan.

There are backup files and configuration files which are not removed by the uninstall process:

- In the directory `/var/opt/SMAWstor/StorMan/config/` the configuration file `smserver.ini` is not removed.
- In the directory `/var/opt/SMAWstor/StorMan/backup/` all backup files are not removed to make sure that your data is not lost with the deinstallation.
- In the directory `/var/opt/SMAWstor/StorMan/repository/` the StorMan repository containing the complete configuration managed by StorMan is not removed.
- In the directory `/var/opt/SMAWstor/StorMan/log/` the StorMan logging files are not removed.

6.5   Upgrade Installations

Upgrade installation in one step is supported on Windows systems only. During the start of StorMan V8.0 installation it is automatically checked if a StorMan version is already installed and the upgrade can be done automatically.

For Linux and M2000 a deinstallation must be done before upgrading to a higher version. The StorMan data are not deleted during deinstallation.

However, if a data in place upgrade is planned that should save the existing StorMan configuration the migration steps should be done as described below.

Migration from previous versions to StorMan V8.0 is supported.

Data in place upgrades for StorMan configurations from previous StorMan Versions to StorMan V8.0 is supported "on the fly": During the upgrade process the StorMan repository is upgraded automatically.

ⓘ Please note that downgrading from StorMan V8.0 to a lower StorMan version is not supported with the same repository. For this reason it is recommended to create a backup of the repository using `stormandb -dump` before starting the upgrade.

If your managed storage configuration requires the EMC SMI-S provider, this may require an additional upgrade step.

The following migration scenario is supported to upgrade from StorMan V7.0 to StorMan V8.0. The steps have to be performed according to the specific platform:

1. Create a backup of your StorMan repository and save it for the case of a possible downgrade:

   ```
   stormandb -dump
   ```

2. Make sure your application is not using StorMan during the upgrade.

3. Stop the StorMan server:

   ```
   storman -stop
   ```

4. Only if you are using EMC SMI-S provider:
   Upgrade EMC SMI-S provider to version V8.4 (according to the EMC Release Notes)

5. Start StorMan upgrade installation for StorMan V8.0

6. Check if StorMan V8.0 was successfully updated and is running:

   ```
   storcheck
   ```

7. Check the correct settings in the `smserver.ini` file after successful upgrade.

   If you are using EMC SMI-S provider an additional step is necessary:

8. Only if you are using external EMC SMI-S provider:
   Check if EMC SMI-S provider V8.4 was successfully updated and is running:

   ```
   storcfg cimom –show
   ```

7 The graphical user interface – StorMan WebUI

This chapter describes how to start and work with graphical user interface (WebUI).

7.1 Starting the WebUI

StorMan WebUI can be used

- 'stand-alone' mode for StorMan in Windows / Linux environments
- integrated in SEM for SE Server on M2000.
  On M2000 StorMan WebUI supports no 'stand-alone' mode. StorMan does not check this.

7.1.1 Stand-alone Mode

The WebUI can be started as follows:

- Start your browser.
- Enter the following URL:

  `https://<hostname>/StorMan/index.php`

- The StorMan Login window opens next asking to enter or confirm the server name or IP address of the StorMan server.

  The Server Name specifies a host system running StorMan Service. The port name and server are saved in the file `smConf.ini` in the USERPROFILE directory.

  A userid and a password can be specified if the access to the StorMan server is restricted to specific StorMan users. The userid is a StorMan specific user identification defined by WebUI or CLI (refer to section "StorMan user management tasks" on page 76).

- Click *OK* to confirm the settings. Then the WebUI main window appears next (see section "Elements of StorMan WebUI" on page 64).

7.1.2 Integrated in SE Manager (SEM)

On SE Server StorMan WebUI is integrated in the SE Managers as an add-on pack.

Preconditions:

- Add-on pack name is STORMAN
- Supported Browsers:
  - Internet Explorer as of V11 and Microsoft Edge
  - Firefox as of V45 ESR (Extended Support Release)

The Session Management is controlled by the calling SE Manager. This means:

- No extra authorization (Login) when calling StorMan.
- Main navigation is done by SE Manager → StorMan WebUI is called by link:

  To change from SE Manager to the StorMan WebUI click the *Storage Manager* tab in the menu *Hardware → Storage*.

  - From every single screen, there is a 'return to SE Manager' function/button to the calling SE Manager screen.
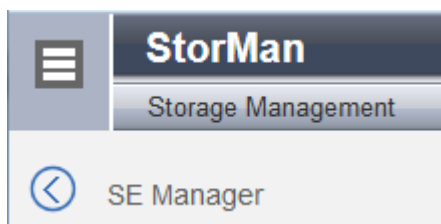
  - Session validation is done at each klick, the session timer is reset.
  - In case of timeout detection during session validation a redirection to the SE Manager Log in screen is done.
  - The Log out function in the Header returns to the SE Manager Log in screen.
  - The 'Change Language' function is NOT provided in SE Manager environment, as in SE Manager environment the language is only set by SE Manager.
    StorMan uses the language setting defined for the session language specific output.
    The 'Change Language' function is provided in 'stand-alone' mode.
  - The Navigation is able to expand/collapse.
  - The StorMan Help System is automatically installed in SE Manager.

Example (stand-alone mode):

7.2 Elements of StorMan WebUI

In stand-alone mode the main window of the WebUI appears in a new window after you have started the WebUI and entered the server name and port. The window's title bar informs about the application and the current StorMan server.

The main window contains a header with product information and the **Help** button. After successful login the header additionally displays the current user name and the **Logout** button.

> If no StorMan user is defined on the StorMan server the login is only possible without **Account** and **Password** (the fields must be empty).

Following a successful login, the StorMan WebUI's main window opens. In the event of an input error, you can correct the input data and repeat the login.

Possible errors:

- An invalid account or an invalid password cause a login error.
- An invalid **Server** causes a communication error.

If the WebUI is called from SE Manager there is no login necessary. The WebUI appears in the SE Manager window.

7.2.1 Main window

The main window of StorMan opens in a new window as soon as you have logged in.

The window's title bar informs you of the application and the current StorMan server.

The header area contains general product information, language options, help, and the logout.

The following elements are contained below the header area:

- The **tree structure** on the left enables an object to be selected which is to be displayed in the work area.
- The **work area** on the right-hand side displays the data on the selected object and permits actions to be performed.

7.2.2 Navigation

The navigation in the Storage Manager consists of the following main menus:

- **SE Manager** (exists only if the call took place via the SE Manager)

- **Storage**

- **Storage Cluster**

- **Server**

- **Configuration**

- **Authorizations**

The main menus **Storage**, **Storage Cluster**, **Server**, **Configuration** and **Authorizations** can be expanded.

When you click a main menu, the tree structure beneath it expands. Below this you see objects and functions as links. Navigation using the main menus is also referred to as **primary navigation**.

When you click a link, a tab opens in the working area which enables you to manage or operate the object or function Some functions are distributed over more than one tab, and these are displayed at the top of the working area. These tabs are also referred to as **secondary navigation**.

A main menu expands in the following cases:

- When you click the main menu again.
- When you click a link in another main menu.

Hiding or displaying the tree structure

You have the option of hiding or displaying the tree structure:

The toggle icon ☰ in the information bar hides or displays the tree structure.

7.2.3 Work area

The work area shows object tables in accordance with the object which is selected in the main menu's tree structure.

The main menu **Authorization** does not contain a tree structure to select objects.

7.2.3.1 Tab

When a pool or volume is selected in the main menu Storage or when a server or an HBA port is selected, the work area is split into multiple tabs to display different object tables:

- The **Overview** tab displays an information overview.
- The **Connections** tab displays connections of volumes.
- The **Replications** tab displays the volumes for which volume replication is defined.

7.2.3.2 Object table

The topmost object table displays the properties of the selected object.

Optionally one or more tables can display additional information on the selected object and the objects subordinate to it.

7.2.4 Task areas

StorMan offers functions for the following main tasks:

- Setting up and configuring StorMan in the main menu **Configuration**
- Managing storage resources in the main menu **Storage**
- Managing storage cluster in the main menu **Storage Cluster**
- Setting up and configuring StorMan in the main menu **Configuration**
- Managing assignment of storage resources in the **Connections** tab from the storage view in the main menu **Storage** or from the server view in the main menu **Server**
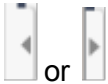
- Managing volume replication in the **Replication** tab from the storage view in the main menu **Storage** or from the server view in the main menu **Server**
- Managing StorMan users and authorizations in the main menu **Authorization**

7.2.5   Using Help

The StorMan help starts in a separate browser window when clicking the **Help** button or the ⓘ icon in the WebUI window. If the help is already started only the existing help window is activated.

The help window displays on the left-hand side the navigation area and on the right-hand side the help topic depending on the selected object in the WebUI at calling time.

Icons on the top

◀ or ▶	hides or shows the navigation area
🖨	prints the displayed topic
←	scrolls back one page in the topic history
→	scrolls forward one page in the topic history
☰	expands hidden text in the displayed topic
☰	collapses hidden text which was expanded in the displayed topic
✎×	removes the highlighting of search terms

Help navigation

Navigation by TOC is selected by default. The table of contents displays in a tree view the hierarchy of all help topics. Selecting a TOC entry displays the concerning topic. Topics which contain subordinate topics will appear as book.
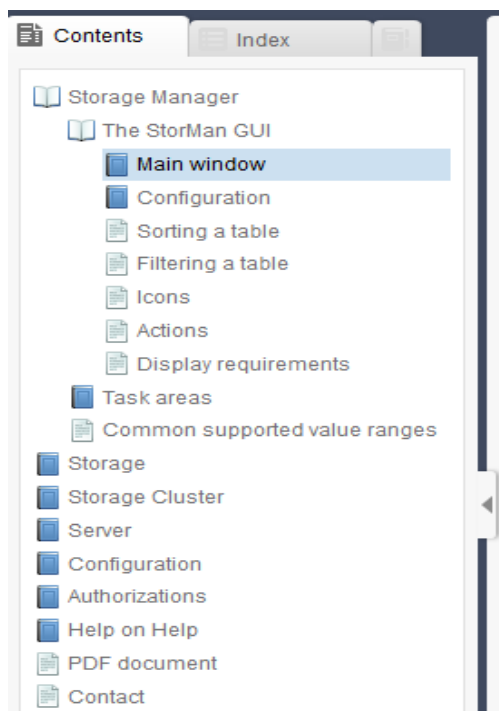
Clicking such a topic

- "opens" the book and shows the contained topics on the tree
- or "closes" the book and hides the contained topics.

To change to navigation by Index, Glossary of Favourites select the concerning tab in the navigation area.

The top of each topic displays the topic hierarchy (path from main topic to displayed topic).
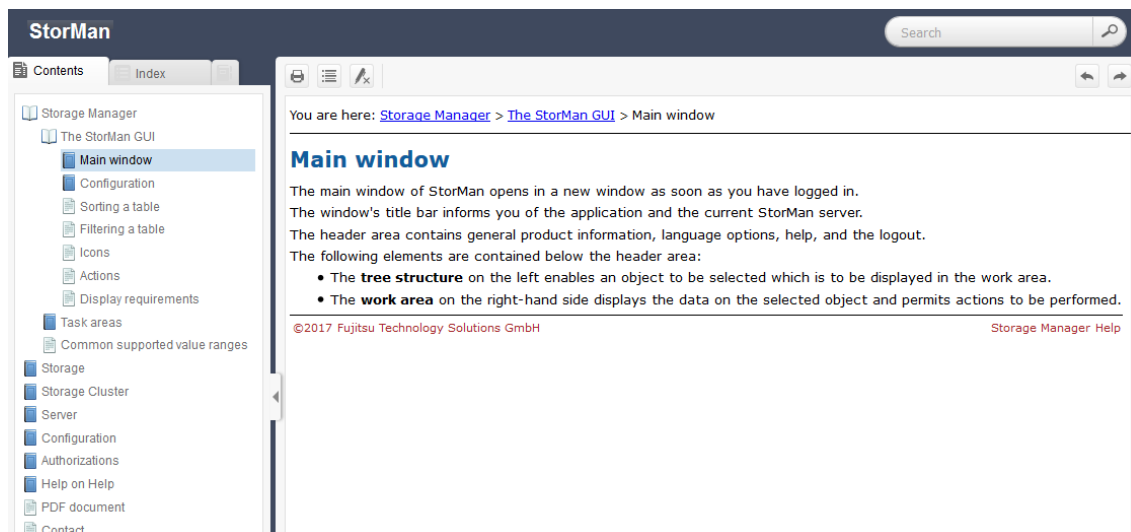
Clicking to an upper topic on this path displays the concerning topic.

For a detailed description of the WebUI functions please refer to the StorMan online help.

8 Setting up StorMan configurations

8.1 Overview

Configuration features are supported by the StorMan WebUI and CLI. The basic functions are available on both interfaces, some functions are only available on the CLI..

8.2 Setting up StorMan configurations using the WebUI

Use the **Storage** and the **Configuration** menu of the WebUI to set up StorMan. See chapter "The graphical user interface – StorMan WebUI" on page 62 on basic information on the WebUI.

The **Storage** menu reflects the view of the storage configuration as seen by a Management Instance. The tree view linked to a Management Instance reflects all storage arrays that can be managed by the respective Management Instance.

Following functions are available:

Configuration menu:
- Add a new Management Instance
- Remove Management Instance
- Display/modify Management Instance properties (implicit function)

Storage menu
- Add a new pool
- Delete a pool
- Rename a pool
- Display/modify pool properties (implicit function)
- Moving devices into/between/from pools
- Display/modify device properties (implicit function)
- Remove a storage system

The StorMan help system contains the complete WebUI functions reference. Refer to section "Using Help" on page 67.

8.3 Setting up StorMan configurations using the CLI

This section is a description based on the StorMan CLI.

For details about the CLI commands, refer to chapter "StorMan for programmers – CLI description".

8.3.1 Specify one or more CIM Servers / Management Instances

Storage systems managed via SMI-S providers (CIM server) in proxy mode must be defined in StorMan's configuration to allow the communication between StorMan and SMI-S provider. The SMI-S provider must be configured as management instance for the storage system.

Execute the command

```
storcfg cimom -add -ip ip [-cimuser myCimUser  -cimpwd myCimPassword]
```

to specify the IP address of the host running the CIM server. You have specified a CIM user and password (see section "Installation and start of EMC SMI-S Provider" on page 33) as part of this command as described in section "storcfg cimom –add" on page 117 according to the settings of the CIM server according to the storage vendor. The discovery of the storage systems managed by the CIM server is started automatically.

For Eternus DX/AF or EMC VMAX3 / VMAX All Flash storage arrays with embedded SMI-S providers, the CIM server IP address corresponds with the storage system.

For EMC Symmetrix VMAX storage arrays a proxy SMI-S provider is used. The IP address of the corresponding servers is used. Only https access is supported.

> ⓘ A management instance must be defined in StorMan configuration for each managed storage system. Management via remote connected storage systems is not supported.

8.3.2 Discover storage systems

The first discovery for the storage system starts automatically, immediately after successfully adding the CIM server. Discovery may also be restarted with the command

```
storcfg cimom -discover -ip ip
```

This checks the connection to the CIM server and starts a discovery of the storage systems. The complete discovery of the storage systems and their configuration by the CIM server is periodically running. The background discovery may take some minutes depending on number and configuration of the connected storage systems (from 15 seconds up to a few minutes per storage system).

Verify the results with

```
storcfg system -show
```

8.3.3 Create StorMan pools

To manage storage volumes a StorMan pool is required as a container for volumes of a specific Storage System. The pools can be created by CLI:

```
storcfg pool -add -poolid myPool -system system
```

Display the pools by CLI:

```
storcfg pool -show
```

8.3.4 Adding storage volumes

To add volumes to the pool, use

```
storcfg volume -add -poolid myPool -system system
       -deviceid 75[,76,…] [-storid myStorID][,myStorID2]
```

(assuming that 75 is the device number / device ID of one of your logical volumes).

Repeat this command for each volume or specify a list. If storIDs are specified, they are assigned to the volume and can be used for further commands.

If this device has LUN masking connections to one or more hosts when it is added to the pool, StorMan automatically assigns a storID to the volume because it is already `in-use`.

8.3.5 Discover changes to a storage array

StorMan is able to detect configuration changes in the storage system automatically by means of the SMI-S provider. However a discover process can be triggered by StorMan, e.g.:

- For one storage system use

```
storcfg system -discover -system system
```

- For all storage systems visible to a SMI-S provider use

```
storcfg cimom -discover -ip ip-of-the-cim-server
```

8.3.6   Remove a storage system

A storage system that is no longer managed by StorMan should be removed from StorMan configuration.

- To remove a storage system use:

  storcfg system –rem –system system

- In case the removed storage system is the only visible to a specific SMI-S provider you should also remove the SMI-S provider :

  ```
  storcfg cimom -rem -ip ip-of-the-cim-server
  ```

8.4 Setting up StorMan configurations for SE Server

StorMan configurations for SE server on M2000 can be delivered at least partly preconfigured. However all activities to setup or modify the StorMan configuration are available for the storage administrator via WebUI, integrated into SE Manager (SEM). On M2000 the complete functionality for StorMan is available as for any other platform.

To set up or modify StorMan configurations on M2000 using the StorMan WebUI please refer to chapter "Setting up StorMan configurations using the WebUI" on page 69.

To setup or modify StorMan configurations on M2000 based on the StorMan CLI please refer to chapter "Setting up StorMan configurations using the CLI" on page 70. In M2000 the StorMan CLI is reserved for the service personnel and administrators only. For details about the CLI commands, refer to chapter "StorMan for programmers – CLI description" on page 91.

> ℹ️ A management instance must be defined in StorMan configuration for each managed storage system. Management via remote connected storage systems is not supported.

On the Management Unit (MU) in M2000 there are some additional functions available to maintain the StorMan configuration. The current chapter handles configuration functions available for SE servers only.

8.4.1 Configure Server Units in StorMan repository

The StorMan repository contains the server names and IP addresses of all Server Units of the SE server managed by SEM. The necessary information is obtained automatically and added to the StorMan repository by internal use of CLI

```
storadmin configsrv
```

This is automatically processed during installation on M2000 and is available for the service to update after configuration changes of the SE Server Units.

The function is also available on the WebUI.

8.4.2 Configure Storage for information only

By WebUI you can register information about storage systems not managed and monitored by StorMan. This enables StorMan to display all storage systems for a complete overview.

8.5 Diagnostic aids

8.5.1 StorMan

StorMan provides a number of files containing important information for troubleshooting and for diagnosis.

To ensure the best possible support in case of problems, you are recommended to recreate the problem after setting the highest debug level on the StorMan server for the duration of recreation process by StorMan CLI:

```
storparam -debug 5
```

More detailed logging information you may get using the parameters `-debugcom` and `-traceworker` of the StorMan CLI `storparam`.

All these settings are also available on the WebUI.

Please use the StorMan CLI to provide the current configuration data:

```
stormandb -dump
```

Afterwards, collect the following files and transmit them to your support organization:

1. The StorMan logging files with format `stormanTraceyyyy-mm-dd` in the `./log` directory for the day(s) concerned.
2. The configuration file of the StorMan server smserver.ini in the `./config` directory.
3. The saved StorMan database files `AddData.sql` and `AddTables.sql` (created by `stormandb -dump`) in the `./backup` directory.

These files are located in the `/var/opt/SMAWstor/StorMan` directory for Linux environments and in the `C:\Programme\Fujitsu\StorMan` directory for Windows environments.

Additional support for Linux (including M2000)

On Linux platforms and on M2000 with user role `service` and `administrator` you may also get all diagnostic information as a g-zipped tar archive by using the StorMan CLI

```
storadmin getlogs
```

The resulting file is located at:

- `/home/service/storManLogs_<uname>_YYYY.MM.DD_HHMMSS.tar.gz` for M2000
- `/tmp/storManLogs_<uname>_YYYY.MM.DD_HHMMSS.tar.gz` for Linux.

> ⓘ Please note that `storadmin getlogs` automatically removes previously created diagnostic information (zipped tar archive) before collecting diagnostic information. Therefor previously created StorMan log files should be saved if needed, before calling `storadmin getlogs`.

To remove all log files use (this should be done after saving the results to save disk space)

```
storadmin remlogs
```

On the WebUI you may create the diagnostic information and download it directly to your local server.

StorMan writes eventually occurring cores to the following directories:

- Windows: `<installation directory>\log`
- Linux: `/var/opt/SMAWstor/StorMan/log`, only if no other directory or program is specified in `/proc/sys/kernel/core_pattern`
- M2000: in the globally specified diectory `/var/crash/core/storman`

8.5.2   SMI-S Provider

Please refer to the Release Notes of the specific vendor for general diagnostic information regarding the support of SMI-S providers.

In some cases the SMI-S provider might not be aware of configuration changes on the storage system initiated by other management tools or instances.

In this situation you are recommended to initiate an update of the internal SMI-S provider repository (only in case of proxy configurations) using

```
storcfg system –discover
```

or

```
storcfg cimom -discover
```

and retry the failed function.

9 StorMan user management tasks

The administration of StorMan users and authorizations is supported by CLI and WebUI. Currently all authorizations to access StorMan are controlled by StorMan internal user and password combinations.

ℹ️ If no StorMan user is defined the complete StorMan functions are available for all connecting StorMan servers. No authorization checks are done.

The following section is a description based on the StorMan CLI and shows the actions to administrate StorMan users.

The corresponding WebUI functions are described in the WebUI's help system (refer to section "Using Help" on page 67).

In SEM environment, StorMan users must correspond to SEM users. StorMan users are defined without a password, as the user and password check is already done centrally by SEM.

9.1 Define a StorMan user

Define a new StorMan user, its password protection and StorMan role by using

```
storauth user –add –name user –passwd pwd –role role
```

Defining the first StorMan user activates the authorization checks for all connecting StorMan servers. All subsequent calls require the specification of `user` and `passwd`.

ℹ️ On M2000 no `-passwd` should be specified. Subsequent CLI calls do not have to specify `user` and `passwd`.

9.2 Modify the password of an existing StorMan user

Modify the password of a user already contained in the StorMan administration by using

```
storauth user –mod –name user –newpasswd newpwd –user user –pwd pwd
```

9.3 Remove a StorMan user

Remove a StorMan user from the StorMan administration by using

```
storauth user -rem -name user  -user user -pwd pwd
```

9.4 Display information related to StorMan users

Display information related to all StorMan users by using

```
storauth user -show [-user user -pwd pwd]
```

Displays information related to a particular StorMan user by using

```
storauth user -show -name user [-user user -pwd pwd]
```

9.5 AssignStorMan Roles for a StorMan user

Assign a new StorMan role to a StorMan user using

```
storauth user -mod -name user -newrole role
```

9.6 Assign pools for management to a StorMan user

Assign a list pools specified by their pool IDs for a StorMan user with the PoolAdmin role to allow management for these pools using

```
storauth user -mod -name user -newpoolids poolid[,...]
```

10 Administration tasks

10.1 Overview

Using its administration features StorMan maintains defined servers with their attributes and port connections in its own StorMan database (repository). Based on this, StorMan provides the information about Server to Storage connections on volume level.

Administration features are supported by the StorMan WebUI and CLI. The basic functions are available on both interfaces, however some functions are only available on the CLI.

10.2 Administration tasks using the WebUI

The **Connections** tab in the main window provides the administrattion features of StorMan on the WebUI.

Following functions are available to administrate servers related to their storage system connections:

- Add a new server
- Remove a server
- Add a new WWPN
- Remove a WWPN
- Display storage volumes with their connected servers (LUN masking)

The StorMan help system contains the complete WebUI functions reference. Refer to section "Using Help" on page 67.

> Please note that on SE servers StorMan collects the information about Server Units automatically. Additional servers can be added.

10.3 Administration tasks using the CLI

This section is a description based on the StorMan CLI. If you prefer to use the WebUI for configuration, see chapter "Administration tasks " on page 78. For details about the CLI commands, refer to chapter "StorMan for programmers – CLI description" on page 91.

10.3.1 Add a new server

Add the servers that are to be administrated by StorMan using the `storcfg host` command, e.g.:

```
storcfg host -add -name myApplicationHost -ip ip-adr1,ip-adr2,...
              -wwpn wwpn1,wwpn2,...
```

StorMan needs the Host WWPNs to display the LUN masking functions.

WWPNs can be specified in the format `210000C09F9568F8` or `21:00:00:C0:9F:95:68:F8`.

The new entries can be checked using the `storcfg host -show` command.

A server can be removed from the StorMan repository using

```
storcfg host -rem -name myApplicationHost.
```

Servers can also be specified just by a WWPN (see section "storcfg host" on page 108" for details). However, if the hosts have more than one HBA, you are recommended to specify a name and / or IP address for each host to provide a better general overview.

> ℹ️ HBA WWPNs can be identified using the software for administering the FC switch or software supplied by the HBA vendor. They also should be printed on the HBA board.

10.3.2 View the connections to a device

Use the command

```
storcfg volume -show -storid myStorID -showconnections
```

All FC pathes and iSCSI pathes between the host and the device are shown. Each path is a combination of InitiatorID, TargetID and SCSI host device number (LUN). The InitiatorID is the identifier of the connection on the host side and can be a WWPN (for FC connections) or an IQN (for iSCSI connections). The targetID is the identifier of the connection on the side of the storage system and can be the WWPN of the storage port (for FC connections) or the IQN of the storage-port for iSCSI connections.

ETERNUS DX/AF storage systems can be configured either for LUN masking or for LUN mapping on storage port level.

StorMan information functions are displaying host connections assigned by LUN masking only. This is reflected by the output storcfg volume –show by the additional property called "`HostAccess`" (see example in section "storcfg volume –show" on page 156).

- The property 'HostAccess' has the value "Restricted" if LUN masking is active for the connected storage port and the volume is visible only via lun-masking.

- The property 'HostAccess' has the value "AllConnected", if the volume is mapped to a storage port without LUN masking enabled. In result every host connected to this storage port can access the volume.

