CentricStor V3.1D

User Guide

Edition July 2007

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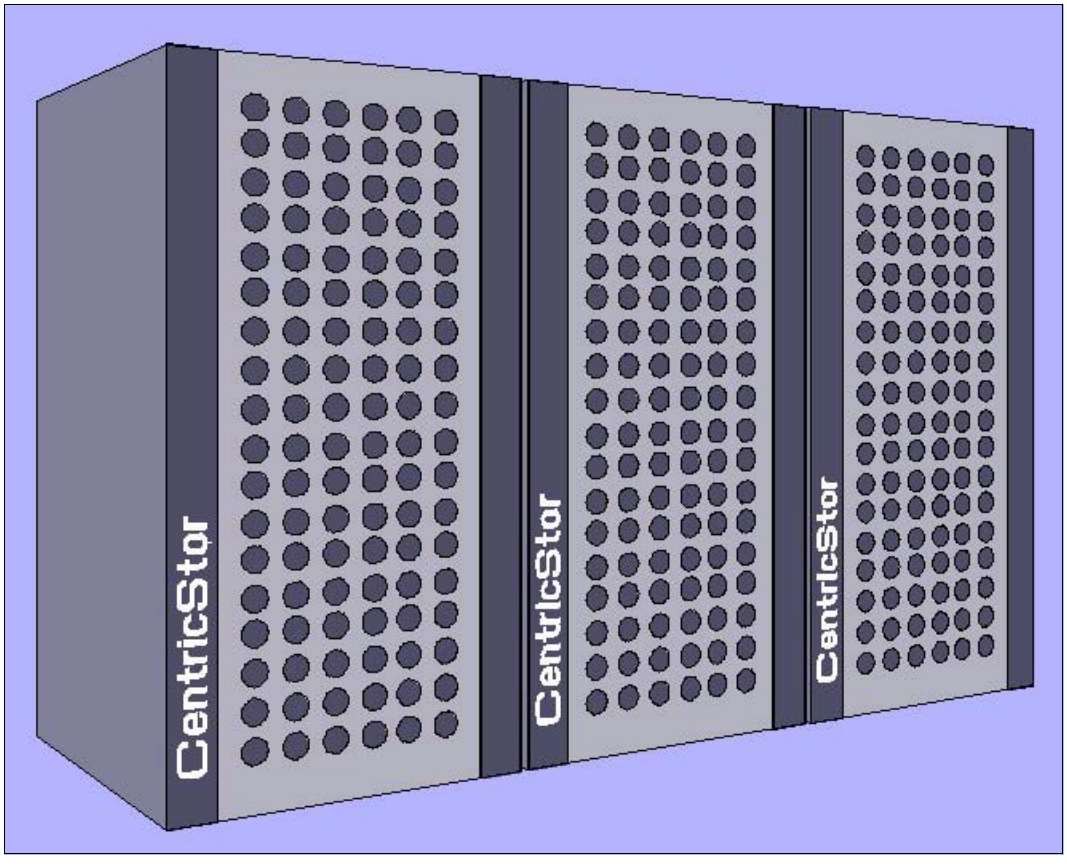
1 Introduction



With CentricStor, a virtual tape robot system is placed in front of the real tape robot system (with the real drives and cartridges). In this way the host and the real archive are fully decoupled. The virtual tape robot system knows what are referred to as virtual (logical) drives and virtual (logical) volumes. The core element here consists principally of a disk system as data cache, guaranteeing not only extremely high-speed access to the data, but also, thanks to the large number of virtual drives (up to 512) and logical volumes (up to 500 000) which can be generated, that the bottlenecks which occur in a real robot system can be cleared.

The host is connected using the following connection technologies:

- ESCON channels
- FibreChannel
- FICON

Communication between the individual control units takes place via the LAN in CentricStor, the transport of the user data to and from the RAID system via the FibreChannel.

The physical drives can be connected to the backend via both FibreChannel and SCSI technology.

1.1 Objective and target group for the manual

This manual provides all the information you need to operate CentricStor. It is thus aimed at operators and system administrators.

1.2 Concept of the manual

This manual describes how to use CentricStor in conjunction with a BS2000/MVS system and Open Systems.

It supplies all the information you need to commission and administer CentricStor:

CentricStor - Virtual Tape Library
This chapter describes the CentricStor hardware and software architecture. It details the operating procedures, so that you can gain an understanding of the way the system works. It also contains information on the technical implementation, and a description of new and optional components.

Switching CentricStor on/off
This chapter describes how to power up and shut down CentricStor.

Selected system administrator activities
This chapter contains information on selected system administrator activities in GXCC and XTCC, the graphical user interface of CentricStor.

Operating and monitoring CentricStor
This chapter describes the technical concept for operating and monitoring CentricStor, and explains how GXCC and XTCC are started.

GXCC
This chapter describes the GXCC program used to operate and monitor CentricStor.

Global Status
The Global Status Monitor provides a graphical display of all important operating data in a window.

XTCC
The program XTCC is used mainly to monitor the individual CentricStor computers (ISPs) including the peripheral devices connected to the computers.

Explanation of console messages
This chapter describes the most important of the console messages. And as far as possible suggests a way of solving the problem.

Appendix
The Appendix contains additional information concerning CentricStor.

Glossary
This chapter describes the most important CentricStor specific terms.

1.3 Notational conventions

This manual uses the following symbols and notational conventions to draw your attention to certain passages of text:

►	This symbol indicates actions that must be performed by the user (e.g. keyboard input).
	This symbol indicates important information (e.g. warnings).
	This symbol indicates information which is particularly important for the functionality of the product.
[...]	Square brackets are used to enclose cross-references to related publications, and to indicate optional parameters in command descriptions.

Names, commands, and messages appear throughout the manual in `typewriter font` (e.g. the `SET-LOGON-PARAMETERS` command).

1.4 Note

CentricStor is subject to constant development. The information contained in this manual is subject to change without notice.

2 CentricStor - Virtual Tape Library

2.1 The CentricStor principle

Conventional host robot system

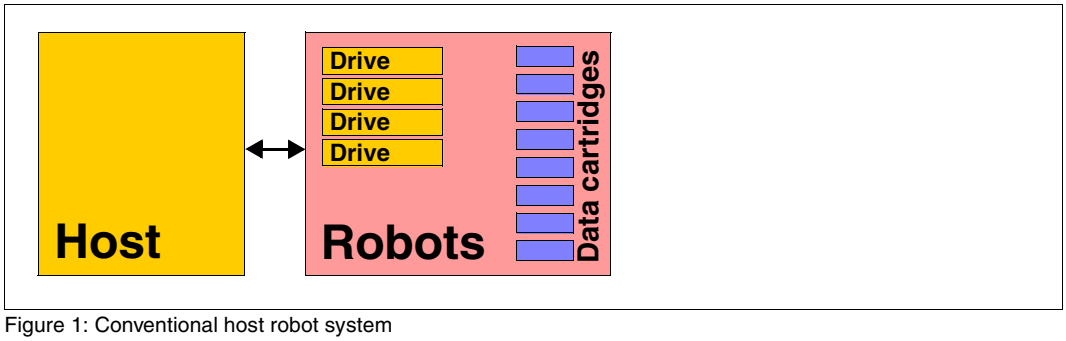


Figure 1: Conventional host robot system

In a conventional real host robot system, the host system requests certain data cartridges to be mounted in a defined real tape drive. As soon as the storage peripherals (robots, drives) report that this has been completed successfully, data transfer can begin. In this case, the host has direct, exclusive access to the drive in the archive system. It is crucial that a completely static association be defined between the application and the physical drive.

Host robot system with CentricStor

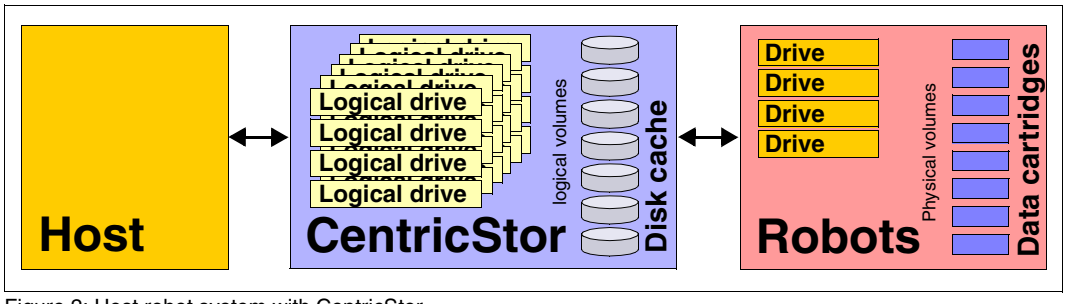


Figure 2: Host robot system with CentricStor

With CentricStor, a virtual archive system is installed upstream of the real archive system with the physical drives and data cartridges. This enables the host to be completely isolated from the real archive. The virtual archive system contains a series of logical drives and volumes. At its heart is a data buffer, known as the disk cache, in which the logical volumes are made available. This guarantees extremely fast access to the data, in most cases allowing both read and write operations to be performed much more efficiently than in conventional operation.

Instead of the term logical drives (or volumes), the term virtual drives (or volumes) is sometimes also used. These terms should be regarded as synonyms. In this manual the term logical is used consistently when drives and volumes in CentricStor are meant, and physical when the real peripherals are meant.

The virtual archive system is particularly attractive, as it provides a large number of logical drives compared to the number of physical drives. As a result, bottlenecks which exist in a real archive can be eliminated or avoided.

From the host's viewpoint, the logical drives and volumes act like real storage peripherals. When a mount job is issued by a mainframe application or an open systems server, for example, the requested logical volume is loaded into the disk cache. If the application then writes data to the logical drive, the incoming data stream is written to the logical volume created in the disk cache.

The Library Manager of the virtual archive system then issues a mount job to the real archive system asynchronously and completely transparently to the host. The data is read out directly from the disk cache and written to a physical tape cartridge. The physical volume is thus updated with optimum resource utilization.

Logical volumes in the disk cache are not erased immediately. Instead, data is displaced in accordance with the LRU principle (Least Recently Used). Sufficient space for this must be allocated in the disk cache.

As soon as a mount job is issued, the Library Manager checks whether the requested volume is already in the disk cache. If so, the volume is immediately released for processing by the application. If not, CentricStor requests the corresponding cartridge to be mounted onto a physical drive, and reads the logical volume into the disk cache.

CentricStor thus operates as a very large, extremely powerful, highly intelligent data buffer between the host level and the real archive system.

It offers the following advantages:

- removal of device bottlenecks through virtualization
- transparency to the host thanks to the retention of interfaces unchanged
- support for future technologies by isolating the host from the archive system

CentricStor thus provides a long-term, cost-effective basis for modern storage management.

2.2 Hardware architecture

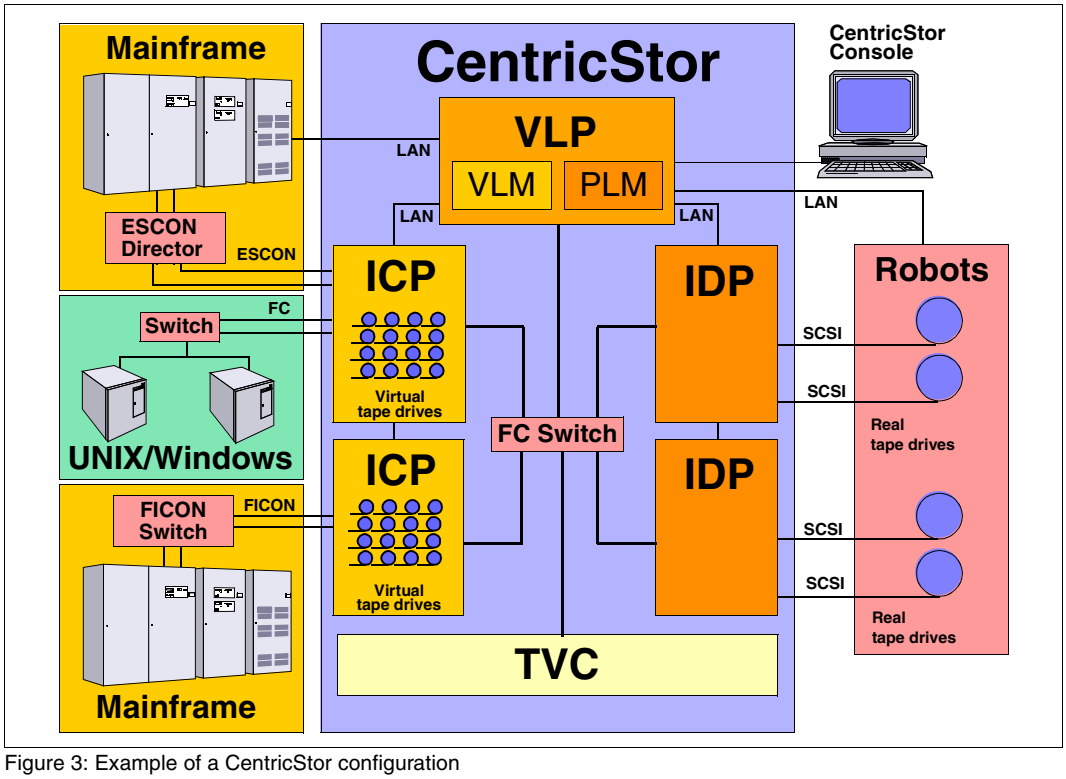


Figure 3: Example of a CentricStor configuration

In this example, CentricStor comprises the following hardware components:

- a VLP (Virtual Library Processor), which monitors and controls the CentricStor hardware and software components
- two ICPs (Integrated Channel Processors), which communicate with the hosts via ESCON (via ESCON Director), FICON (via FICON switch) or FC (via FC switch)
- two IDPs (Integrated Device Processors), which communicate with the tape drives in the robot system via SCSI or FC
- one or more RAID systems for the TVC (Tape Volume Cache) for buffering logical volumes
- an FC switch, which is used by the ICP, IDP, and VLP to transfer data
- a CentricStor console for performing configuration and administration tasks
- a LAN connection between CentricStor and the robot system
- a LAN connection, which is used by the ICP, IDP, and VLP for communication

The PLM (Physical Library Manager) and VLM (Virtual Library Manager) are software components which are particularly important for system operation (see page 34).

2.2.1 ISP (Integrated Service Processor)

CentricStor is a group of several processors, each running special software (UNIX derivative) as the operating system. These processors are referred to collectively as the ISP (Integrated Service Processor). Depending on the peripheral connection, the hardware configuration, the software configuration, and the task in the CentricStor system, a distinction is made between the following processor types:

– VLPs (optional: SVLP = standby VLP)
– ICPs
– IDPs
– ICP_IDP

To permit communication between the processors, they are interconnected by an internal LAN. The distinguishing characteristics of these processors are described in the following sections.

2.2.1.1 VLP (Virtual Library Processor)

The processor of the type VLP can be included twice to provide failsafe performance. Only one of the two plays an active role at any given time: the VLP Master. The other, the Standby VLP (SVLP), is ready to take over the role of the VLP Master should the VLP Master fail (see section “Automatic VLP failover” on page 52). The two VLPs are connected to each other and to the ICPs, IDPs and TVC via FC.

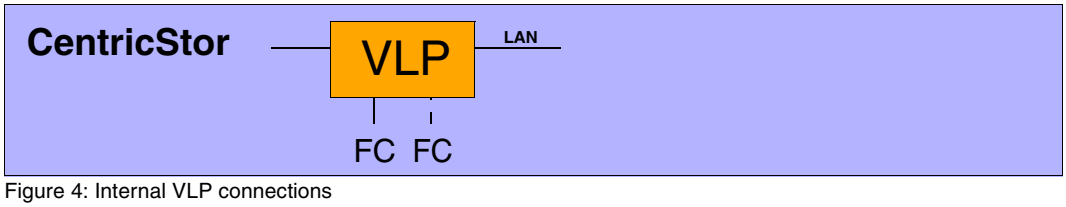


Figure 4: Internal VLP connections

The main task of the VLP Master is the supervision and control of the hardware and software components, including the data maintenance of the VLM and the PLM. Communication takes place via the LAN connection

The software which controls CentricStor (in particular, the VLM and PLM) is installed on all the processors (VLP, ICP, and IDP) but is only activated on one processor (the VLP Master).

2.2.1.2 ICP (Integrated Channel Processor)

The ICP is the interface to the host systems connected in the overall system.

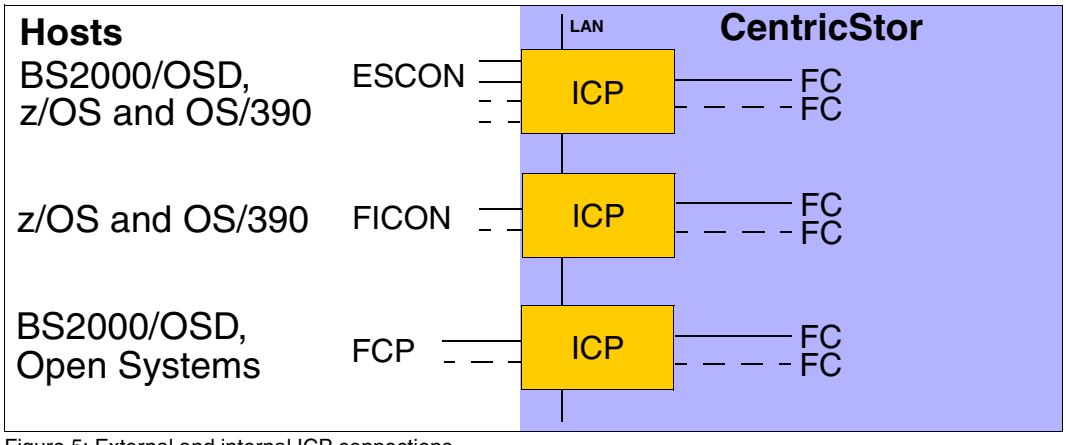


Figure 5: External and internal ICP connections

Depending on the type of host system used, it is possible to equip an ICP with a maximum of 4 ESCON boards on the host side (connection with BS2000/OSD, z/OS or OS/390), with one or two FICON ports (connection with z/OS or OS/390), or with one or two FC boards (BS2000/OSD or open systems). A mixed configuration is also possible.The ICP also has an internal FC board (or two in the case of redundancy) for connecting to the RAID disk system.

The main task of the ICP is to emulate physical drives to the connected host systems.