11 Replication tasks

The Replication Service features support the management of mirroring functions:

- local mirroring based on full volume copies (clones and mirrors)
- local mirroring based on pointer based technologies (snaps)
- remote mirroring based on full volume copies

Information and active management of the Replication Service are supported by CLI and WebUI.

The following section is a description based on the StorMan CLI and shows some typical actions to administrate volume level replications from the original to a snap or clone replication.

> Please note that not all functions are supported for all storage system according to their availability by the storage vendor or model specific implementation.

The corresponding WebUI functions are described in the WebUI's help system (refer to section).

11.1 Working with full local (clones and mirrors)

11.1.1 Creating local replication pairs

To start a clone session for local replication or for migration purpose a clone pair is created. After starting the session, the synchronization process from source volume to target volume is started.

```
stormirror -create -mirrortype full -source storid -target storid
          -waitforsync
```

A local replication for a mirror is started with `-mirrortype full` by default, a local replication session for a clone is started with `-mirrortype fullcopy`.

11.1.2 Suspending replication volumes

To use the replication volume of a mirrror pair by a second host or application independently, the replication volume has to be suspended. This action is not required and not supported for clones (-mirrortype fullcopy).

```
stormirror -suspend -source storid -target storid
```

The consistency of data at the point in time of activation must be assured by the application:

When specifying the parameter *-consistent* the CLI stormirror performs a consistent suspend over all replication pairs specified by the list.
The consistency is assured by SMI-S provider as of ETERNUS DX S3 / AF.

11.1.3 Restarting replication pairs

After finishing independent processing of the target volume the replication pair can be restarted. By restarting all modifications done on the target volume are discarded and the changes on the source volume are copied to the target volume.

```
stormirror -restart -source storid -target storid
```

11.1.4 Swapping the source volume – replication volume attributes

The attributes of original and replication volumes can be exchanged. This can be done by using the `-swap` option. As result the former original volume becomes the new clone volume and the former clone volume becomes the original volume. The replication relationship of the pair is kept but the replication direction is inverted.

```
stormirror -swap -source storid -target storid
```

Swapping is not supported for clones with `-mirrortype fullcopy`.

11.1.5 Terminating a replicationpair

A replication pair can be terminated to stop the replication relationship between source volume and target volume. Both volumes can be used independently further on.

```
stormirror -terminate -source storid -target storid
```

11.1.6 Information about replication pairs

The command

```
stormirror -show [ -storid storid ]
```

shows the information about a specific volume specified by its storid and all its replication related information.

11.2 Working with snapshots

11.2.1 Creating snapshot pairs

To start a snap session a snap pair is created by assigning a snap volume to a source volume. For ETERNUS DX/AF systems the snapshot is directly activated and made accessible to the host at creation time. Afterwards a host or application may use the snap volume independent to the source volume.

```
stormirror -create -mirrortype snap -source storid -target snapstorid
```

11.2.2 Restoring the source volume from the snap volume

In case that all changes on the source volume should be discarded, the snap volume can be restored to the source volume. The snap volume remains accessible by host.

```
stormirror -restore  -source storid -target storid
```

11.2.3 Terminating a snap pair

A snap pair can be terminated to stop the snap session between source volume and snapshot. Both volumes can be used independently further on.

```
stormirror -terminate  -source storid -target storid
```

11.2.4 Information about snap pairs

The command

```
stormirror -show [ -storid storid ]
```

shows the information about a specific volume specified by its storid and all its mirroring related information.

11.3 Working with remote mirrors (synchronous and asynchronous)

11.3.1 Creating remote mirror pairs

To start a remote mirror session between two connected storage systems of the same model a remote mirror pair is created. After starting the session the synchronization from source volume to target volume is started. The remote target volume is no longer accessible to host.

```
stormirror -create -mirrortype full –replica remote -source storid
          -target storid -waitforsync
```

11.3.2 Suspending remote target volumes

To use a remote target volume by a second host or application independent to the source volume the remote mirror has to be suspended.

```
stormirror -suspend -source storid -target storid
```

The consistency of data at the point in time of activation must be assured by the application:

11.3.3 Restarting remote mirror pairs

After finishing independent processing of the remote target volume the remote mirror pair can be restarted. By restarting all modifications done on the target volume are discarded and the changes on the source volume are resynchronized to the target volume. The target volume is no longer accessible by host.

```
stormirror -restart -source storid -target storid
```

11.3.4 Swapping the source – target attributes

In case that the attributes of source and target volumes should be changed, this can be done with the swap option. As result the former source volume becomes the new target volume and the former target volume becomes the source volume. The remote mirroring relationship of the pair is kept but the mirroring direction is inverted.

```
stormirror -swap -source storid -target storid
```

11.3.5   Terminating a remote mirror pair

A remote mirror pair can be terminated. As a result the mirroring relationship between source volume and target volume is stopped. Both volumes can be used independently further on.

```
stormirror -terminate -source storid -target storid
```

11.3.6   Information about remote mirror pairs

The command

```
stormirror -show -storid storid
```

shows the information about a specific volume specified by its storid and all its mirroring related information.

12 Statistics and performance tasks

The statistic and performance features supported are suitable for monitoring of storage arrays.

The statistic and performance monitoring features are provided on volume (LUN) level, namely the following:

- reads per second
- writes per second
- MB read per second
- MB write per second
- Response times for read and write IOs
- Cach Hit Rates for read and write IOs
- Average IO times for reads and writes

These features are available only for internal use (in particular openSM2).

For different storage systems the provided statistical data may be different.

For ETERNUS DX/AF storage systems additional statistic data are available.

12.1 Evaluation

As StorMan's `storstat` interface is providing counters and sampled metrics in conjunction with the time stamp representing the absolute collection time for the statistics. The calling application has to calculate and normalize the values to obtain the metrics per second. This can be achieved by periodical calls in time intervals (t_n, t_m) calculating the rates for the delta = t_m - t_n.

1. To calculate the IO and MB values per second please use the following method:

$$\texttt{ReadIOs per second} = \frac{\texttt{delta(ReadIOs)}}{\texttt{delta(statisticTime) [s]}}$$

2. To calculate the average read (or write) times for ETERNUS DX/AF and EMC Symmetrix please use the following method:

$$AverageReadTime\,[\,\mu s\,]\; =\; \frac{delta(SampledReadsTime\,)}{delta(SampledReadsCounter\,)}$$

$$AverageWriteTime\,[\,\mu s\,]\; =\; \frac{delta(SampledWriteTime\,)}{delta(SampledWriteCounter\,)}$$

> ⓘ An evaluation tool has to assure to get statistical data at least once during one sample interval (default values: 3 min for ETERNUS DX/AF, 5 min for EMC Symmetrix).

12.2 Getting statistics

The `storstat` command delivers statistical data (refer to).

The provided statistical data are dependent on the supported storage system:

- For ETERNUS as of DX S3 / AF statistical data are provided via SMI-S.
    - The measurement must be started on the storage system itself (WebUI)
    - The statistical data are delivered as absolute values, there is no sample interval
    - PMCC is not used, therefor no PMCC specific settings required.
- For ETERNUS DX S2 statistical data are provided via PMCC.
    - PMCC must be installed and the settings have to be done as documented
    - The measurement can be started and the sample interval set on the ETERNUS DX S2 or implicetely via StorMan at the first call of storstat.
- For EMC Symmetrix statistical data is provided via SMI-S.

Statistical data for volumes
- Execute the command

```
storstat volume -get -system *308
```

to get the statistic data for all volumes of the storage system with serial number *308 (wildcard specification).

Statistical data for the complete ETERNUS DX/AF
- Execute the command (only available for ETERNUX DX/AF storage)

```
storstat all -get -system *9005
```

to get all available statistic data of the storage system with serial number *9005 (wildcard specification).

13 Provisioning tasks

13.1 LUN masking of Fujitsu ETERNUS DX / AF storage systems

StorMan does not support active LUN masking for DX / AF storage systems. This is normally configured directly on the storage system or by management software ETERNUS SF.

The information about server to storage connection as defined by LUN masking is provided by StorMan.

13.2 LUN masking for EMC Symmetrix VMAX systems

StorMan does not support active LUN masking for EMC Symmetrix VMAX.

LUN masking is configured by EMC product Unisphere for VMAX.

The information about server to storage connection as defined by LUN masking is provided by StorMan.

13.3 LUN masking on EMC VMAX3 systems

For EMC VMAX3 storage systems active LUN masking is configured by EMC product Unisphere for VMAX.

The information about server to storage connection as defined by LUN masking is provided by StorMan.

The EMC VMAX3 comes with a pool structure, because of the full virtual provisioned system and the pre-configuration of resources, as described below:

Storage Resource Pool(s) - SRP
- All user accessible volumes are configured in a SRP for their specific SLA
- The SRPs consist of their assigned Data Pools (Thin Pools) to provide the resources according to SLA

Thin Pools - (Data Pools)
- The components of SRP, each with a specific technology, RAID type, etc.
- Thin Pools are based on a specific assigned Device Storage Pool = Physical Disk Group that contains the physical resources
- References to both SRP and specific Device Storage Pool

Device Storage Pools – (Physical Disk Group)
- The group of physical disks, each with a specific technology, RAID type, etc.
- Assigned one-to-one to a specific Thin Pool of same characteristics

StorMan provides information about of the Thin Pools and the Storage Resource Pools (SRP). The information about the SRPs includes the information about the subjacent Thin Pools.

Example:

```
storcfg system -show -system 000296800293 -showstoragepools
storage system name = 000296800293
  serial number       = 000296800293
  storage vendor      = EMC
  storage model       = Symmetrix
  storage model name  = SYMMETRIX VMAX100K
  OS                  = VMAX OS
  version             = 5977.691.684
  cache size          = 225 GB
  physical disks      = 56
  logical volumes     = 839
  masking enabled     = yes
  preferred CIMOM     = 172.17.40.252
  configuration state = Ok
  storage pool(s)     = SRP_1
                        type            = normal
                        status          = Ok
                        raid type       = UNKNOWN
                        enabled size    = 18267 GB
                        free size       = 17537 GB
                        percent full    = 3
                      DG1_FBA10K
                        type            = thin
                        status          = Ok
                        raid type       = RAID1
                        enabled size    = 4291 GB
                        free size       = 0 KB
                        percent full    = 100
                      DG2_FBA10K
                        type            = thin
                        status          = Ok
```

```
                               raid type        = RAID5
                               enabled size     = 6437 GB
                               free size        = 0 KB
                               percent full     = 100
                         DG3_FBA10K
                               type             = thin
                               status           = Ok
                               raid type        = RAID6
                               enabled size     = 6437 GB
                               free size        = 0 KB
                               percent full     = 100
                         DG4_FBA_F
                               type             = thin
                               status           = Ok
                               raid type        = RAID5
                               enabled size     = 1100 GB
                               free size        = 0 KB
                               percent full     = 100
```

StorMan does not provide information about the disk storage pools and about disks.

14   StorMan for programmers – CLI description

This chapter covers all the StorMan features related to StorMan administration and storage provisioning provided on CLI level.

ℹ️   Please note, that for SE servers on M2000 the CLI is reserved for authorized personnel only.

The StorMan CLI is not required for the information and monitoring features delivered for server management integration except the function `storcfg cimom` to manage the SMI-S provider configuration.

14.1   General

14.1.1   Common CLI aspects

Some aspects are valid for all commands of the StorMan CLI. These are centrally specified in this section in stead for each command.

14.1.1.1   Parameter file

The CLI can read additional command parameters from a file. This can be useful especially for connection parameters that do not change, or if the command line is too short to specify all required parameters. This file must be specified as

`–file file`

The file will be interpreted as a list of specified parameters prior to all other parameters in the command line.

The `-file` option is not designed to contain multiple commands; only additional parameters for a single command can be specified.

Lines beginning with `#` in such a file are interpreted as comments and therefore ignored.

The `-file` option is not mentioned in the syntax diagrams of the individual commands.

14.1.1.2   Format parameter

If the `-show` or `-get` function of a command is specified, the output format can be selected by specifying the `-format` parameter.

-format *format*

> Specifies the output format.
>
> Permitted values: std (default) | short | medium | xml | xmlp.
>
> std selects a multi-line output: Each attribute of an object is displayed on a separate line. This is also the default output format.
>
> short displays only the id / name of an object on a separate line.
>
> medium displays the id / name and some basic properties of an object on a separate line. The value is not supported by storstat.
>
> xml writes the output in xml format in a single line.
>
> xmlp writes the output in xml format, but in a multi-line format for better human readability (pretty print).

14.1.1.3　Connection parameters

All commands need a connection to the StorMan server. The necessary connection parameters are:

-server *stormanserver*

> Specifies the IP address (IPv4 or IPv6) or name of the StorMan server (default: localhost).

-user *user*

> Specifies the StorMan user for validation on the server (default: not specified).

-pwd *pwd*

> Specifies the StorMan password for validation on the server (default: not specified).

-*connectparam*

> substitutes these parameters in the syntax diagrams of the individual commands.

14.1.1.4　Help function

An internal help function is supported for every command by the -help option.

14.1.1.5　Additional common aspects

- If a parameter is specified more than once, the last value will be used.
- Parameters are not case-sensitive. Parameter values are case-sensitive except when specified otherwise. StorIDs and Pool IDs are stored as input with case (for display) but treated without case in all internal search functions.
- If a specified parameter is not supported, the command is rejected.

14.1.2 Common enumeration values

All StorMan commands use a common set of enumerations for input parameters and output values. These enumeration are only provided for show functions with parameter – `format xml/xmlp`. These are described below:

StorMan connection types

The enumeration `STORMAN_CONNECTION_TYPE` represents possible connection type values.

Value	Meaning
STORMAN_CONNECTION_TYPE_ANY	No specific storage type requested
STORMAN_CONNECTION_TYPE_FC	SAN connected by FC
STORMAN_CONNECTION_TYPE_ISCSI	SAN connected by iSCSI
STORMAN_CONNECTION_TYPE_SAS	SAN connected by SAS (serial attached SCSI)
STORMAN_CONNECTION_TYPE_FCoE	SAN connected by FCoE
STORMAN_CONNECTION_TYPE_NAS	NAS connected Storage

StorMan storage models

The enumeration `STORMAN_STORAGE_MODEL` represents a list of supported storage system models.

Value	Meaning
STORMAN_STORAGE_MODEL_ANY	No specific model requested
STORMAN_STORAGE_MODEL_SYMMETRIX	Symmetrix storage system from EMC
STORMAN_STORAGE_MODEL_ETERNUS	ETERNUS DX / AF storage system
STORMAN_STORAGE_MODEL_OTHER	Storage system monitored by specific scripts
STORMAN_STORAGE_MODEL_USER	Storage system registered manually

Storman volume status

The enumeration `STORMAN_VOLUME_STATUS` represents a list of supported of volume status.

Value	Meaning
STORMAN_VOLUME_STATUS_ANY	No specific status requested
STORMAN_VOLUME_STATUS_UNKNOWN	State of volume is not known
STORMAN_VOLUME_STATUS_READY	Storage volume is in status READY
STORMAN_VOLUME_STATUS_NOT_READY	Storage volume is in status NOT_READY
STORMAN_VOLUME_STATUS_READ_ONLY	Storage volume is in status READ_ONLY

Value	Meaning
STORMAN_VOLUME_STATUS_ERROR	Storage volume is in status ERROR

Storman RAID levels

The enumeration STORMAN_RAID_LEVEL represents a list of supported raid levels.

Value	Meaning
STORMAN_RAID_LEVEL_ANY	No specific RAID requested
STORMAN_RAID_LEVEL_UNKNOWN	Unknown RAID level
STORMAN_RAID_LEVEL_DISK	No RAID level
STORMAN_RAID_LEVEL_0	Striped
STORMAN_RAID_LEVEL_1	mirrored disk
STORMAN_RAID_LEVEL_10	mirrored disk with striping
STORMAN_RAID_LEVEL_3	striping with parity
STORMAN_RAID_LEVEL_5	striping with distributed parity
STORMAN_RAID_LEVEL_6	striping with 2 distributed parities

Storman mirror volume usage

The enumeration STORMAN_MIRROR_VOLUME represents a list of supported values for the usage of a volume in mirroring relationships.

Value	Meaning
STORMAN_MIRROR_VOLUME_NONE	Not used for mirroring
STORMAN_MIRROR_VOLUME_ORIG_LOCAL	Used as original in local mirroring relationship
STORMAN_MIRROR_VOLUME_MIRROR_LOCAL	Used as local mirror
STORMAN_MIRROR_VOLUME_ORIG_REMOTE	Used as original in remote mirroring relationship
STORMAN_MIRROR_VOLUME_MIRROR_REMOTE	Used as remote mirror
STORMAN_MIRROR_VOLUME_UNKNOWN	Unknown mirroring relationship
STORMAN_MIRROR_VOLUME_ANY	No specific mirroring requested

Storman mirror type usage

The enumeration STORMAN_MIRROR_TYPE represents a list of supported values for the mirroring type.

Value	Meaning
STORMAN_MIRROR_TYPE_NONE	No mirror type
STORMAN_MIRROR_TYPE_SNAP	Used as snap
STORMAN_MIRROR_TYPE_FULL	Used as full mirror
STORMAN_MIRROR_TYPE_FULL_COPY	Used as clone
STORMAN_MIRROR_TYPE_UNKNOWN	Unknown mirror information

Storman mirror replica usage

The enumeration STORMAN_MIRROR_REPLICA represents a list of supported values for the replica location.

Value	Meaning
STORMAN_MIRROR_REPLICA_NONE	No replica
STORMAN_MIRROR_REPLICA_LOCAL	Used as local replica
STORMAN_MIRROR_REPLICA_REMOTE	Used as remote replica

Storman mirror remote replication mode

The enumeration STORMAN_REMOTE_COPY_MODE represents a list of supported values for the remote replication mode.

Value	Meaning
STORMAN_REMOTE_COPY_MODE_UNKNOWN	Unknown remote replication mode
STORMAN_REMOTE_COPY_MODE_ANY	Remote replication mode not specified
STORMAN_REMOTE_COPY_MODE_SYNC	Synchronous remote replication mode
STORMAN_REMOTE_COPY_MODE_ASYN	Asynchronous, conisitent remote replication mode
STORMAN_REMOTE_COPY_MODE_ASYNC_STAC	Asynchronous stack mode (ETERNUS DX/AF)
STORMAN_REMOTE_COPY_MODE_ASYNC_THROUGH	Asynchronous through mode (ETERNUS DX/AF)

Storman mirror pair status

The enumeration STORMAN_MIRROR_PAIR_STATUS represents a list of supported of volume status.

Value	Meaning
STORMAN_MIRROR_PAIR_STATUS_ INITIALIZING	Mirror pair is in initialization
STORMAN_MIRROR_PAIR_STATUS_INITIALIZED	Mirror pair is initialized
STORMAN_MIRROR_PAIR_STATUS_FAILED	Mirror pair is broken after a failure
STORMAN_MIRROR_PAIR_STATUS_TERMINATING	Mirror pair is in termination
STORMAN_MIRROR_PAIR_STATUS_RESTORING	Mirror pair is restoring to original
STORMAN_MIRROR_PAIR_STATUS_RESYNCING	Mirror pair is resyncing to mirror
STORMAN_MIRROR_PAIR_STATUS_SPLIT	Mirror pair is split but out of synch, the mirror is accessible from host
STORMAN_MIRROR_PAIR_STATUS_SPLIT_AND_ SYNC	Mirror pair is split and synchronized, the mirror is accessible from host
STORMAN_MIRROR_PAIR_STATUS_SUSPENDED	Mirror pair is suspended, the mirror is not accessible from host
STORMAN_MIRROR_PAIR_STATUS_FAILED_OVER	Mirror pair is failed over, only the mirror is accessible from host.
STORMAN_MIRROR_PAIR_STATUS_ SYNCHRONIZING	Mirror pair is synchronizing
STORMAN_MIRROR_PAIR_STATUS_ SYNCHRONIZED	Mirror pair is synchronized, the mirror is not accessible from host
STORMAN_MIRROR_PAIR_STATUS_NOT_ APPLICABLE	Mirror pair status is not applicable to the pair
STORMAN_MIRROR_PAIR_STATUS_WAIT_FOR_ SYNC	Mirror pair is waiting for synchronization
STORMAN_MIRROR_PAIR_STATUS_PARTITIONED	Mirror pair is partitioned
STORMAN_MIRROR_PAIR_STATUS_BROKEN	Mirror pair is broken
STORMAN_MIRROR_PAIR_STATUS_SPLIT_NOT_ CONSISTENT	Mirror pair is split during a synchronization process, the mirror is accessible from host, but data is not consistent
STORMAN_MIRROR_PAIR_STATUS_SPLIT_NOT_ CONSISTENT	Mirror pair is split during a synchronization process, the mirror is accessible from host, but data is not consistent

14.1.3   Common supported value ranges

All StorMan commands have some common parameters with a defined range of supported values specified below:

Value	Meaning and supported values
ip | hostip	**IP address**: a string of 4 decimal numbers delimited by '.' each in the range from 0 to 255 or ipV6
hostname	**host name**: a string containing alphabetic characters ('A', 'B',... 'Z', 'a', 'b',... 'z', numbers and other signs except: '\', '/', '*', '? ', '"', '<', '>', '|', ' '. Internally it is not case-sensitive.
poolid	**pool ID**: a string starting with an alphabetic character ('A', 'B',... 'Z', 'a', 'b',... 'z' followed by up to 254 alphabetic characters, numbers, '_' or '.'. The pool ID must be unique. Internally it is not case-sensitive.
storid	**storage ID** (storID): a string starting with an alphabetic character ('A', 'B', ..., 'Z', 'a', 'b', ..., 'z') followed by up to 254 characters, numbers, '+', '-', '_' or '.' It should not start with prefix 'SM_' (regardless of case) as this is reserved for internal use. Internally it is not case-sensitive
wwpn	**WWPN**: a string of 16 or 32 hexadecimal numbers delimited by ':', '-' or without delimiter

The wildcard '*' is supported for alphabetic character strings as specified in the CLI description. Generally it can be used at any place of the string.

On Linux systems strings that do not contain only letters and numbers, must be enclosed in quotation marks (eg "#all").

14.2 storadmin

The `storadmin` command provides specific functions to administrate StorMan on Linux platforms (including M2000):

- `storadmin configsrv` collects host information and saves it to StorMan repository for SE Server Units and Application Units (on M2000 only)
- `storadmin getlogs` collects diagnostic information in an archive
- `storadmin remlogs` removes all internal log files

On M2000 the `storadmin` functions are available for administrator and service accounts. The parameters `-user` and `-pwd` specify the StorMan user authorization (not required for M2000).

`-user user`

Specifies the user for validation on the server (default: not specified).

`-pwd pwd`

Specifies the password for validation on the server (default: not specified).

14.2.1 storadmin configsrv

This function is supported on M2000 for SE servers only.

Collects all server names and IP addresses and further attributes of the Server Units and Application Units on the SE server and adds the obtained host information to the StorMan repository.

This is especially helpful during the initial setup, but also to detect server configuration changes later on.

Syntax

```
storadmin configsrv
```

There are no further parameters.

Return codes

Error Code	Error Type
0	Function successful
1	Parameter Error
3	Function not supported
4	Function not successful

Example

```
storadmin configsrv
```

Check the result with:

```
storcfg host -show
```

14.2.2 storadmin getlogs

Collects all diagnostic information in a g-zipped tar archive.

The resulting file is located at:

- `/home/service/storManLogs_<uname>_YYYY.MM.DD_HHMMSS.tar.gz` for M2000
- `/tmp/storManLogs_<uname>_YYYY.MM.DD_HHMMSS.tar.gz` for Linux.

> ℹ Please note that `storadmin getlogs` automatically removes previously created diagnostic information (zipped tar archive) before collecting diagnostic information. Therefor previously created StorMan log files should be saved if needed, before calling `storadmin getlogs`.

For service support the resulting file can be located at a directory specified by special parameter `-targetdir`. If specifying `-targetdir` the resulting file should be removed after usage.

Syntax

```
storadmin getlogs [ -user user -pwd pwd ] [-targetdir]
```

Parameters -user and -pwd are not required on M2000. There are no further parameters.

14.2.3 storadmin remlogs

Removes all internal log files.

Syntax

```
storadmin remlogs [ -user user -pwd pwd ]
```

Parameters -user and -pwd are not required on M2000. There are no further parameters.

14.3   storauth

The `storauth` command is used to manage the StorMan user authentification and StorMan roles.

```
storauth object -function -functionparam ... -connectparam ...
```

The first parameter specifies the object group of the repository that is configured:

First parameter *object*	Object
`user`	StorMan user

The second parameter specifies the function. Most commands support at least the following functions:

Second parameter *function*	Meaning
`-add`	adds an object to the repository
`-mod`	modifies the properties of an object
`-rem`	removes an object from the repository
`-show`	shows the attributes of one or more object(s)

If the `-show` function is specified, the output format can be selected by specifying the `-format` parameter.

14.3.1   storauth user

`storauth user` is used to manage StorMan user authentification. This command is restricted to the administrator of StorMan.

After initialization, this command should be used to restrict the access tor StorMan server.

```
storauth user -function -functionparam ... -connectparam ...
```

Functions

The *–function* parameter supplies one of the following functions:

`-add`

   defines a new user and his authorization in the StorMan administration

`-mod`

   modifies the attributes of an existing StorMan user

`-rem`

    removes a StorMan user from the administration

`-show`

    displays information related to StorMan users

14.3.1.1   storauth user –add

Adds a new user to the StorMan administration and defines its access password. Additionally it assigns the StorMan roles that entitle the StorMan user for a specific set of functions and StorMan pools (storage resources).

Syntax

```
storauth user -add -name user [-passwd passwd] -role role
               [-poolids poolid [,...]] -connectparam ...
```

Parameters

`-name user`

    Specifies the new StorMan user.

`-passwd passwd`

    Specifies the password for the new StorMan user. On M2000 no password is specified for the StorMan user.

`-role role`

    Specify the predefined StorMan role (`StorAdmin`, `PoolAdmin` or `Info`).

`-poolids poolid[,...]`

    Specifies a list of storage pool IDs. Refer to the common description.

    The parameter is only supported for StorMan role PoolAdmin, otherwise rejected.

    If the operand is not specified no storage pools are assigned. The whole storage configuration visible by StorMan is enabled by default for StorMan role StorAdmin.

    The pool ID *#all* enables the user's StorMan roles for all storage pools configured in (managed by) StorMan.

    Wildcards (*) are supported as suffix to specify multiple pool IDs (e.g. HA_* specifies all pool IDs starting with HA_...).

`-connectparam`

    Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	`STORMAN_OK`	Function successful.
3	`STORMAN_VER_NOT_SUPP`	Version not supported.
7	`STORMAN_INV_PARAMETERS`	Specified parameters invalid.
13	`STORMAN_COMMUNIC_ERROR`	Error in StorMan communication between client and server
16	`STORMAN_FAULT`	Unexpected error in function.
20	`STORMAN_ALREADY_EXISTS`	Object already exists in repository
22	`STORMAN_RESOURCE_NOT_AVAILABLE`	CIM server or database not available
36	`STORMAN_AUTH_FAILED`	User / password for StorMan not valid

14.3.1.2 storauth user –mod

Modifies the attributes and authorization of a user already contained in the StorMan repository.

This command is restricted to the administrator i.e. StorMan users disposing of the role StorAdmin. Only the function to change the user's own password is supported for every StorMan user

If a parameter is not specified, the corresponding attribute is not changed.

Syntax

```
storauth user –mod –name user [–passwd passwd ] [–newpasswd newpasswd ]
      [–newrole  role] [–newpoolids poolid [,...]]  –connectparam ...
```

Parameters

–name *user*

Specifies the StorMan user to be modified.

–passwd *passwd*

Specifies the password of the StorMan user to be modified. On M2000 no password is specified for the StorMan user.

–newpasswd *newpasswd*

Specifies a new password for the specified StorMan user.

–newrole *role*

Specify a new role for the StorMan user (`StorAdmin`, `PoolAdmin` or `Info`). Any eventually existing StorMan role is replaced by the new one.

StorMan role `StorAdmin` cannot be replaced if there is only one StorMan user with this role.

–newpoolids *poolid*[,...]

Replaces storage pool IDs from the user's manageable storage pools. Specifies a list of storage pool IDs.

Any eventually existing storage pool IDs in the list of user's manageable storage pools are replaced.

The pool ID #all enables the user's roles for all storage pools configured in StorMan.

Wildcards (*) are supported as suffix to specify multiple pool IDs (e.g. HA_* specifies all pool IDs starting with HA_...).

–connectparam

Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
3	STORMAN_VER_NOT_SUPP	Version not supported.
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid.
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function.
18	STORMAN_NOT_FOUND	Specified host could not be found.
20	STORMAN_ALREADY_ EXISTS	Object already exists in repository
22	STORMAN_RESOURCE_ NOT_ AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.3.1.3   storauth user –rem

Removes a StorMan user from the StorMan user administration. All StorMan roles and storage pool assignments to the StorMan user are removed too. This command is restricted to the administrator i.e. StorMan users disposing of the role `StorAdmin`.

Syntax

```
storauth user –rem –name user –connectparam ...
```

Parameters

–name *user*

> Specifies the StorMan user to be removed from StorMan.
>
> Removing the last StorMan user with StorMan role `StorAdmin` is inhibited as long as there is still any other user in StorMan administration.
>
> After removing the last user `storadmin` the complete StorMan functions are available again for all connecting StorMan servers. No more authorization checks are done.

–*connectparam*

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
3	STORMAN_VER_NOT_SUPP	Version not supported.
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid.
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function.
18	STORMAN_NOT_FOUND	Specified host could not be found.
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.3.1.4   storauth user –show

Displays information related to the specified StorMan user.

Syntax

```
storauth user -show [ -name user ] [ -format format ]
             -connectparam ...
```

Parameters

-name *user*

> Selects the StorMan user to be listed. If -name is not specified all StorMan users are listed.

All parameters above can be specified partially using '*' as wildcard.

-format *format*

> Specifies the output format. Refer to the description of the "Format parameter" on page 91.

-connectparam

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
3	STORMAN_VER_NOT_SUPP	Version not supported.
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid.
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function.
22	STORMAN_RESOURCE_NOT_ AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

Example

Output for user with `-format std` (default)

```
storauth user –show –name my*
```

```
user      myself
  roles:
      StorPoolAdmin
  pool IDs:
      HA_sq210_x
      HA_sq210_y
```

Output for user with `-format xmlp`

```
storauth user -show -name s* -format xmlp
<Response>
  <ReturnCode>
    <Code>STORMAN_OK</Code>
    <CodeNumber>0</CodeNumber>
    <Text>successful</Text>
    <SubCode>0</SubCode>
    <SubCodeText>STORMAN_SUB_NONE</SubCodeText>
    <MessageID>53850</MessageID>
  </ReturnCode>
  <Result>
    <Authorizations>
      <Authorization>
        <Account>service</Account>
        <Roles>
          <Role>STORMAN_USER_ROLE_STOR_ADMIN</Role>
        </Roles>
        <PoolIDs>
        </PoolIDs>
      </Authorization>
      <Authorization>
        <Account>storadm</Account>
        <Roles>
          <Role>STORMAN_USER_ROLE_INFO</Role>
        </Roles>
        <PoolIDs>
        </PoolIDs>
      </Authorization>
    </Authorizations>
  </Result>
</Response>
```

14.4   storcheck

Checks the availability of the StorMan server. The check covers the availability of the StorMan server itself, its database, and if at least one of the configured management instances (CIM-OMs, SMI-S provider) is accessible.

The result message of the check is directed to stdout and the exit code is set (see return codes below).

Syntax

```
storcheck -connectparam ...
```

Parameters

-connectparam

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Text	Error Type
0	OK	Everything OK
1	StorMan not reachable	The StorMan server is not reachable
2	No Database	The StorMan server is running but the database has failed
3	No CIM-OM	The StorMan server is running and the database is up but no CIM-OM is reachable
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5 storcfg

The `storcfg` command is used to configure the StorMan repository.

```
storcfg object –function –functionparam ... –connectparam ...
```

The first parameter specifies the object group of the repository that is configured:

First parameter *object*	Object
host	hosts / servers in the confguration
cimom	Management instance (e.g.CIM Object Manager)
system	storage systems managed by StorMan
pool	pools to organize logical volumes
volume	logical volumes

The second parameter specifies the function. Most commands support at least the following functions:

Second parameter *function*	Meaning
–add	adds an object to the repository
–discover	starts a discovery for the object to update the configuration
–mod	modifies the properties of an object
–rem	removes an object from the repository
–show	shows the attributes of one or more object(s)

If the `–show` function is specified, the output format can be selected by specifying the `–format` parameter.

14.5.1 storcfg host

`storcfg host` is used to manage host information in a StorMan configuration. The host information is required to display a storage volume with its server to storage connections. The host information provides a server oriented view on the storage resources.

```
storcfg host –function –functionparam ... –connectparam ...
```

Functions

The `–function` parameter supplies one of the following functions:

`-add`

>   adds a new host to the StorMan repository

`-mod`

>   modifies the attributes of a host already contained in StorMan repository

`-rem`

>   removes a host from the StorMan repository

`-show`

>   displays information related to hosts

14.5.1.1   storcfg host –add

Adds a new host to the StorMan repository.

Syntax

```
storcfg host -add { -name hostname | -ip ip[,...] }
                  [ -wwpn wwpn[,...] ] [ -iqn iqn[,...] ]
                  -connectparam ...
```

Parameters

`-name hostname`

>   Specifies the name of the host.
>
>   Refer to the common description of "hostname" in chapter "Common supported value ranges" on page 97.

`-ip ip[,...]`

>   Specifies a list of IP addresses delimited by comma. If no hostname is specified, one of the IP addresses is used as hostid.

`-wwpn wwpn[,...]`

>   Specifies a list of WWPNs delimited by comma.

`-iqn iqn[,...]`

>   Specifies a list of IQNs for iSCSI connected storage delimited by comma.

`-connectparam`

>   Refer to the description of the "Connection parameters" on page 92.

At least one of the parameters `-name` or `-ip` must be specified and have a non-empty value.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
20	STORMAN_ALREADY_ EXISTS	Object already exists in repository
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5.1.2   storcfg host –mod

Modifies the attributes of a host already contained in the StorMan repository.

If a parameter is not specified, the corresponding attribute is not changed.

Syntax

```
storcfg host -mod {-name hostname | -ip ip | -wwpn wwpn | -iqn iqn}
                [ -newname hostname ]
                { -newip ip[,...] | -addip ip | -remip ip }
                { -newwwpn wwpn[,…] | -addwwpn wwpn | -remwwpn wwpn }
                { -newiqn iqn[,...] | -addiqn iqn | -remiqn iqn }
                -connectparam ...
```

Parameters

-name *hostname*

   Identifies the host by its name.

-ip *ip*

   Identifies the host by an IP address belonging to the host.

-wwpn *wwpn*

   Identifies the host by a WWPN belonging to the host.

-iqn *iqn*

> Identifies the host by a IQN belonging to the host.
>
> Exactly one of the parameters -name, -ip, -wwpn or -iqn must be specified to identify the host.

-newname *hostname*

> Specifies the new name of the host. If the -newname is specified without a value, the name is removed.
>
> Refer to the common description of "hostname" in chapter "Common supported value ranges" on page 97.

-newip *ip*[,...]

> Specifies a list of IP addresses delimited by comma. If no hostname is specified, one of the IP addresses is used as hostid.

-addip *ip*[,...]

> Assigns a single IP address to the host.

-remip *ip*

> Deassigns a single IP address from the host.

-newwwpn *wwpn*[,…]

> Assigns a list of WWPNs delimited by comma to assign to the host.

-addwwpn *wwpn*

> Assigns a single WWPN to the host.

-remwwpn *wwpn*

> Deassign a single WWPN from the host.

-newiqn *iqn*[,…]

> Assigns a list of IQNs delimited by comma to assign to the host.

-addiqn *iqn*

> Assigns a single IQN to the host.

-remiqn *iqn*

> Deassigns a single IQN from the host.

-*connectparam*

> Refer to the description of the "Connection parameters" on page 92.

Only one of the parameters -newip, -addip or -remip can be specified to modify the IP address assignment to the host. Combined input of these parameters is rejected with STORMAN_INV_PARAMETERS. If a specified IP address is already assigned to a different host, the (re)assignment of this IP address is rejected with return code STORMAN_ALREADY_ EXISTS.

Only one of the parameters -newwwpn, -addwwpn or -remwwpn can be specified to modify the WWPN assignment to the host. Combined input of these parameters is rejected with

STORMAN_INV_PARAMETERS. If a specified WWPN is already assigned to a different host, the (re)assignment of this WWPN is rejected with return code STORMAN_ALREADY_EXISTS.

Only one of the parameters -newiqn, -addiqn or -remiqn can be specified to modify the IQN assignment to the host. Combined input of these parameters is rejected with STORMAN_INV_PARAMETERS. If a specified IQN is already assigned to a different host, the (re)assignment of this IQN is rejected with return code STORMAN_ALREADY_EXISTS.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Specified host could not be found
20	STORMAN_ALREADY_ EXISTS	Object already exists in repository
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5.1.3   storcfg host –rem

Removes a host from the StorMan repository. If this host is also acting as a CIM-OM, it is also removed from repository.

Syntax

```
storcfg host -rem {-name hostname | -ip ip | -wwpn wwpn | -iqn iqn}
                 -connectparam ...
```

Parameters

-name *hostname*

> Identifies the host by its name. This parameter supports wildcards (*).

-ip *ip*

> Identifies the host by an IP address belonging to the host.

-wwpn *wwpn*

> Identifies the host by a WWPN belonging to the host.

-iqn *iqn*

> Identifies the host by a IQN belonging to the host.

Exactly one of the parameters -name, -ip, -wwpn or -iqn must be specified with a non-empty value to identify the host.

-connectparam

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Specified host could not be found
22	STORMAN_RESOURCE_ NOT_ AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5.1.4   storcfg host –show

Displays information related to the specified hosts.

Syntax

```
storcfg host -show { -name hostname | -ip ip | -wwpn wwpn |-iqn iqn }
           [ -format format ]  -connectparam ...
```

Parameters

`–name hostname`

> Selection by the name of the host.

`–ip ip`

> Selection by the IP address of the host.

`–wwpn wwpn`

> Selection by the WWPN of a host

`–iqn iqn`

> Selection by the IQN of a host.

All parameters above can be specified partially using * as wildcard. Using only * selects all hosts with this specific attribute supplied, regardless of its value. (e.g. –iqn * selects all hosts with iSCSI connectivity).

`–format format`

> Specifies the output format. Refer to the description of the "Format parameter" on page 91.

`–connectparam`

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function

Error Code	Name	Error Type
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

Examples

1. Output for hosts with `-format std` (default)

```
storcfg host -show -name d*


    hostID type name
    hostID      D021ZE01
      hostname      D021ZE01
      hosttype      SU390
      host model    SE SERVER SU700
      OS            BS2000 OSD/BC V11.0A
      FQDN          D021ZE01.abg.fsc.net
      SE Server     SE-Server-2
      SE Model      SE700
      SE Unit model SU700
      no IPs found
      WWPNs:
          00C90FF003000000
          0100000000000000
          5000000000000000
          7061737377640000
          B84F030000000000
          E0C70FF000000000
          E0D17D16627F0000
          F02B9F17627F0000
          F8F0F040C1F040F0
    no IQNs found
```

2. Output for hosts with `-format medium`

storcfg host -show -name d* -format medium

```
    D021ZE01 WWPNs:00C90FF003000000,0100000000000000,5000000000000000
```

3. Output for hosts with `-format xmlp`

storcfg host -show -name d* -format xmlp

```
    <Response>
      <ReturnCode>
        <Code>STORMAN_OK</Code>
```

```
            <CodeNumber>0</CodeNumber>
            <Text>successful</Text>
            <SubCode>0</SubCode>
            <SubCodeText>STORMAN_SUB_NONE</SubCodeText>
            <AdditionalInformation/>
            <MessageID>4307</MessageID>
            <ConnectionID>55525B9BAC7A3</ConnectionID>
        </ReturnCode>
        <Result>
          <Hosts>
            <Host>
                <HostIDType>STORMAN_HOSTID_TYPE_NAME</HostIDType>
                <HostID>D021ZE01</HostID>
                <HostName>D021ZE01</HostName>
                <HostType>SU390</HostType>
                <HostModel>SE SERVER SU700</HostModel>
                <HostOs>BS2000 OSD/BC V11.0A</HostOs>
                <HostFQDN>D021ZE01.abg.fsc.net</HostFQDN>
                <HostSEServer>SE-Server-2</HostSEServer>
                <HostSEModel>SE700</HostSEModel>
                <SeUnitModel>SU700</SeUnitModel>
                <HostSEEnsemble/>
                <IsInternalCim>false</IsInternalCim>
                <IsActionAllowed>true</IsActionAllowed>
                <IPs>
                </IPs>
                <WWPNs>
                  <WWPN>00C90FF003000000</WWPN>
                  <WWPN>0100000000000000</WWPN>
                  <WWPN>5000000000000000</WWPN>
                  <WWPN>7061737377640000</WWPN>
                  <WWPN>B84F030000000000</WWPN>
                  <WWPN>E0C70FF000000000</WWPN>
                  <WWPN>E0D17D16627F0000</WWPN>
                  <WWPN>F02B9F17627F0000</WWPN>
                  <WWPN>F8F0F040C1F040F0</WWPN>
                </WWPNs>
                <IQNs>
                </IQNs>
                <ConnectedStorageSystems>
                </ConnectedStorageSystems>
            </Host>
          </Hosts>
        </Result>
    </Response>
```

14.5.2   storcfg cimom

`storcfg cimom` is used to manage CIM Object Manager information as management instance for SMI-S controlled storage systems in the StorMan repository.

```
storcfg cimom –function –functionparam ... –connectparam ...
```

Functions

The *–function* parameter supplies one of the following functions:

`–add`

> adds a new CIM-OM (SMI-S provider) information to the StorMan repository

`–mod`

> modifies the attributes of an existing CIM-OM (SMI-S provider) in the StorMan repository

`–rem`

> removes CIM-OM (SMI-S provider) information from the StorMan repository

`–discover`

> requests to discover the CIM-OM (SMI-S provider) all available storage systems

`–show`

> displays information related to hosts hosting CIM-OMs (SMI-S providers)

14.5.2.1   storcfg cimom –add

Adds the a CIM-OM (SMI-S provider) information to the StorMan repository. The discovery process for the storage system is started automatically and will periodically refresh the configuration in the background.

Syntax

```
storcfg cimom -add –ip ip [–http port | –https port ]
            [ –cimuser user ] [ –cimpwd pwd ]–connectparam ...
```

Parameters

`–ip ip`

> Specifies the IP address of the host the CIM-OM is running on.
>
> Refer to the common description of `ip` in section "Common supported value ranges" on page 97.

`–http port`

> Specifies the port the CIM-OM is listening on
> (typically: if –https is not specified: 5988 for interface type smis).

`–https port`

Specifies the secure port the CIM-OM is listening on (typically: 5989).

`–cimuser user`

Specifies the user for the CIM-OM connection (default: none).

`–cimpwd pwd`

Specifies the password for the CIM-OM connection (default: none).

At least the parameter `-ip` must be specified. If no host with the specified ip exists in the StorMan repository, a new host is added.

Only one of the port types `-http` or `-https` can be specified.

The cimuser and cimpwd must be specified for the StorMan repository with the function `storcfg cimom -add` or `storcfg cimom -mod`.

- For FUJITSU embedded SMI-S provider `cimuser` / `cimpwd` are the user name and password with role software administration defined in the storage system.
- For EMC's SMI-S provider `cimuser` / `cimpwd` is a user/password combination that is configured and mandatory for the specified CIM server (refer to the vendor specific Installation Guides for information on how to add a cimuser).

`–connectparam`

Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
2	STORMAN_NOT_COMPLETE	Function only partly completed
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
20	STORMAN_ALREADY_EXISTS	Object already exists in repository
22	STORMAN_RESOURCE_NOT_AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5.2.2   storcfg cimom –mod

Modifies the attributes of an existing CIM-OM (SMI-S provider) in the StorMan repository.

If a parameter is not specified, the corresponding attribute is not changed.

Any combination of the parameters `ip` and `http` or `https` which uniquely identifies the CIM-OM may be used to specify the CIM-OM to be modified.

A discovery process for the concerned storage system(s) is started automatically and will periodically refresh the configuration in the background.

To change the name or IP address of the CIM-OM, please use the function `storcfg host –mod`.

Syntax

```
storcfg cimom -mod -ip ip [-http port |-https port]
                [ -newhttp port | -newhttps port ] [ -newuser user ]
                [ -newpwd pwd ]] -connectparam ...
```

Parameters

`-ip ip`

> Specifies the IP address of the host the CIM-OM is running on.

`-http port`

> Specifies the port the CIM-OM is listening on.

`-https port`

> Specifies the secure port the CIM-OM is listening on.

`-newhttp port`

> Specifies the new port the CIM-OM is listening on.

`-newhttps port`

> Specifies the new secure port the CIM-OM is listening on.

`-newuser user`

> Specifies the new user for the CIM-OM connection.

`-newpwd pwd`

> Specifies the new password for the CIM-OM connection.

At least the parameter `-ip` must be specified to select the CIM-OM.

`-connectparam`

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	`STORMAN_OK`	Function successful
2	`STORMAN_NOT_COMPLETE`	Function only partly completed
3	`STORMAN_VER_NOT_SUPP`	Version not supported
7	`STORMAN_INV_` `PARAMETERS`	Specified parameters invalid
13	`STORMAN_COMMUNIC_` `ERROR`	Error in StorMan communication between client and server
16	`STORMAN_FAULT`	Unexpected error in function
18	`STORMAN_NOT_FOUND`	Specified host was not found
22	`STORMAN_RESOURCE_` `NOT_` `AVAILABLE`	CIM server or database not available
36	`STORMAN_AUTH_FAILED`	User / password for StorMan not valid

14.5.2.3   storcfg cimom –rem

Removes the CIM-OM (SMI-S provider) from the StorMan repository. The storage arrays and their corresponding pools managed by the removed CIM-OM are not removed from the repository as a further CIM-OM may be or may become available for management. The host information remains in the StorMan repository; only the definition of the CIM-OM is removed.

Any combination of the parameters `ip` and `http` or `https` which uniquely identifies the CIM-OM may be used to specify the CIM-OM to be removed.

Syntax

```
storcfg cimom –rem –ip ip [-http port | -https port]
                –connectparam ...
```

Parameters

`–ip` *ip*

    Specifies the IP address of the host the CIM-OM is running on.

`–http` *port*

    Specifies the port the CIM-OM is listening on.

`–https` *port*

    Specifies the secure port the CIM-OM is listening on.

–connectparam

Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Specified host was not found
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5.2.4 storcfg cimom –discover

Connects to the SMI-S provider (CIM-OM) for managed storage systems and starts an update process in the background to get or update all the configuration data of all storage The background function may take some time depending on the number of connected storage systems and their complexity.

Any combination of the parameters ip and http or https which uniquely identifies the CIM-OM may be used to specify that the CIM-OM should discover storage systems. If these parameters are omitted all CIM-OMs of the repository are updated.

ⓘ When adding a new CIM-OM or modifying a CIM-OM's attributes with storcfg cimom –add or storcfg cimom –mod a discovery is started automatically for all concerned storage systems.

Syntax

```
storcfg cimom -discover -ip ip [-http port | -https port]
                    -connectparam ...
```

Parameters

–ip ip

Specifies the IP address of the host the CIM-OM is running on.

–http *port*

> Specifies the port the CIM-OM is listening on.

–https *port*

> Specifies the secure port the CIM-OM is listening on.

–connectparam

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Specified host was not found
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
25	STORMAN_CIMOM_AUTH_ FAILED	User / password for CIM server not valid. If the CIM server supports authentication.
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5.2.5   storcfg cimom –show

Displays information about CIM-OMs (SMI-S providers).

Syntax

```
storcfg cimom –show [ –system system ] [ –ip ip ]
        [ –http port | –https port ] [ –showsystems ]
        [ –format format ] –connectparam ...
```

Parameters

`–system` *system*

Specifies the storage system name and selects all CIM-OMs managing the respective storage system(s). This parameter supports wildcards (*). If the parameter is not specified, all CIM-OMs in StorMan repository are displayed.

`–ip` *ip*

Selects the CIM-OM by its IP address.

`–http` *port*

Selects the CIM-OM by the listening port.

`–https` *port*

Selects the CIM-OM by the listening secure port.

`–showsystems`

Selects and list all storage systems managed by a CIM-OM.

`–format` *format*

Specifies the output format. Refer to the description of the "Format parameter" on page 91.

`–connectparam`

Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Specified host was not found
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

Examples

1. Output for CIM-OMs with `-format std` (default)

   storcfg cimom -show

   ```
   hostID type IP
   hostID      192.1.0.0
     hostname
     IP          192.1.0.0
     http port   5988
     user        root
     connection  OK
     interface   SMIS
     vendor      FUJITSU
     version     V04L00-0000
   ```

2. Output for CIM-OMs with `-format medium`

   storcfg cimom -show -format medium

   ```
   192.1.0.0 connection=Ok version=V05L00-0000
   ```

3. Output for CIM-OMs with `-format=xmlp`

   storcfg cimom -show -format xmlp

   ```
   <Response>
     <ReturnCode>
       <Code>STORMAN_OK</Code>
       <CodeNumber>0</CodeNumber>
       <Text>successful</Text>
       <SubCode>0</SubCode>
       <SubCodeText>STORMAN_SUB_NONE</SubCodeText>
       <AdditionalInformation/>
       <MessageID>4320</MessageID>
       <ConnectionID>55525CB8C9CB3</ConnectionID>
     </ReturnCode>
     <Result>
       <CIMOMs>
         <CIMOM>
           <HostIDType>STORMAN_HOSTID_TYPE_IP</HostIDType>
           <HostID>192.1.0.0</HostID>
           <HostName/>
           <OwnIP>192.1.0.0</OwnIP>
           <IP>172.17.40.174</IP>
           <PortHttp>5988</PortHttp>
           <PortHttps/>
           <User>root</User>
           <SnmpCommunity/>
   ```

```
                    <InteropNamespace>interop</InteropNamespace>
                    <CliName/>
                    <CliRefreshTime/>
                    <AuthorizationType>2</AuthorizationType>
                    <CliInitSuccessful>false</CliInitSuccessful>
                    <ConnectStatusValue>4</ConnectStatusValue>
                    <ConnectStatus>STORMAN_CIMOM_CONNECT_OK</ConnectStatus>
                    <InterfaceType>STORMAN_INTERFACE_TYPE_SMIS</InterfaceType>
                    <StorageModel>ETERNUS_DX</StorageModel>
                    <Vendor>FUJITSU</Vendor>
                    <VersionString>V04L64-0000</VersionString>
                    <IsProxyProvider>no</IsProxyProvider>
                    <DiscoverPending>false</DiscoverPending>
                    <IndicationsAnnounced>false</IndicationsAnnounced>
                    <NextIndicationRetry/>
                    <StorageSystems>
                    </StorageSystems>
                </CIMOM>
            </CIMOMs>
        </Result>
    </Response>
```

14.5.3 storcfg system

`storcfg system` is used to manage the storage systems in the StorMan repository.

The `-add` function is not supported because storage systems are automatically added to the StorMan repository only as a result of a `storcfg cimom -add | -discover` call.

```
storcfg  system -function -functionparam ... -connectparam ...
```

Functions

The `-function` parameter supplies one of the following functions:

`-rem`

removes the storage system from the StorMan repository

`-discover`

requests to rediscover the storage system, i.e. to completely update the configuration data of the specified storage system

`-mod`

sets or modifies the user access to the storage systems to access performance data for ETERNUS DX S2 systems only (via PMCC)

`-show`

displays information related to the storage systems

14.5.3.1 storcfg system –rem

Removes the storage system from the StorMan repository.