The host application issues a logical mount job for a logical drive in an ICP connected to a host system (see section “Issuing a mount job from the host” on page 39). The data transferred for the associated logical volume is then stored by the ICP directly in the RAID disk system.

The virtual CentricStor drives support a maximum block size of 256 KB.

Communication with the other processors takes place over a LAN connection.

2.2.1.3 IDP (Integrated Device Processor)

The IDP is the interface to the connected tape drives.

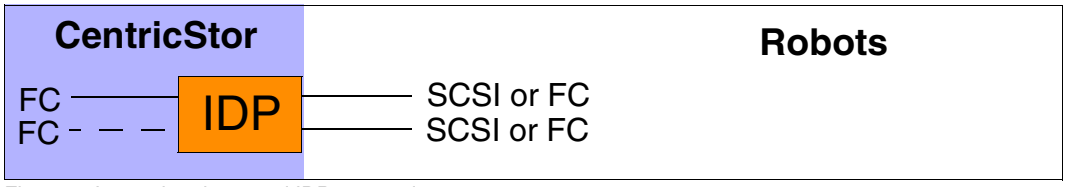


Figure 6: Internal and external IDP connections

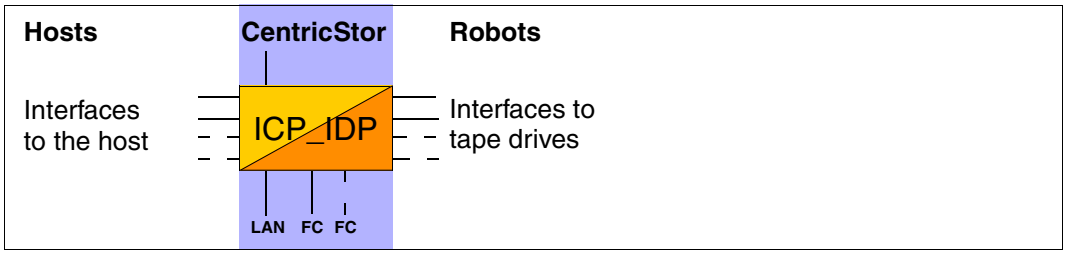
The IDP is responsible for communication with real tape drives. To optimize performance, only two real tape drives should be configured per IDP.

Because of the relatively short length of a SCSI cable (approx. 25 m), the CentricStor IDPs are typically installed directly in the vicinity of the robot archive if a SCSI connection is to be used to connect the drives.

It is capable of updating tape cartridges onto which data has already been written by appending a further logical volume after the last one.
A cartridge filled in this way with a number of logical volumes is also referred to as a stacked volume (see section “Administering the tape cartridges” on page 35).

Communication with the other processors takes place over a LAN connection.

2.2.1.4 ICP_IDP or IUP (Integrated Universal Processor)



An ICP_IDP provides the features of a VLP, an ICP and an IDP. This processor has interfaces to the hosts and to the tape drives.

However, the performance is a great deal lower than if its functions are distributed on its own processors of the types VLP, ICP and IDP.

IUP (Integrated Universal Processor) is a synonym for ICP_IDP.

2.2.2 RAID systems for the Tape Volume Cache

A TVC (Tape Volume Cache) is the heart of the entire virtual archive system. It represents all of the Tape File Systems in which the logical volumes can be stored temporarily. One or more RAID systems (up to 8) are used for this.

Each RAID system contains at least the basic configuration, which consists of FC disks and 2 RAID controllers. It can also be equipped with up to 7 extensions, which in turn constitute a fully equipped shelf with FC or ATA disks. A RAID system consists of shelves which in CentricStor are always fully equipped with disks. The TVC illustrated in the figure below contains 2 RAID systems with a total of 12 equipped shelves:

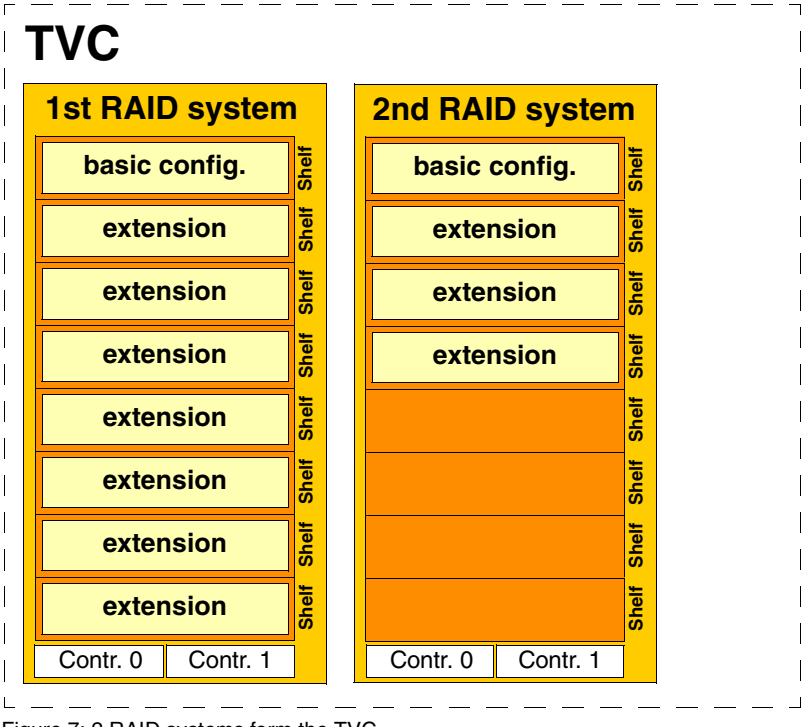


Figure 7: 2 RAID systems form the TVC

In the case of the FibreCat CX3-20, for example, the 300-GB FC disks used offer a net capacity of 900 GB per RAID group. Here the basic configuration and each extension contain 3 RAID groups, resulting in a net capacity of 3 * 0.9 TB = 2.7 TB for each shelf. The net capacity of the maximum configuration of a RAID system is therefore 8 * 2.7 TB = 21.6 TB. One RAID group is used for one cache file system, which means that the basic configuration and each extension contain 3 cache file systems and one RAID system with the maximum configuration with 24 cache file sytems.

The metadata of the logical volumes to be written or read is stored on the 1st RAID system, as a result of which the usable capacity of this RAID system is reduced by 16 GB.

A CentricStor can contain up to 8 RAID.

The number of cache file systems determines the number of logical volumes available (up to 500,000). At least one cache file system is required for each 100,000 logical volumes. The *Cache Mirroring Feature* (CMF) requires an additional cache file system for possible recovery measures. Under these conditions the following minimum requirements consequently apply for logical volumes with the standard size of 900 MB:

Logical volumes	Cache file systems required
100,000	At least 2
200,000	At least 3
300,000	At least 4
400,000	At least 5
500,000	At least 6

When larger logical volumes are used (2 - 200 GB, see the section “New system functions” on page 43), correspondingly more cache file systems can be required. When the *Cache Mirroring Feature* (see the page 55) is used, all cache file systems are mirrored to RAID system pairs and therefore require double the disk resources. The capacity is therefore reduced by 50%.

2.2.3 FibreChannel (FC)

The entire flow of data between all CentricStor components (ISPs and external RAID systems) is handled via an internal SAN which can provided with redundancy. It is implemented by one high-performance FC switch or, if redundancy is provided, by two high-performance FC switches.

2 FC technologies are available, *Multi Mode* and *Single Mode*. In *Multi Mode* the devices which are connected via Fibre Channel can be located up to 300 m from each other; in *Single Mode* the distance can be as much as 10 km. The FC controllers used in CentricStor support bandwidths between 1Gb/s (Gigabits per second) and 4 Gb/s.

2.2.4 FC switch (fibre channel switch)

In the CentricStor models VTA 1500-5000, the entire flow of data between all CentricStor components is handled by means of an FC switch.

This SAN-based design means that each CentricStor component is in a position to access the TVC.

2.2.5 Host connection

The host connection on the ICP is implemented using the following connection technologies:

Host system	Operating system	Connection
Mainframe	BS2000/OSD	ESCON or FibreChannel
	z/OS and OS/390	ESCON or FICON
	Bull	ESCON
	Unisys	ESCON
Open Systems	Reliant UNIX	FibreChannel
	Solaris	FibreChannel
	Microsoft Windows	FibreChannel
	AIX	FibreChannel
	HP-UX	FibreChannel

FibreChannel with ESCON or FICON connections can be operated in mixed mode on an ICP.

CAUTION!
Simultaneous operation of ESCON and FICON connections is not permitted on the same ICP.

2.3 Software architecture

The functions VLP, ICP and IDP which are described in the following sections are not necessarily separate hardware components.

In large CentricStor configurations (VTA 1500-5000) all functions are normally implemented in separate hardware components. In smaller hardware configurations (VTA 500/1000, VTC, SBU), several of these functions are implemented on one hardware component. In the VTC all functions, including the RAID system, are combined in a hardware component.

If, for example, an ICP is designated an Integrated Channel Processor, this is to be understood as a function and not as a hardware component.

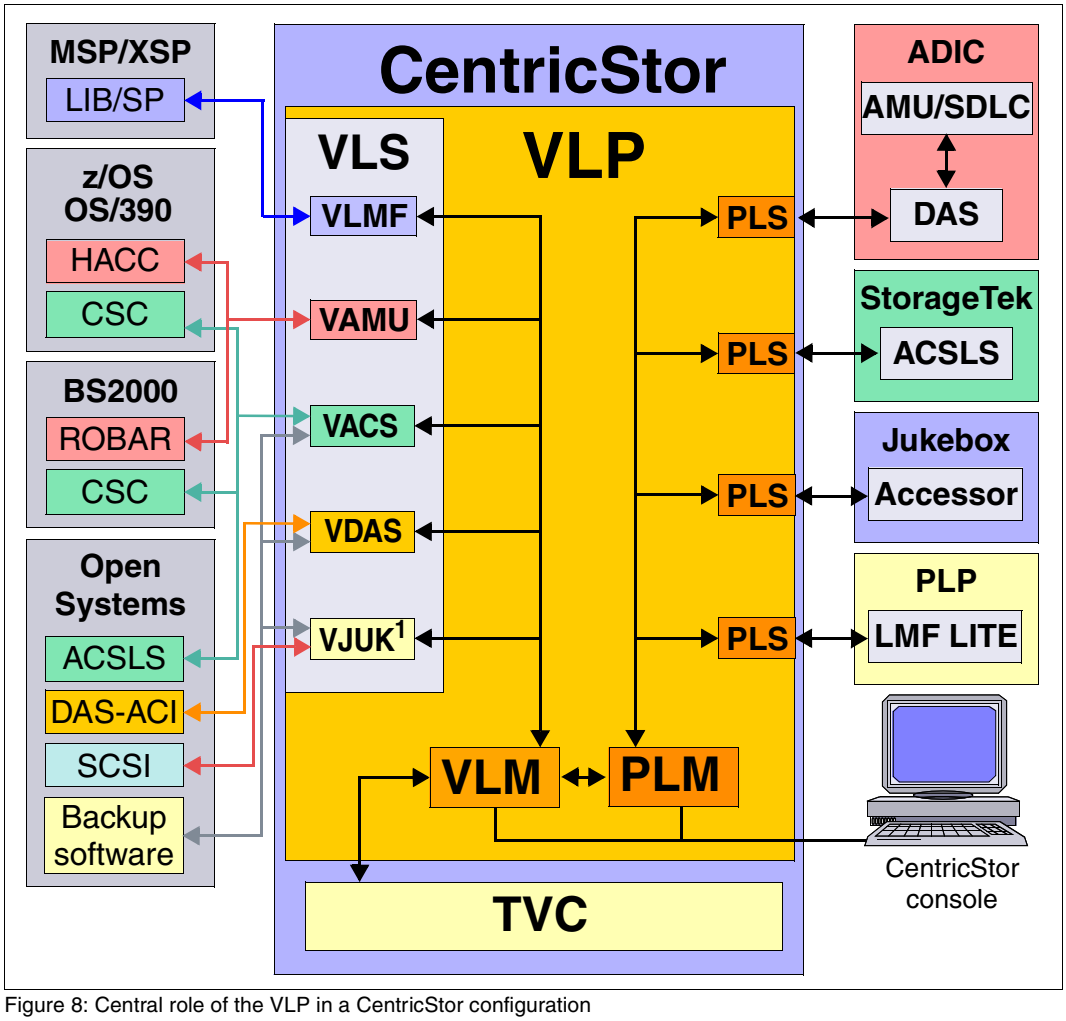


Figure 8: Central role of the VLP in a CentricStor configuration

VLP (Virtual Library Processor)

The VLP is responsible for the coordination of the entire CentricStor system. Although the software can be activated on any of the ICP or IDP systems, it is recommended for performance reasons that you either provide a separate VLP, or activate the components of the VLP on one of the IDPs, since the CPU utilization is at its lowest here.

The use of a second VLP (SVLP) is optionally possible.

[1] VJUK runs on an ICP.

VLM (Virtual Library Manager)

Each robot job from the requesting host system is registered in the VLM. To support the libraries, corresponding emulations (VLMF, VAMU, VACS, VDAS, VJUK) are used in CentricStor.

The TVC is administered exclusively by the VLM.

The VLM data maintenance contains the names of the logical volumes with which the TVC is to work.

PLM (Physical Library Manager)

The PLM coordinates all jobs issued to the connected peripherals (robot drives). The PLM's data maintenance facility stores information about where and on which physical volume each logical volume is stored.

VLS (Virtual Library Service)

There may be various different instances of the VLS, depending on the type and number of connected host systems:

Host connection	Instance	Library
BS2000/OSD, z/OS and OS/390	VAMU	ADIC
Open Systems Server (UNIX, Windows)	VDAS	
CSC Clients of BS2000/OSD	VACS	StorageTek
Open Systems Server (UNIX, Windows) with ACSLS		
LIB/SP Clients from Fujitsu	VLMF	Fujitsu
Open Systems Clients, UNIX and Windows	VJUK	SCSI

PLS (Physical Library Service)

The PLS is the link between CentricStor and the robot archive. Jobs to the robots, e.g. moving a tape cartridge in the robot archive, are issued at the behest of the PLM.

2.4 Operation

CentricStor is operated via the graphical user interfaces GXCC (Global Extended Control Center) and XTCC (Extended Tape Control Center). These are used to perform all administration and configuration tasks.

Using this control center, it is possible to display the current operating statuses of all CentricStor components, together with a large amount of performance and utilization data.

For a description, refer to chapter “Operating and monitoring CentricStor” on page 83, chapter “GXCC” on page 119 and chapter “XTCC” on page 325.

2.5 Administering the tape cartridges

Tape cartridge administration is performed separately by the PLM for each physical volume group (PVG) (see also section “Partitioning on the basis of volume groups” on page 63). Each PVG has its own scratch pool. All reorganization parameters can be set separately for each PVG.

2.5.1 Writing the tape cartridges according to the stacked volume principle

The figure below shows the location of logical volumes on the magnetic tape:

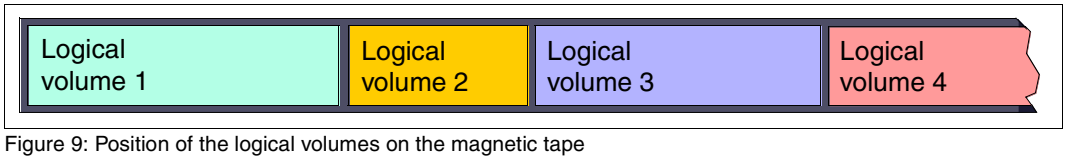


Figure 9: Position of the logical volumes on the magnetic tape

Each tape cartridge of the robot archive is administered by CentricStor as a stacked volume, where a series of logical volumes is stored consecutively on the tape. In this way, tapes are filled almost to capacity. There will be a small section of unused tape, since a logical volume will always be written in full onto a physical tape cartridge (no continuation tape processing).

2.5.2 Repeated writing of a logical volume onto tape

If a logical volume which has already been saved onto tape is written to tape a second time following an update, the first backup will be declared invalid. The current volume is appended after the last volume of this tape or another tape with sufficient storage space.

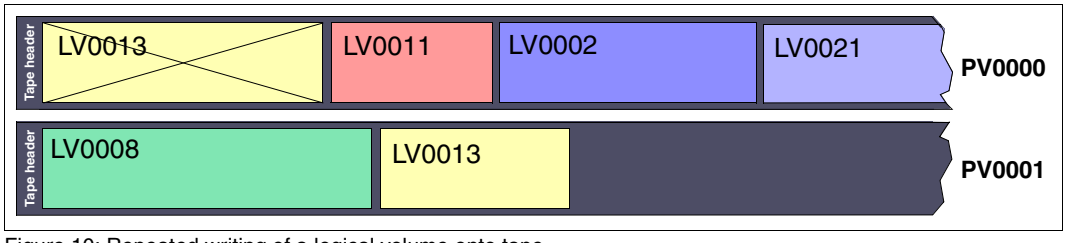


Figure 10: Repeated writing of a logical volume onto tape

In the example above, the logical volume LV0013 on physical volume PV0000 is declared invalid and is written anew to physical volume PV0001.

2.5.3 Creating a directory

After each write operation a directory is created at the end of the tape. This permits high-speed data access during a later read/write operation.

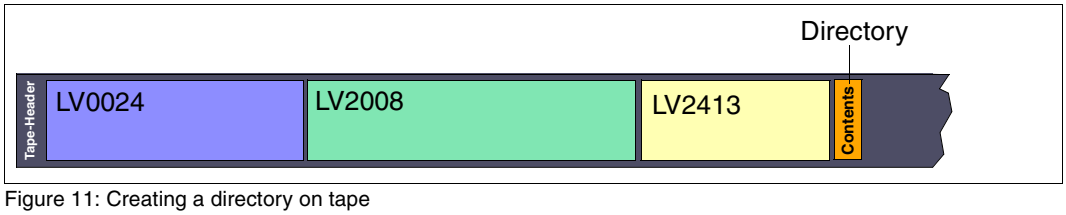


Figure 11: Creating a directory on tape

2.5.4 Reorganization of the tape cartridges

When a logical volume is released by the host's volume management facility (e.g. MAREN in BS2000/OSD), it is flagged accordingly in the CentricStor data maintenance facility which contains the metadata for each volume. This process, combined with updates (see the section section "Creating a directory" on page 36), will cause the areas containing invalid data on the real tape cartridges to increase more and more over time (stacked volume with gaps). If the number of scratch tapes for a CentricStor system falls below a configurable lower limit, the PLM automatically performs a reorganization by using the VLM to load any logical volumes still valid into the RAID system and then, so to speak, moving them piecemeal onto scratch tapes.