If pools are defined for the storage system concerned, they are also completely removed from the StorMan repository together with their logical volumes. Therefore the contents of the pools (logical volumes and their assigned storIDs) can no longer be managed by StorMan.

The configuration of the storage system and its assignment to servers is not touched by this function.

Syntax

```
storcfg system -rem -system system  -connectparam ...
```

Parameters

–system *system*

> Specifies the system name of the storage system to be removed. This parameter is mandatory and supports wildcards (*).

–*connectparam*

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5.3.2 storcfg system –discover

Storman starts a discovery of the storage system (i.e. the complete configuration data of the specified storage system is updated).

The discovery is processed by the appropriate CIM-OM in StorMan's configuration

Syntax

```
storcfg system -discover -system system  -connectparam ...
```

Parameters

–system *system*

> Specifies the system name of the storage system to discover. This parameter is mandatory and does **not** support wildcards (*).

–*connectparam*

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Matching object could not be provided
21	STORMAN_FCT_NOT_POSSIBLE	Function not supported
22	STORMAN_RESOURCE_NOT_AVAILABLE	CIM server or database not available
25	STORMAN_CIMOM_AUTH_FAILED	User / password for CIM server not valid

14.5.3.3 storcfg system –mod

Sets or modifies the access information for ETERNUS DX S2 storage systems to retrieve performance and statistical information.

This function is no longer required as of ETERNUS DX S3 / AF.

Syntax

```
storcfg system –mod –system system –statuser statuser –statpwd statpwd
            –connectparam ...
```

Parameters

–system *system*

Specifies the system name of the storage system to discover. This parameter is mandatory and does **not** support wildcards (*).

–statuser *statuser*

Specifies the user identification for PMCC access to ETERNUS DX S2.

–statpwd *statpwd*

Specifies the password for PMCC access to ETERNUS DX S2.

-connectparam

>   Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Matching object could not be provided
21	STORMAN_FCT_NOT_ POSSIBLE	Function not supported

14.5.3.4   storcfg system –show

Displays information related to the storage systems.

Selection criteria for the `-show` function can be specified using the parameters described below.

Syntax

```
storcfg system -show [ -system system ] [ -model model ]
              [ -name name ] [ -type type ]
              [ -cimip cimip ] [ -cimname cimname ]
              [ -unmanaged ] [ -managed managed ] [ -showstoragepools ]
              [ -showports ] [ -showraidtypes ] [ -showremote]
              [-showenvironment] [ -showclusters ] [ -format format ]
              -connectparam ...
```

Parameters

-system system

>   Specifies the system name of the storage system (default: *). Wildcards (*) are supported.

-name name

>   Specifies the name of the storage system.This may be the customized name given by the administration or the name in the network.

`-type` *type*

>   Select the storage systems by its type. If the parameter –type is omitted no selection is done (default).

>   Supported values of –type:

>   - `disk`: deliver Disk Storage (e.g. ETERNUS DX)
>   - `tape`: deliver Tape Storage (e.g. ETERNUS CS)

`-model` *model*

>   Only for `-type disk`: Specifies the model of the storage system.
>   Supported values: `eternus` | `symmetrix` | `any` (default).

`-cimname` *cimname*

>   Select the storage systems by the name of the managing CIMOM.

`-cimip` *cimip*

>   Select the storage systems by the IP address of the managing CIMOM.

`-unmanaged`

>   Displays only storage systems without an active management instance.

`-managed` *managed*

>   Displays only storage systems with an active management instance.

>   Permitted values: `active` | `monitor` | `manual`. If the parameter `-managed` is omitted no selection is done (default).

>   `active` displays storage systems supporting active management (replication, …)

>   `monitor` displays storage systems supporting only information functions and monitoring.

>   `manual` displays storage systems only statically configured in StorMan configuration.

`-showstoragepools`

>   Displays also the storage pools of the storage systems with `-format std`. The xml output always contains these information.

`-showports`

>   Displays also the storage port information of the storage systems with `-format std`. The xml output always contains these information.

`-showraidtypes`

>   Displays also the RAID types supported by the storage systems with `-format std`. The xml output always contains these information.

`-showremote`

>   Displays all remote connected storage systems to the storage system specified by parameter `-system`.

`-showenvironment`

>   Displays also the physical component information (e.g. controller, power supplies, fans, etc.) with `-format std`. The xml output always contains these information.

`-showclusters`

Displays information about storage clusters:

- Without specifying additional parameters, the storage cluster information will be displayed for the specified storage system.
- In combination with the `-showports` parameter, the cluster specific information will be displayed for each storage port of the specified storage system.

`-format` *format*

Specifies the output format. Refer to the description of the "Format parameter" on page 91.

`-connectparam`

Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INVPARAMETERS	Specified parameters invalid
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Matching object could not be provided
22	STORMAN_RESOURCE_NOT_ AVAILABLE	CIM server or database not available
25	STORMAN_CIMOM_AUTH_ FAILED	User / password for CIM server not valid
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

Examples

1. Output for storage systems with `-format=std` (default)

    storcfg system -show -system 4621347002

    ```
    storage system name = 4621347002
      serial number      = 4621347002
      custom name        = DX500 S3-01
      storage vendor     = FUJITSU
      storage model      = ETERNUS DX
      storage model name = ETERNUS DX500 S3
      version            = V10L70-5000
      cache size         = 64 GB
      physical disks     = 48
      logical volumes    = 857
      preferred CIMOM    = 172.17.67.121
      configuration state = OK
    ```

2. Output for storage systems `-format=xmlp`

    storcfg system -show -system 4621347002 -showports -showstoragepools
    -showraidtypes -format xmlp

    ```
    <Response>
      <ReturnCode>
        <Code>STORMAN_OK</Code>
        <CodeNumber>0</CodeNumber>
        <Text>successful</Text>
        <SubCode>0</SubCode>
        <SubCodeText>STORMAN_SUB_NONE</SubCodeText>
        <AdditionalInformation/>
        <MessageID>270</MessageID>
        <ConnectionID>5553667FBD6D0</ConnectionID>
      </ReturnCode>
      <Result>
        <StorageSystems>
          <StorageSystem>
            <StorageSystemName>4621347002</StorageSystemName>
            <StorageSerialNumber>4621347002</StorageSerialNumber>
            <StorageSystemID>DX00002A2AAA</StorageSystemID>
            <StorageVendor>STORMAN_STORAGE_VENDOR_FUJITSU</StorageVendor>
            <Vendor>FUJITSU</Vendor>
            <StorageModel>STORMAN_STORAGE_MODEL_ETERNUS</StorageModel>
            <EternusModelType>STORMAN_ETERNUS_MODEL_DX500_S3</EternusModelType>
            <EternusModelTypeCode>14</EternusModelTypeCode>
            <StorageModelName>ETERNUS DX500 S3</StorageModelName>
            <StorageType>STORMAN_STORAGE_TYPE_DISK</StorageType>
            <LinkUI>172.17.67.121</LinkUI>
    ```

```
<Features>29694</Features>
<StorageFeatures>29694</StorageFeatures>
<DataProviderType>STORMAN_STORAGE_PROVIDER_TYPE_INTERNAL
    </DataProviderType>
<DataProviderTypeCode>1</DataProviderTypeCode>
<StorageWWNN>500000E0DA804700</StorageWWNN>
<RemoteSAP>00ETERNUSDXMS3ET503SAU####OJ4621347002##</RemoteSAP>
<OSName/>
<OSVersion>V10L70-000G</OSVersion>
<CacheSize>68719476736</CacheSize>
<CacheSizeNormalized>64 GB</CacheSizeNormalized>
<NumOfPhysDisks>48</NumOfPhysDisks>
<NumOfVolumes>857</NumOfVolumes>
<NumberOfSpareDevices>2</NumberOfSpareDevices>
<NumberOfUnmangedVolumes>857</NumberOfUnmangedVolumes>
<PrimaryHostAccessController/>
<ConfigID>86952+293</ConfigID>
<ConfigIDVolumes>86952</ConfigIDVolumes>
<ConfigIDClusters>86952</ConfigIDClusters>
<CopyIndicationCount>179</CopyIndicationCount>
<ConfigState>BOX_CONFIG_STATE_NOT_SCANNED_IN_SESSION</ConfigState>
<ConfigStateNum>2</ConfigStateNum>
<IsActionAllowed>true</IsActionAllowed>
<PreferredCim>172.17.67.121</PreferredCim>
<EnclosureCount>3</EnclosureCount>
<Product>ETERNUSDXMS3(ET503SAU)</Product>
<Contact>Werner</Contact>
<Location>DC6a_168 Pos 16</Location>
<CustomName>DX500 S3-01</CustomName>
<Version>V10L70-000G</Version>
<SCSIVendor>FUJITSU</SCSIVendor>
<TotalManagedSpace>20565338357760</TotalManagedSpace>
<TotalManagedSpaceNormalized>18.70 TB</TotalManagedSpaceNormalized>
<RemainingManagedSpace>7392738803712</RemainingManagedSpace>
<RemainingManagedSpaceNormalized>6.72 TB
                </RemainingManagedSpaceNormalized>
<RemainingUnmanagedSpace>5281736032256</RemainingUnmanagedSpace>
<RemainingUnmanagedSpaceNormalized>4.80 TB
                </RemainingUnmanagedSpaceNormalized>
<GUID/>
<SupportsReplication>true</SupportsReplication>
<IsUnifiedStorage>false</IsUnifiedStorage>
<StatUser/>
<OwningServer/>
<EditableFields>
  <EditableField>StatUser</EditableField>
```

```
              <EditableField>StatPassword</EditableField>
          </EditableFields>
          <RemoteCopyModes>
            <RemoteCopyMode>sync</RemoteCopyMode>
            <RemoteCopyMode>async</RemoteCopyMode>
            <RemoteCopyMode>asyncstack</RemoteCopyMode>
          </RemoteCopyModes>
          <SupportedRaidTypes>
            <SupportedRaidType>UNPROTECTED</SupportedRaidType>
            <SupportedRaidType>RAID0</SupportedRaidType>
            <SupportedRaidType>RAID1</SupportedRaidType>
            <SupportedRaidType>RAID1+0</SupportedRaidType>
            <SupportedRaidType>RAID5</SupportedRaidType>
            <SupportedRaidType>RAID5+0</SupportedRaidType>
            <SupportedRaidType>RAID6</SupportedRaidType>
            <SupportedRaidType>RAID6-FR</SupportedRaidType>
            <SupportedRaidType>RAID0_TPP</SupportedRaidType>
            <SupportedRaidType>RAID1_TPP</SupportedRaidType>
            <SupportedRaidType>RAID1+0_TPP</SupportedRaidType>
            <SupportedRaidType>RAID5_TPP</SupportedRaidType>
            <SupportedRaidType>RAID6_TPP</SupportedRaidType>
            <SupportedRaidType>RAID6-FR_TPP</SupportedRaidType>
          </SupportedRaidTypes>
          <StoragePools>
            <StoragePool>
              <PoolName>
                Primordial Storage pool for FUJITSU storage system
                    /PoolName>
              <InstanceID>FUJITSU:PSP</InstanceID>
              <Status>STORMAN_STORAGE_POOL_STATUS_OK</Status>
              <EnabledSize>40703405064192</EnabledSize>
              <EnabledSizeNormalized>37.02 TB</EnabledSizeNormalized>
              <FreeSize>5281736032256</FreeSize>
              <FreeSizeNormalized>4.80 TB</FreeSizeNormalized>
              <PercentFull>87</PercentFull>
              <PoolUsage>DMTF_STORAGE_POOL_USAGE_UNRESTRICTED</PoolUsage>
              <PoolType>STORMAN_STORAGE_POOL_TYPE_PRIMORDIAL</PoolType>
              <StatusString/>
              <OwningController/>
              <RaidType/>
              <NumDisks/>
              <NumSpares/>
              <DiskType>N.A.</DiskType>
              <LowSpaceWarningThreshold>0</LowSpaceWarningThreshold>
              <AlarmStatus/>
              <AttentionLevelRange/>
```

```
                            <WarningLevelRange/>
                            <SevereLevelRange/>
                            <BasicStoragePoolNames>
                            </BasicStoragePoolNames>
                            <BasicStoragePoolIDs>
                            </BasicStoragePoolIDs>
                            <OperationalStatus>OK</OperationalStatus>
                            <OperationalStatusDetailList>
                            </OperationalStatusDetailList>
                    </StoragePool>
                    <StoragePool>
                            <PoolName>RG900_00</PoolName>
                            <InstanceID>FUJITSU:RSP0000</InstanceID>
                            ...
                            ...
                    </StoragePool>
            </StoragePools>
            <RemoteSystems>
            </RemoteSystems>
            <StoragePorts>
                    <StoragePort>
                            <PortID>500000E0DA804720</PortID>
                            <PortName>FCP_CM00CA00P00</PortName>
                            <ConnectionType>STORMAN_CONNECTION_TYPE_FC</ConnectionType>
                            <Mode>STORMAN_PORT_MODE_RA</Mode>
                            <ControllerName>CM00</ControllerName>
                            <DeviceID>FCP_CM00CA00P00</DeviceID>
                            <Speed>4 GB/s</Speed>
                            <MaxSpeed>16 GB/s</MaxSpeed>
                            <RemoteMirroringEnabled>STORMAN_BOOL_TRUE
                                    </RemoteMirroringEnabled>
                            <HostAccessEnabled>STORMAN_BOOL_FALSE</HostAccessEnabled>
                            <ChassisID/>
                            <AdapterNumber/>
                            <PortNumber>0</PortNumber>
                            <CeID/>
                            <CMSlotNumber>0</CMSlotNumber>
                            <CASlotNumber>0</CASlotNumber>
                            <NasIP/>
                            <IsSCGPort>false</IsSCGPort>
                            <StorageClusterName/>
                            <RemotePorts>
                                <RemotePort>
                                    <StorageSystemName>4631528004</StorageSystemName>
                                    <StorageSerialNumber>4631528004</StorageSerialNumber>
                                    <StorageCustomName>DX8700-S3-01</StorageCustomName>
```

```
                    <StorageConfigStateNum>2</StorageConfigStateNum>
                    <PortID>500000E0DAC19AD3</PortID>
                    <PortName>FCP_CM13CA00P03</PortName>
                    <ConnectionStatus>Up</ConnectionStatus>
                    <ChassisID/>
                    <AdapterNumber/>
                    <PortNumber>3</PortNumber>
                    <CeID>1</CeID>
                    <CMSlotNumber>1</CMSlotNumber>
                    <CASlotNumber>0</CASlotNumber>
                    <RAGroupNames>
                    </RAGroupNames>
                </RemotePort>
                <RemotePort>
                    <StorageSystemName>4631508013</StorageSystemName>
                    <StorageSerialNumber>4631508013</StorageSerialNumber>
                     ....
                     ....
                </RemotePort>
            </RemotePorts>
            <StorageClusterPorts>
            </StorageClusterPorts>
            <RAGroupNames>
            </RAGroupNames>
            <OperationalStatus>OK</OperationalStatus>
            <OperationalStatusDetailList>
            </OperationalStatusDetailList>
        </StoragePort>
        <StoragePort>
            <PortID>500000E0DA804721</PortID>
            <PortName>FCP_CM00CA00P01</PortName>
            <ConnectionType>STORMAN_CONNECTION_TYPE_FC</ConnectionType>
            <Mode>STORMAN_PORT_MODE_CA</Mode>
            <ControllerName>CM00</ControllerName>
            <DeviceID>FCP_CM00CA00P01</DeviceID>
            <Speed>8 GB/s</Speed>
            <MaxSpeed>16 GB/s</MaxSpeed>
            <RemoteMirroringEnabled>STORMAN_BOOL_FALSE
                </RemoteMirroringEnabled>
            <HostAccessEnabled>STORMAN_BOOL_TRUE</HostAccessEnabled>
            <ChassisID/>
            <AdapterNumber/>
            <PortNumber>1</PortNumber>
            <CeID/>
            <CMSlotNumber>0</CMSlotNumber>
            <CASlotNumber>0</CASlotNumber>
```

```
                  <NasIP/>
                  <IsSCGPort>false</IsSCGPort>
                  <StorageClusterName/>
                  <RemotePorts>
                  </RemotePorts>
                  <StorageClusterPorts>
                  </StorageClusterPorts>
                  <RAGroupNames>
                  </RAGroupNames>
                  <OperationalStatus>OK</OperationalStatus>
                  <OperationalStatusDetailList>
                  </OperationalStatusDetailList>
              </StoragePort>
              <StoragePort>
                  <PortID>500000E0DA804722</PortID>
                  <PortName>FCP_CM00CA00P02</PortName>
                  ....
                  ....
              </StoragePort>
          </StoragePorts>
          <PhysicalDisks>
          </PhysicalDisks>
          <Controllers>
              <Controller>
                  <DeviceName>CM00</DeviceName>
                  <DisplayName>CE# CM#0</DisplayName>
                  <CardType>STORMAN_CONTROLLER_CARD_TYPE_STD</CardType>
                  <Manufacturer>FUJITSU</Manufacturer>
                  <MemoryOnBoard>34359738368</MemoryOnBoard>
                  <Model>Unknown</Model>
                  <SerialNumber>PP135001QF</SerialNumber>
                  <Version>A1</Version>
                  <PhysicalPosition>0</PhysicalPosition>
                  <CMSlotNumber>0</CMSlotNumber>
                  <CeID/>
                  <ChassisID/>
                  <PartNumber>CA07555-D801</PartNumber>
                  <IP>172.17.67.121</IP>
                  <MACAdress>B0ACFAA382EF</MACAdress>
                  <ControllerWWNN>500000E0DA804700</ControllerWWNN>
                  <OperationalStatus>OK</OperationalStatus>
                  <OperationalStatusDetailList>
                  </OperationalStatusDetailList>
              </Controller>
              <Controller>
                  <DeviceName>CM01</DeviceName>
```

```
            <DisplayName>CE# CM#1</DisplayName>
        ...
        ...
      </Controller>
   </Controllers>
   <Enclosures>
   </Enclosures>
   <BackendControllers>
   </BackendControllers>
   <PCIeFlashModules>
   </PCIeFlashModules>
   <RecBuffers>
   </RecBuffers>
   <PowerSupplys>
   </PowerSupplys>
   <Batterys>
   </Batterys>
   <Fans>
   </Fans>
   <BootUtilityDevices>
   </BootUtilityDevices>
   <StorageClusters>
     <StorageCluster>
       <StorageClusterName>DX500_1-DX500_2</StorageClusterName>
       <AutoFailover>false</AutoFailover>
       <AutoFailback>true</AutoFailback>
       <ReadMode>false</ReadMode>
       <Phase>STORMAN_SCG_PHASE_NORMAL</Phase>
       <HaltFactor>STORMAN_SCG_FACTOR_NONE</HaltFactor>
       <Status>STORMAN_SCG_STATUS_NORMAL</Status>
       <PercentSynced/>
       <PartnerStorageSystemName>
          00ETERNUSDXMS3ET503SAU####OO4621349005##
             </PartnerStorageSystemName>
       <PartnerRemoteSAP/>
       <PairGroupStorageSystemName>
          00ETERNUSDXMS3ET503SAU####OO4621349005##
             </PairGroupStorageSystemName>
       <Type>STORMAN_SCG_SYSTEM_TYPE_PRIMARY</Type>
       <SystemMode>STORMAN_SCG_SYSTEM_MODE_ACTIVE</SystemMode>
       <PortIDs>
         <PortID>500000E0DA804724</PortID>
         <PortID>500000E0DA804733</PortID>
       </PortIDs>
     </StorageCluster>
     <StorageCluster>
```

```
            <StorageClusterName>DX500_2-DX500_1</StorageClusterName>
            ....
            ....
         </StorageCluster>
      </StorageClusters>
      <RAGroups>
      </RAGroups>
      <OperationalStatus>OK</OperationalStatus>
      <OperationalStatusDetailList>
      </OperationalStatusDetailList>
    </StorageSystem>
  </StorageSystems>
 </Result>
</Response>
```

3. Output for storage systems with `-format=medium`

   storcfg system -show –model eternus –format medium

   ```
   4621347002 model=ETERNUS DX500 S3 version=V10L70-000G
   ```

4. Output for storage clusters

   storcfg system –show –system 4621347002 -showclusters

   ```
   storage system name = 4621347002
     serial number      = 4621347002
     storage vendor     = FUJITSU
     storage model      = Eternus
     storage model name = ETERNUS DX500 S3
     version            = V10L60-6300
     cache size         = 64 GB
     physical disks     = 48
     logical volumes    = 853
     preferred CIMOM    = 172.17.67.121
     configuration state = OK
     storage cluster(s)  = DX500_1-DX500_2
   status            = normal
                          halt factor       = disabled
                          phase             = normal
                         auto failover     = true
                          auto failback     = false
                          read mode         = false
                          type              = primary
                          system mode       = active
                          percent synced    = 100
                          partner system(s) = 4621349005
   ```

5. Output for storage cluster, information for each SCO port

   storcfg system –show –system 4621347002 -showclusters –showports

   displays for each port:

```
                   …
               500000E0DA805434/FC
                   PortName           = FCP_CM01CA01P00
                   speed              = 8 GB/s
                   max speed          = 16 GB/s
                   status             = OK
                   cluster name       = DX500_2-DX500_1
                   partner port(s)    = 4621349005/FCP_CM01CA01P00
                   …
```

14.5.4   storcfg pool

`storcfg pool` is used to manage the pools in the StorMan repository.

```
storcfg pool –function –functionparam ... –connectparam ...
```

Functions

The `-function` parameter supplies one of the following functions:

`–add`

    adds a new pool to the StorMan repository

`–mod`

    modifies the attributes of an existing pool or renames the pool

`–rem`

    removes a pool from the StorMan repository

`–show`

    displays information related to pools

14.5.4.1   storcfg pool –add

Creates and adds a new pool to the StorMan repository. The pool is defined for a specific storage system already contained in the repository.

After completing the `-add` function, the new pool is created and empty; it contains no logical volumes.

Syntax

```
storcfg pool –add –poolid poolid –system system
                –connectparam ...
```

Parameters

`–poolid poolid`

    Specifies the ID of the pool. This parameter is mandatory.
    Refer to the common description of "poolid" in chapter "Common supported value ranges" on page 97.

    The pool ID must be unique and is internally not case-sensitive. If the pool ID already exists in the repository, the command is rejected.

`–system system`

    Specifies the system name of the storage system that contains the pool. If the specified storage system is not contained in the repository, the command is rejected.

This parameter is mandatory.

–connectparam

Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Matching object could not be provided
19	STORMAN_POOLID_IN_ USE	Pool ID is in use
20	STORMAN_ALREADY_ EXISTS	Object already exists in the repository
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5.4.2   storcfg pool –mod

Modifies the name (pool ID) of an existing pool.

Syntax

```
storcfg pool -mod -poolid poolid [ -newpoolid poolid ]
                -connectparam ...
```

Parameters

`–poolid poolid`

Specifies the ID of the pool. This parameter is mandatory.
Refer to the common description of "poolid" in chapter "Common supported value ranges" on page 97.

The pool ID must be unique and is internally not case-sensitive.

`-newpoolid` *poolid*

> Specifies the new ID of the pool in the case of renaming.
>
> For restrictions in naming the pool ID, refer to the common description of "poolid" in chapter "Common supported value ranges" on page 97.

`-connectparam`

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Specified pool was not found
19	STORMAN_POOLID_IN_USE	Pool ID already used otherwise
22	STORMAN_RESOURCE_NOT_AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5.4.3   storcfg pool –rem

Removes a pool from the StorMan repository.

If the pool contains logical volumes, these are also removed from the StorMan repository.

Therefore the contents of the pool (logical volumes with their assigned StorIDs) can no longer be managed by StorMan.

The configuration of the storage system and its assignment to servers is not touched by this function.

Syntax

```
storcfg pool -rem -poolid poolid  -connectparam ...
```

Parameters

–poolid *poolid*

> Specifies the ID of the pool to be removed. This parameter is mandatory.
> Refer to the common description of ”poolid” in chapter "Common supported value ranges" on page 97.
> Wildcards (*) are supported.

–connectparam

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Matching object could not be provided, i.e. pool ID not found
19	STORMAN_POOLID_IN_USE	Pool ID already used otherwise
22	STORMAN_RESOURCE_NOT_AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5.4.4   storcfg pool –show

Displays information related to pools.

Syntax

```
storcfg pool -show [ -poolid poolid ]
                [ -system system ] [ -model model ]
                [ -format format ] -connectparam ...
```

Parameters

`-poolid poolid`

Specifies the ID of the pool (default: *). Wildcards (*) are supported.

`-system system`

Specifies the system name of the storage system (default: *).
Wildcards (*) are supported.

`-model model`

Selects by the model of the storage system.
Supported values: `eternus` | `symmetrix` | `any` (default).

`-format format`

Specifies the output format. Refer to the description of the "Format parameter" on page 91.