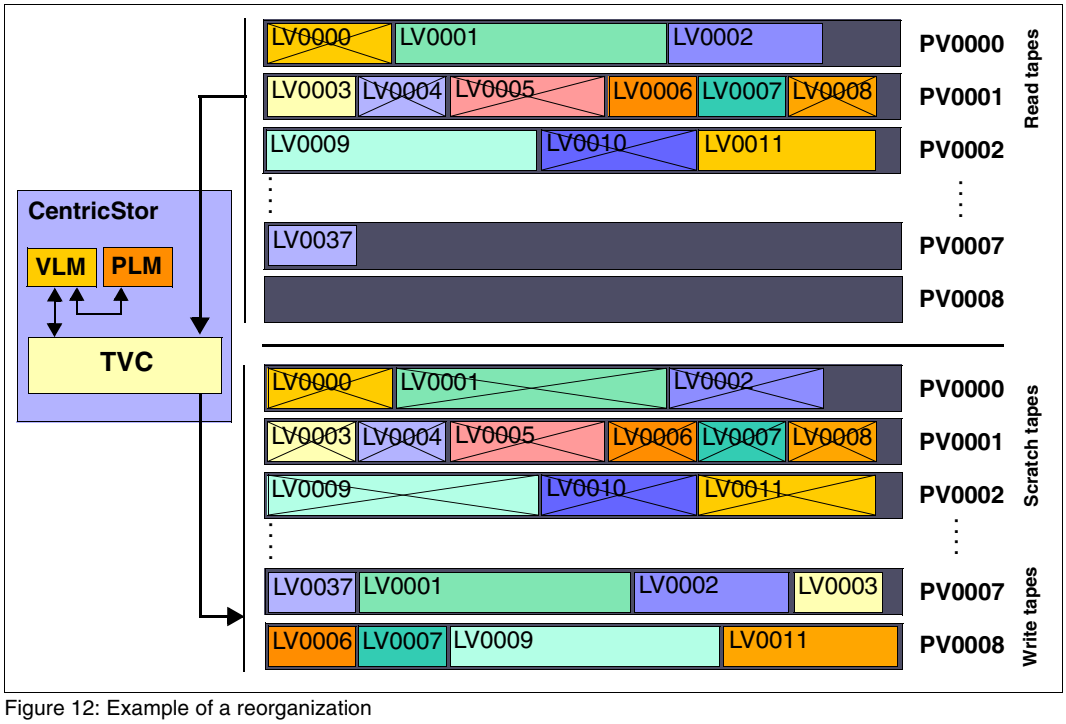


Figure 12: Example of a reorganization

Read tape: Tape cartridge that still contains valid data but has no free space for write operations

Scratch tape: Tape cartridge that only contains invalid data and has been released for rewriting

Write tape: Tape cartridge that still contains space for write operations

2.6 Procedures

2.6.1 Creating the CentricStor data maintenance

Initial situation: CentricStor is installed and configured. As yet, there is no data on the RAID system. The tape cartridges of the robots are blank.

To start CentricStor, the PLM and VLM data maintenance facility must be created:

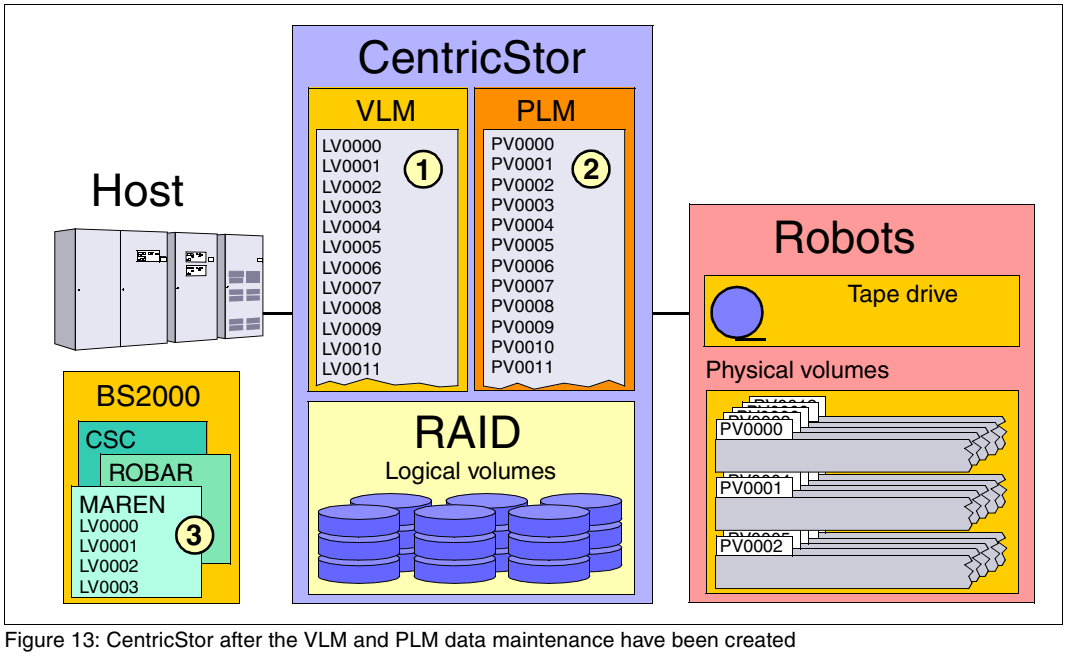


Figure 13: CentricStor after the VLM and PLM data maintenance have been created

1. The names of the logical volumes which are to be loaded into the RAID disk array later are entered in the VLM data maintenance (see the section “Logical Volume Operations » Add Logical Volumes” on page 211).
   In the example, these are the logical volumes LV0000 to LV2000. These volumes still do not contain any data.
2. The names (VSNs) of the physical volumes present in the robots which are to be used in CentricStor are entered in the PLM data maintenance (see the section “Physical Volume Operations » Add Physical Volumes” on page 223). In the example, these are the volumes PV0000 to PV0100.
3. The logical volumes are made known in BS2000/OSD (example of a storage location: “VTLSLOC”).

CentricStor is then ready for operation.

2.6.2 Issuing a mount job from the host

Initial situation: The logical volume LV0005 is already located on the physical volume PV0002.

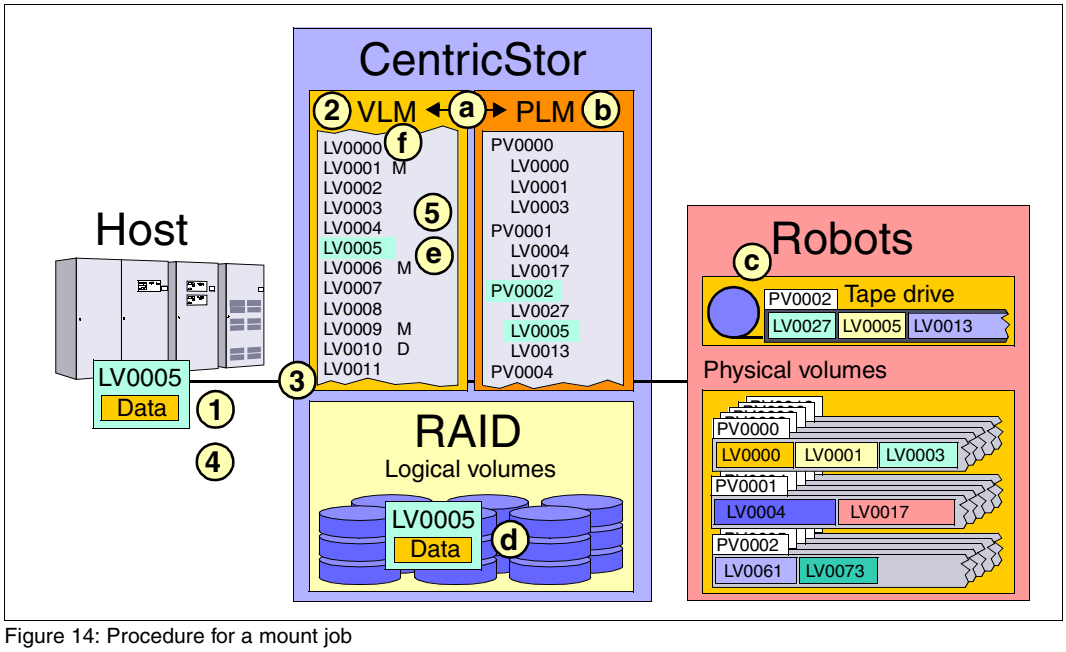


Figure 14: Procedure for a mount job

A mount job is executed as follows:

1. The host issues a mount job for logical volume LV0005, which is then accepted by the VLM.

   The VLM does not know at this point what task is involved:

   – read the volume or a part thereof
   – append a file to the end of the volume
   – overwrite the entire volume

2. The VLM checks its data maintenance to establish whether the logical volume LV0005 specified by the host is available and whether there is a corresponding free storage space on the RAID system.

   If the RAID system does not have enough free capacity at this point, the LRU (Least Recently Used) procedure is employed to delete the oldest data from the RAID system.

   If a sufficient number of old files cannot be deleted, the mount job is suspended (“Mount queued”).

Depending on whether the logical volume is still in the RAID system or is only on a physical volume, the following two situations arise:

Case 1: The volume is migrated to tape and is no longer located in the RAID system.

a) The VLM issues a request to the PLM to read the logical volume LV0005 into the RAID system.

b) The PLM checks its data maintenance to determine the physical volume on which the requested logical volume LV0005 is located: PV0002.

c) The PLM requests the robot to mount the real tape cartridge PV0002 onto a free tape drive.

d) The data of the logical volume LV0005 is loaded from the tape drive into the RAID system.

e) A flag is set in the VLM data maintenance to indicate that the logical volume LV0005 is in the RAID system.

f) Only at this point does the VLM grant the host access to the volume (mount acknowledged).

Case 2: The volume is present in the RAID system.

The VLM immediately grants the host access to the volume.

3. The host performs read and write accesses on the logical volume.
4. The host issues an unmount job.

In contrast to a real archive system, the job will be confirmed immediately.

5. The VLM checks whether the logical volume in the RAID system has been modified.

Case 1: The logical volume has not been modified.

No further action is taken, since the copy of the logical volume on the physical volume is still valid.

Case 2: The logical volume has been modified.

a) The VLM informs the PLM that the logical volume is to be copied onto tape.

b) The PLM selects a suitable tape cartridge: a completely new tape, a scratch tape, or a tape onto which writing has not yet resulted in an overflow. If this cartridge is not yet mounted, the PLM checks whether a real drive is available in the robot archive at this point.

c) The PLM requests the selected real tape cartridge to be mounted, if required, and begins data transfer from the RAID system to the tape.

The data of the logical volume is retained on the RAID system until deleted by the VLM in accordance with the LRU procedure.

2.6.3 Scratch mount

To prevent reading in from the physical medium in cases where a logical volume is to be rewritten anyway, under certain circumstances CentricStor performs a “scratch mount”.

The special features of the scratch mount in CentricStor are as follows:

– If the logical volume is migrated, i.e. it is no longer in the TVC, only a “stub” is made available for the application. This stub contains only the tape headers.

– As this stub is always kept in the TVC a scratch mount can always be performed very quickly as no restore is required from the physical tape.

– For the application this means that only access to the tape headers is possible.

If a scratch mount is performed incorrectly this can result in read errors when an attempt is made to access the other data. In this case the data is not lost: When a subsequent “normal” mount is performed it is available again.

CentricStor performs a scratch mount under the following conditions, depending on the frontend (interface of the virtual library):

VAMU The mount command supports a flag which can be used to indicate that the mount is to be performed as a scratch mount.

VDAS There is a special `DAS_MOUNT_SCRATCH` command (used only by FSC Networker). In this case CentricStor performs a scratch mount.

VACS A scratch mount is performed in the following two cases:

– “Mount_scratch” with the “pool-ID” parameter without specification of a particular volume
– Mount on a specific volume if this is contained in a pool whose pool ID is not 0

VLMF A scratch mount is performed in the following two cases:

– Mount with the “scratch” command with specification of a pool or specific volume
– Mount of a volume that is marked as “scratch”

VJUK No scratch mount is used

2.7 New system functions

CentricStor Version 3.1C for the first time provides the option of creating logical volumes (LVs) more than 2 GB in size as a standard feature. The LV size can be selected in discrete steps for each logical volume group (LVG):

- STANDARD: 900 MB
- EXTENDED: 2 GB
  5 GB
  10 GB
  20 GB
  50 GB
  100 GB
  200 GB

The DTV file system must be migrated for CentricStor systems configured with Version 3.0 or earlier. This is done by the service staff.

For the user, using large logical volumes is basically no different from the way logical volumes have been used to date.

The following special aspects must be taken into consideration:

– The LV size of an existing LVG can be increased if the PVs (physical volumes) of the PVG (physical volume group) which is linked to the LVG has the necessary capacities (see the section “Logical Volume Groups” on page 173).

– The LV size of an existing LVG cannot be decreased (see the section “Logical Volume Groups” on page 173).

– The size of the LVG "TR-LVG" cannot be modified (see the section “Logical Volume Groups” on page 173).

– An LVG with LVs > 2 GB can be assigned to a PVG only if the capacity of the PVs already assigned is twice as large as the LV size (see the section “Physical Volume Operations » Link/Unlink Volume Groups” on page 221).

– PVs can be assigned to a PVG only if their capacity is greater than or equal to the LV size of the LVG which is linked to the PVG (see the section “Physical Volume Operations » Add Physical Volumes” on page 223).

– The TVC must be large enough to permit the use of large LVs. If the TVC is too small, frequent displacement of LVs must be reckoned with. This can have a significant effect on the LV mount times depending on the volume size and the drive type (e.g. with 200 GB approx. 90-120 min.).

2.8 Standard system functions

The following functions are standard in every CentricStor system:

- Partitioning by volume groups
- “Call Home” in the event of an error
- SNMP support
- Exporting and importing tape cartridges

2.8.1 Partitioning by volume groups

CentricStor supports a volume group concept. This provides the following benefits:

– It can be ensured that the copies of a logical volume created by an application are stored on two different physical volumes (data security in case a magnetic tape cartridge becomes unreadable).

– The storing of logical volumes of different host systems or applications on one and the same magnetic tape cartridge can be prevented.

The volume group concept is a prerequisite for “Dual Save” (see the section “Dual Save” on page 50).

2.8.2 “Call Home” in the event of an error

In the event of serious errors in CentricStor operation, the following measures are initiated automatically:

– The error is reported to a hotline using “Call Home”.

  In the event of connection via ROBAR, information is also sent to the BS2000 host via “Hot Messages”.

– The error report can be transferred to a Service Access System (SAS) so that specific responses can be triggered there. In addition, it is possible to send an SMS when certain messages are issued.

– The responses to the individual error events are preset for various service provider profiles. One of these can be selected. In addition, the selected default can be adjusted on a customer-specific basis.

2.8.3 SNMP support

It is possible to integrate CentricStor into remote monitoring by an SNMP Management Station such as “CA Unicenter” or “Tivoli”.

In the event of system errors (error weighting EMERGENCY, ALERT, ERROR, CRITICAL), CentricStor sends a trap to the SNMP Management Station, which causes the CentricStor icon to change color (insofar as this is supported by the SNMP Management Station). Furthermore, a status trap with the weightings green, yellow and red is sent periodically to the Management Station.

Application launching enables the CentricStor administration software “GXCC” to be started simply on the SNMP Management Station by means of a mouse click.

2.8.4 Exporting and importing tape cartridges

The options for exporting and importing tape cartridges (physical volumes) which are offered by CentricStor can be used for various purposes:

- Storing the backup data at a disaster-proof location, e.g. in a fire-resistant room or at a large distance from the CentricStor system
- Manual archiving of data which is accessed extremely rarely, e.g. because it is only required when a disaster occurs
- Exchanging data between independent systems at separate locations in order to guard against local disaster sby means of redundant data storage
- Transfer of bulk data when extremely large distances are involved in order to save on line costs or if there is a lack of infrastructure

Two standard functions are available for exporting/importing tape cartridges:

- Setting the vault attribute for a physical volume group (PVG) and setting the vault status for a physical volume (PV)
- Use of the transfer PVG (TR-PVG)

These functions are totally separate from the tape management tool of the host applications and are controlled solely by the CentricStor system administrator.

2.8.4.1 Vault attribute and vault status

The vault attribute is assigned to a physical volume group (PVG) by means of the GXCC function *Configuration ➟ Physical Volume Groups* in the *Type* entry field (see page 187). The associated tape cartridges (PVs) can be placed in vault status using the following command:

```
plmcmd conf -E  -V <PV>  -G <PVG>
```

They are then locked for all read and write operations until vault status is cancelled again using the following command:

```
plmcmd conf -I  -V <PV>  -G <PVG>
```

While vault status is set, the tape cartridges can be removed from the tape library and stored at a safe location (hence the status name vault). However, like all the logical volumes contained on them, they are still administered by CentricStor.

An attempt to read from a tape cartridge which is in vault status is responded to with the system message `SXPL049` (see page 88). When a logical volume (LV) of such a tape cartridge is saved again by a host application, a different tape cartridge is used and the old LV on the *vault* tape cartridge is flagged as invalid. Tape cartridges in vault status are also excluded from reorganization (see section “Reorganization” on page 73).

2.8.4.2 Transfer PVG

A so-called transfer PVG and a transfer LVG which is linked to this are permanently installed in CentricStor for this export/import function. The logical or physical columes which are to be exported or imported are temporarily added to these volume groups.

The LVs to be exported are also copied to tape cartridges of the transfer PVG. The original LVs continue to belong to their former LVG. Their backup to tape cartridges of the PVG assigned to this LVG and access by the host applications are not affected by the export.

The system administrator alone is reponsible for controlling the copy operation for the LVs concerned and for synchronizing this operation with their use by the host applications. CentricStor keeps no management data for these copy operations and does not know whether or not an LV was exported via a transfer PVG.

When the required LVs have been copied, the tape cartridges can be removed from the transfer PVG and transported to another CentricStor system. There the tape cartridges are added to the transfer PVG and the LVs contained on them are read in. To do this it is necessary that all these LVs should already exist and be assigned to a normal LVG.