`-connectparam`

Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

Examples

1. Output for pools with `-format std` (default)

   storcfg pool –show –poolid test

   ```
   storage system name = 4621347002
   storage vendor      = FUJITSU
   storage model       = ETERNUS DX
   ```

2. Output for pools with `-format medium`

   storcfg pool –show –poolid test -format medium

   ```
   test storage=4621347002
   ```

3. Output for pools with `-format xmlp`

   storcfg pool –show –poolid SHC-OSD* -format xmlp

   ```
   <Response>
     <ReturnCode>
       <Code>STORMAN_OK</Code>
       <CodeNumber>0</CodeNumber>
       <Text>successful</Text>
       <SubCode>0</SubCode>
       <SubCodeText>STORMAN_SUB_NONE</SubCodeText>
       <AdditionalInformation/>
       <MessageID>290</MessageID>
       <ConnectionID>55536A4721098</ConnectionID>
     </ReturnCode>
     <Result>
       <PoolDescriptions>
         <PoolDescription>
           <PoolID>test</PoolID>
           <StorageSystemName>4621347002</StorageSystemName>
           <StorageVendor>STORMAN_STORAGE_VENDOR_FUJITSU</StorageVendor>
           <StorageModel>STORMAN_STORAGE_MODEL_ETERNUS</StorageModel>
           <StorageFeatures>29694</StorageFeatures>
           <IsActionAllowed>true</IsActionAllowed>
           <IsActionAllowed4Volumes>true</IsActionAllowed4Volumes>
           <HaveVolumesWithCustomProperties>false
                   </HaveVolumesWithCustomProperties>
           <NumVolumes>2567</NumVolumes>
           <NumPossibleTargetVolumes>756</NumPossibleTargetVolumes>
           <NumPossibleTargetSnaps>123</NumPossibleTargetSnaps>
         </PoolDescription>
       </PoolDescriptions>
   ```

```
        </Result>
    </Response>
```

14.5.5 storcfg volume

`storcfg volume` is used to manage the logical volumes in the pools of the StorMan repository.

```
storcfg volume –function –functionparam ... –connectparam ...
```

Functions

The `-function` parameter supplies one of the following functions:

`-add`

> adds new logical volumes to a specified pool of the StorMan repository

`-mod`

> changes the attributes of logical volumes of the pool or moves a logical volume into another pool

`-rem`

> removes a logical volume from the pool of StorMan repository

`-discover`

> requests to discover a logical volume on a storage system, i.e. to update the configuration data of the specified logical volume

`-show`

> displays information related to logical volumes

14.5.5.1 storcfg volume –add

Adds one or more logical volumes to a specified pool of the StorMan repository. The pool must already exist in the repository. The logical volumes must be part of the same storage system as the pool.

The function supports the addition of single logical volumes to a list of logical volumes, or a mass operation adding all logical volumes of a storage system not yet contained in the StorMan repository.

Syntax

```
storcfg volume –add [ -storid storid ] –poolid poolid
                   [-system system] [-prefix prefix]
                   [-startnumber startnumber] –deviceid devid
                   –connectparam ...
```

Parameters

`-storid` *storid*

Default: Parameter not specified.

If the parameter is not specified (or no value is specified), there are two cases:

- A storID is assigned automatically by StorMan if the logical volume is already attached to a server.
- No storID is assigned if the logical volume is currently not attached to any server. It is considered as a free volume in the pool.

If the parameter is specified with a storID, the value `storid` specifies the unique identifier to be assigned to the logical volume for further management by StorMan which is selectable by the caller.

It is possible to specify a list of storIDs separated by comma. The number of storIDs must equal the number of deviceIDs specified.

- For naming conventions related to storIDs, refer to the common description of "storid" in chapter "Common supported value ranges" on page 97.
- If the storID already exists, the command is rejected.
- If specified by caller, the storID is assigned regardless of the attachment of the logical volume to a server.

If the value `#auto` is specified, StorMan automatically generates a storID for all logical volumes regardless of any attachment to a server.

If the value `#byrule` is specified, StorMan automatically generates a storID for logical volumes (list of deviceids supported as defined by parameters `-prefix` and `-startnumber` regardless of any attachment to a server. If `-deviceid #all` is specified, all deviceIDs not yet assigned to a pool are added. Parameter `-prefix` must be specified.

`-poolid` *poolid*

Specifies the ID of the pool the logical volume should be added to. This parameter is mandatory. If the pool ID does not exist in the repository, the command is rejected.

`-system` *system*

Specifies the name of the storage system.

This parameter is optional. It can be specified to uniquely define the volume in combination with `-deviceid` *devid*. If not specified the storage system defined by parameter `-poolid` is used.

–prefix *prefix*

> This parameter is only supported for –storid #byrule.
>
> –prefix defines a common prefix for the automatically generated storIDs of the deviceids specified in the call. The prefix must be conform with the naming conventions for the storID.
>
> If the parameter -startnumber is not specified the storIDs are automatically generated from the specified prefix and the complete deviceid used as suffix.
>
> e.g. call with:
>
> –prefix ABC_ creates storIDs: ABC_devid1, ABC_devid2,….,ABC_devidn

-startnumber *startnumber*

> This parameter is only supported for –storid #byrule and –prefix *prefix*.
>
> If specified the automatically generated storIDs are built by the prefix specified with –prefix and an incremented number as suffix starting with the number specified with –startnumber (with leading zeros) for all deviceids specified in the call.
>
> e.g. call with:
>
> –prefix ABC_ -startnumber 0022 creates storIDs: ABC_0022, ABC_0023,….,ABC_00nm
>
> The specified startnumber is a decimal number greater or equal 0.
>
> If the assigned number exceeds the size of the number of digits specified with –startnumber, including leading zeroes, the number of digits incremented for the numbers exceeding this size.

-deviceid *devid*

> Specifies the device ID(s) of the logical volume. This parameter is mandatory. Possible values:
>
> - The value is interpreted as a string (representing a number without leading zeros; e.g. 234 not 00234) and must be equal to the value shown by StorMan via storcfg volume –show –system *system* –storid. Otherwise STORMAN_NOT_FOUND is returned.
> - It is possible to specify a list of deviceIDs separated by comma. If storIDs are specified the number of deviceIDs must be equal to the number of storIDs specified.
> - If the value #all is specified, all logical volumes of the storage system not yet contained in the StorMan repository are added. In this case the parameter –storid #auto or –storid #byrule must be specified to automatically assign storIDs to the volumes. It is not possible to specify storIDs directly or by list in this case.

–*connectparam*

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_PARAMETERS	Specified parameters invalid
9	STORMAN_STORID_IN_USE	StorID already used otherwise
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client and server
14	STORMAN_STORAGE_LOCKED	Storage unit to be modified currently locked
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Matching object could not be provided
20	STORMAN_ALREADY_EXISTS	Object already exists in the repository
22	STORMAN_RESOURCE_NOT_AVAILABLE	CIM server or database not available
25	STORMAN_CIMOM_AUTH_FAILED	User / password for CIM server not valid
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5.5.2   storcfg volume –mod

Changes attributes of logical volumes in a pool (e.g. rename) or moves a logical volume from a pool to another pool.

If a parameter is not specified, the corresponding attribute is not changed.

Syntax

```
storcfg volume -mod { [ -storid storid ] [ -deviceid devid ] }
                    [ -system system ] [ -newpoolid poolid ]
                    [ -newstorid storid ]  -connectparam ...
```

Parameters

`-storid storid`

This parameter is mandatory for logical volumes with an assigned storID.

For logical volume without assigned storID, the parameter must be omitted and the parameter `-deviceid` must be specified instead.

–deviceid *devid*

> Specifies the device ID of the logical volume. This parameter is mandatory if the logical volume does not have an assigned storID.
>
> It may be specified additionally for logical volumes with an assigned storID. If both storID and device ID are specified, the input must be consistent.

–system *system*

> Specifies the name of the storage system. This parameter must be specified if the -deviceid parameter is used to specify the volume.

–newpoolid *poolid*

> Specifies the target pool to which the logical volume should be moved by its pool ID. The current pool is implicitly specified by the storID or the device ID of the logical volume.
>
> Both pools must belong to the same storage system.

–newstorid *storid*

> If specified, renames the storID of the logical volume to the specified value.
> Refer to the common description of "storid" in "Common supported value ranges" on page 97.

–connectparam

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_PARAMETERS	Specified parameters invalid
9	STORMAN_STORID_IN_USE	StorID already used otherwise
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client and server
14	STORMAN_STORAGE_LOCKED	Storage unit to be modified currently locked
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Matching object (Storage Volume) could not be provided
20	STORMAN_ALREADY_EXISTS	Object already exists in the repository

Error Code	Name	Error Type
22	STORMAN_RESOURCE_NOT_AVAILABLE	CIM server or database not available
25	STORMAN_CIMOM_AUTH_FAILED	User / password for CIM server not valid
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5.5.3 storcfg volume –discover

Starts a discovery call to the storage system for a specific logical volume to update its configuration and attributes. The specified volume(s) must be contained in a pool.

Syntax

```
storcfg volume –discover [ –storid storid ] [ –system system ]
                         [ –deviceid devid ] –connectparam ...
```

Parameters

–storid *storid*

    This parameter is used for logical volumes with an assigned storID.

    For logical volumes without assigned storID, the parameter must be omitted and the parameter –deviceid must be specified instead.

–system *system*

    Specifies the name of the storage system. This parameter must be specified if the -deviceid parameter is used to specify the volume.

–deviceid *devid*

    Specifies the device ID of the logical volume. This parameter is mandatory if the logical volume does not have an assigned storID.

    It may be specified additionally for logical volumes with an assigned storID. If both storID and device ID are specified, the input must be consistent.

–*connectparam*

    Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.

Error Code	Name	Error Type
3	STORMAN_VER_NOT_SUPP	Version not supported.
7	STORMAN_INV_PARAMETERS	Specified parameters invalid.
9	STORMAN_STORID_IN_USE	StorID already used otherwise
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client & server
14	STORMAN_STORAGE_LOCKED	Storage unit to be discovered currently locked.
16	STORMAN_FAULT	Unexpected error in function.
18	STORMAN_NOT_FOUND	Matching object (Storage Volume) could not be provided.
20	STORMAN_ALREADY_EXISTS	Object already exists in the repository
22	STORMAN_RESOURCE_NOT_AVAILABLE	CIM server or database not available
25	STORMAN_CIMOM_AUTH_FAILED	User / password for CIM server not valid.
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5.5.4 storcfg volume –rem

Removes a logical volume from a pool of StorMan repository.

Syntax

```
storcfg volume -rem  [ -storid storid ] { [ -deviceid devid ] }
                     [ -system system ] -connectparam ...
```

Parameters

-storid *storid*

> This parameter is mandatory for logical volumes with an assigned storID. It is possible to specify a list of storIDs separated by comma. Wildcards (*) are supported. storid's matching with the wildcard are removed without further checks if no system is specified. If -system is specified it must match too.
>
> For logical volume without assigned storID, the parameter must be omitted and the -deviceid parameter must be specified instead.

-deviceid *devid*

Specifies the device ID of the logical volume. This parameter is mandatory if the logical volume does not have an assigned storID. It is possible to specify a list of device IDs separated by comma.

The logical volume specified by its device ID must be contained in a pool.

`-system` *system*

Specifies the name of the storage system. This parameter must be specified if the `-deviceid` parameter is used to specify the volume.

`-connectparam`

Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_PARAMETERS	Specified parameters invalid
9	STORMAN_STORID_IN_USE	StorID already used otherwise
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client and server
14	STORMAN_STORAGE_LOCKED	Storage unit to be modified currently locked
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Matching object could not be provided
20	STORMAN_ALREADY_EXISTS	Object already exists in the repository
22	STORMAN_RESOURCE_NOT_AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

14.5.5.5 storcfg volume –show

Displays information related to logical volumes. For volumes used in a storage cluster the command displays additionally storage cluster related information for the specified volume.

Selection criteria can be specified using the function parameters.

Syntax

```
storcfg volume -show [ -storid storid ] [ -poolid poolid ]
                     [ -system system ] [ -systemname systemname ]
                     [ -deviceid devid ] [ -vendor vendor ]
                     [ -model model ] [ -type type ]
                     [ -minsize minsize ] [ -maxsize maxsize ]
                     [ -hostname hostname ] [ -hostip ip ]
                     [ -hostwwpn wwpn ] [ -hostiqn iqn ]
                     [ -hostlun lun ] [ -hostaccess hostaccess ]
                     [ -withunmanaged] [ -showconnections] [ -showmirrors]
                     [ -mirrortype mirrortype] [ -replica replica]
                     [ -mirrorusage mirrorusage] [ -copymode copymode]
                     [ -raidtype raidtype] [ -format format ]
                     -connectparam ...
```

Parameters

-storid *storid*

    Specifies the storID for the logical volume (default: *). Wildcards (*) are supported.

    To display all logical volumes of a storage system (even if they are not managed by StorMan) specify -storid #all and exactly one storage system using the system parameter. All other parameters are ignored in this case.

-poolid *poolid*

    Specifies the ID of a pool the logical volume belongs to (default: *).
    Wildcards (*) are supported.
    -poolid #none displays all volumes of a storage system that are NOT assigned to any pool for the specifid system.

-system *system*

    Specifies the system name of the storage system the logical volume belongs to (default: *). Wildcards (*) are supported.

-systemname *systemname*

    Specifies the (custom) name of the storage system the logical volume belongs to (default: *).

-deviceid *devid*

    Specifies the device ID of the logical volume. (default: *). Wildcards (*) are supported.

-vendor *vendor*

    Specifies the vendor of the storage system.

    Supported values: `fujitsu` | `emc` | `any` (default).

-model *model*

    Selects by the model of the storage system.

    Supported values: `eternus` | `symmetrix` | `any` (default).

-type *type*

    Selects by the type of logical volume in the storage system (currently supported for ETERNUS DX/AF only).

    Supported values: `normal|thin|snap|flexible` (default: no selection)

    `normal` displays normal volumes.

    `thin` displays thin provisioned volumes.

    `snap` displays snap volumes used for snapshots.

    `flexible` displays flexible volumes used for automated storage tiering.

-minsize *minsize*

    Selects by the minimum size of the logical volume in MB (default: no restriction).

-maxsize *maxsize*

    Selects by the maximum size of the logical volume in MB (default: no restriction).

-hostname *hostname*

    Selects by the name of the host the storID of is attached to (default: *).
    Wildcards (*) are supported.

-hostip *ip*

    Selects by the IP address of the host the storID of is attached to (default: *).
    Wildcards (*) are supported.

-hostwwpn *wwpn*

    Selects by the WWPN of the host port the storID of is attached to (default: *).
    Wildcards (*) are supported.

-hostiqn *iqn*

    Selects by the IQN of the host port the storID of is attached to (default: *).
    Wildcards (*) are supported.

-hostlun *lun*

    Selects by the device number of the host the storID of is attached to.
    If `-showconnections` is specified only this connection is displayed.

–hostaccess *hostaccess*

> Selects storage volumes according to their visibility to hosts (defined by lun mapping/ masking). Supported Values: restricted | allconnected | any (default). See section "LUN masking for EMC Symmetrix VMAX systems " on page 88.

–withunmanaged

> Displays also volumes which are not managed by StorMan (i.e. volumes which are not contained in the repository).

–showconnections

> Displays also the host connections of the volumes (with output format `std`).

–showmirrors

> Displays also assigned mirror volumes (with output format `std`).

–mirrorusage *mirrorusage*

> Selects the displayed volumes according to their usage as mirroring (replication) pairs (default: no selection). If the parameter is not specified, no selection of mirror usage is done.
>
> Supported values: `none` | `origlocal` | `mirrorlocal` | `origremote` | `mirrorremote` | `any` (default)
>
> `any` selects all volumes used for mirroring regardless of the kind of mirror usage.
>
> `none` selects only volumes not used for mirroring.
>
> `origlocal` selects all volumes used as original volumes of local mirror pair(s).
>
> `mirrorlocal` selects all volumes used as mirror volumes of local mirror pair(s).
>
> `origremote` selects all volumes used as original volumes of remote mirror pair(s).
>
> `mirrorremote` selects all volumes used as mirror volumes of remote mirror pair(s).

–mirrortype *mirrortype*

> Specifies the mirror type of the volume for mirroring (replication) functions.
>
> Supported values: `snap` | `full` | fullcopy | `any` (default)
>
> `any` selects the mirroring feature defined by the specified mirror pair(s).
>
> `snap` selects snapshot (pointer based) mirror pair(s).
>
> `full` selects full copy mirror pairs.
>
> fullcopy selects full copy clones

–replica *replica*

> Specifies the replica type of the volume for mirroring (replication) functions.
>
> Supported values: `local` | `remote` | `any` (default)
>
> `any` selects the mirroring feature defined by the specified mirror pair(s).
>
> `local` selects local mirror pair(s).
>
> `remote` selects remote mirror pairs.

–copymode *copymode*

    Specifies the copy mode synchronous or asynchronous: `sync | async | asyncstack`

    The default value (when omitted) is sync (synchronous).

    `-copymode sync` as of ETERNUS DX S3 / AF corresponds to sync REC mode.

    `-copymode async` as of ETERNUS DX S3 / AF corresponds to async REC consistent mode.

    `-copymode asyncstack` as of ETERNUS DX S3 / AF corresponds to async REC stack mode.

    The parameter is only supported for `-replica remote` and as of ETERNUS DX S3 / AF.

–raidtype *raidtype*

    Selects by the RAID type of the volume.

    `any` selects the volumes regardless of the RAID type. The supported RAID types on a storage system can be shown by using `storcfg system -show -showraidtypes`.

–format *format*

    Specifies the output format. Refer to the description of the "Format parameter" on page 91.

–*connectparam*

    Refer to the description of the "Connection parameters".

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
14	STORMAN_STORAGE_ LOCKED	Storage unit to be modified currently locked
16	STORMAN_FAULT	Unexpected error in function
18	STORMAN_NOT_FOUND	Matching object could not be provided
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available

Examples

1. Output for logical volumes with `-format std` (default)

```
storcfg volume -show -storid SM_2081* -showmirrors
```

```
storage ID          = SM_20817
  pool ID           = test
  storage system name = 4621347002
  storage serial nr.  = 4621347002
  device ID         = 751
  GUID              = 600000E00D2A0000002A004702EF0000
  storage size      = 10 GB
  type              = normal
  storage vendor    = FUJITSU
  storage model     = ETERNUS DX
  status            = READY
  raid level        = RAID1
  raid type         = RAID1
  owner controller  = CM00
  storage pools     = TFO-Group
  host access       = restricted
  mirror targets
    storage ID          = SM_20819
      storage system name   = 4621347002
      pool ID             = test
      device ID           = 753
      GUID                = 600000E00D2A0000002A004702F10000
      mirror type         = full-copy
      replication mode    = local
      copy mode           = sync
      status              = split
      isSynch             = no
      percentSynced       = 1
      timestamp           = 20170511164532.000000+000
  no mirror sources found
```

2. Output for logical volumes with `-format medium`

```
storcfg volume -show -storid SM_20817 -format medium
```

```
SM_20817 storage=4621347002 deviceID=751 size=10 GB
```

3. Output for logical volumes with `-format xmlp`

```
storcfg volume -show -storid SM_20817  -showmirrors -format xmlp
```

```
<Response>
  <ReturnCode>
    <Code>STORMAN_OK</Code>
    <CodeNumber>0</CodeNumber>
    <Text>successful</Text>
    <SubCode>0</SubCode>
    <SubCodeText>STORMAN_SUB_NONE</SubCodeText>
    <AdditionalInformation/>
    <MessageID>846</MessageID>
    <ConnectionID>55546C7F911F0</ConnectionID>
    <TimeID>1501137374676000</TimeID>
  </ReturnCode>
  <Result>
    <VolumeDescriptions>
      <VolumeDescription>
        <StorID>SM_20817</StorID>
        <PoolID>test</PoolID>
        <StorageSystemName>4621347002</StorageSystemName>
        <StorageSerialNumber>4621347002</StorageSerialNumber>
        <StorageCustomName>DX500 S3-01</StorageCustomName>
        <GUID>600000E00D2A0000002A004702EF0000</GUID>
        <DeviceID>751</DeviceID>
        <DeviceNumber>751</DeviceNumber>
        <VolumeName>TFO-Vol1</VolumeName>
        <Size>10737418240</Size>
        <SizeNormalized>10 GB</SizeNormalized>
        <StorageVendor>STORMAN_STORAGE_VENDOR_FUJITSU</StorageVendor>
        <StorageModel>STORMAN_STORAGE_MODEL_ETERNUS</StorageModel>
        <StorageFeatures>29694</StorageFeatures>
        <Status>STORMAN_VOLUME_STATUS_READY</Status>
        <VolumeType>STORMAN_VOLUME_TYPE_NORMAL</VolumeType>
        <HostAccess>STORMAN_HOST_ACCESS_RESTRICTED</HostAccess>
        <RaidLevel>STORMAN_RAID_LEVEL_1</RaidLevel>
        <RaidType>RAID1</RaidType>
        <CurrOwnerController>CM00</CurrOwnerController>
        <SpaceConsumedInBox>10737418240</SpaceConsumedInBox>
        <MayBeSource>true</MayBeSource>
        <MayBeTarget>true</MayBeTarget>
        <MayBeFullTarget>true</MayBeFullTarget>
        <MayBeSnapTarget>false</MayBeSnapTarget>
        <IsActionAllowed>true</IsActionAllowed>
        <FirstHostLun/>
        <StorageClusterName/>
        <Usage>Remote Replica Source or Target</Usage>
        <UsageCode>11</UsageCode>
```

```
<HostIDs>
</HostIDs>
<StoragePoolNames>
  <StoragePoolName>TFO-Group</StoragePoolName>
</StoragePoolNames>
<StoragePoolIDs>
  <StoragePoolID>FUJITSU:RSP0014</StoragePoolID>
</StoragePoolIDs>
<HostConnections>
</HostConnections>
<MirroringTargets>
  <MirroringTarget>
    <StorID>SM_20819</StorID>
    <DeviceID>753</DeviceID>
    <DeviceNumber>753</DeviceNumber>
    <GUID>600000E00D2A0000002A004702F10000</GUID>
    <StorageSystemName>4621347002</StorageSystemName>
    <StorageSerialNumber>4621347002</StorageSerialNumber>
    <StorageCustomName>DX500 S3-01</StorageCustomName>
    <StorageVendor>STORMAN_STORAGE_VENDOR_FUJITSU</StorageVendor>
    <StorageModel>STORMAN_STORAGE_MODEL_ETERNUS</StorageModel>
    <PoolID>test</PoolID>
    <MirrorType>STORMAN_MIRROR_TYPE_FULL_COPY</MirrorType>
    <ReplicationMode>STORMAN_MIRROR_REPLICA_LOCAL</ReplicationMode>
    <CopyMethod>STORMAN_ETERNUS_COPY_METHOD_QUICK_OPC</CopyMethod>
    <Status>STORMAN_MIRROR_PAIR_STATUS_SPLIT</Status>
    <CopyMode>STORMAN_REMOTE_COPY_MODE_SYNC</CopyMode>
    <SplitMode>STORMAN_MIRROR_SPLIT_MODE_UNKNOWN</SplitMode>
    <RecoveryMode>STORMAN_MIRROR_RECOVERY_MODE_UNKNOWN</RecoveryMode>
    <IsSynch>false</IsSynch>
    <IsSCO>false</IsSCO>
    <ContinuousCopy>false</ContinuousCopy>
    <PercentSynced>1</PercentSynced>
    <StorageClusterName/>
    <RAGroupName/>
    <PairEstablishedSince/>
    <PointInTime>
      <TimeStamp>20170511164532.000000+000</TimeStamp>
    </PointInTime>
    <CustomProperties>
    </CustomProperties>
  </MirroringTarget>
</MirroringTargets>
<MirroringSources>
</MirroringSources>
<TargetPorts>
```

```
          </TargetPorts>
          <CustomProperties>
          </CustomProperties>
          <OperationalStatus>OK</OperationalStatus>
          <OperationalStatusDetailList>
          </OperationalStatusDetailList>
       </VolumeDescription>
     </VolumeDescriptions>
   </Result>
```

4. Output for logical volumes extended with storage cluster information (if existing)

```
storcfg volume –show –system <system> -deviceid <deviceid>
 storage ID        =
   pool ID             =
   storage system name = 4621349005
   storage serial nr.  = 4621349005
   device ID           = 912
   GUID                = 600000E00D2A0000002A005403900000
   storage size        = 20 GB
   type                = normal
   resource type       = predefined
   storage vendor      = FUJITSU
   storage model       = Eternus
   status              = NOT-READY
   raid level          = RAID5
   raid type           = RAID5
   owner controller    = CM00
   cluster name        = DX500_2-DX500_1
   storage pools       = RG900_02
   host access         = restricted
storcfg volume –show –system <system> -deviceid <deviceid> -stormirrors
 storage ID        =
   pool ID             =
   storage system name = 4621349005
   storage serial nr.  = 4621349005
   device ID           = 912
   GUID                = 600000E00D2A0000002A005403900000
   storage size        = 20 GB
   type                = normal
   resource type       = predefined
   storage vendor      = FUJITSU
   storage model       = Eternus
   status              = READY
   raid level          = RAID5
   raid type           = RAID5
   owner controller    = CM00
```

```
cluster name          = DX500_2-DX500_1
storage pools         = RG900_02
host access           = restricted
mirror targets
  storage ID          =  SER_4621347002_DEV_764
    storage system name     = 4621347002
    pool ID                 = SHC-OSD-DX-4621347002
    device ID               = 764
    GUID                    = 600000E00D2A0000002A005403900000
    mirror type             = full
    replication mode        = remote
    copy mode               = sync
    status                  = synchronized
    isSynch                 = yes
    percentSynced           = 100
    cluster name            = DX500_2-DX500_1
    time stamp              =
no mirror sources found
```

14.6 storcluster

Manages storage clusters in StorMan for ETERNUS DX/AF storage systems. A storage cluster is manageable by StorMan only if both primary storage and secondary storage are managed by StorMan.

```
storcluster –function –functionparam ... –connectparam ...
```

Functions

The *–function* parameter supplies one of the following functions:

`–failback`

> Performs a manual storage cluster failback.

`–failover`

> Performs a manual storage cluster failover.

`–show`

> Displays the storage cluster related information.

If the `–show` function is specified, the output format can be selected by specifying the `–format` parameter.

14.6.1 storcluster –failback

Performs a manual failback for the specified storage cluster from the secondary storage system back to the primary storage system.

Requirement: After a failover, the primary storage system is available again and the internal resynchronization is completed.

The command is always sent to the primary storage system.

Syntax

```
storcluster –failback –cluster clustername
                      –connectparam ...
```

Parameters

`–cluster clustername`

> Selects the SCO group (storage cluster group) for the failback by the specified name.

`–connectparam`

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
2	STORMAN_NOT_COMPLETE	Function only partly completed.
3	STORMAN_VER_NOT_SUPP	Version not supported.
7	STORMAN_INV_PARAMETERS	Specified parameters invalid.
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function.
18	STORMAN_NOT_FOUND	Matching object could not be provided.
21	STORMAN_FUNCTION_NOT_POSSIBLE	StorMan SubCode STORMAN_SUB_SCO_ADD_INFO indicates additional information related to failed SCO call output as meaning.
22	STORMAN_RESOURCE_NOT_AVAILABLE	CIM server or database not available
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid
37	STORMAN_CIMOM_ERROR	CIM server returned an error. StorMan SubCode STORMAN_SUB_SCO_ADD_INFO indicates additional information related to failed SCO call output as meaning.

Error subcodes of STORMAN_SUB_SCO_ADD_INFO:

Subcode	Error Type
0	Success
1	Not supported
2	Unknown
3	Timeout
4	Failed
5	Invalid parameter
32768	No license found
32768	Invalid TFO (Transparent Failover) group phase
32768	No FTV volume type in TFO group

Subcode	Error Type
32768	TFO group status is inconsistent in the primary storage
32768	TFO group status is inconsistent in the secondary storage
32768	Invalid TFO group activation specified for the secondary storage (failover)
32768	Invalid TFO group activation specified for the secondary storage (failback)
32768	REC paths are disabled
32768	Invalid TFO group condition

Example

```
storcluster –failback –cluster DX500_1-DX500_2
```

14.6.2   storcluster –failover

Performs a manual failover for the specified storage cluster from the primary storage system to the secondary storage system.

The command is always sent to the secondary storage system.

Syntax

```
storcluster –failover –cluster clustername [ -force ]
                    –connectparam ...
```

Parameters

`–cluster clustername`

Selects the SCO group (storage cluster group) for the failover by the specified name.

`-force`

Starts the failover for the SCO group only for storage clusters not in status 'normal'.
This option is required after failure of the primary storage or the REC connection.

🛑 **Attention!**

Use this option with care to avoid potential data loss or data corruption.

`–connectparam`

Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	`STORMAN_OK`	Function successful.
3	`STORMAN_VER_NOT_ SUPP`	Version not supported.
7	`STORMAN_INV_ PARAMETERS`	Specified parameters invalid.
13	`STORMAN_COMMUNIC_ ERROR`	Error in StorMan communication between client and server
16	`STORMAN_FAULT`	Unexpected error in function.
18	`STORMAN_NOT_FOUND`	Matching object could not be provided.
21	`STORMAN_FUNCTION_ NOT_POSSIBLE`	StorMan SubCode `STORMAN_SUB_SCO_ADD_INFO` indicates additional information related to failed SCO call output as meaning.
22	`STORMAN_RESOURCE_ NOT_AVAILABLE`	CIM server or database not available
36	`STORMAN_AUTH_ FAILED`	User / password for StorMan not valid
37	`STORMAN_CIMOM_ ERROR`	CIM server returned an error. StorMan SubCode `STORMAN_SUB_SCO_ADD_INFO` indicates additional information related to failed SCO call output as meaning.
38	`STORMAN_SCO_ERROR`	Error in failover processing: • `STORMAN_SUB_SCO_WRONG_PHASE`: Phase does not allow a failover, use force • `STORMAN_SUB_SCO_AUTOFAILBACK`: Cluster is OK and has 'autofailback' enabled • `STORMAN_SUB_SCO_FORCE_NOT_ALLOWED`: Cluster state is `NORMAL`, force is rejected

Error subcodes of `STORMAN_SUB_SCO_ADD_INFO`:

Subcode	Error Type
0	Success
1	Not supported
2	Unknown

Subcode	Error Type
3	Timeout
4	Failed
5	Invalid parameter
32768	No license found
32768	Invalid TFO (Transparent Failover) group phase
32768	No FTV volume type in TFO group
32768	TFO group status is inconsistent in the primary storage
32768	TFO group status is inconsistent in the secondary storage
32768	Invalid TFO group activation specified for the secondary storage (failover)
32768	Invalid TFO group activation specified for the secondary storage (failback)
32768	REC paths are disabled
32768	Invalid TFO group condition

Example

```
storcluster –failback –cluster DX500_1-DX500_2
```

14.6.3   storcluster –show

Displays all related information about the storage clusters.

Syntax

```
storcluster -show [ -cluster clustername ] [ -format format ]
                -connectparam ...
```

Parameters

–cluster *clustername*

Specifies the name of the storage cluster.
If the parameter is not specified, all storage clusters in the StorMan repository are displayed.

–format *format*

Specifies the output format. Refer to the description of the "Format parameter" on page 91.

–*connectparam*

Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
3	STORMAN_VER_NOT_SUPP	Version not supported.
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid.
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function.
18	STORMAN_NOT_FOUND	Matching object could not be provided.
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
35	STORMAN_SYSTEM_ LOCKED	The storage system is locked for administration
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

Examples

1. Output for storage clusters with `-format std` (default)

```
storcluster -show
cluster name      = DX500_1-DX500_2
  status          = normal
  halt factor     = none
  phase           = normal
  auto failover   = false
  auto failback   = false
  read mode       = false
  percent synced  = 100
  storage systems
    system name   = 4621347002
      serial nr.      = 4621347002
      custom name     = DX500 S3-01
      type            = primary
      system mode     = active
      cluster port(s) = 500000E0DA804724/FC
                         port name          = FCP_CM00CA01P00
                         speed              = 8 GB/s
                         max speed          = 16 GB/s
                         status             = OK
                         partner port(s)    = 4621349005/FCP_CM00CA01P00
                        500000E0DA804733/FC
```

```
                                port name         = FCP_CM01CA00P03
                                speed             = 8 GB/s
                                max speed         = 16 GB/s
                                status            = OK
                                partner port(s)   = 4621349005/FCP_CM01CA00P03
            system name    = 4621349005
              serial nr.     = 4621349005
              custom name    = DX500 S3-02
              type           = secondary
              system mode    = standby
              cluster port(s)  = 500000E0DA804724/FC
                                port name         = FCP_CM00CA01P00
                                speed             = -
                                max speed         = 16 GB/s
                                status            = OK
                                partner port(s)   = 4621347002/FCP_CM00CA01P00
                               500000E0DA804733/FC
                                port name         = FCP_CM01CA00P03
                                speed             = -
                                max speed         = 16 GB/s
                                status            = OK
                                partner port(s)   = 4621347002/FCP_CM01CA00P03
```

14.7   storinfo

Provides information about StorMan.

Syntax

```
storinfo [-server server]  -connectparam ...
```

Parameters

`-server server`

Specifies hostname or IP address of the StorMan server where the information is provided from.

If the parameter is not specified information about the CLI is displayed.

`-connectparam`

Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
7	STORMAN_INV_PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

Example

Output for storinfo

```
storinfo

local StorMan version: V8.0.1
local StorMan build:  8.0.1-0
local StorMan buildDate:  Jan 24 2018 15:03:47
local hostname:  G02DEXN00390
local hostinfo:  Windows Server 2012 Standard 64-bit Build 9200
```

14.8   stormandb

Saves or restores the StorMan repository. This command is only supported on the StorMan server.

Syntax

```
stormandb { -dump | -load } [-noserver]
```

Parameters

-dump

Selects the backup function. The StorMan repository will be saved to the folder `backup` of the StorMan directory.

-load

Selects the restore function. The StorMan repository will be restored from the `backup` folder of the StorMan directory.

The StorMan server must be stopped to execute this command. Otherwise the command is rejected.

-noserver

Required for function -dump only: Setting this parameter the command will work directly on the repository. Make sure there is really no server working with the repository and no concurrent `stormandb` command is running because else the repository may be corrupted.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
7	STORMAN_INV_PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
21	STORMAN_FCT_NOT_POSSIBLE	StorMan server running

14.9   stormirror

Manages volume based replication functions.

Local replication functions are supported as full copy mirrors of a source volume (for ETERNUS DX/AF) or as snapshots (pointer based) local mirrors of a source volume (for ETERNUS DX/AF).

Remote replication functions are supported as full mirrors in synchronuous mode for ETERNUS DX and EMC Symmetrix VMAX systems.
Asynchronous mode for remote replication is supported for ETERNUS as of DX S3 / AF series.

stormirror function	ETERNUS DX/AF -mirror-type / -replica				EMC Symmetrix VMAX/VMAX3 -mirror-type / -replica		
	full local	fullcopy local	snap local	full remote	full local	snap	full remote
create	yes	yes	yes	yes	no	no	yes
modify	no	no	no	yes	no	no	no
restart	yes	yes	yes	yes	no	no	yes
restore	yes	yes	yes	yes	no	no	yes
suspend	yes	no	no	yes	no	no	yes
swap	yes	no	no	yes	no	no	yes
terminate	yes	yes	yes	yes	no	no	yes
show	yes	yes	yes	yes	no	no	yes

Please note for the management of replication functions:

- All logical volumes of a mirror pair have to have a storid assigned.
- When using a list of mirror pairs, the following applies:
    - All sources must be in the same storage system and all targets must be in the same storage system.
    - Only one mirror of a source can be managed in one call.
    - All mirror pairs must have the same `mirrortype`, `replica`, `copymode` and `status`.

```
stormirror –function –functionparam ... –connectparam ...
```

Functions

The *–function* parameter supplies one of the following functions:

–create

>   creates new local or remote mirror pair(s) for logical volume(s) by establishing a mirroring relationship between source volume(s) and mirror volume(s)

–modify

>   Modifies the remote copy mode for remote mirror pair(s) from synchronous to asynchronous and back

–restart

>   restarts local or remote mirroring function for mirror pair(s)

–restore

>   restores local mirror volume(s) of mirror pair(s) to source volume(s)

–suspend

>   suspends mirroring on local or remote mirror pair(s). Afterwards the mirror volume(s) are available for direct access from server.

–swap

>   reverses the roles of local or remote mirror pair(s)

–terminate

>   terminates local or remote mirroring relationship for mirror pair(s)

–show

>   displays information related to local or remote mirror pair(s)

If the –show function is specified, the output format can be selected by specifying the –format parameter.

14.9.1   stormirror –create

Creates one or multiple local or remote mirroring pairs by assigning one or multiple mirror volumes to one or multiple source volumes. The mirror volumes can be specified as full mirror copies or local pointer based logical copies (snapshots).

For full mirror copies after establishing the mirroring relationship the synchronization process is started. For local replication pairs, the source volumes and mirror volumes must all be part of the same storage system.

Syntax

```
stormirror -create -mirrortype mirrortype [ -replica replica ]
                 [ -copymode copymode ] -source storid[,...]
                -target storid[,...] [ -waitforsync ]
                 -connectparam ...
```

Parameters

-mirrortype *mirrortype*

> Specifies the type of mirror pair(s) to be created.

> Supported values: `snap` | `full` |`fullcopy`

> `snap` creates snapshot (pointer based) mirror pair(s). Snapshots on ETERNUS DX/AF based on SnapOPC+ systems are immediately available and accessible after creation.

> `full` creates full copy mirror pairs (on ETERNUS DX/AF based on EC or REC).

> `fullcopy` creates full copy pairs (on ETERNUS DX/AF based on QuickOPC)

-replica *replica*

> Specifies if local or remote mirror pair(s) should be created.

> Supported values: `local` | `remote` | `bytarget` (default)

> `local` creates local replica(s) in the same storage system.

> `remote` creates remote replica(s) in a different storage system of the same model for ETERNUS DX/AF. This can be on a different site. This value is supported for `-mirrortype full` only.

> `bytarget` selects the replica location defined by the specified mirror pair(s). The automatically selected replica must be the same for all specified mirror pairs.

-copymode *copymode*

> Defines the copy mode synchronous or asynchronous: `sync` | `async` | `asyncstack`

> The default value (when omitted) is `sync` (synchronous).

> `-copymode sync` for ETERNUS DX/AF corresponds to sync REC mode.

> `-copymode async` for ETERNUS DX/AF corresponds to async REC consistent mode.

> `-copymode asyncstack` for ETERNUS DX/AF corresponds to async REC stack mode.

> The parameter is only supported for `-replica remote` and for storage systems ETERNUS DX /AF.

`-source` *storid*[,...]

Specifies the storID(s) of one or a list of source volumes for the mirror pair(s).

The number of specified storIDs for the source volumes must be equal to the number of specified storIDs for the target volumes.

`-target` *storid*[,...]

Specifies the storID(s) of one or a list of target volumes for the mirror pair(s).

The number of specified storIDs for the source volumes must be equal to the number of specified storIDs for the target volumes.

The capacity and type of the specified target volumes must match to the prerequisites of the specified mirroring feature of the storage system.

If the value `#auto` is specified, StorMan automatically assigns appropriate target volumes to create the mirror pair(s). This function can be supported for `-mirrortype snap` only.

`-waitforsync`

Option to wait for the completion of the synchronization process of the newly created mirror pair(s). This function can be supported for `-mirrortype full` only.

`-connectparam`

Refer to the description of the .

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
1	STORMAN_NO_ACTION	Nothing to do.
2	STORMAN_NOT_COMPLETE	Function only partly completed.
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid.
8	STORMAN_INVALID_ STORID	Specified storID not allowed
10	STORMAN_STORID_NOT_ FOUND	storID does not yet exist.
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server.
14	STORMAN_STORAGE_ LOCKED	Storage unit currently locked.
16	STORMAN_FAULT	Unexpected error in function.

Error Code	Name	Error Type
18	STORMAN_NOT_FOUND	No wwpn for the specified host was found in the repository.
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
25	STORMAN_CIMOM_AUTH_ FAILED	User / password for CIM server not valid.
29	STORMAN_MIRROR_ERROR	Failure of the mirror operation
35	STORMAN_SYSTEM_ LOCKED	The ETERNUS DX/AF system is locked for administration
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid
37	STORMAN_CIMOM_ERROR	CIMOM returned an error

14.9.2   stormirror –modify

Modifies the copy mode of remote mirroring pairs by switching between synchronous mode and asynchronous modes.

This function is supported for remote replication on ETERNUS DX/AF storage systems as of ETERNUS DX S3 / AF.

Syntax

```
stormirror –modify [ -newcopymode newcopymode ]
                     -mirrortype mirrortype [ -replica replica ]
                     -source storid[,...] -target storid[,...]
                      -connectparam ...
```

Parameters

–newcopymode *newcopymode*

Defines the copy mode synchronous or asynchronous: sync | async | asyncstack

The default value (when omitted) is sync (synchronous).

–newcopymode sync for ETERNUS DX/AF corresponds to sync REC mode.

–newcopymode async for ETERNUS DX/AF corresponds to async REC consistent mode.

–newcopymode asyncstack for ETERNUS DX/AF corresponds to async REC stack mode.

The parameter is only supported for –replica remote and for storage systems ETERNUS DX/AF.

–mirrortype *mirrortype*

> Specifies the type of mirror pair(s) to be processed.
>
> Supported values: `full`
>
> `full` modifies full copy mirror pairs.

–replica *replica*

> Specifies if local or remote mirror pair(s) should be processed.
>
> Supported values: `remote` (default)
>
> `remote` modifies remote replica(s) in a different storage system of the same model. This can be on a different site. This value is supported for `–mirrortype full` only.

–source *storid*[,...]

> Specifies the storID(s) of one or a list of source volumes for the mirror pair(s).
>
> The number of specified storIDs for the source volumes must be equal to the number of specified storIDs for the target volumes.

–target *storid*[,...]

> Specifies the storID(s) of one or a list of target volumes for the mirror pair(s).
>
> The number of specified storIDs for the source volumes must be equal to the number of specified storIDs for the target volumes.

–connectparam

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
1	STORMAN_NO_ACTION	Nothing to do.
2	STORMAN_NOT_COMPLETE	Function only partly completed.
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid.
8	STORMAN_INVALID_ STORID	Specified storID not allowed
10	STORMAN_STORID_NOT_ FOUND	storID does not yet exist.
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server.
14	STORMAN_STORAGE_ LOCKED	Storage unit currently locked.

Error Code	Name	Error Type
16	STORMAN_FAULT	Unexpected error in function.
18	STORMAN_NOT_FOUND	No wwpn for the specified host was found in the repository.
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
25	STORMAN_CIMOM_AUTH_ FAILED	User / password for CIM server not valid.
29	STORMAN_MIRROR_ERROR	Failure of the mirror operation
35	STORMAN_SYSTEM_ LOCKED	The ETERNUS DX/AF system is locked for administration
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid
37	STORMAN_CIMOM_ERROR	CIMOM returned an error

14.9.3   stormirror –restart

Restarts the mirroring for the specified local or remote mirror pair(s). The mirror volumes are no longer accessible to the server and/or application and all changes done on the mirror volumes are discarded.
For local mirror pairs a subsequent `stormirror -suspend` may activate the mirror volumes again to obtain a new point in time of the mirrored data.

The function is only supported for local and remote full mirror pairs. It is not supported for –`mirrortype snap`.

Syntax

```
stormirror –restart [ –mirrortype mirrortype ]
                    [ –replica replica]
                     –source storid[,...] –target storid[,...]
                    [ –waitforsync ] –connectparam ...
```

Parameters

–`mirrortype` *mirrortype*

Specifies the type of mirror pair(s) to be restarted.

Supported values: `full` | `any` (default)

`full` selects full copy mirror pairs (on ETERNUS DX/AF based on EC or REC).

`fullcopy` selects full copy pairs (on ETERNUS DX/AF based on QuickOPC)

`any` selects the mirroring feature defined by the specified mirror pair(s).

–replica *replica*

> Specifies if local or remote mirror pair(s) should be processed.
>
> Supported values: `local` | `remote` | `bytarget` (default)
>
> `local` creates local replica(s) in the same storage system.
>
> `remote` creates remote replica(s) in a different storage system of the same model. This can be on a different site. This value is supported for `–mirrortype full` only.
>
> `bytarget` selects the replica location defined by the specified mirror pair(s). The automatically selected replica must be the same for all specified mirror pairs.

–source *storid*[,...]

> Specifies the storID(s) of one or a list of source volumes for the mirror pair(s).
>
> The number of specified storIDs for the source volumes must be equal to the number of specified storIDs for the target volumes.

–target *storid*[,...]

> Specifies the storID(s) of one ore a list of target volumes for the mirror pair(s).
>
> The number of specified storIDs for the source volumes must be equal to the number of specified storIDs for the target volumes.

–waitforsync

> Option to wait for the completion of the re-synchronization process of the mirror pair(s).

–connectparam

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
1	STORMAN_NO_ACTION	Nothing to do.
2	STORMAN_NOT_COMPLETE	Function only partly completed.
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid.
8	STORMAN_INVALID_ STORID	Specified storID not allowed
10	STORMAN_STORID_NOT_ FOUND	storID does not yet exist.
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server.

Error Code	Name	Error Type
14	STORMAN_STORAGE_LOCKED	Storage unit currently locked.
16	STORMAN_FAULT	Unexpected error in function.
18	STORMAN_NOT_FOUND	No wwpn for the specified host was found in the repository.
22	STORMAN_RESOURCE_NOT_AVAILABLE	CIM server or database not available
25	STORMAN_CIMOM_AUTH_FAILED	User / password for CIM server not valid.
29	STORMAN_MIRROR_ERROR	Failure of the mirror operation
35	STORMAN_SYSTEM_LOCKED	The ETERNUS DX/AF system is locked for administration
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid
37	STORMAN_CIMOM_ERROR	CIMOM returned an error

14.9.4   stormirror –restore

Restores one or more mirror pairs. This function restores the contents of the local mirror volumes back to the original volumes of the mirrored pairs. All changes on the original volumes are discarded.
The mirror volumes of mirror type snap remain accessible to the server and/or application. The mirror volumes of mirror type full are no longer accessible to the server and/or application. The status of mirror volumes after processing a restore operation depends on the specific storage system.

ⓘ This function is supported for ETERNUS DX/AF systems only for –copymode sync.

For ETERNUS DX/AF systems the restore operation is completed only after synchronization is also completed. The mirror volumes are accessible to the server and the mirror pairs are 'split' and 'synchronized'.

Syntax

```
stormirror –restore [ –mirrortype ] ] [ –replica replica ]
                –source storid[,...] –target storid[,...]
                –connectparam ...
```

Parameters

–mirrortype *mirrortype*

Specifies the type of mirror pair(s) to be restored.

Supported values: snap | full | fullcopy | any (default)

snap selects snapshot (pointer based) mirror pair(s).

full selects full copy mirror pairs (on ETERNUS DX/AF based on EC or REC).

fullcopy selects full copy pairs (on ETERNUS DX/AF based on QuickOPC)

any selects the mirroring feature defined by the specified mirror pair(s).

–replica *replica*

Specifies if local or remote mirror pair(s) should be restored.

Supported values: local | remote | bytarget (default)

local creates local replica(s) in the same storage system.

remote restores remote replica(s) in a different storage system of the same model. This can be on a different site. This value is supported for –mirrortype full only.

bytarget selects the replica location defined by the specified mirror pair(s). The automatically selected replica must be the same for all specified mirror pairs.

–source *storid*[,...]

Specifies the storID(s) of one or a list of source volumes for the mirror pair(s).

The number of specified storIDs for the source volumes must be equal to the number of specified storIDs for the target volumes.

–target *storid*[,...]

Specifies the storID(s) of one or a list of target volumes for the mirror pair(s).

The number of specified storIDs for the source volumes must be equal to the number of specified storIDs for the target volumes.

–*connectparam*

Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
1	STORMAN_NO_ACTION	Nothing to do.
2	STORMAN_NOT_COMPLETE	Function only partly completed.
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid.

Error Code	Name	Error Type
8	STORMAN_INVALID_ STORID	Specified storID not allowed
10	STORMAN_STORID_NOT_ FOUND	storID does not yet exist.
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server.
14	STORMAN_STORAGE_ LOCKED	Storage unit currently locked.
16	STORMAN_FAULT	Unexpected error in function.
18	STORMAN_NOT_FOUND	No wwpn for the specified host was found in the repository.
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
25	STORMAN_CIMOM_AUTH_ FAILED	User / password for CIM server not valid.
29	STORMAN_MIRROR_ERROR	Failure of the mirror operation. Details in subcodes: STEP_RESTART_FAILED STEP_SUSPEND_FAILED STEP_2ND_SWAP_FAILED
35	STORMAN_SYSTEM_ LOCKED	The storage system is locked for administration
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid
37	STORMAN_CIMOM_ERROR	CIMOM returned an error

14.9.5   stormirror –suspend

Suspends the mirroring between source and target volumes of one or more mirrors pairs. The function suspends the mirroring for the specified mirror pair(s).

The local volumes remain accessible to the server and/or application and all changes are tracked by the storage system.

The mirror volumes become available for a server and/or application. The activation of multiple mirror volumes is not supported consistently by means of IO sequence. Therefore consistency must be assured by caller.

The mirror pairs specified by the source and mirror volumes must be homogenous, i.e. they must have the same mirror type and must be specified in the correct order.

The function is supported for local and remote full mirror pairs.

Syntax

```
stormirror –suspend [ -mirrortype mirrortype ] [ -replica replica ]
                    –source storid[,...] –target storid[,...]]
                    [-consistent] [ -force ] –connectparam ...
```

Parameters

–mirrortype *mirrortype*

   Specifies the type of mirror pair(s) to be supended.

   Supported values: `full` | `any` (default)

   `full` selects full copy mirror pairs (on ETERNUS DX/AF based on EC or REC).

   `any` selects the mirroring feature defined by the specified mirror pair(s).

–replica *replica*

   Specifies if local or remote mirror pair(s) should be processed.

   Supported values: `local` | `remote` | std (default)

–source *storid*[,...]

   Specifies the storID(s) of one or a list of source volumes for the mirror pair(s).

   The number of specified storIDs for the source volumes must be equal to the number of specified storIDs for the target volumes.

–target *storid*[,...]

   Specifies the storID(s) of one ore a list of target volumes for the mirror pair(s).

   The number of specified storIDs for the source volumes must be equal to the number of specified storIDs for the target volumes.

-consistent

When specifying the parameter -consistent the CLI stormirror performs a consistent suspend over all mirror pairs specified by the list. The consistency is assured by SMI-S provider. The option is only supported for ETERNUS DX/AF for the combination of -replica local and -mirrortype full.

A maximum number of 800 replication pairs can be consistently suspended by one call. Return code 'STORMAN_INV_PARAMETERS' is returned if the maximum number is exceeded.

-force

Suspends the mirroring regardless of the status. The function is performed as supported by underlaying functions of the storage system.

-connectparam

Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
1	STORMAN_NO_ACTION	Nothing to do.
2	STORMAN_NOT_COMPLETE	Function only partly completed.
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_PARAMETERS	Specified parameters invalid.
8	STORMAN_INVALID_STORID	Specified storID not allowed
10	STORMAN_STORID_NOT_FOUND	storID does not yet exist.
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client and server.
14	STORMAN_STORAGE_LOCKED	Storage unit currently locked.
16	STORMAN_FAULT	Unexpected error in function.
22	STORMAN_RESOURCE_NOT_AVAILABLE	CIM server or database not available
25	STORMAN_CIMOM_AUTH_FAILED	User / password for CIM server not valid.
29	STORMAN_MIRROR_ERROR	Failure of the mirror operation
35	STORMAN_SYSTEM_LOCKED	The storage system is locked for administration
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid
37	STORMAN_CIMOM_ERROR	CIMOM returned an error

14.9.6 stormirror –swap

Swaps the mirror roles of source and target volumes of one or more mirrors pairs. The function reverses the roles of the volumes for the specified mirror pair(s) in the storage system, making the source volumes to target volumes and vice versa. The current local volumes are no longer accessible to the server and/or application and all.

The function is supported for local and remote full mirror pairs (clones).