Further information on the export/import function via transfer PVG is provided in section “Transferring volumes” on page 562.

2.9 Optional system functions

CentricStor is available in a variety of configuration levels, in each of which further customer-specific extensions (e.g. larger disk cache) are possible.
In addition to the basic configuration, optional functions are available which allow you to customize the CentricStor functionality to suit your needs:

- Compression
- Multiple library support
- Dual Save
- Extending virtual drives
- System administrator's edition
- Fibre channel connection for load balancing and redundancy
- Automatic VLP failover
- Cache Mirroring Feature
- Accounting

These optional system functions are released by means of key disks.

2.9.1 Compression

The figure below illustrates the principle of software compression of logical volumes:

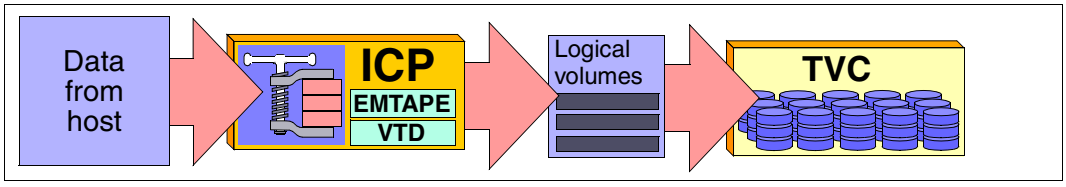


Figure 15: Principle of compressing logical volumes

Just as a physical drive can perform data compression, so also can the tape drive emulations (EMTAPE[1] or VTD[2]) once they have been released[3] on the ICP. In this way, the logical volumes can be stored in compressed form in the TVC. This results in a whole range of advantages:

- Disk cache utilization is significantly improved depending on the compression level, i.e. without changing the cache size, it is possible to keep considerably more logical volumes “online” in the cache than without compression, frequently resulting in a very high-performance response time vis-à-vis the host system.
- The performance of the overall system is improved due to the fact that the load on the FC network is reduced by the compression factor.
- In the case of data quantities greater than 900 MB, the number of logical volumes is reduced.

  Example (Standard)

  To save a 4 GB file on standard volumes (900 MB) without compression, you will need five logical volumes. If we assume a compression factor of 3, then only two logical volumes will be necessary.
- Within the CentricStor migration concept (i.e. the relocation of volumes from the real robot archive to the CentricStor archive while retaining the volume number), it is currently necessary to identify all volumes whose size exceeds 800 MB after hardware compression. If software compression is switched on for the logical drives, however, then automatic 1:1 conversion will also be possible for these volumes.

Compression can be set separately for each drive (this is done using Service).
The “Compression” attribute can be set to “ON”, “OFF” or “HOST” for each drive.

[1] Mainframes

[2] Open systems

[3] Compression only works with a block size of at least 1 Kbyte.

In BS2000/OSD (“HOST” attribute), compression is controlled on the basis of the tape type:

– TAPE-C3: compression off
– TAPE-C4: compression on

In UNIX, the compression setting can be selected by the device nodes.

The compression setting can be passed in ESCON or SCSI command to the tape emulation, and the compressed data is stored block-by-block on the logical volume (the VLM and PLM do not have any information about this).

If the data is already compressed on the host, e.g. if backup data is supplied in compressed format by a NetWorker client, then compression should be switched off for this logical volume on the ICP, so that the load on the CPU of the ICP can be kept to a minimum.

2.9.2 Multiple library support

One of the important characteristics of CentricStor is the parallel connection of multiple real robot archives of different types.

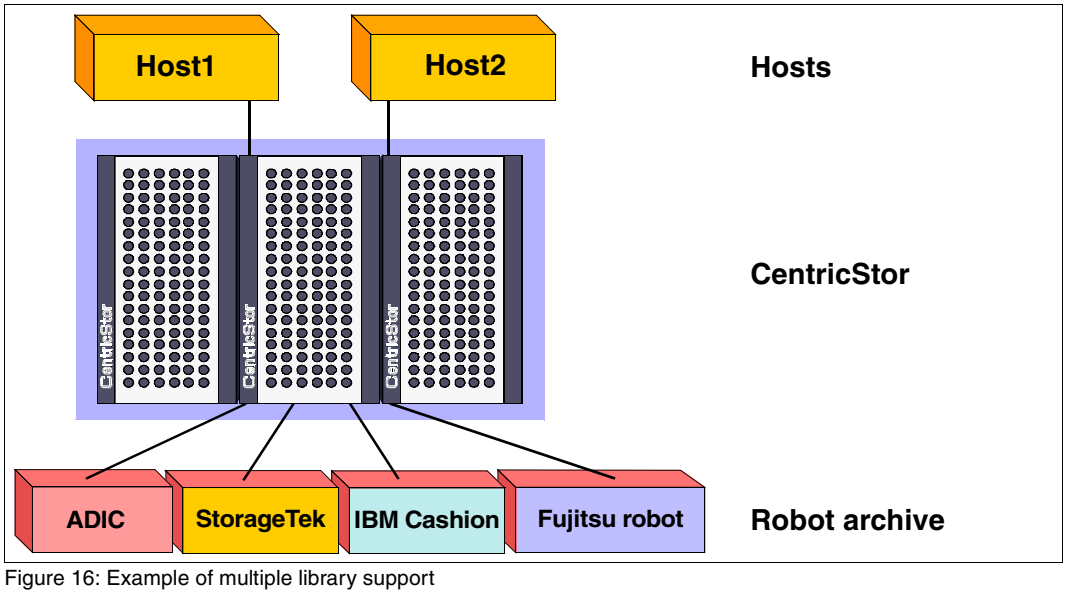


Figure 16: Example of multiple library support

The number of robot archives that can be operated in parallel is theoretically unlimited. However, since at least one physical volume group is required per library, it is only possible to support as many libraries as there are corresponding volume groups.

All supported robot archive types are permitted:

- ADIC AML systems (with DAS)
- ADIC scalar systems (with DAS or SCSI)
- StorageTek systems (with ACSLS or SCSI)
- IBM Cashion
- Fujitsu robot (with LMF)

Please refer to the current product information for the library and drive type configurations currently available. It is possible to have different drive types within the same archive. However, a separate physical volume group must be configured for each drive type (see section “Partitioning on the basis of volume groups” on page 63).

2.9.3 Dual Save

Based on the volume group functionality (see page 63), CentricStor offers the Dual Save function. This involves making a copy of a logical volume on a second physical volume, which may be located either in the same robot archive (Dual Local Save) or in a remote robot archive (Dual Remote Save). This ensures the highest possible level of data security. If a physical volume which usually contains a large number of logical volumes is in some way corrupted (e.g. due to a tape error), CentricStor can access a copy of this logical volume created on a different physical volume. If the copy is located in a second robot archive, then even the complete destruction of the first robot archive would not cause any irrevocable loss of data.

In many computer centers, for example, it is currently common practice to move the volumes written during a backup operation (or copies generated by the application) to a secure location directly on completion of the backup. The Dual Remote Save functionality provides an elegant means of automating this procedure. Not only does it relieve the host application of any copy or move operations, it also eliminates the need to transport the cartridges to a second archive (and back again). The associated risk of data manipulation is thus excluded.

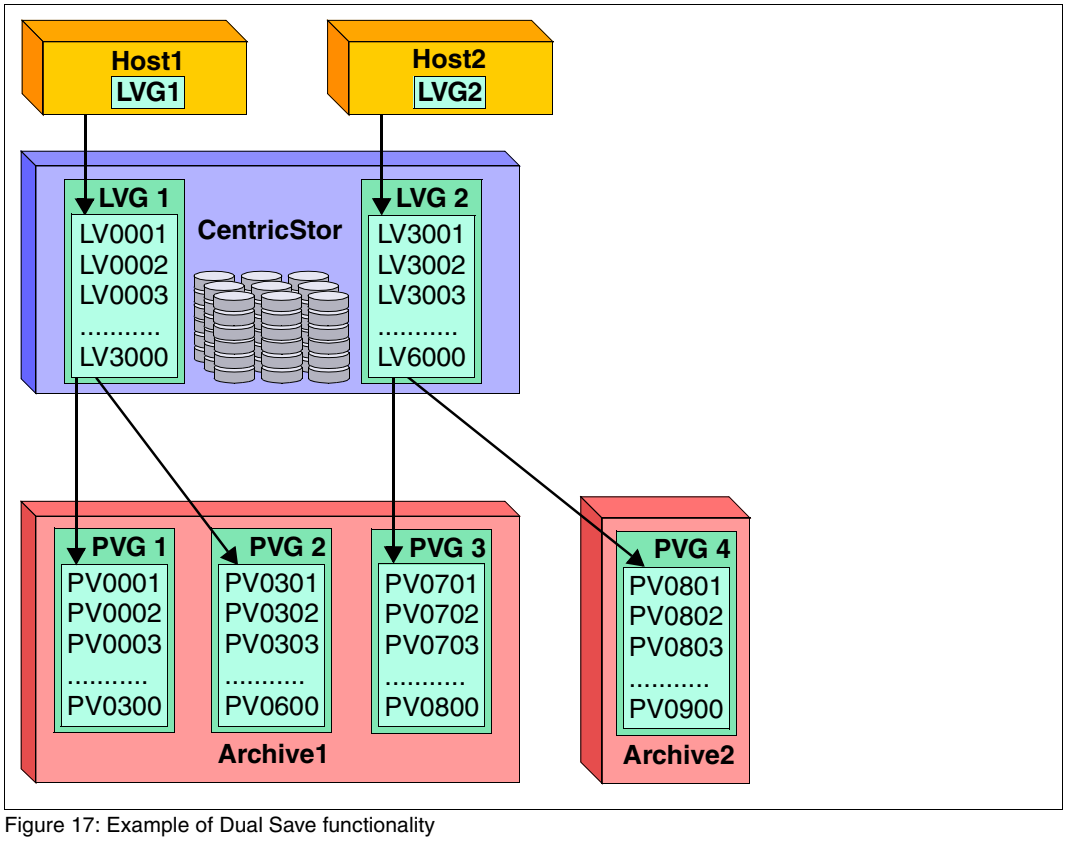


Figure 17: Example of Dual Save functionality

In accordance with the assignment rules for the volume group functionality (see page 64), the logical volumes from **LVG 1** (LV0001-LV3000) are mirrored on the physical volumes of **PVG 1** (PV0001-PV0300) and **PVG 2** (PV0301-PV0600) in the robot **Archive1**. The logical volumes of **LVG 2** (LV3001-LV6000) are duplicated in **Archive1** on **PVG 3** (PV0701-PV0800) and in **Archive2** on **PVG 4** (PV0801-PV0900), where the two robots are located some distance apart.

2.9.4 Extending virtual drives

This option allows you to increase the number of logical drives from the standard 32 per ICP to up to 64 per ICP. This makes it possible to operate up to 256 logical drives in a single CentricStor system.

2.9.5 System administrator's edition

The "System Administrator Edition" (SAE) option provides a graphical user interface for administering the CentricStor system from a remote PC workstation.

The operator PC is included as part of the scope of delivery. This machine can be used to monitor a number of CentricStor systems.

2.9.6 Fibre channel connection for load balancing and redundancy

This option provides the CentricStor system with a second internal FC network for data transfer. This enables operation to be continued without interruption even when a switch fails (in normal operation the data stream is distributed to both switches).

2.9.7 Automatic VLP failover

Typically almost all CentricStor control functions run on the VLP. This processor is largely protected against disk errors by RAID system disks. If this processor were to fail nevertheless, the CentricStor system would have no controller and thus no longer be operable. Ongoing save jobs would be completed, but new ones would no longer be accepted.

To prevent this situation occurring, the "automatic VLP failover" function is provided (AutoVLP failover).

A release via key is required for the "automatic VLP failover" function, and the SVLP must be configured to use it. This is done by the maintenance staff.

Further prerequisites:

– The VLP and the standby processor SVLP must be equipped with an external and an internal LAN interface.
– The standby processor SVLP must be equipped and configured like the VLP.

If the “automatic VLP failover” function has been activated, the following actions are no longer permitted in the system:

- changing the LAN configuration
- rebooting or shutting down of the VLP (`init 0` or `init 6`: these commands cause a failover!)
- disconnecting a LAN or FC cable

If the VLP fails, the scenario is as follows:

1. The VLP fails in the CentricStor system:

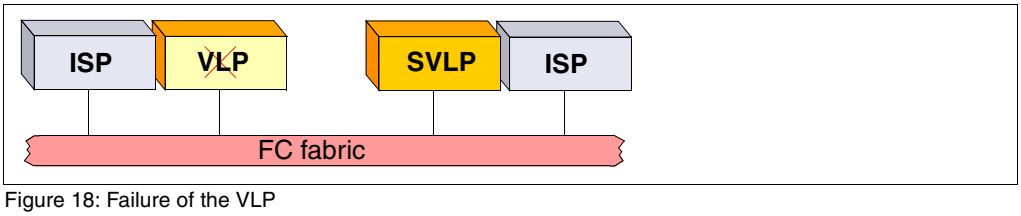


Figure 18: Failure of the VLP

The SVLP is active in the system and monitoring the VLP. If the VLP fails, the SVLP takes over control of CentricStor.

2. The SVLP is activated automatically:

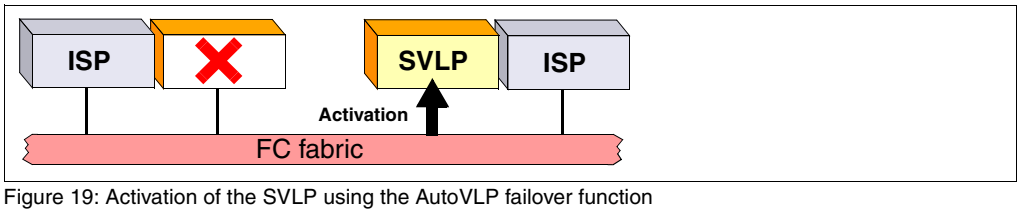


Figure 19: Activation of the SVLP using the AutoVLP failover function

During the switchover operation, which can last up to 5 minutes, this procedure is interpreted on the host side as a mount delay and a new connection setup to the robot control. All backup jobs continue to run normally.

The switchover involves reconfiguring the two ISPs (VLP/SVLP): they swap their external IP addresses and tasks.

3. After the defective processor has been repaired, it is integrated once again into the overall system and takes over the role of the SVLP:

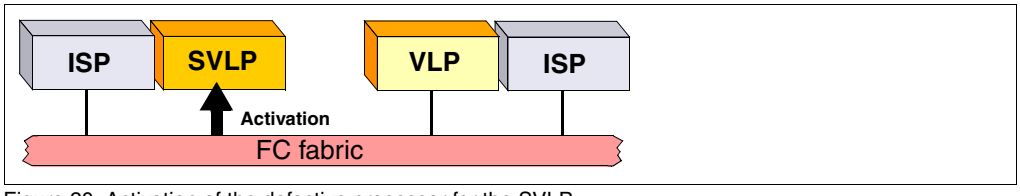


Figure 20: Activation of the defective processor for the SVLP

The status, i.e. AutoVLP failover active or inactive, is clearly visible on the GUI:

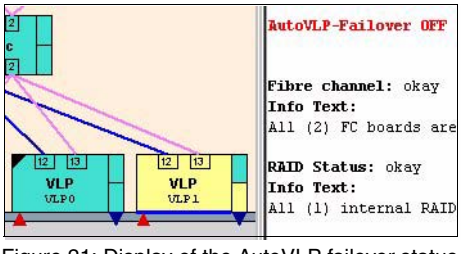


Figure 21: Display of the AutoVLP failover status on the GUI

The left-hand triangle is only displayed if an SVLP is configured.

If the left-hand triangle below the VLP is green, this means that AutoVLP failover is activated. If it is red, AutoVLP failover is not activated. In addition, the text “AutoVLP-Failover OFF” is displayed in red in the text window on the right.

CAUTION!
The function must have the same status on the VLP and SVLP: enabled or not enabled (ON or OFF).

When the AutoVLP failover function is configured and activated, VLP monitoring on this ISP is activated automatically with every reboot.

2.9.8 Cache Mirroring Feature

2.9.8.1 General

CentricStor V3.1 provides users with enhanced data security and greater protection against data loss through disasters, promptly for all nearline data. Data stored on the internal hard disk system is mirrored synchronously to a second cluster location. This is done via 2-Gbit FibreChannel connections, also over long distances. Even if one location is totally destroyed, all the saved data is available which is backed up on a CentricStor configuration of this type. As the status of the data is at all times identical on both systems, a restart is significantly quicker and simpler. No modifications to applications or data backup processes are required.

2.9.8.2 Hardware requirements

A functioning mirror always requires two RAID systems. In CentricStor a maximum of 8 RAID systems are supported, i.e. a maximum of 4 RAID system pairs can be set up for mirroring.

By definition a RAID system pair can only be set up when the following conditions apply:

- The RAID IDs begin with an odd ID.
- The RAID IDs of these systems are in unbroken ascending order.

As a result, a maximum of four possible RAID ID pairs are possible: 1+2, 3+4, 5+6 and 7+8.

A CentricStor system can contain two possible types of RAID mirror pairs:

– Potential mirror pairs

  These pairs do satisfy the above-mentioned hardware requirements, but secondary caches (mirror caches) must also be provided by a corresponding LUN assignment (see the section “Mirrored RAID systems” on page 57). This is done by customer support.

  Potential mirror pairs can be recognized in GXCC by a thicker, black separating line (see the section “Presentation of the mirror function in GXCC” on page 58).

– Genuine mirror pairs

  These pairs satisfy all hardware requirements. They contain primary and secondary caches (section “Mirrored RAID systems” on page 57) and are identified in GXCC by a white dot (see the section “Presentation of the mirror function in GXCC” on page 58).

2.9.8.3 Software requirements

The “vtlsmirr” key must have been read in and enabled for the mirror function. This is done by customer support.

Assuming that the hardware requirements are satisfied (see the section above) and the RAID systems have been defined by the corresponding LUN assignment (see the section “Mirrored RAID systems” on page 57), the overall system is configured as a mirror system solely through the existence of the key. No operator intercvention is required for this purpose.

Example

After the mirror key has been read into a CentricStor system with 6 RAID systems, the following configuration is established:

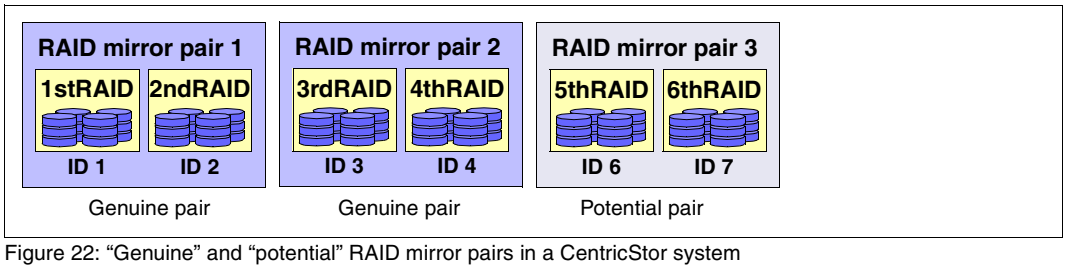


Figure 22: “Genuine” and “potential” RAID mirror pairs in a CentricStor system

The first and second RAIDs and also the third and fourth RAIDs form genuine mirror pairs as the IDs here begin with an odd number and are in unbroken ascending order.

The RAID systems with IDs 6 and 7 do not satisfy the hardware requirements and therefore form a potential pair. They can be turned into a genuine mirror pair by changing ID 7 to ID 5.

2.9.8.4 Mirrored RAID systems

A mirrored CentricStor system has 1 to a maximum of 4 RAID mirror pairs.

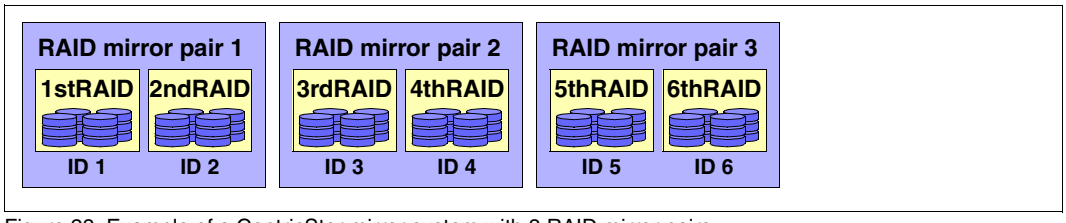


Figure 23: Example of a CentricStor mirror system with 3 RAID mirror pairs

In a RAID mirror pair, one RAID system contains only primary caches, the other only secondary caches (mirror caches):

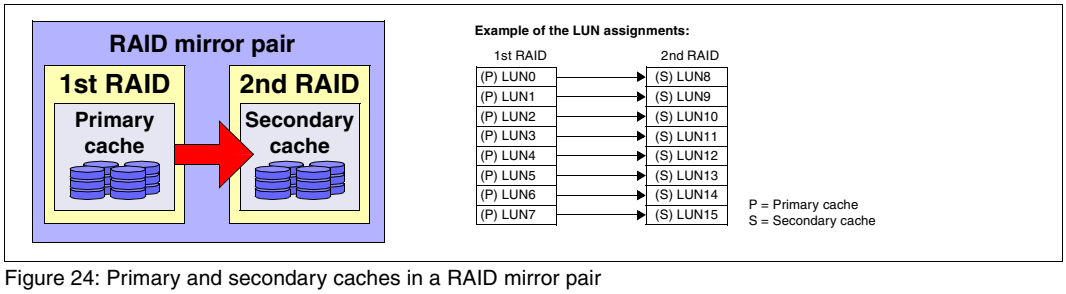


Figure 24: Primary and secondary caches in a RAID mirror pair

Such a mirror pair is defined by the corresponding assignment of the LUNs, as shown in the example (where x is in the range 0 through 7) below:

Assignment of the LUNs for DTV caches (/cache/...)	
1st RAID	**2nd RAID**
(P) x + 0	(S) x + 8
(P) x + 1	(S) x + 9
(P) x + 2	(S) x + 10
(P) x + 3	(S) x + 11
(P) x + 4	(S) x + 12
(P) x + 5	(S) x + 13
(P) x + 6	(S) x + 14
(P) x + 7	(S) x + 15

2.9.8.5 Presentation of the mirror function in GXCC

In GXCC the mirror functions of a double RAID system are indicated by two arrows.

Example

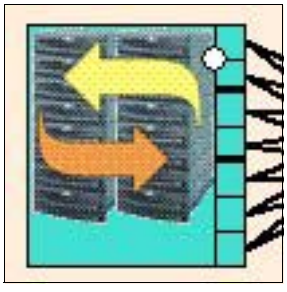


Figure 25: Presentation of the mirror function in GXCC

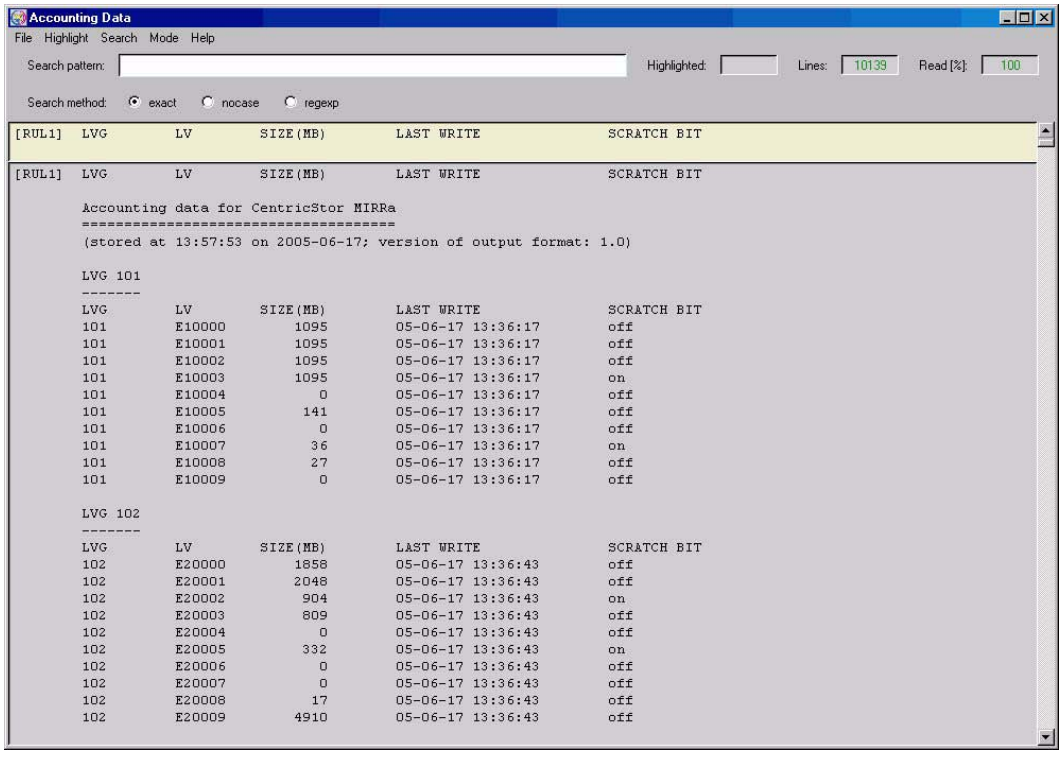
Genuine RAID pairs are indicated with a white dot, potential pairs by a thicker black line between the boxes on the right-hand side

The display can contain an odd number of RAID systems if, for example, a defective RAID system has been separated from the CentricStor system. Further information on this is provided in the section “RAID symbol for mirror mode” on page 131.

2.9.9 Accounting

On the one hand this function permits the accounting data of logical volume groups to be displayed in GXCC (see the section “Statistics » Usage (Accounting)” on page 293).

Example



On the other hand this function enables the current accounting data to be sent by e-mail at defined times (see the section “Setup for accounting mails” on page 229).

3 Switching CentricStor on/off

IMPORTANT!
The vendor recommends that CentricStor should not be switched off. This should only be done in exceptional circumstances.

3.1 Switching CentricStor on

Before switching CentricStor on, you must ensure that the units with which CentricStor is to communicate, i.e. host computers, ROBAR-SV systems (in the case of host connection via ROBAR), the robot control processor, and the tape robots are already up and running.

The following sequence must be followed when switching on the individual CentricStor components:

1. **Switch on the LAN hubs and switches** (see corresponding operating instructions).
2. **Switch on the fibre channel switches** (see corresponding operating instructions).

   When connecting open systems:
   The **external FC switches** must now also be switched on, as otherwise the ICPs will not establish a point-to-point connection.
3. **Switch on the RAID systems** (see corresponding operating instructions).

   Wait a minute after the “System Ready” status has been reached after the RAID systems have been started up.
4. Switch on the **ICPs/IDPs/VLP** by pressing the POWER ON/OFF button:

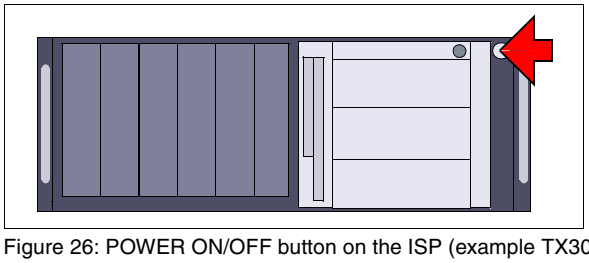


Figure 26: POWER ON/OFF button on the ISP (example TX300)

Using GXCC or XTCC check that all the necessary CentricStor processes are running (all processor boxes must be green).

5. **BS2000/OSD:**

   Case 1: Host connection via ROBAR

   ► **Start ROBAR-SV** (with the menu program `robar` or `robar_start`; see ROBAR manual [3]).

   Case 2: Host connection via CSC

   ► Start **CSC** (see CSC manual [4]).

3.2 Switching CentricStor off

CentricStor can be switched off only in Service mode! As this mode is explained in the CentricStor Service Manual, only a brief description is provided below.

The following sequence must be followed when switching off the individual CentricStor components:

1. **BS2000/OSD, z/OS and OS/390:**
   DETACH or VARY OFFLINE all logical drives on the host.
2. CentricStor is switched off via the GXCC user interface:

   ► Activate the “Shutdown” function (see the Service Manual).

   All CentricStor processors (VLP, IDPs, ICPs) and - if the “power off” option is activated - the connected RAID system are then shut down gracefully and switched off.

   ► Wait for 5 minutes.
3. Switch off the hubs/switches (see corresponding operating instructions):
   – LAN hubs
   – fibre channel switches

4 Selected system administrator activities

4.1 Partitioning on the basis of volume groups

4.1.1 General

By partitioning on the basis of volume groups, it is possible to combine certain logical volumes to form a logical volume group (**LVG**) and certain physical volumes to form a physical volume group (**PVG**).

Using rules which create associations between logical and physical volume groups, it is possible to have CentricStor copy the logical volumes belonging to a particular LVG exclusively onto the physical volumes of the assigned PVG.

Partitioning on the basis of volume groups offers the following advantages:

- It allows you to store the logical volumes of various host systems or applications on different physical volumes.
- In the case of Dual Save[1], it allows you to store copies of a logical volume on two different physical volumes. This offers an extra degree of data security for situations where a tape becomes unreadable, for example (see section “Dual Save” on page 71).

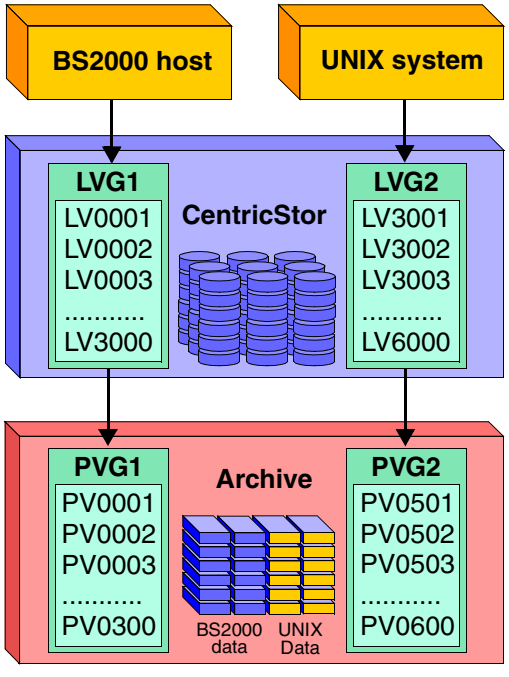
Normally CentricStor has four volume groups:

– the logical volume group “BASE”
– the physical volume group “BASE”
– the logical volume group “TR-LVG”
– the physical volume group “TR-PVG”

The TR-LVG and TR-PVG volume groups are used to transfer logical and physical volumes (see the section “Transferring volumes” on page 562).

Each physical volume group has its own local free pool from which new volumes can be taken as the need arises and to which freed volumes can be returned (e.g. following reorganization).

[1] This assumes that the Dual Save functionality has been released (see page 71).



You have two different systems (a BS2000 host and a UNIX system) using CentricStor in conjunction with an archive system. By grouping volumes, it is hoped to achieve a situation where BS2000 data and UNIX data are stored on different physical volumes.

The logical volumes of the BS2000 host are assigned to the logical volume group LVG1, while those of the UNIX system are assigned to the logical volume group LVG2. These logical volumes can (but need not necessarily) be assigned to various physical volume groups.

As a result of these assignments, BS2000 data will now be stored on the physical volumes PV0001 through PV0300, while UNIX files will be stored on the physical volumes PV0501 through PV0600.

Figure 27: Example of partitioning on the basis of volume groups

4.1.2 Rules

Logical volume groups:

– It is possible to configure up to 512 logical volume groups.

> **i** By default, CentricStor always has at least two logical volume groups (“BASE” and “TR-LVG“). These are available in addition to the freely configureable volume groups.

– Each logical volume in CentricStor belongs to precisely one logical volume group.

Physical volume groups:

– It is possible to configure up to 100 physical volume groups[1].

By default, CentricStor always has at least two physical volume groups (“BASE” and “TR-LVG”). These exist in addition to the freely configurable volume groups.

– All physical volumes of a physical volume group belong to the same physical library.

– A physical volume group does not possess any tape drives, it is instead linked to a tape library. This tape library can be part of a real tape library, and may only contain tape drives of a single type.

– A physical library can contain several physical volume groups.

4.1.3 System administrator activities

This section contains brief information on the main system administrator activities:

– “Adding a logical volume group” on page 66
– “Adding a physical volume group” on page 66
– “Adding logical volumes to a logical volume group” on page 66
– “Adding physical volumes to a physical volume group” on page 67
– “Assigning an LVG to a PVG” on page 67
– “Removing an assignment between an LVG and a PVG” on page 67
– “Changing logical volumes to another group” on page 68
– “Removing logical volumes” on page 68
– “Removing logical volume groups” on page 68
– “Removing physical volumes from a physical volume group” on page 69
– “Removing physical volume groups” on page 69

[1] Cleaning and transfer groups are not included here.

4.1.3.1 Adding a logical volume group

- The form and detailed information are provided in the section “Logical Volume Groups” on page 173

1. Click on the “NEW” button.
2. The following must be entered:

Name	Name of the new logical volume group
Type	Extended (2 GB, ... , 200 GB) or standard (900 MB)
Location	Cache area (floating or defined explicitly)
Comment	Comment

3. Click on the “OK” button.

The entries become effective with the next “Distribute and Activate” (see page 188).

4.1.3.2 Adding a physical volume group

- The form and detailed information are provided in the section “Physical Volume Groups” on page 181.

1. Click on the “NEW” button.
2. A large number of entries need to be made. The description of the individual fields is provided on page 183.

   You will find further information in the section “Creating a new physical volume group” on page 187.
3. Click on the “OK” button.

The entries become effective with the next “Distribute and Activate” (see page 188).

4.1.3.3 Adding logical volumes to a logical volume group

- The form and detailed information are provided in the section “Logical Volume Operations » Add Logical Volumes” on page 211.

  The following information must be specified:
  – the VSN of the first logical volume
  – the logical volume group
  – the number of logical volumes

  The logical volumes are then incorporated in the CentricStor pool.

4.1.3.4 Adding physical volumes to a physical volume group

Only physical volumes contained in the physical library may be specified.

- The form and detailed information are provided in the section “Physical Volume Operations » Add Physical Volumes” on page 223.

  The following information must be specified:
  – the VSN of the first physical volume
  – an entry specifying whether the header of the added volume should be unconditionally overwritten with a CentricStor header
  – the physical volume group (see section “Adding a physical volume group” on page 66)
  – the number of physical volumes
  – the type of physical volumes

  The physical volumes are then incorporated in the CentricStor pool.

4.1.3.5 Assigning an LVG to a PVG

- The form and detailed information are provided in the section “Physical Volume Operations » Link/Unlink Volume Groups” on page 221.

  The following elements must be selected:
  – the logical volume group
  – the physical volume group (original)
  – a second physical volume group (copy, only applies for “Dual Save”)

  The logical volume group is then assigned to the selected physical volume group(s).

4.1.3.6 Removing an assignment between an LVG and a PVG

Before executing this function, all logical volumes must be removed from the logical group.

- The form and detailed information are provided in the section “Physical Volume Operations » Link/Unlink Volume Groups” on page 221.

  The following elements must be selected:
  – the logical volume group
  – the physical volume group

    The original physical volume group must be set to ’-unlinked-’. If a Dual-Save LVG exists, the physical Dual-Save PVG must also be set to '-unlinked-'.

  The assignment between the logical and physical volume groups is then removed.

4.1.3.7 Changing logical volumes to another group

- The form and detailed information are provided in the section “Logical Volume Operations » Change Volume Group” on page 209.

  The following information must be specified:
  – Specification whether all volumes (“all”) or just a certain number (“range”) of volumes of the original logical volume group are to be moved to the new group. If only part of the original group is to be transferred, the VSN of the first logical volume and the number of affected volumes must also be specified.
  – Original logical volume group (“Source Logical Volume Group”)
  – New logical volume group (“Target LVG”)

  The logical volumes are then assigned to the new logical volume group.

4.1.3.8 Removing logical volumes

Logical volumes should only be removed after being released by the host.

- The form and detailed information are provided in the section “Logical Volume Operations » Erase Logical Volumes” on page 213.

  The following information must be specified:
  – the VSN of the first logical volume
  – the number of logical volumes

  The logical volume group need not be specified, since all VSNs within CentricStor are unique.

  The logical volumes are then removed from the CentricStor pool.

4.1.3.9 Removing logical volume groups

Logical volume groups which have been made known to the system with the “Distribute and Activate” function can be removed from the “Logical Volume Groups” form (see page 173). However, this is possible only if the following prerequisites are satisfied:

– The logical volume group concerned may no longer be linked to a physical volume group.
– The logical volume group may not contain any logical volumes.