Syntax

```
stormirror -swap [ -mirrortype mirrortype ] [ -replica replica ]
                  -source storid[,...] -target storid[,...]
                  -connectparam ...
```

Parameters

–mirrortype *mirrortype*

> Specifies the type of mirror pair(s) to be swapped.
>
> Supported values: `full` | `any` (default)
>
> `full` selects full copy mirror pairs (on ETERNUS DX/AF based on EC or REC).
>
> `any` selects the mirroring feature defined by the specified mirror pair(s).

–replica *replica*

> Specifies if local or remote mirror pair(s) should be processed.
>
> Supported values: `local` | `remote` | `bytarget` (default)
>
> `local` selects local replica(s) in the same storage system.
>
> `remote` selects remote replica(s) in a different storage system of the same model. This can be on a different site.
>
> `bytarget` selects the replica location defined by the specified mirror pair(s). The automatically selected replica must be the same for all specified mirror pairs.

–source *storid*[,...]

> Specifies the storID(s) of one or a list of source volumes for the mirror pair(s).
>
> The number of specified storIDs for the source volumes must be equal to the number of specified storIDs for the target volumes.

–target *storid*[,...]

> Specifies the storID(s) of one ore a list of target volumes for the mirror pair(s).
>
> The number of specified storIDs for the source volumes must be equal to the number of specified storIDs for the target volumes.

–*connectparam*

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
1	STORMAN_NO_ACTION	Nothing to do.
2	STORMAN_NOT_COMPLETE	Function only partly completed.
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_PARAMETERS	Specified parameters invalid.
8	STORMAN_INVALID_STORID	Specified storID not allowed
10	STORMAN_STORID_NOT_FOUND	storID does not yet exist.
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client and server.
14	STORMAN_STORAGE_LOCKED	Storage unit currently locked.
16	STORMAN_FAULT	Unexpected error in function.
22	STORMAN_RESOURCE_NOT_AVAILABLE	CIM server or database not available
25	STORMAN_CIMOM_AUTH_FAILED	User / password for CIM server not valid.
29	STORMAN_MIRROR_ERROR	Failure of the mirror operation
35	STORMAN_SYSTEM_LOCKED	The storage system is locked for administration
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid
37	STORMAN_CIMOM_ERROR	CIMOM returned an error

14.9.7   stormirror –terminate

Terminates one or more local or remote mirror pairs. This function removes the relationship between the original volumes and the mirror volumes.

Syntax

```
stormirror –terminate [ –mirrortype mirrortype ] [ replica replica ]
                      –source storid[,...] { –target storid [,...] |
                      [ –force ] –connectparam ...
```

Parameters

–mirrortype *mirrortype*

> Specifies the type of mirror pair(s) to be terminated.
>
> Supported values: `snap` | `full` | `fullcopy` | `any` (default)
>
> `snap` selects snapshot (pointer based) mirror pair(s).
>
> `full` selects full copy mirror pairs (on ETERNUS DX/AF based on EC or REC).
>
> `fullcopy` selects full copy pairs (on ETERNUS DX/AF based on QuickOPC)
>
> `any` selects the mirroring feature defined by the specified mirror pair(s).

–replica *replica*

> Specifies if local or remote mirror pair(s) should be processed.
>
> Supported values: `local` | `remote` | `bytarget` (default)
>
> `local` selects local replica(s) in the same storage system.
>
> `remote` selects remote replica(s) in a different storage system of the same model. This can be on a different site.
>
> `bytarget` selects the replica location defined by the specified mirror pair(s). The automatically selected replica must be the same for all specified mirror pairs.

–source *storid*[,...]

> Specifies the storID(s) of one ore a list of source volumes for the mirror pair(s).
>
> The number of specified storIDs for the source volumes must be equal to the number of specified storIDs for the target volumes.

–target *storid*[,...]

> Specifies the storID(s) of one ore a list of target volumes for the mirror pair(s).
>
> The number of specified storIDs for the source volumes must be equal to the number of specified storIDs for the target volumes.

–force

> Terminates the mirror pair(s) regardless of their status. The function is performed as supported by underlaying functions of the storage system.

–connectparam

Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
1	STORMAN_NO_ACTION	Nothing to do.
2	STORMAN_NOT_COMPLETE	Function only partly completed.
3	STORMAN_VER_NOT_SUPP	Version not supported
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid.
8	STORMAN_INVALID_ STORID	Specified storID not allowed
10	STORMAN_STORID_NOT_ FOUND	storID does not yet exist.
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server.
14	STORMAN_STORAGE_ LOCKED	Storage unit currently locked.
16	STORMAN_FAULT	Unexpected error in function.
18	STORMAN_NOT_FOUND	No wwpn for the specified host was found in the repository.
22	STORMAN_RESOURCE_ NOT_ AVAILABLE	CIM server or database not available
25	STORMAN_CIMOM_AUTH_ FAILED	User / password for CIM server not valid.
29	STORMAN_MIRROR_ERROR	Failure of the mirror operation
35	STORMAN_SYSTEM_ LOCKED	The storage system is locked for administration
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid
37	STORMAN_CIMOM_ERROR	CIMOM returned an error

14.9.8   stormirror –show

Displays information about the relationship and status of mirrored pairs. The selection is controlled by the specified parameters. E.g. use parameters `-system` *system* and `-mirrorusage` *origlocal* to show all volumes on a specific storage system that are used as source volumes for local mirroring. A subset of the selection parameters of `storcfg volume -show` is supported.

> For storage volumes used in a storage cluster a remote replication is always maintained to the secondary system.
> This remote replication is managed exclusively by ETERNUS SF Storage Cluster functions. The replication relationship is not displayed by `stormirror -show`.

Syntax

```
stormirror -show [ -storid storid ] [ -poolid poolid ]
                 [ -system system ] [ -replica replica ]
                 [ -mirrortype mirrortype ] [-copymode copymode ]
                  [ -mirrorusage mirrorusage ] [ -format format ]
                 -connectparam ...
```

Parameters

`-storid` *storid*

Specifies the storID for the logical volume (default: *). Wildcards (*) are supported.

To display all logical volumes of a storage system (even if they are not managed by StorMan) specify `-storid #all` and exactly one storage system using the `system` parameter. All other parameters are ignored in this case.

`-poolid` *poolid*

Specifies the ID of a pool the logical volume belongs to (default: *).
Wildcards (*) are supported.

`-system` *system*

Specifies the system name of the storage system the logical volume belongs to (default: *). Wildcards (*) are supported.

–replica *replica*

    Specifies if local or remote mirror pair(s) should be displayed.

    Supported values: `local` | `remote` | `any` (default)

    `local` selects local replica(s) in the same storage system.

    `remote` selects remote replica(s) in a different storage system of the same model.

    `any` selects all replicas.

–mirrortype *mirrortype*

    Specifies the mirror type of the volume for mirroring (replication) functions.

    Supported values: `snap` | `full` | `fullcopy` | `any` (default)

    `snap` selects snapshot (pointer based) mirror pair(s).

    `full` selects full copy mirror pairs (on ETERNUS DX/AF based on EC or REC).

    `fullcopy` selects full copy pairs (on ETERNUS DX/AF based on QuickOPC).

    `any` selects the mirroring feature defined by the specified mirror pair(s).

–copymode *copymode*

    Selects the displayed volumes according to their copy mode, supported only for `mirrorusage origremote` and `mirrorremote`:

    `sync` | `async` | `asyncstack` | `asyncthrough` | `any` (default)

    `–copymode sync` selects the volumes with copy mode `sync` .

    `–copymode async` selects the volumes with copy mode `async`.

    `–copymode asyncstack` selects the volumes with copy mode `asyncstack`.

    `–copymode asyncthrough` selects the volumes with copy mode `asyncthrough`.

–mirrorusage *mirrorusage*

    Selects the displayed volumes according to their usage as mirroring (replication) pairs (default: any).

    Supported values: `origlocal` | `mirrorlocal` | `origremote` | `mirrorremote` | `any` (default)

    `any` selects the pairs regardless of their mirror usage.

    `origlocal` selects all volumes used as original volumes of local mirror pair(s).

    `mirrorlocal` selects all volumes used as mirror volumes of local mirror pair(s).

    `origremote` selects original volumes of remote mirror pair(s).

    `mirrorremote` selects mirror volumes of remote mirror pair(s).

–format *format*

    Specifies the output format. Refer to the description of the "Format parameter" on page 91.

–*connectparam*

    Refer to the description of the "Connection parameters" on page 92.

To display all logical volumes (even if they are not managed by StorMan) of a storage system you have to specify exactly one system using the `-system` parameter and specify `-storid` without a value. All other parameters are ignored in this case.

> ℹ Additionally all selection parameters offered by `storcfg volume -show` are supported.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
2	STORMAN_NOT_COMPLETE	Function only partly completed.
3	STORMAN_VER_NOT_SUPP	Version not supported.
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid.
8	STORMAN_INVALID_ STORID	Specified storID not allowed
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function.
18	STORMAN_NOT_FOUND	Matching object could not be provided.
22	STORMAN_RESOURCE_ NOT_AVAILABLE	CIM server or database not available
35	STORMAN_SYSTEM_ LOCKED	The storage system is locked for administration
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid
37	STORMAN_CIMOM_ERROR	CIMOM returned an error

Examples

1. Output for logical volumes with `-format std` (default)

```
stormirror -show -storid SM_20817

storage ID         = SM_20817
  pool ID          = test
  storage system name = 4621347002
  storage serial nr. = 4621347002
  device ID         = 751
  GUID             = 600000E00D2A0000002A004702EF0000
  storage size      = 10 GB
```

```
type               = normal
storage vendor     = FUJITSU
storage model      = ETERNUS DX
status             = READY
raid level         = RAID1
raid type          = RAID1
owner controller   = CM00
storage pools      = TFO-Group
host access        = restricted
mirror targets
  storage ID           = SM_20819
    storage system name    = 4621347002
    pool ID                = test
    device ID              = 753
    GUID                   = 600000E00D2A0000002A004702F10000
    mirror type            = full-copy
    replication mode       = local
    copy mode              = sync
    status                 = split
    isSynch                = no
    percentSynced          = 1
    timestamp              = 20170511164532.000000+000
no mirror sources found
```

2. Output for logical volumes with `-format medium`

```
stormirror -show -storid UID_ SM_20817 -format medium


SM_20817 storage=4621347002 deviceID=751 size=10 GB
    targets:SM_20819/753/split
```

3. Output for logical volumes with `-format xmlp`

```
stormirror -show -storid SM_20817 -format xmlp


<Response>
  <ReturnCode>
    <Code>STORMAN_OK</Code>
    <CodeNumber>0</CodeNumber>
    <Text>successful</Text>
    <SubCode>0</SubCode>
    <SubCodeText>STORMAN_SUB_NONE</SubCodeText>
    <AdditionalInformation/>
    <MessageID>889</MessageID>
    <ConnectionID>55547508F2658</ConnectionID>
    <TimeID>1501139666197000</TimeID>
  </ReturnCode>
  <Result>
```

```
<VolumeDescriptions>
  <VolumeDescription>
    <StorID>SM_20817</StorID>
    <PoolID>test</PoolID>
    <StorageSystemName>4621347002</StorageSystemName>
    <StorageSerialNumber>4621347002</StorageSerialNumber>
    <StorageCustomName>DX500 S3-01</StorageCustomName>
    <GUID>600000E00D2A0000002A004702EF0000</GUID>
    <DeviceID>751</DeviceID>
    <DeviceNumber>751</DeviceNumber>
    <VolumeName>TFO-Vol1</VolumeName>
    <Size>10737418240</Size>
    <SizeNormalized>10 GB</SizeNormalized>
    <StorageVendor>STORMAN_STORAGE_VENDOR_FUJITSU</StorageVendor>
    <StorageModel>STORMAN_STORAGE_MODEL_ETERNUS</StorageModel>
    <StorageFeatures>29694</StorageFeatures>
    <Status>STORMAN_VOLUME_STATUS_READY</Status>
    <VolumeType>STORMAN_VOLUME_TYPE_NORMAL</VolumeType>
    <HostAccess>STORMAN_HOST_ACCESS_RESTRICTED</HostAccess>
    <RaidLevel>STORMAN_RAID_LEVEL_1</RaidLevel>
    <RaidType>RAID1</RaidType>
    <CurrOwnerController>CM00</CurrOwnerController>
    <SpaceConsumedInBox>10737418240</SpaceConsumedInBox>
    <MayBeSource>true</MayBeSource>
    <MayBeTarget>true</MayBeTarget>
    <MayBeFullTarget>true</MayBeFullTarget>
    <MayBeSnapTarget>false</MayBeSnapTarget>
    <IsActionAllowed>true</IsActionAllowed>
    <FirstHostLun/>
    <StorageClusterName/>
    <Usage>Remote Replica Source or Target</Usage>
    <UsageCode>11</UsageCode>
    <HostIDs>
    </HostIDs>
    <StoragePoolNames>
      <StoragePoolName>TFO-Group</StoragePoolName>
    </StoragePoolNames>
    <StoragePoolIDs>
      <StoragePoolID>FUJITSU:RSP0014</StoragePoolID>
    </StoragePoolIDs>
    <HostConnections>
    </HostConnections>
    <MirroringTargets>
      <MirroringTarget>
        <StorID>SM_20819</StorID>
        <DeviceID>753</DeviceID>
```

```
            <DeviceNumber>753</DeviceNumber>
            <GUID>600000E00D2A0000002A004702F10000</GUID>
            <StorageSystemName>4621347002</StorageSystemName>
            <StorageSerialNumber>4621347002</StorageSerialNumber>
            <StorageCustomName>DX500 S3-01</StorageCustomName>
            <StorageVendor>STORMAN_STORAGE_VENDOR_FUJITSU</StorageVendor>
            <StorageModel>STORMAN_STORAGE_MODEL_ETERNUS</StorageModel>
            <PoolID>test</PoolID>
            <MirrorType>STORMAN_MIRROR_TYPE_FULL_COPY</MirrorType>
            <ReplicationMode>STORMAN_MIRROR_REPLICA_LOCAL</ReplicationMode>
            <CopyMethod>STORMAN_ETERNUS_COPY_METHOD_QUICK_OPC</CopyMethod>
            <Status>STORMAN_MIRROR_PAIR_STATUS_SPLIT</Status>
            <CopyMode>STORMAN_REMOTE_COPY_MODE_SYNC</CopyMode>
            <SplitMode>STORMAN_MIRROR_SPLIT_MODE_UNKNOWN</SplitMode>
            <RecoveryMode>STORMAN_MIRROR_RECOVERY_MODE_UNKNOWN</RecoveryMode>
            <IsSynch>false</IsSynch>
            <IsSCO>false</IsSCO>
            <ContinuousCopy>false</ContinuousCopy>
            <PercentSynced>1</PercentSynced>
            <StorageClusterName/>
            <RAGroupName/>
            <PairEstablishedSince/>
            <PointInTime>
              <TimeStamp>20170511164532.000000+000</TimeStamp>
            </PointInTime>
            <CustomProperties>
            </CustomProperties>
          </MirroringTarget>
        </MirroringTargets>
        <MirroringSources>
        </MirroringSources>
        <TargetPorts>
        </TargetPorts>
        <CustomProperties>
        </CustomProperties>
        <OperationalStatus>OK</OperationalStatus>
        <OperationalStatusDetailList>
        </OperationalStatusDetailList>
      </VolumeDescription>
    </VolumeDescriptions>
  </Result>
</Response>
```

14.10   storparam

Modifies the settings for the StorMan server without restarting it. All settings are valid for the current StorMan server session. They can optionally be maintained persistent for further sessions.

Syntax

```
storparam { -show | [ -debug level ] [ -debugcom comopt ]
            [ -traceworker level] [ -tracefilemaxage level]
            [ -pmcc pmcc_installation_directory ] [ -save ]
            -connectparam ...
```

Parameters

-show

> Shows the settings of the StorMan server.

-debug *level*

> Sets the debug level of the server. Supported values:

0	Trace severe errors only
1	Trace errors too
2	Trace even warnings
3	Trace information
4	Trace debug (default)
5	Trace extended debug

-debugcom *comopt*

> Sets the debug option for communication (only active if the overall debug level is 5). Supported values:

1	Trace tcp / ip calls of clients
2	Trace messages of clients
4	Trace tcp / ip calls of CIM communication
8	Trace messages of CIM communication

> Adding the values enables multiple traces.

`-traceworker` *level*

> Enables the tracing of background threads with debug trace level (not higher than the level set by debug) to the trace file. Supported values:

0	Trace off (default)
1	Trace worker
2	Trace system updater
4	Trace mirror updater
8	Trace CIMOM status updater
16	Trace statistics collector
32	Trace main thread
64	Trace indication handler
128	Trace script updater
256	Trace volume updater
512	Trace cluster updater

> Adding the values enables multiple levels.

`-tracefilemaxage` *level*

> Defines how many days the StorMan log files are kept before they are automatically deleted. Supported values:

0	No limit (default)
n	n = number of days

`-pmcc` *pmcc_installation_directory*

> Set the installation folder for pmcc. This is only required to obtain performance data from ETERNUS DX S2 storage systems.

`-save`

> Saves the currently specified parameter values to the file `smserver.ini` to be preserved for subsequent sessions (restart of StorMan server).

-connectparam

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful
7	STORMAN_INV_ PARAMETERS	Specified parameters invalid
13	STORMAN_COMMUNIC_ ERROR	Error in StorMan communication between client and server
16	STORMAN_FAULT	Unexpected error in function
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

Examples

Output of the StorMan parameters `storparam -show`:

```
# storparam -show
debug level: 4
communication debug level: 15
worker trace: 255
CIM timeout: 600
authorization level: enabled
PMCC installation folder: /opt/FJSVstxp
trace file max ages: 0
```

14.11 storstat

The `storstat` command is used to manage the collection of performance and statistical information.

```
storstat object -function -functionparam ... -connectparam ...
```

The first parameter specifies the object group of the repository that is configured:

First parameter *object*	Object
`volume`	logical volumes of storage systems visible by StorMan
`all`	All available components of storage systems (ETERNUS DX/AF only)

The second parameter specifies the function:

Second parameter *function*	Meaning
`-get`	get statistic information

If the `-get` function is specified, the output format can be selected by specifying the `-format` parameter.

14.11.1 storstat volume

`storstat volume` is used to get statistical and performance data for storage volumes by StorMan.

```
storstat volume -function -functionparam ... -connectparam ...
```

Functions

The `-function` parameter supplies the following functions:

`-get`

Gets the statistical data for volumes of a storage system.

14.11.1.1 storstat volume –get

Gets the statistical and performance data related to storage volumes of a storage system. Selection criteria for the `-get` function can be specified using the parameters described below.

Please note that the output may be different for different storage systems

Syntax

```
storstat volume –get –system system [ –format format ]
                    –connectparam ...
```

Parameters

–system *system*

> Specifies the system name of the storage system the logical volume belongs to.
> Wildcards (*) are supported.

–format *format*

> Specifies the output format. Refer to the description of the "Format parameter" on page 91.

–*connectparam*

> Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
3	STORMAN_VER_NOT_SUPP	Version not supported.
7	STORMAN_INV_PARAMETERS	Specified parameters invalid.
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client and server.
16	STORMAN_FAULT	Unexpected error in function.
18	STORMAN_NOT_FOUND	Matching object could not be provided.
21	STORMAN_FCT_NOT_POSSIBLE	Function rejected by SMI-S provider.
22	STORMAN_RESOURCE_NOT_AVAILABLE	CIM server or database not available.
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

Output

The output field DataVersion for ETERNUS DX/AF storage systems contains the information:

- DataVersion = 1: data provided via PMCC for ETERNUS DX S2 and via SMI-S for Symmetrix and
- DataVersion = 2: data provided via SMI-S (ETERNUS DX/AF)

The following volume specific metrics are provided for EMC Symmetrix and ETERNUS DX S2 (DataVersion = 1):

Name	Description	Comments
TimeLastSampled	Absolute point in time of last sampled statistical data. Format: `yyyy-mm-dd hh:mm:ss.sss`	Example: `2017-10-12 13:56:15.000`
SampleInterval	Period of time the statistical data are collected from the storage array. Format: in seconds	Default setting: • `180 sec. = 3 min. (ETERNUS DX S2)` • `300 sec. = 5 min. (EMC Symmetrix)` Example: `180 (in seconds)`

StatisticsTime	Absolute point in time of collecting statistical data. Format: CIM_DATETIME	Available for EMC Symmetrix.
		Example:
		`20170919063103.781250+000`
		`yyyymmddHHMMSS.mmmmmmsUUU`

DeviceID	Device Id of the volume	Available for ETERNUS DX S2 and Symmetrix.
ReadIOs	Number of read IOs (Counter)	Available for ETERNUS DX S2 and EMC Symmetrix.
WriteIOs	Number of write IOs (Counter)	Available for ETERNUS DX S2 and EMC Symmetrix.
MBytesRead	Amount of MB read (Counter)	Available for ETERNUS DX S2 and EMC Symmetrix.
MBytesWritten	Amount of MB written (Counter)	Available for ETERNUS DX S2 and EMC Symmetrix.
ResponseTimeRead	Response time for Read IOs (msec). current value	Available for ETERNUS DX S2 only.
ResponseTimeWrite	Response time for Write IOs (msec). current value	Available for ETERNUS DX S2 only.

Name	Description	Comments
ResponseTimeTotal	Total Response time for IOs (msec). current value	Available for ETERNUS DX S2 only.
CacheHitRateRead	Cache Hit Rate for Read IOs	Available for ETERNUS DX S2 only.
CacheHitRateWrite	Cache Hit Rate for Write IOs	Available for ETERNUS DX S2 only.
CacheHitRatePrefetch	Cache Hit Rate for Prefetch	Available for ETERNUS DX S2 only.
CacheHitRateTotal	Total Cache Hit Rate	Available for ETERNUS DX S2 and EMC Symmetrix.
SampledReadsCounter	Number of read IOs sampled to obtain the sampledReadsTime	Available for EMC Symmetrix only.
SampledReadsTime	Cumulated time value in µsec elapsed for the sampled read IOs	Available for EMC Symmetrix only.
SampledWritesCounter	Number of write IOs sampled to obtain the sampledWritesTime	Available for Symmetrix only.
SampledWritesTime	Number of write IOs sampled to obtain the sampledWritesTime	Available for Symmetrix only.

The following volume specific metrics are provided for ETERNUS DX/AF (DataVersion = 2):

Name	Description
TimeLastSampled	Absolute point in time of last sampled statistical data. Format: yyyy-mm-dd hh:mm:ss.sss Example: `2016-01-13 13:56:15.000`
DeviceID	Device Id of the volume
ReadIOs	Number of read IOs (Counter)
WriteIOs	Number of write IOs (Counter)
MBytesRead	Amount of MB read (Counter)
MBytesWritten	Amount of MB written (Counter)

Name	Description
KBytesRead	Amount of KB read (Counter)
KBytesWritten	Amount of KB written (Counter)
ReadHitIOs	Number of read hit IOs (Counter)
WriteHitIOs	Number of write hit IOs (Counter)
ReadIOTimeCounter	Time counter for read IOs (ms)
ReadHitIOTimeCounter	Time counter for read hit IOs (ms)
WriteIOTimeCounter	Time counter for write IOs (ms)
WriteHitIOTimeCounter	Time counter for write Hit IOs (ms)

- All Counters are defined as UINT64 (the maximum value being 18446744073709551615). However overflow is handled by the provider.