The two logical volume groups BASE and TR-LVG cannot be removed.

1. Select the logical volume group to be removed in the list.
2. Click on the “To Be Deleted” button (see page 175) and select “YES”.
3. Click on the “OK” button.

4.1.3.10 Removing physical volumes from a physical volume group

Only scratch tapes which do not contain any valid logical volumes can be removed, unless the physical volumes have been reorganized prior to doing this (flag is set).

- The form and detailed information are provided in the section “Physical Volume Operations » Erase Physical Volumes” on page 226.

  The following information must be specified:
  – the VSN of the first physical volume
  – the physical volume group
  – the number of physical volumes
  – flag for switching on/off a preceding reorganization

  The physical volumes are then removed from the CentricStor pool. They are no longer used and can be removed from the library.

4.1.3.11 Removing physical volume groups

Physical volume groups which have been made known to the system with the “Distribute and Activate” function can be removed from the “Physical Volume Groups” form (see page 181). However, this is possible only if the following prerequisites are satisfied:

– The physical volume group concerned may no longer be linked to a logical volume group.
– The physical volume group may not contain any physical volumes.

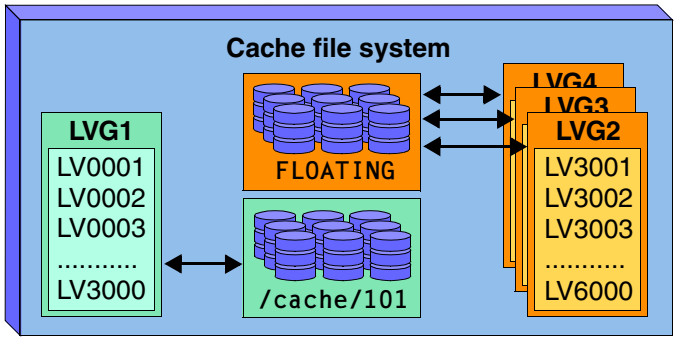
The two physical volume groups BASE and TR-PVG cannot be removed.

1. Select the physical volume group to be removed in the list.
2. Click on the “To Be Deleted” button (see page 183) and select “YES”.
3. Click on the “OK” button.

4.2 Cache management

This functionality enables individual cache file systems to be reserved for exclusive use by particular LV groups.

LV groups which are not assigned to a cache file system are distributed to the remaining caches (“FLOATING” setting).



In this example the LV group LVG1 is assigned the cache file system /cache/101.

The LV groups LVG2, LVG3 and LVG4 are distributed to the remaining caches (FLOATING).

Figure 28: Example of the exclusive use of the cache file system by LV groups

In concrete terms this means:

– An assignment of cache file system to LV group is defined by a configuration.
– An LV can be assigned to precisely one cache file system.
– Multiple LV groups can be assigned to a cache file system.

Possible applications:

- “Location” of the logical volumes

  The cache management function can be used to ensure that volumes are at a particular location or on a particular RAID system.

- Cache residence of the volumes

  The volumes are always in the cache file system.

  Benefit: Access to volumes of an LV group which is assigned to a particular cache file system is extremely quick.

  The reason for this is that the volumes are always in the cache file system. The volumes are displaced only if the volume of data on these volumes exceeds the capacity of the file system.

  However, it must be ensured that the volume of data on the volumes does not exceed the capacity of the cache file system.

The specification of whether a logical volume group is defined as “FLOATING” or with cache residence in a particular cache is made in the “Location” field when the logical volume group is defined (see section “Logical Volume Groups” on page 173).

The settings for the cache file system can be altered later at any time.

4.3 Dual Save

4.3.1 General

Dual Save (see page 50) is an optional system function which must be purchased separately from the CentricStor basic configuration. It is released by the service engineer by means of a key disk.

In order to use the Dual Save function, you must have at least two physical volume groups (see section “Partitioning on the basis of volume groups” on page 63).

If this prerequisite is fulfilled, the Dual Save function will cause each logical volume to be duplicated in two different physical volume groups. If you have two robots installed at different locations, you can enhance data security even further.

If a Dual-Save library should fail completely, logical volumes with the status “dirty” cannot be saved to tape. They remain in the cache without being saved.

Only when the library is once more in the normal status (e.g. after a repair) are the dirty volumes saved to tape.

If the failure of the library lasts for a long time, more and more volumes are placed in the “dirty” status until CentricStor ultimately becomes inoperable.

4.3.2 System administrator activities

4.3.2.1 Assigning a logical volume group to two physical volume groups

- The form and detailed information are provided in the section “Physical Volume Operations » Link/Unlink Volume Groups” on page 221.

  The following information must be selected:
  – the name of the logical volume group
  – the names of the two physical volume groups: PVG (Original) and (Copy)

  The logical volumes are then saved to two different physical volume groups.

4.3.2.2 Removing a Dual Save assignment

Before using this function, all logical volumes must be removed from the group.

- The form and detailed information are provided in the section “Physical Volume Operations » Link/Unlink Volume Groups” on page 221.

  – After the logical volume group has been selected the two PVGs (Original and Copy) must be set to ’-unlinked-’.

  The Dual Save assignment between the logical volume group and the two specified physical volume groups is then removed. The logical volume group is then an LVG without a connection to a physical volume group.

4.4 Reorganization

A brief overview of the reorganization of tape cartridges can be found on page 37.

4.4.1 Why do we need reorganization?

Reorganizations are performed for the following four reasons:

1. Effective use of the physical volumes' capacity

   There are two situations in which logical volumes may be rendered invalid on a physical volume:

   – When removing logical volumes (see section "Logical Volume Operations » Erase Logical Volumes" on page 242), the VLM sends an internal delete command to the PLM. This causes the PLM to remove the logical volumes from its pool, and flag the affected areas of the physical volumes in its data maintenance facility (PV file) as invalid.

   – If the host modifies a logical volume, the VLM sends a save request to the PLM. This causes the PLM to save the new version of the logical volume by appending it to the same physical volume or a different physical volume. The old version of the logical volume then becomes invalid.

     Over time, the second situation in particular causes a build-up of invalid logical volumes on a physical volume. If a physical volume contains nothing but invalid logical volumes, it becomes a scratch tape and can be overwritten.

     The purpose of reorganization is to free up any physical volumes with a very low occupancy level, i.e. to relocate any logical volumes still valid to another physical volume (write tape).

2. Refreshing the physical volumes

   Physical volumes are subject to physical and chemical aging, which means that even without read and write accesses they can become unusable after a long time. Regular reorganization of physical volumes which have not been accessed for a long time refreshes the magnetization of the tapes and prevents age-related loss of the magnetization.

3. Occurrence of a read or write error (faulty status)

   Physical volumes on which a read or write error has occurred and which are thus in *faulty* status are reorganized so that they can be taken out of service and the logical volumes affected can be backed up again.

4. Physical volume inaccessible status

   The PLM can no longer access the physical volume. This can be due to the following reasons:

   – The robot cannot access the physical volume.
   – The tape header cannot be read.

   The logical volumes affected may need to be read in again from a backup copy (dual save) and backed up again.

4.4.2 How is a physical volume reorganized?

To prevent the reorganization process from overloading the system, the PLM always reorganizes only one physical volume at a time. Once this physical volume has been completely cleared (all logical volumes on the tape are invalid) to become a scratch tape, the reorganization of the next physical volume can begin.

Since logical volumes cannot be copied directly from one tape to another, they are stored temporarily in the TVC as follows:

1. The PLM selects a logical volume on the physical volume which is to be reorganized and sends a “Move” request for each logical volume to the VLM.
2. The VLM checks whether this logical volume is located in the TVC. If it is, it sends a “Restore” request to the PLM.
3. As soon as the TVC has a copy of the logical volume (again), the VLM sends a “Save” request to the PLM. This causes the logical volume to be copied to another *write tape*. From the point of view of the PLM, the logical volume has now been moved.

The PLM issues “Move” requests to the VLM for all valid logical volumes on a physical volume in the ascending order of the block numbers on the tape. Once again, to prevent a system overload, only a certain number of “Move” requests are initially sent. A further “Move” request is not released until the preceding one has been completed successfully.

4.4.3 When is a reorganization performed?

Depending on the type of event or status which triggers reorganization, the PLM performs reorganization either immediately after the event occurs or within a configurable time of day interval.

The following three events cause reorganization to be triggered immediately regardless of the time of day:

- Explicitly by means of a user command

  It is possible for the user to explicitly request the reorganization of a physical volume via the GXCC user interface (see section “Starting the reorganization of a physical volume” on page 78). This event has priority over all other reasons for reorganization which may occur simultaneously. Any reorganization which may be running for the physical volume group concerned is aborted.

- Hard minimum event

  This event has occurred whenever one of the following two conditions are fulfilled:

  – The number of scratch tapes falls below the hard minimum specified in the GXCC menu “Physical Volume Groups” (see page 187).
  – There are read tapes present with any occupancy level.

  If the number of scratch tapes falls below the hard minimum, the following system message is issued (see page 75):

  ```
  SXPL008 ... PLM(#8): WARNING: hard minimum of free PVs (<num>) of PV-
  group <PVG> reached
  ```

  Once the number of scratch tapes exceeds the hard limit again, the “all clear” is given (see page 75):

  ```
  SXPL009 ... PLM(#9): NOTICE: number of free PVs of PV-group <PVG> over
  hard minimum (<num>) again
  ```

- Absolute minimum event

  If the number of scratch tapes falls below the absolute minimum, the PLM will reject all normal “Save” requests and will only process those issued in the context of the reorganization.

  This is because the PLM itself requires a number of scratch tapes for reorganization purposes. Without these, it could find itself in a dead-lock situation.

  If the number of scratch tapes falls below the hard minimum, the following message will be written to the file `klog.msg` (see page 76):

  ```
  SXPL010 ... PLM(#10): WARNING: absolute minimum of free PVs (<num>) of
  PV-group <PVG> reached
  ```

Once the number of scratch tapes reaches the hard limit again, the “all clear” is given (see page 76):

```
SXPL011 ... PLM(#11): NOTICE: number of free PVs of PV-group <PVG> over
absolute minimum (<num>) again
```

For the following statuses, reorganization is only initiated within the configured time of day interval. When several of these statuses exist simultaneously, the PLM prioritizes the reorganization of the physical volumes affected in the specified order.

- Physical volumes which have reached refreshing age

  Once the data on physical volumes exceeds a certain age, the physical volumes are reorganized in accordance with the settings in the physical volume group (see section “Physical Volume Groups” on page 187). In the process, the logical volumes are written anew to another physical volume.

- Physical volumes in the faulty or inaccessible status
- Soft minimum status

  This status exists when the number of *scratch tapes* has fallen below the configured *soft minimum* and at the same time *read tapes* exist whose occupancy level is below the configured percentage value (*Fill Grade* parameter).

When the *hard minimum* is fallen below and at the same time physical volumes in *faulty* or *inaccessible* status or which have reached the *refreshing* age exist, these physcial volumes are not taken into account for reorganization. When this situation occurs, highest priority is assigned to the most effective method of obtaining new *scratch tapes*: physical volumes in *faulty* or *inaccessible* status cannot be reused anyway, and those which have reached the *refreshing* age normally have a high occupancy level and can easily cope with a delay of a few hours which is slight in comparison to their age.

4.4.4 Which physical volume is selected for reorganization?

Selection of a physical volume for reorganization takes place randomly in the following groups and does not depend on its occupancy level:

- Physical volumes selected by means of an explicit command
- Physical volumes which have reached the refreshing age
- Physical volumes in faulty or inaccessible status

Further physical volumes are queued for reorganization only if the first limit value for the number of *scratch tapes* (soft minimum) is fallen below. In the group affected in this case, the next physical volume selected is the one for which the lowest costs for copying the logical volumes are estimated.

Only physical volumes in *read* status on which the relative proportion of valid data is less than the percentage value configured in the *Fill Grade* parameter are taken into account. If a physical volume is in *write* status and the percentage value for its valid data drops below the *Fill Grade* value, it is placed in *read* status and is therefore a candidate for reorganization.

The costs are estimated according to the following formula:

(N * estimate1) + (M / estimate2)

where

N Number of valid logical volumes on the physical volume
estimate1 Estimated overhead, in seconds, for each logical volume which is to be written (configuration parameter *Write Overhead*)
M Sum, in MiB, of the data contained on the valid logical volumes
estimate2 Estimated write performance in MiB/sec (configuration parameter *Write Throughput*)

When the two estimated values are configured, it must be borne in mind that these do not depend solely on the hardware characteristics of the tape drives, but also to a large degree on the relative size of the valid logical volumes. For example, large logical volumes have fairly certainly been displaced from the TVC and would have to be read in first, which practically doubles the time required and halves the write performance.

Example

```
pos PV     TL     PVG    state  next-bl  LVs -  val  cap/GB  valid/GB  valid %
 :
 15 CSJ016 JAGUAR JAG001 _r__  2518971  1156   583 279.397     0.000     0
 16 CSJ017 JAGUAR JAG001 _r__  1109297    16     1 279.397    15.795     5
 :
```

The default values (*Write Overhead* = 3, *Write Throughput* = 5) result in the following costs:

PV	Number of valid LVs	Valid data volume (MiB)	Estimated costs
CSJ016	583	0	1749
CSJ017	1	16155	3234

CSJ016 is therefore selected.

Example with *Write Overhead* = 3 and *Write Throughput* = 20:

PV	Number of valid LVs	Valid data volume (MiB)	Estimated costs
CSJ016	583	0	1749
CSJ017	1	16155	810

CSJ017 is therefore selected.

4.4.5 Own physical volumes for reorganization backup

The PLM distinguishes between backup requests from the host and backup requests which are caused by a reorganization. As long as the number of *scratch tapes* is above the *hard minimum*, the PLM attempts to use a physical volume exclusively for the request type involved. The reason for this is as follows: the logical volumes affected by the same request type are more similar to each other in terms of the retention period of their data than to those affected by the other request type. Consequently, in the event of separate backup according to the request type, either a very high or very low occupancy level of the physical volumes is more probable than a medium occupancy level, and the tape backup is therefore more efficient.

However, as a result the number of mount requests during reorganization increases. If the separation of physical volumes for host backup requests and for reorganization consequently proves to be disadvantageous, the service staff can suppress this by means of a configuration switch.

4.4.6 Starting the reorganization of a physical volume

The form and detailed information are provided in the section “Physical Volume Operations » Reorganize Physical Volumes” on page 257.

The following information must be specified:

– the VSN of the physical volume

– the name of the physical volume group

If another physical volume is currently being reorganized either explicitly or automatically, this process is aborted and reorganization of the physical volume currently specified in GXCC is initiated.

4.4.7 Configuration parameters

All configuration parameters can be set specifically for each physical volume group.

It must be ensured that a dependency on the number of available drives exists and that not too many reorganizations take place in parallel, otherwise these will be delayed unnecessarily on account of the lack of drives. Each reorganization requires two drives: one for reading in and one for writing.

The form and detailed information are provided in the section “Physical Volume Operations » Reorganize Physical Volumes” on page 257.

Time Frame

This parameter defines the time of day interval within which the reorganizations resulting from the *soft minimum* limit value being fallen below again, for *refreshing* and for restoring the backups for physical volumes in *faulty* or *inaccessible* status should take place.
The interval should be in an off-peak period.
Default: 10:00 - 14:00

Soft Minimum

The minimum number of physical volumes (scratch tapes) which, if fallen below, automatically triggers a reorganization process.
Default: 30
Recommendation: Empty physical volumes required per week + *Absolute Minimum*

Hard Minimum

If the number of free physical volumes (scratch tapes) specified here is fallen below, a reorganization run is started immediately, i.e. regardless of the *Time Frame* parameter.
Default: 8
Recommendation: Empty physical volumes required per week + *Absolute Minimum*

Absolute Minimum

Absolute minimum number of free physical volumes (scratch tapes). When this minimum is reached, all resources are used with priority for reorganization. The following hierarchy must be observed:
Soft Minimum > Hard Minimum > Absolute Minimum.
Default: 4
Recommendation: Number of Physical Device Services

Fill Grade

This parameter defines a particular percentage value for the proportion of valid data in relation to the total amount of written date on a physical volume.
All physical volumes in *read* status on which the percentage of valid data is below this limit are candidates for reorganization.

When the percentage of valid data on a physical volume which is in *write* status and is not currently mounted in a *Physical Device Service* is below this limit value and at the same time a reorganization is in progress because a scratch tape limit value has been fallen below, this physical volume is placed in *read* status, and it is therefore a candidate for reorganization.
Default: 70

Parallel Request Number

When a PV is reorganized, a movement request for each logical volume of this physical volume is sent to the VLM. The parameter defines the number of such movement requests which can be processed in parallel.
The value specified may not be too high for the following reasons:

– Space must be created in the TVC for each logical volume which is to be read in, i.e. under certain circumstances other logical volumes are displaced unnecessarily.
– The VLM limits the number of logical volumes for reorganization per cache. When this value is reached, subsequent “Move” requests must wait.

Default: 5

Move Cancel Time

The PLM monitors the progress of the reorganization of a physical volume. This value, specified in seconds, is used for this purpose.
If the status of the reorganization of a physical volume remains unchanged for this period, the reorganization of this physical volume is aborted and, if applicable, the next volume is reorganized.
The timer is reset for each of the individual steps listed in the section “When is a reorganization performed?” on page 75.
Default: 1800

Write Throughput

This parameter specifies the estimated write performance, in MiB/s, for reorganization of a physical volume. It plays a part in determining the physical volume for which the shortest reorganization time is to be expected (see section “Which physical volume is selected for reorganization?” on page 76).
Default: 5

Write Overhead

This parameter specifies the estimated overhead, in seconds, for each logical volume which is to be written. It plays a part in determining the physical volume for which the shortest reorganization time is to be expected (see section “Which physical volume is selected for reorganization?” on page 76).
Default: 3

PLM Refresh Interval

Number of days after which the physical volumes in this group are to be recopied. The count starts with the day on which the physical volume switched from *scratch* status to *write* status. This value must be defined in accordance with the recommendations of the tape manufacturer.

Default: 365

4.5 Cleaning physical drives

The cleaning of physical drives can be carried out by the robots, or by CentricStor (see section “Physical Volume Operations » Add Physical Volumes” on page 223).

Generally speaking, physical drives are cleaned automatically by the robots which means that it is only necessary to check the cleaning tapes regularly.

However, the following robots are the exception to this rule:

- SCALAR 1000 with a direct SCSI connection (not via DAS/ACI or SDLC) with MAGSTAR drives

  Since SCALAR 1000 has no special interface to the MAGSTAR drives that allow it to see a clean request from the MAGSTAR drives, the system administrator must regularly check the operating panel of the MAGSTAR drives.

  MAGSTAR drives indicate a clean request by issuing a `*CLEAN` message to their operating panel. And then the system administrator must trigger the cleaning process by hand from the SCALAR 1000 operating panel.

- SCALAR 100

  SCALAR 100 also does not have an automatic cleaning feature. The drives indicate a clean request via a special clean symbol (stylized broom) on the drive field of the SCALAR 100 operating panel.

  In this case, the system administrator must also trigger the cleaning process by hand from the SCALAR 100 operating panel.

If the robots you are using do not offer an automatic cleaning function, CentricStor can also take on the cleaning of physical drives.

Cleaning by CentricStor is carried out if the cleaning PVG that is automatically created for each tape library provides cleaning tapes (see section “Physical Volume Operations » Add Physical Volumes” on page 223 and section “Physical Components” on page 254).

4.6 Synchronization of the system time using NTP

In CentricStor the configuration with regard to NTP is carried out automatically, which means that the file `/etc/ntp.conf` is created with the appropriate entries for each computer.

It is no longer necessary for the system administrator to modify the files.

Exceptions

– If the first NTP server (VTLS Message Manager) is to be configured as the NTP client of an NTP server in an external LAN, the appropriate entry must be made by hand in the `/etc/ntp.conf` file on this computer.

– If the files `/etc/ntp.conf` are not to be updated automatically (because the computer has been specially onfigured with regard to NTP, the entry `#static` must be made in the `/etc/ntp.conf` file for all computers. If this is the case, these files will not be modified.

CAUTION!
CMF is based on a correct time setting. An incorrect NTP configuration can result in data loss.

5 Operating and monitoring CentricStor

5.1 Technical design

5.1.1 General

CentricStor monitoring and operation is carried out on two levels by GXCC and XTCC.

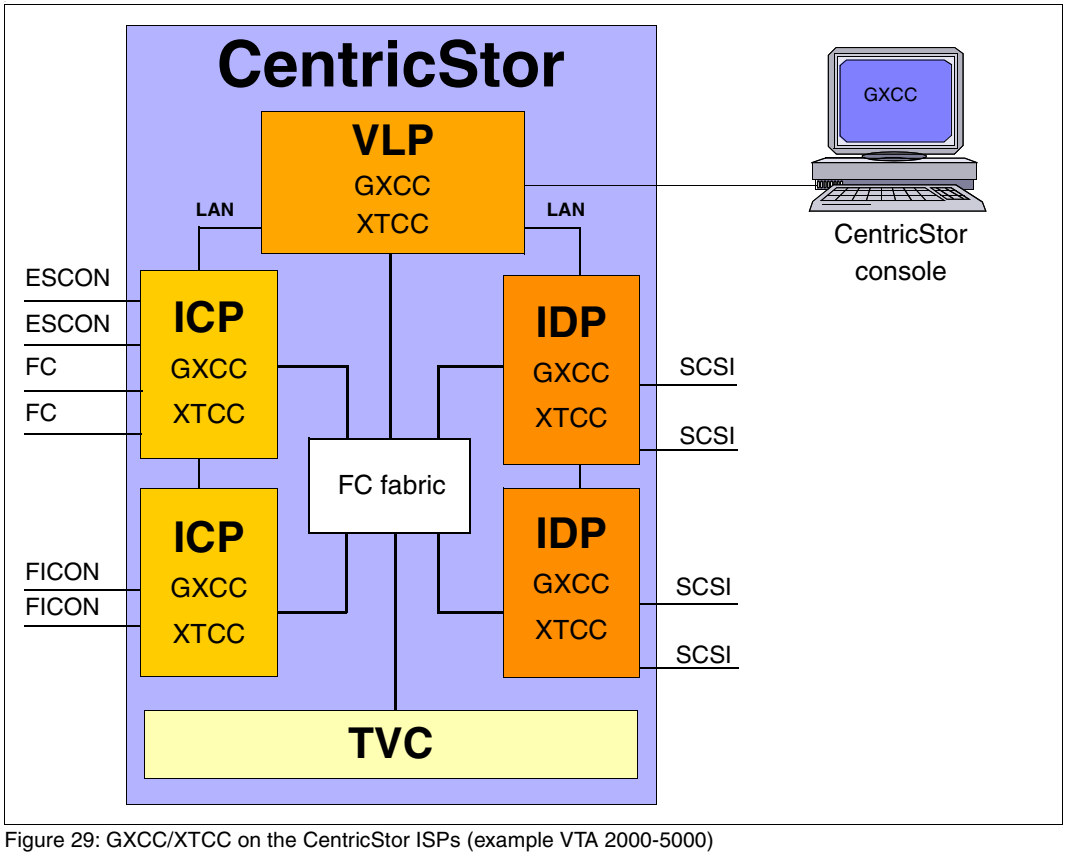


Figure 29: GXCC/XTCC on the CentricStor ISPs (example VTA 2000-5000)

GXCC (Global Extended Control Center) is a program with an X user interface that provides a complete graphical representation of a CentricStor system, and covers all connected devices and ISPs (Integrated Service Processors) such as ICPs (Integrated Channel Processors), IDPs (Integrated Device Processors), and VLPs (Virtual Library Processors). GXCC processes all ISPs and other components of a CentricStor cluster as if they were a single unit.

Displays and operations within an ISP are implemented in the downstream XTCC application (Extended Tape Control Center). An XTCC application is started by choosing the “Show Details” command from the function menu of an ISP.

GTCC and XTCC are standard components of the CentricStor software package, and are installed on all the CentricStor ISPs. They can also be operated on a computer (workstation) that is running independently of CentricStor. To permit this, a GUI CD is supplied with each CentricStor which can be used to install the GUI software for monitoring a CentricStor system under the operating systems MS-Windows 95/98/NT/2000/XP, LINUX, SOLARIS and SINIX-Z.

5.1.2 Principles of operation of GXCC

As shown in the figure below, the CentricStor user interface is represented by the interaction of three components:

– **InfoBrokers** exchange information with the individual CentricStor processes. An InfoBroker is an object-oriented data maintenance system containing all information relevant to the system. This includes measured values supplied by the monitoring programs of the CentricStor components.

– **GXCC** and **XTCC** receives information from the various InfoBrokers and presents it in graphical format.

– An **X11 server** provides any on-screen display requied and processes commands entered via your keyboard or mouse.

These three components communicate with each other on the basis of the TCP/IP protocol. The InfoBroker, GXCC, and the X11 server can thus reside on the same system, or be distributed between two or three systems connected via TCP/IP. Please note that the flow of data between the InfoBroker and GXCC is considerably less than that between GXCC and the X server.

Please refer to the product data sheet for information on the supported standard and optional configurations of the user interface.

CentricStor utilizes numerous components, all of which are monitored and managed by GXCC. There are several options for accessing these components.

The figure below shows the components and the connections used for control and monitoring (the Fibre Channel networking and the paths to the hosts are not shown):

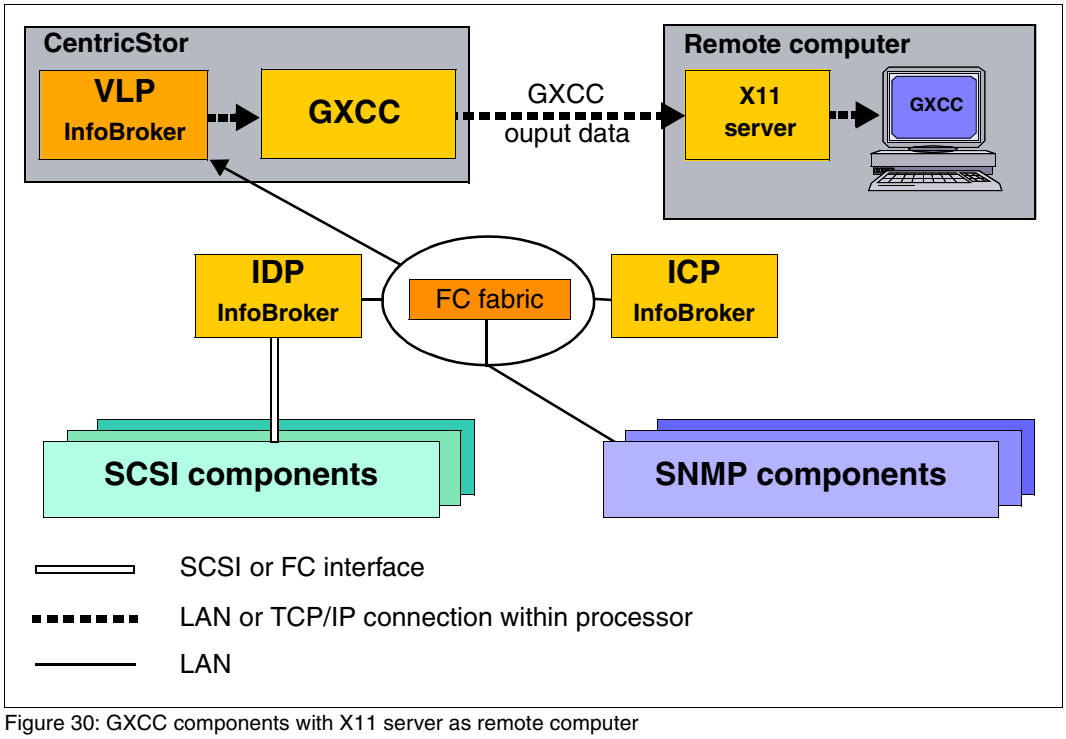


Figure 30: GXCC components with X11 server as remote computer

In this example GXCC runs on a CentricStor computer. The data is made available by the VLP InfoBroker. All GXCC output data is sent to the remote computer (X11 server) and there displayed on the screen.

In the case of a low-speed data connection between CentricStor and the remote computer the large data quantities to be transferred result in performance problems.

Consequently a configuration without X11 server provides a better solution:

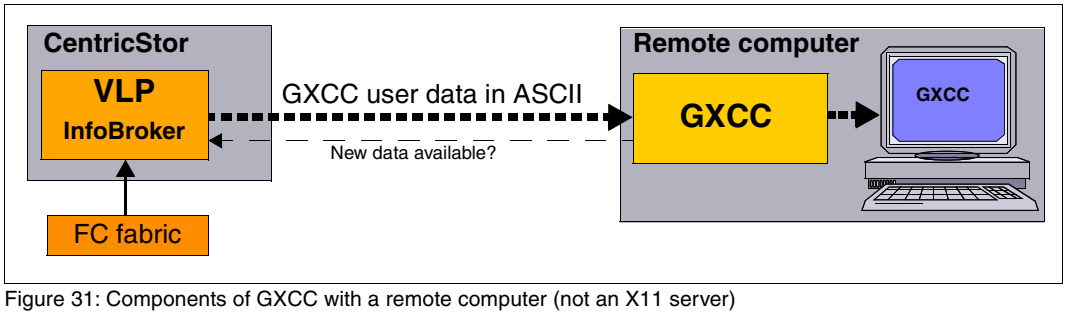


Figure 31: Components of GXCC with a remote computer (not an X11 server)

In this configuration GXCC runs on the remote computer (e.g. Windows PC) and uses the interfaces of its user interface directly. At short intervals GXCC inquires of the CentricStor VLP whether there is new data. Here only 20 bytes are transferred. If new data is available, the VLP sends the GXCC user data to the remote computer, which edits the data and forwards it to the output screen.

ISP

Each ISP has its own InfoBroker which gathers information on the local software components via optimized interfaces. This information is then passed on to GXCC over the local CentricStor network.

Components managed via SNMP (FC switches)

These components can only be controlled and monitored using SNMP mechanisms. The control component, referred to as the SNMP manager, monitors these stations and receives traps. During configuration, you define the ISP in the CentricStor network on which the underlying SNMP manager for GXCC is to be started.

In GXCC, all of the FC switches are represented as FC fabric.

SCSI-controlled components (tape drives, certain libraries)

All tape drives and some archives are controlled and managed by means of mechanisms contained in the SCSI protocol. The associated InfoBroker instance is located in the ISP of the CentricStor system to which the SCSI or FC interface leads.

5.1.3 Monitoring structure within a CentricStor ISP

The figure on page 89 contains a more detailed representation of how GXCC monitors the individual CentricStor control components. This figure should also be regarded as one example of the many configurations possible.

The figure shows the logical or physical connections used by GXCC for monitoring and control purposes. The internal Fibre Channel system is depicted only insofar as it is used in the management of the RAID system. The thick continuous lines represent TCP/IP connections which alternate between processors. The broken lines represent connections that may also exist within an ISP. All other interfaces are represented by thin lines.

The central monitoring point in each ISP is the InfoBroker and the associated Request-Broker. All InfoBrokers in the CentricStor network have exactly the same configuration and are considered peers. They provide special interfaces for communicating with all CentricStor control components. These components are present in latent form in all ISPs. During the configuration process, you define which components are actually activated in which ISPs. Inactive control components are shown in blue in the figure below. While the InfoBroker only 'knows' the components of the local ISP, the affiliated RequestBrokers exchange configuration information with the RequestBrokers of the other ISPs, and thus 'see' CentricStor as an overall unit.

XTCC always monitors a single ISP. As a result, XTCC connects directly to the InfoBroker of 'its' ISP.

The following example of many possible CentricStor configurations. In principle the individual processes can be distributed over the ISPs almost without restriction. Only those processes which require supervisor access must be started on **one** ISP.

The table below lists the control components:

Name	Function	Comment
LD	Logical Device: emulation of a drive.	Must run on the ISP in which the associated host interface (ESCON/ FICON/FC) is installed (ICP).
MSGMGR	Message Manager: filters and stores system messages. Triggers actions in response to certain situations (e.g. SNMP traps).	Only one instance throughout CentricStor.
PDS	Physical Device Service: drives one physical tape drive.	Must run on the ISP in which the associated SCSI interface is installed (IDP).
PERFLOG	Performance Logging: captures and stores performance-related system data.	Only one instance throughout CentricStor
PLM	Physical Library Manager: manages the physical CentricStor components.	Only one instance throughout CentricStor.
PLS	Physical Library Service: drives a real robot archive.	In the case of SCSI-controlled robots, must be installed on the same ISP as the associated SCSI interface.
VLM	Virtual Library Manager: manages the CentricStor virtual libraries.	One instance throughout CentricStor, installed in the same ISP as the PLM (VLP).
VLS	Virtual Library Service	VDAS, VACS and VLMF are each provided once in CentricStor, VAMU 10 times, and VJUK 20 times.
VMD	Virtual Mount Daemon	In each ICP.

GXCC/XTCC can also run on SINIX-Z/Solaris/LINUX/Windows systems which are independent of CentricStor. In this case, GXCC connects via the LAN to the RequestBroker of the ISP referenced in the unit selection, exchanges information with it and, on the basis of this information, builds the graphical display.

GXCC/XTCC also covers the CentricStor components that can only be monitored via SNMP, such as the Fibre Channel switches. During configuration, you define the ISPs in which the management station is to be started. In addition, an SNMP agent can be installed in CentricStor that permits CentricStor to be monitored by an SNMP management station.

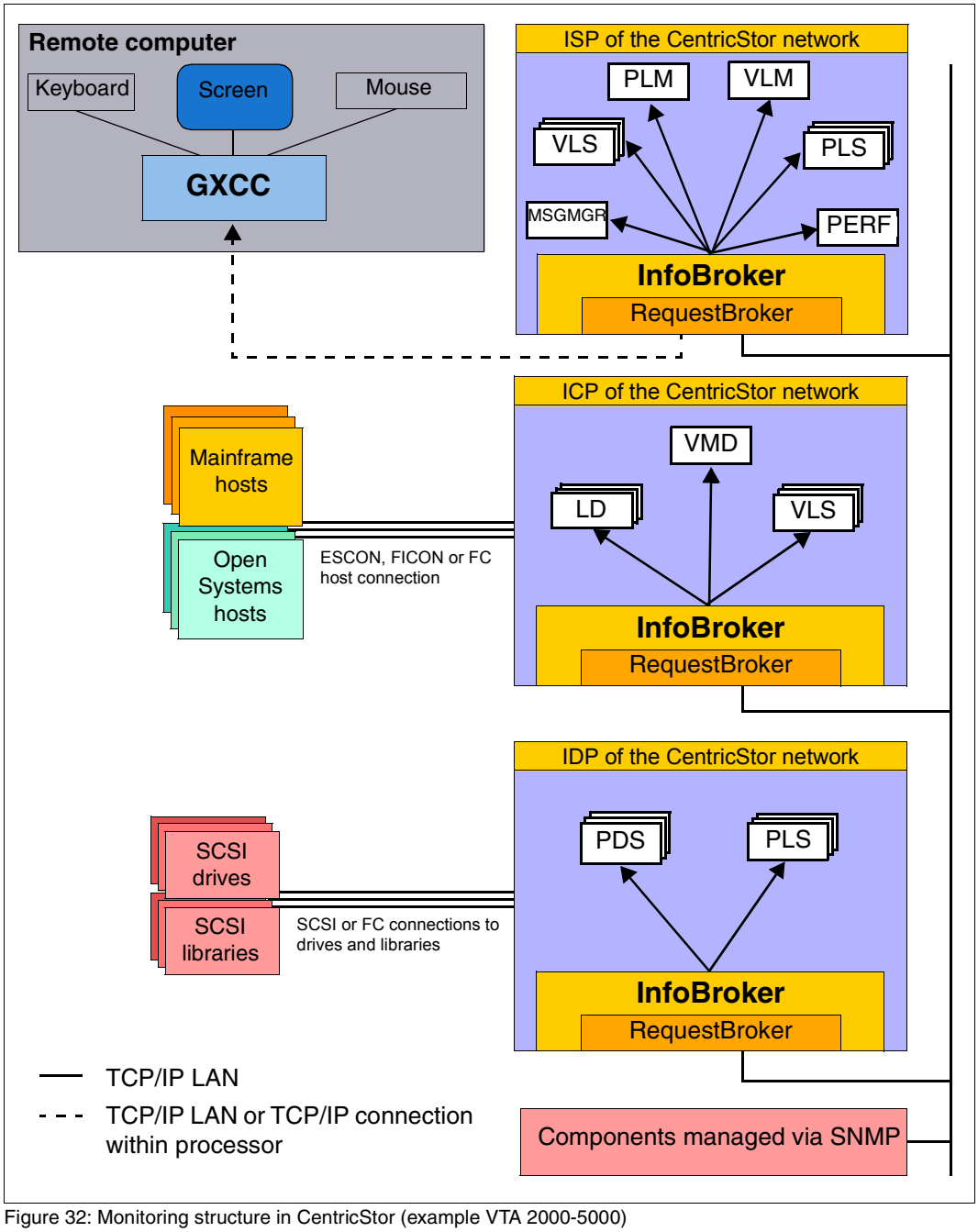


Figure 32: Monitoring structure in CentricStor (example VTA 2000-5000)

5.1.4 Operating modes

GXCC recognizes the following three user privilege levels:

Service mode Access to all CentricStor functions available via GXCC. Users must use the “diag” password to identify themselves to the CentricStor ISP with which they are connected.