Examples

1. Output for logical volumes with `-format xmlp` (default)

   ETERNUS DX500 S3:

```
storstat volume -get -system 4621347002 -format xmlp
<Response>
<Response>
  <ReturnCode>
    <Code>STORMAN_OK</Code>
    <CodeNumber>0</CodeNumber>
    <Text>successful</Text>
    <SubCode>0</SubCode>
    <SubCodeText>STORMAN_SUB_NONE</SubCodeText>
    <AdditionalInformation/>
    <MessageID>53</MessageID>
    <ConnectionID>5555D641C8740</ConnectionID>
  </ReturnCode>
  <Result>
  <StorageSystem>
    <StorageSystemName>4621347002</StorageSystemName>
    <StorageModel>STORMAN_STORAGE_MODEL_ETERNUS</StorageModel>
    <StorageVendor>STORMAN_STORAGE_VENDOR_FUJITSU</StorageVendor>
    <DataVersion>2</DataVersion>
    <StatusCode>0</StatusCode>
    <Status>successful</Status>
    <TimeLastSampled>2017-07-28 10:33:23.000</TimeLastSampled>
```

```
<SampleInterval>300</SampleInterval>
<StatisticsVolumes>
  <StatisticsVolume>
    <DeviceID>0</DeviceID>
    <TimeLastSampled>2017-07-28 10:33:23.000</TimeLastSampled>
    <ReadIOs>27</ReadIOs>
    <WriteIOs>0</WriteIOs>
    <KBytesRead>290</KBytesRead>
    <KBytesWritten>0</KBytesWritten>
    <MBytesRead>0</MBytesRead>
    <MBytesWritten>0</MBytesWritten>
    <ReadHitIOs>23</ReadHitIOs>
    <WriteHitIOs>0</WriteHitIOs>
    <ReadIOTimeCounter>45</ReadIOTimeCounter>
    <ReadHitIOTimeCounter>2</ReadHitIOTimeCounter>
    <WriteIOTimeCounter>0</WriteIOTimeCounter>
    <WriteHitIOTimeCounter>0</WriteHitIOTimeCounter>
  </StatisticsVolume>
  <StatisticsVolume>
    <DeviceID>1</DeviceID>
    <TimeLastSampled>2017-07-28 10:33:23.000</TimeLastSampled>
    <ReadIOs>23</ReadIOs>
    <WriteIOs>0</WriteIOs>
    <KBytesRead>46</KBytesRead>
    <KBytesWritten>0</KBytesWritten>
    <MBytesRead>0</MBytesRead>
    <MBytesWritten>0</MBytesWritten>
    <ReadHitIOs>22</ReadHitIOs>
    <WriteHitIOs>0</WriteHitIOs>
    <ReadIOTimeCounter>8</ReadIOTimeCounter>
    <ReadHitIOTimeCounter>1</ReadHitIOTimeCounter>
    <WriteIOTimeCounter>0</WriteIOTimeCounter>
    <WriteHitIOTimeCounter>0</WriteHitIOTimeCounter>
  </StatisticsVolume>
```

EMC VMAX3:

```
storstat volume -get -system *293 -format xmlp
<Response>
  <ReturnCode>
    <Code>STORMAN_OK</Code>
    <CodeNumber>0</CodeNumber>
    <Text>successful</Text>
    <SubCode>0</SubCode>
    <SubCodeText>STORMAN_SUB_NONE</SubCodeText>
    <MessageID>7</MessageID>
  </ReturnCode>
  <Result>
    <StorageSystem>
      <StorageSystemName>000296800293</StorageSystemName>
      <StorageModel>STORMAN_STORAGE_MODEL_SYMMETRIX</StorageModel>
      <StorageVendor>STORMAN_STORAGE_VENDOR_EMC</StorageVendor>
      <StatusCode>0</StatusCode>
      <Status>successful</Status>
      <TimeLastSampled>2016-06-06 15:01:51.593</TimeLastSampled>
      <SampleInterval>900</SampleInterval>
      <StatisticsVolumes>
        <StatisticsVolume>
          <DeviceID>1</DeviceID>
          <ReadIOs>2097</ReadIOs>
          <WriteIOs>4</WriteIOs>
          <MBytesRead>16</MBytesRead>
          <MBytesWritten>0</MBytesWritten>
          <SampledReadsCounter>2097</SampledReadsCounter>
          <SampledReadsTime>434356</SampledReadsTime>
          <SampledWritesCounter>4</SampledWritesCounter>
          <SampledWritesTime>1369</SampledWritesTime>
        </StatisticsVolume>
          …
      </StatisticsVolumes>
    </StorageSystem>
  </Result>
</Response>
```

2. Output for logical volumes with –format std (default)

ETERNUS DX500 S3:

```
storstat volume -get -system 4621347002
storage system name = 4621347002
  storage vendor      = STORMAN_STORAGE_VENDOR_FUJITSU
  storage model       = STORMAN_STORAGE_MODEL_ETERNUS
  status              = successful
```

```
time last sampled  = 2016-06-06 15:01:42.000
storage StatisticsVolume(s)
  DeviceID = 857
  TimeLastSampled = 2017-07-28 15:08:24.000
  ReadIOs = 30198
  WriteIOs = 0
  KBytesRead = 15099
  KBytesWritten = 0
  MBytesRead = 14
  MBytesWritten = 0
  ReadHitIOs = 30198
  WriteHitIOs = 0
  ReadIOTimeCounter = 2172
  ReadHitIOTimeCounter = 2172
  WriteIOTimeCounter = 0
  WriteHitIOTimeCounter = 0
...
```

EMC VMAX3:

storstat volume -get -system *293
```
storage system name = 000296800293
  ...
  time last sampled  = 2016-06-06 15:01:51.593
  sample interval    = 900
  storage StatisticsVolume(s)
    DeviceID = 1
    ReadIOs = 2097
    WriteIOs = 4
    MBytesRead = 16
    MBytesWritten = 0
    SampledReadsCounter = 2097
    SampledReadsTime = 434356
    SampledWritesCounter = 4
    SampledWritesTime = 1369
```

14.11.2   storstat all

`storstat all` is used to get all available statistical and performance data including volumes, frontend ports (FA and CA) for ETERNUS DX/AF storage systems by StorMan.

```
storstat all -function -functionparam ... -connectparam ...
```

Functions

The -function parameter supplies the following functions:

-get

    Get all statistical data for volumes, front end ports and controllers of a storage system.

14.11.2.1   storstat all -get

Get the statistical and performance data related to volumes, front end ports and controllers of a storage system. Selection criteria for the -get function can be specified using the parameters described below.

Syntax

```
storstat all -get -system system [ -format format ] -connectparam ...
```

Parameters

-system *system*

    Specify the system name of the storage system to get information from. Wildcards (*) are supported.

-format *format*

    Specifies the output format. Refer to the description of the "Format parameter" on page 91.

-*connectparam*

    Refer to the description of the "Connection parameters" on page 92.

Return codes

Error Code	Name	Error Type
0	STORMAN_OK	Function successful.
3	STORMAN_VER_NOT_SUPP	Version not supported.
7	STORMAN_INV_PARAMETERS	Specified parameters invalid.

Error Code	Name	Error Type
13	STORMAN_COMMUNIC_ERROR	Error in StorMan communication between client and server.
16	STORMAN_FAULT	Unexpected error in function.
18	STORMAN_NOT_FOUND	Matching object could not be provided.
21	STORMAN_FCT_NOT_POSSIBLE	Function rejected by SMI-S provider.
22	STORMAN_RESOURCE_NOT_AVAILABLE	CIM server or database not available.
36	STORMAN_AUTH_FAILED	User / password for StorMan not valid

Output

The following volume and port specific metrics are provided for ETERNUS DX S2 (DataVersion = 1):

Name	Description
TimeLastSampled	Absolute point in time of last sampled statistical data. Format: `yyyy-mm-dd hh:mm:ss.sss` Example: `2017-10-12 13:56:15.000`
SampleInterval	Period of time the statistical data are collected from the storage array. Format: in seconds Default setting: 180 (in seconds)
Volume specific:	
DeviceID	Device Id of the volume
ReadIOs	Number of read IOs (Counter)
WriteIOs	Number of write IOs (Counter)
MBytesRead	Amount of MB read (Counter)
MBytesWritten	Amount of MB written (Counter)
ResponseTimeRead	Response time for Read IOs (msec). current value
ResponseTimeWrite	Response time for Write IOs (msec). current value

Name	Description
ResponseTimeTotal	Total Response time for IOs (msec). current value
CacheHitRateRead	Cache Hit Rate for Read IOs
CacheHitRateWrite	Cache Hit Rate for Write IOs
CacheHitRatePrefetch	Cache Hit Rate for Prefetch
CacheHitRateTotal	Total Cache Hit Rate
Port specific:	
PortName	Name of the port
ControllerName	Identifier of the Controller
ReadIOs	Number of read IOs / port (Counter)
WriteIOs	Number of write IOs / port (Counter)
MBytesRead	Amount of MB read / port (Counter)
MBytesWritten	Amount of MB written / port (Counter)

- All Counters are defined as UINT64 (the maximum value being 18446744073709551615). However overflow is handled by the provider.
- All time values are provided in micro seconds (µsec).
- The port specific output can be added up for each controller.

The following volume and port specific metrics are provided for ETERNUS DX/AF (DataVersion = 2):

Name	Description
TimeLastSampled	Absolute point in time of last sampled statistical data. Format: `yyyy-mm-dd hh:mm:ss.sss` Example: `2016-01-13 13:56:15.000`
Volume specific:	
DeviceID	Device Id of the volume
ReadIOs	Number of read IOs (Counter)
WriteIOs	Number of write IOs (Counter)
MBytesRead	Amount of MB read (Counter)
MBytesWritten	Amount of MB written (Counter)
KBytesRead	Amount of KB read (Counter)
KBytesWritten	Amount of KB written (Counter)
ReadHitIOs	Number of read hit IOs (Counter)
WriteHitIOs	Number of write hit IOs (Counter)
ReadIOTimeCounter	Time counter for read IOs (ms)
ReadHitIOTimeCounter	Time counter for read hit IOs (ms)
WriteIOTimeCounter	Time counter for write IOs (ms)
WriteHitIOTimeCounter	Time counter for write hit IOs (ms)
Port specific:	
PortName	Name of the port
ControllerName	Identifier of the Controller
ReadIOs	Number of read IOs / port (Counter)
WriteIOs	Number of write IOs / port (Counter)
MBytesRead	Amount of MB read / port (Counter)

Name	Description
MBytesWritten	Amount of MB written / port (Counter)
KBytesRead	Amount of KB read / port (Counter)
KBytesWritten	Amount of KB written / port (Counter)
KBytesTransferred	Amount of KB transferred / port (Counter)
ReadIOTimeCounter	Time counter for read IOs (ms)
WriteIOTimeCounter	Time counter for write IOs (ms)
Disk specific:	
DeviceID	ID if the disk
ReadIOs	Number of read IOs
WriteIOs	Number of write IOs
KBytesTransferred	Amount of KB transferred

Examples

Output for all statistics of ETERNUS DX500 S3 with -format xmlp (default)

```
storstat all -get -system 4621349005-format xmlp
<Response>
  <ReturnCode>
    <Code>STORMAN_OK</Code>
    <CodeNumber>0</CodeNumber>
    <Text>successful</Text>
    <SubCode>0</SubCode>
    <SubCodeText>STORMAN_SUB_NONE</SubCodeText>
    <MessageID>2</MessageID>
  </ReturnCode>
  <Result>
    <StorageSystem>
      <StorageSystemName>4531107011</StorageSystemName>
      <StorageModel>STORMAN_STORAGE_MODEL_ETERNUS</StorageModel>
      <StorageVendor>STORMAN_STORAGE_VENDOR_FUJITSU</StorageVendor>
      <TimeLastSampled>2016-06-06 15:01:51.000</TimeLastSampled>
      <SampleInterval>60</SampleInterval>
      <UTCDiff>-120</UTCDiff>
      <StatusCode>0</StatusCode>
      <Status>successful</Status>
```

```
            <StatisticsVolumes>
              <StatisticsVolume>
                <DeviceID>0</DeviceID>
                <ReadIOs>0</ReadIOs>
                <WriteIOs>0</WriteIOs>
                <MBytesRead>0</MBytesRead>
                <MBytesWritten>0</MBytesWritten>
                <ResponseTimeRead>0</ResponseTimeRead>
                <ResponseTimeWrite>0</ResponseTimeWrite>
                <ResponseTimeTotal>0</ResponseTimeTotal>
                <CacheHitRateRead>0</CacheHitRateRead>
                <CacheHitRateWrite>0</CacheHitRateWrite>
                <CacheHitRatePrefetch>0</CacheHitRatePrefetch>
                <CacheHitRateTotal>0</CacheHitRateTotal>
              </StatisticsVolume>
          …
            <StatisticsPorts>
              <StatisticsPort>
                <PortName>FCP_CM00CA00P00</PortName>
               <ControllerName>CM00</ControllerName>
                <ReadIOs>120</ReadIOs>
                <WriteIOs>60</WriteIOs>
                <MBytesRead>60</MBytesRead>
                <MBytesWritten>60</MBytesWritten>
              </StatisticsPort>
          …
            </StatisticsPorts>
            <StatisticsControllers>
              <StatisticsController>
                <ControllerName>CM00</ControllerName>
                <BusyMain>1</BusyMain>
                <DirtyCache>0</DirtyCache>
          </StorageSystem>
        </Result>
      </Response>
```

15 Appendix

15.1 Fujitsu Technology Solutions: Software License Agreement for End Users

1. Subject of this Agreement

1.1 For the purposes of this agreement "Software" shall mean the software with the object code, the version and the specification indicated in the software product data sheet of Fujitsu Technology Solutions.

The Software consists of machine-readable instructions and/or printed documentation and related licensed materials.

1.2 Please read this agreement carefully before you use the Software. If you do not agree with the license terms in this agreement, you are not permitted to use the Software and must immediately return all copies of the Software and all accompanying items to the Licensor/Sublicensor (either Fujitsu Technology Solutions or the reseller who supplied you with the Software) with proof of purchase for a full refund.

1.3 Any use of the Software requires the proper payment of the applicable license fees. By using the Software you agree to be bound by the terms of this agreement.

1.4 Fujitsu Technology Solutions reserves the right to implement at any time in the future an additional software license key and/or license certificates as countermeasures against software piracy.

1.5 Software components from third-party software suppliers which are part of the scope of the delivery are subject to separate license agreements that are included with the Software or that are transmitted by Fujitsu Technology Solutions upon request.

2. End User License

2.1 Fujitsu Technology Solutions grants you a non-exclusive and non-transferable license to use the Software on the number of workstations for which you have purchased licenses. Unless you purchase additional licenses, you are not permitted to operate the Software on more than the maximum number of licensed workstations or on hardware that exceeds the specified type.

You are permitted to make a backup copy of the Software for archiving purposes, provided you properly mark the copy or partial copy of the Software with the copyright notice and any other ownership information.

2.2 You are not permitted to copy, modify or distribute the Software. Furthermore, you are not permitted to re-compile, re-engineer, convert, revise, compile or modify the Software. You may not sub-license, without selling the related hardware, assign, rent, lease or transfer the Software except as expressly permitted by this agreement or due to mandatory legal regulations.

2.3 If you acquired the Software as a program upgrade, your license for the use of the old software version ends automatically with the installation of the upgrade version of the Software. If parts of the old software version are not replaced by the upgrade version, the license for the old version continues to be effective until the remnants of the old software version are also replaced or deactivated or shut down in any other way.

2.4 Unless specified otherwise in the respective software data sheet of Fujitsu Technology Solutions, the license for a software version or release does not give you any rights to new releases (updates), new versions (upgrades) or technical support services for the Software. Supplemental software support contracts and maintenance services, including or excluding new releases and new versions and additional technical support services, can be purchased separately either from Fujitsu Technology Solutions directly or from authorized software resellers.

3. Downloading

For Software supplied by Fujitsu Technology Solutions over a network or a similar distribution path, the following additional conditions shall apply:

All products supplied for downloading by Fujitsu Technology Solutions are selected, made available and - if supplied by third parties - provided without modification. However, you are fully responsible for ensuring the most current version and usability of downloadable material for your own purposes and on your own system. You download Software at your own risk. Fujitsu Technology Solutions will not accept any liability, particularly not for transmission errors or problems that arise during the downloading process (line failures, connection interruptions, server failures, data corruption, etc.).

The website of Fujitsu Technology Solutions is operated and administered only for those countries in which Fujitsu Technology Solutions has one or more offices. Fujitsu Technology Solutions accepts no responsibility that Software and/or documentation can or may be downloaded from a Fujitsu Technology Solutions website also in locations other than the countries mentioned above. If you access a website of Fujitsu Technology Solutions from abroad, you are fully responsible for complying with any local regulations. Fujitsu Technology Solutions expressly prohibits the downloading of Software and/or documentation from a Fujitsu Technology Solutions website in countries where such downloading is considered illegal.

4. Copyright

All rights and licenses, unless they are expressly granted to you in this license terms, as well as all property and usage rights related to the Software (including parts of the Software) remain fully with Fujitsu Technology Solutions and/or its third-party licensors.

The license terms do not authorize you to use the brands, logos or trademarks of Fujitsu Technology Solutions or its third-party licensors, nor are you permitted to use any other brands which are deceptively similar to the brands, logos or trademarks of Fujitsu Technology Solutions. Each and any use of brands, logos or trademarks with respect to the Software or Fujitsu Technology Solutions requires the express consent of Fujitsu Technology Solutions.

5. Licensor's warranty and liability disclaimer, if Software is sold and delivered by Reseller

If you acquire the Software directly from an authorized reseller (called "Reseller"), the right to install and use the Software may be subject to additional software license conditions agreed upon between you as the licensee and the respective reseller.

In all cases of an authorized software resale, the software is sublicensed and made available to the licensee directly by the Reseller. In such cases, Fujitsu Technology Solutions is not a contractual party of the software license agreement between you, as licensee and the Reseller, as far as the procurement of the software licenses are concerned. Legal claims in connection with the software licensing can therefore be asserted only on the basis of the agreements with the Reseller. Under no circumstances, however, will the respective scope of the license for the licensee exceed the scope of the license agreements as specified in sections 1, 2, 3 and 4 of this agreement.

Subject to mandatory legal regulations, particularly those governing liability and/or warranties, which cannot be excluded in connection with end user license agreement regulations and with reference to the licensee's claims against the Reseller, Fujitsu Technology Solutions disclaims all warranties for the Software in this agreement. For the same reason, Fujitsu Technology Solutions disclaims any and all liability/claims for any violations of third parties' rights as well as any implied warranties for the software's marketability and its suitability for a particular purpose. This disclaimer of liability does not apply in cases of willful or malicious behavior by Fujitsu Technology Solutions.

In this End User License Agreement, Fujitsu Technology Solutions grants no warranties of any kind, either express or implied.

6. Disclaimer of liability with respect to shareware, freeware and/or open source software components

6.1 The Software may contain freeware or shareware which Fujitsu Technology Solutions received from a third party. Fujitsu Technology Solutions paid no license fees for the use of this freeware or shareware. Accordingly, the licensee is not charged any license fees for

the use of the freeware or shareware. You recognize and accept that Fujitsu Technology Solutions therefore grants no warranties with respect to such freeware or shareware components and does not assume any liability in connection with the ownership, the distribution and/or the use of the respective freeware or shareware.

6.2 The Software may also contain open source software components that were developed according to the "open source model" and which are distributed exclusively on the basis of the GPL (General Public License: http://www.gnu.org/copyleft/gpl.html) terms and conditions or other standard open source standard license terms and conditions applicable to the respective open source components at the time of their dissemination. You recognize and accept that the licensing of such open source software components is governed exclusively by the abovementioned GPL terms or by the conditions which are otherwise included with the open source software components. Fujitsu Technology Solutions receives neither license fees nor any other compensation for the delivered open source software components. As far as Fujitsu Technology Solutions or a third party receives any compensation in connection with open source software components, it is received exclusively for additional delivery items and/or services.

Because of the special nature of the development and distribution of open source software components, Fujitsu Technology Solutions assumes no express or implied liability for such components and excludes any kind of warranty for such open source software components, particularly in connection with missing specifications, lack of functionality, programming errors or any other malfunctions.

7. General limitations of liability

7.1 Neither Fujitsu Technology Solutions nor its suppliers are liable for any consequential or indirect damages, including damages arising as a result of or in connection with an operational interruption, lost profits or sales, lost data, or costs of capital. Fujitsu Technology Solutions and its suppliers will not be liable for additional ancillary or consequential costs or for any other losses, costs or expenses of any kind which arise as a result of the holding, sale, use or impossibility of use of the Software, independent of whether such claims are asserted due to warranty rights, contracts, tort or any other legal theory.

7.2 The liability of Fujitsu Technology Solutions for direct damage caused as a result of a contract violation and/or other action or lapse on the part of Fujitsu Technology Solutions which have not been excluded or cannot be completely excluded due to mandatory law are limited to no more than €250,000.00. Any and all other liabilities for direct damage are excluded. Damage caused by Fujitsu Technology Solutions as a result of slight negligence are excluded to the extent permitted by applicable legal regulations.

7.3 Limitations and exclusions of liability resulting from this agreement do not apply to damage where Fujitsu Technology Solutions carries compulsory liability according to applicable laws and where such liability cannot be limited to a maximum amount (for example, liability for bodily damage; product liability or fraudulently incorrect information).

8. Export controls

Due to its components as well as the nature or purpose of these components, the export of the Software and/or its accompanying documents may be subject to official or regulatory approval. In cases where the Software is intended for export, you are obliged to get all approvals and authorizations required to comply with all relevant export regulations.

The Software may not be exported if there is reason to assume that the Software will be used in connection with nuclear, chemical or biological weapons or for missile technology. Furthermore, you may not deliver the Software - or have it delivered indirectly - to such companies or persons who are listed in the applicable U.S. export regulations (particularly the Table of Denial Orders/U.S. Denied Persons Lists (DPL) or in the E.U. export regulations (particularly the EU Terrorist List) or in the applicable warnings issued by the German export authorities or any other competent authorities in any country.

Under no circumstances is Fujitsu Technology Solutions obligated to deliver software, patches, updates or upgrades, to provide software for download or to fulfill any other contractual commitments if this would be a violation of the applicable export regulations of the Federal Republic of Germany, the European Union, the United States of America or of any other countries.

If you export or re-export the Software or a copy of it, this may be a violation of applicable export laws and a severe violation of the terms of this agreement.

9. Miscellaneous

9.1 If any term or condition in this agreement or any other contract that is subject to the terms and conditions of this agreement turns out to be invalid or unenforceable (partly or in full), the validity of all other terms and conditions remains unaffected, unless complying with the remaining terms and conditions would represent an unreasonable hardship for either contract party, even with the application of applicable legal regulations to close the legal gap.

9.2 If you/ the licensee do not pay the license fees due and/or if the licensee does not comply with essential terms and conditions of this license agreement, Fujitsu Technology Solutions reserves the right to cancel the license. In case of such cancellation, you must immediately return any and all copies of the software in your possession and confirm the complete return [of the software copies] or the destruction of these copies in writing.

9.3 Neither you nor Fujitsu Technology Solutions is responsible or liable for the respective party's non-compliance with its obligations if the reason for such non-compliance is outside the party's control due to force majeure.

9.4 Any and all modifications and/or amendments to these license terms and conditions are only valid if they are made in writing.

10. Applicable law

10.1 These license terms and conditions are governed by the laws of the Federal Republic of Germany.

10.2 In the event that provisions of clause 10.1 are unenforceable, these license terms and conditions shall be governed by the laws of the country in which you acquire the Software, with the following exceptions: 1) In Australia, the terms and conditions of this license are governed by the laws of the state or sovereign territory in which the business contract is being concluded; 2) in Albania, Armenia, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, the Czech Republic, Georgia, Hungary, Kazakhstan, Kirgizia, the former Yugoslavian Republic of Macedonia (FYROM), Moldavia, Poland, Romania, Russia, Slovakia, Slovenia, the Ukraine and the Federal Republic of Yugoslavia, the terms and conditions of this license are governed by the laws of the Federal Republic of Germany; 3) in the United Kingdom [Great Britain], all disputes with respect to these license terms and conditions are governed by English law, and English courts have exclusive jurisdiction; 4) in Canada, the terms and conditions of this license are governed by the laws of the Province of Ontario; 5) in the United States of America and in Puerto Rico as well as in the People's Republic of China the terms and conditions of this license are governed by the laws of the U.S. State of New York.

15.2 Third Party Licenses

These document contains legal attribution for acknowledging open-source and third-party software copyright, and licensing requirements for StorMan V7.0.

15.2.1 OpenSSL License

http://www.sdisw.com/openssl.htm

Copyright (c) 1998-2000 The OpenSSL Project. All rights reserved. Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

3. All advertising materials mentioning features or use of this software must display the following acknowledgment: This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit. (http://www.openssl.org)

4. The names "OpenSSL Toolkit" and "OpenSSL Project" must not be used to endorse or promote products derived from this software without prior written permission. For written permission, please contact openssl-core@openssl.org

5. Products derived from this software may not be called "OpenSSL" nor may "OpenSSL" appear in their names without prior written permission of the OpenSSL Project.

6. Redistributions of any form whatsoever must retain the following acknowledgment: "This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (http://www.openssl.org)"

THIS SOFTWARE IS PROVIDED BY THE OpenSSL PROJECT ``AS IS'' AND ANY EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE OpenSSL PROJECT OR ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
This product includes cryptographic software written by Eric Young (eay@cryptsoft.com). This product includes software written by Tim Hudson (tjh@cryptsoft.com).

15.2.2 SQLite License

All of the deliverable code in SQLite has been dedicated to the public domain (http://en.wikipedia.org/wiki/Public_domain) by the authors. All code authors and representatives of the companies for which they work have signed affidavits dedicating their contributions to the public domain and originals of those signed affidavits are stored in a firesafe at the main offices of Hwaci (http://www.hwaci.com). Anyone is free to copy, modify, publish, use, compile, sell, or distribute the original SQLite code, either in source code form or as a compiled binary, for any purpose, commercial or non-commercial, and by any means.

15.2.3   jquery License

https://jquery.org/license/

Copyright 2013 jQuery Foundation and other contributors

http://jquery.com/

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

15.2.4   jqueryUI License

https://jquery.org/license/

Copyright 2013 jQuery Foundation and other contributors

http://jquery.com/

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including

without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

15.2.5   jquery-cookie MIT-License

https://github.com/carhartl/jquery-cookie/blob/master/MIT-LICENSE.txt

Copyright 2014 Klaus Hartl

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

15.2.6   DataTables License

https://datatables.net/license_mit

MIT license

Copyright (C) 2008-2014, SpryMedia Ltd.

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

15.2.7   zTree License

http://www.ztree.me/v3/main.php#_license

zTree -- jQuery tree plug-ins.

License (MIT License)

copyright (c) <2011> < hunter.z >

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.
IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

15.2.8 7zip License

http://7-zip.org/license.txt

License for use and distribution

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

7-Zip Copyright (C) 1999-2014 Igor Pavlov.

Licenses for files are:

    1) 7z.dll: GNU LGPL + unRAR restriction

    2) All other files: GNU LGPL

    The GNU LGPL + unRAR restriction means that you must follow both

    GNU LGPL rules and unRAR restriction rules.

    Note:

        You can use 7-Zip on any computer, including a computer in a commercial organization. You don't need to register or pay for 7-Zip.

GNU LGPL information

    This library is free software; you can redistribute it and/or   modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version.

    This library is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU Lesser General Public License for more details.

    You can receive a copy of the GNU Lesser General Public License from

    http://www.gnu.org/

unRAR restriction

    The decompression engine for RAR archives was developed using source code of unRAR program.

All copyrights to original unRAR code are owned by Alexander Roshal.

The license for original unRAR code has the following restriction:

The unRAR sources cannot be used to re-create the RAR compression algorithm, which is proprietary. Distribution of modified unRAR sources in separate form or as a part of other software is permitted, provided that it is clearlystated in the documentation and source comments that the code maynot be used to develop a RAR (WinRAR) compatible archiver.

--

Igor Pavlov

Related publications

You will find the manuals on the internet at http://manuals.ts.fujitsu.com. You can order printed copies of those manuals which are displayed with an order number.

[1] **SHC-OSD**

 Storage Management for BS2000

 User Guide

[2] **IMON** (BS2000)

 Installation Monitor

 User Guide

[3] **FUJITSU Server BS2000**

 SE700 / SE500 / SE300

 Operation and Administration

 User Guide

[4] **SE Servers**

 SE Manager Help

 Online Help

Index