User mode Access to the functions required for normal operation. Examples of this are the addition of new logical volumes and the inclusion of or changes to logical and physical volume groups. Users identify themselves with the ISP “xtccuser” password.

Observe mode Monitoring function. Access to the global status and history. By default no password is required. On CentricStor, access control can optionally be configured for this mode. Users then legitimate themselves with the ISP’s “xtccobsv” password.

The operating mode is set as a start parameter when GXCC is called. The password will be queried once the connection has been established.

If the wrong password is entered, an error message is output and the query is repeated. After a third wrong entry for Service or User mode the GXCC is started in Observe mode provided no access control exists for this. If access control is specified for Observe mode, three wrong password entries are also possible here, after which the program aborts.

This manual describes User mode and Observe mode. Service mode is reserved for service personnel.

5.2 Operator configuration

5.2.1 Basic configuration

Without requiring additional hardware or further software licences, CentricStor offers the following configuration for operation and monitoring:

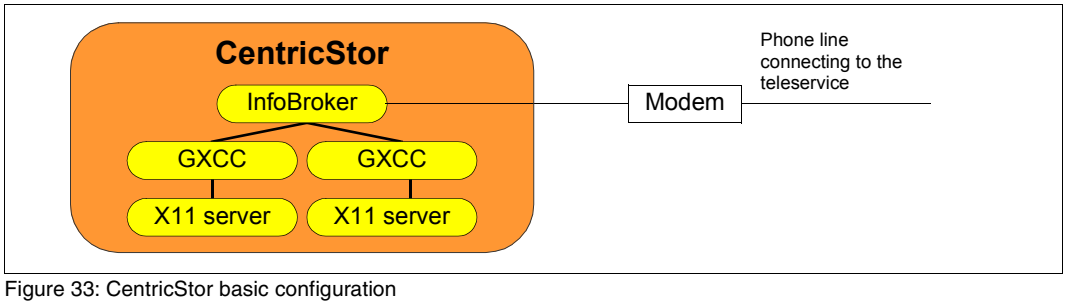


Figure 33: CentricStor basic configuration

Within a CentricStor cluster, the InfoBroker will accept two connections to GXCC if this has been started on an ISP of CentricStor. The X11 server can run internally in CentricStor, using the local consoles, but also externally. The InfoBroker can also accept an additional connection to a GXCC outside CentricStor if this is made using a modem (SLIP) connection. This connection is designed to be used for remote maintenance purposes.

5.2.2 Expansion

The operating options can be expanded using the additional license 3595-RMT (CS Remote Monitoring and Administration). If the RMT key is installed in a CentricStor system, the InfoBroker accepts any number of connections to a GXCC outside its CentricStor. This CentricStor can consequently be monitored on any number of independent computers (workstations) with GXCC/XTCC.

For performance reasons the number of connections with GXCC within CentricStor remains limited to two.

5.2.3 GXCC in other systems

GXCC can also be installed and is executable in Windows 98/NT/2000/XP, LINUX and SOLARIS systems. An installation CD is supplied with each CentricStor. This contains the tools and information files required for installation on the relevant systems. You will find more information on this in the installation manual.

GXCC V6.0, GXCC V3.0 and GXTCC V2.x can be installed in the same system at the same time.

Ongoing updating of GXCC takes place semiautomatically from the connected CentricStor systems.

5.2.4 Screen display requirements

- The operator consoles of the ISPs meet the requirements.
- An external X11 server will require a graphics-capable color monitor. The ideal resolution is 1280 x 1024 Pixel. The minimum requirement which must be set is 1024 x 786 Pixel.
- In GXCC important information is displayed using colors. As a result, 16-bit True Color (or better) is ideal. 8-bit color palettes may lead to incorrect color displays if GXCC is sharing the screen with other applications.

5.2.5 Managing CentricStor via SNMP

5.2.5.1 Connection to SNMP management systems

CentricStor is prepared for connection to an SNMP management station. On the GUI-CD of CentricStor the software and information have the settings required. Special functions are available for CA Unicenter.

SNMP is used, above all, to forward special situations reported in console outputs, for example, to the management station as traps. The user interface or command-line interface should then be used for detailed diagnostics.

5.2.5.2 SNMP and GXCC

Monitoring and operation of CentricStor by GXCC runs independently of SNMP.

In addition, however, CentricStor also offers the basic functions required for management via an SNMP station. Thanks to the great flexibility of GXCC as regards configuration, when GXCC is used together with SNMP the monitoring and operation of CentricStor can be adapted to suit the IT infrastructure and the requirements of the user.

The VLP of CentricStor provides the connection to the outside world. It supports “ping” and elementary MIB-II. Thus, the operation of the carrier system can be monitored, but not the functioning of CentricStor.

In addition to standard Traps such as coldStart, linkUp, linkDown etc., when system messages of priority 5, 6, 7 or 8 (ERROR, CRITICAL, ALERT, EMERGENCY) occur, CentricStor therefore sends corresponding traps to the management station.

In addition, every 300 seconds a “Global State” with the following values is sent to the SNMP management station by means of a trap:

1 CentricStor is ready to operate (green).
4 Subcomponents of CentricStor are faulty, operation is still possible (yellow).
7 Operation of CentricStor has been disrupted (red).

Additional functions are made available for installation in management stations of the type CA Unicenter.

Since GXCC will run on most standard systems, the startup of GXCC for detailed diagnostics when there is a trap can be largely automated in practically all management systems.

The current status regarding SNMP support is indicated in a text file. After GUI installation on a type CA Unicenter management station you can find this file at “...Setup > SNMP Integration README”.

The figure below shows some of the possible configurations for an SNMP manager for connecting GXTXCC to the triggering CentricStor on the basis of a trap:

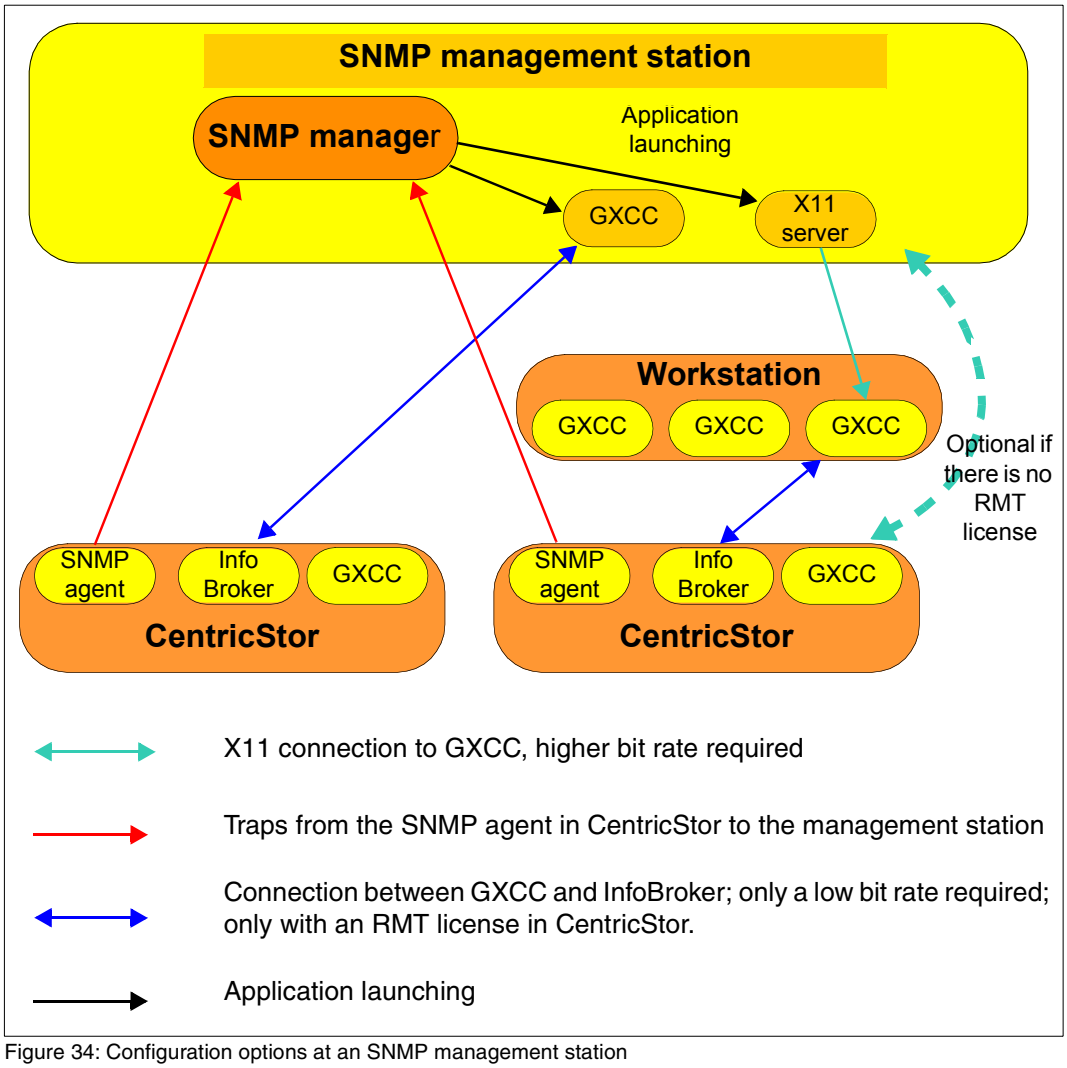


Figure 34: Configuration options at an SNMP management station

- In the case of configurations in which there is an external connection between GXCC and an InfoBroker (shown here in blue), an RMT license is required in the relevant CentricStor.
- The InfoBroker accepts a maximum of two local connections. It is irrelevant here whether the X11 server runs within CentricStor using the local console or outside CentricStor on a workstation.

– The GUI software must be installed explicitly on the workstation for operation of GXCC outside CentricStor. A CD with GXCC (GUI CD) is provided free with each CentricStor. GXCC can be installed an unlimited number of times to run CentricStor. It will run on Windows 98/NT/2000/XP, LINUX, SOLARIS and SINIX-Z systems.

5.3 Starting GXCC

5.3.1 Differences to earlier CentricStor versions

In CentricStor V3.0 the name of the interface had already been changed from “GXTCC” to “GXCC”. Furthermore, Service mode is now started by the start parameter “-service” (previously “-modify”). The access point (mostly VLP) is selected via “-unit” (previously “-host”).

For compatibility reasons the call for GXCC and the previous start parameters will continue to function. However, you are urgently recommended to adapt all the settings to the new names as soon as possible.

5.3.2 Command line

GXCC is called from the remote operator console or the CentricStor console via the Root menu. On auxiliary operator consoles a command line is entered. A number of runtime parameters can or must be entered with this command line.

If GXCC is to be started from a graphical interface, this command line must be entered when configuring the interface function (see section “Starting from a Windows system via Exceed” on page 105, for example, or section “Starting from a Windows/NT system via XVision” on page 108).

The command line has the following format:

```
/usr/apc/bin/GXCC <options as per table below> [&]
```

Example of a GXCC call:

```
/usr/apc/bin/GXCC -user -display 123.45.67.89:0.0 &
```

The start parameter settings are also transferred to the Global Status monitor.

The table below lists the possible start parameters:

Parameter	Meaning	Comment
-aspect[1] <param>	Size and position of the main window on the screen	<param> has the format [=][WxH]+|-X+|-Y WxH: Width x height (pixels) X,Y: Coordinates (pixels) [*] * is optional +|- + or -
-autoscan[1]	Cycle duration for updating the main window	Reduction of the data when operating via Teleservice
-display	Host name/IP address of the X terminal at which the window is to be displayed	Default: local X11 server
-globstat	Activates the Global Status Monitor	
-lang[1]	Language for helps. De | En	In the event of other defaults En is set.
-multiport	Connection via Info and/or RequestBroker port	If not specified: Single Port connection (see page 148)
-nointro	Splash screen suppression	Reduction of the data when operating via Teleservice
-observe	Start in Observe mode	If not specified: User mode
-profile <file>	Name of the profile file (see the section “Profile” on page 191)	If this is not specified, GXCC will be started with the default profile.
-service	Start in Service mode	If not specified: User mode
-simu <file>	Simulation mode	<file> is the file generated in GXCC/XTCC with File ➟ Save.
-singleport	Connection only via RequestBroker port	If not specified: Single Port connection (see page 148)
-size[1] n	Size of the main window	Default value: 80%, 100%, 120%
-unit	Host name/IP address of the CentricStor node to which GXCC is connected after start-up	If GXCC is running on a VLP, a connection to the local InfoBroker is established if nothing else is specified. In all other cases, the Unit Select menu is opened after the program is started.

Parameter	Meaning	Comment
-user	Starts the application in User mode	If not specified: User mode

[1] The command line arguments -aspect, -autoscan, -lang, -size have priority over values already stored in a profile file.

To start in User mode, use:
```
gxcc <other parameters> &
```
or
```
GXCC -user <parameters> &
```
To start in Observe mode, use:
```
GXCC -observe <parameters> &
```

5.3.2.1 Explanation of the start parameter -aspect

The argument of this parameter has the format `{[=][WxH]+|-X+|-Y}`

Where:

`WxH` The window is displayed on the screen with a width of `W` pixels and a height of `H` pixels.
`+X` Distance of the left-hand window margin from the left edge of the screen in pixels
`-X` Distance of the right-hand window margin from the right edge of the screen in pixels
`+Y` Distance of the upper window margin from the upper edge of the screen in pixels
`-Y` Distance of the lower window margin from the lower edge of the screen in pixels

Examples: `-aspect 500x400-100-100; -aspect 500x400; -aspect +100+100`

It is possible that the specification `W` and / or `H` will be ignored by the application.

CAUTION!
Knowledge of the screen setting is required to use `X` and `Y` since if values which are too high are specified, the window will be displayed partly or completely outside the visible area.

5.3.3 Environment variable XTCC_CLASS

GXCC supports an environment variable with this names as follows:

If this environment variable is not defined when GXCC is started, it is set to the value “Xtcc”. Otherwise the specified value is taken.

The relevant value is is inherited by all applications called by the current GXCC instance. This (class) name can, for example, be used by virtual window managers to place all the applications belonging to a particular GXCC instance in the same virtual window.

On Unix systems this variable can, for example, be set as follows when GXCC is called:

```
XTCC_CLASS=Xtcc1 gxcc –unit A [argumente] &
XTCC_CLASS=Xtcc2 gxcc –unit B [argumente] &
```

5.3.4 Passwords

The following passwords are needed to start GXCC:

- The password for logging into the CentriStor system running GXCC. GXCC starts under this password. Normally, this is the user ID “tele”; “root” is also possible.
- In User mode, GXCC requests a password which it uses for authorization when establishing a connection with the InfoBroker. Here you normally require the password of the “xtccuser” ID.
- For Service mode you normally require the password of the “diag” ID.
- In Observe mode generally no password is required. However, if the optional access control has been activated on a CentricStor, you normally require the password of the “xtccobsv” ID.

5.3.4.1 Optional access control for Observe mode

When a CentricStor V3.1 system is installed, the “xtccobsv” ID is set up by default and the line “`+ xtccobsv`” entered in the `home/xtccobsv/.rhosts` file. As a result this optional access control is initially inactive and no password is required for Observe mode. This procedure is the same as in earlier CentricStor versions. To activate access control, the administrator must modify the specified file and - as required - the password of the “xtccobsv” ID on the
CentricStor V3.1 system (in the SINIX system of the VLP and, if required, on other access servers).

Example

If the `home/xtccobsv/.rhosts` file contains only the file entries “`gui_computer_1 xtccobsv`” and “`gui_computer_2 xtccobsv`”, only these two computers have access without a password dialog. All the others must know the password, which may have been modified.

5.3.4.2 Authentication

After connection setup, client authentication takes place (in the SINIX system of the VLP and, if required, on other access servers). Authentication with a password is performed each time the program is started.

The passwords are defined as follows:

Service mode:	Password of the “diag” ID
User mode:	Password of the “xtccuser” ID
Observe mode:	Default: No password. Optional as of CentricStor V3.1: Password of the “xtccobsv” ID

The authorization (Service, User or Observe) is forwarded to the applications that are downstream (such as XTCC for monitoring/operating the ISPs). If the wrong password is entered, an error message is issued and the query is repeated up to 3 times.

5.3.4.3 Suppressing the password query

Releasing individual users

The password query can be suppressed if an entry in the .rhosts file permits access to CentricStor. To do this, the monitoring system is entered in the following .rhosts file on the monitored system:

Service mode:	`/usr/apc/diag/.rhosts`
User mode:	`home/xtccuser/.rhosts`
Observe mode:	`home/xtccobsv/.rhosts`

The following options are available for an entry in the .rhosts file:

- `+ <id>`

  In this case access can take place from any monitoring host.

- `<host-name> <id>`

  In this case, access is permitted only from the host with the name `<host-name>`. The Name Server entry, the Yellow Page entry or the IP address of the source computer must be used for `<host-name>`. This depends on the current operating configuration and network topology. The first two entries generally differ only in that the domain name is part of the name (Name Server) or is missing (Yellow Page). It is most convenient just to take all options into account in the .rhosts file.

  The `<host-name>` currently being used can also be seen in the status line of the GXCC/XTCC.

Example

If password-free access to CentricStor is to be permitted from the PC “PCjoesmith”, the following entries must be made on CentricStor in the `/.rhosts` file which is dependent on the access mode (here: Observe mode):

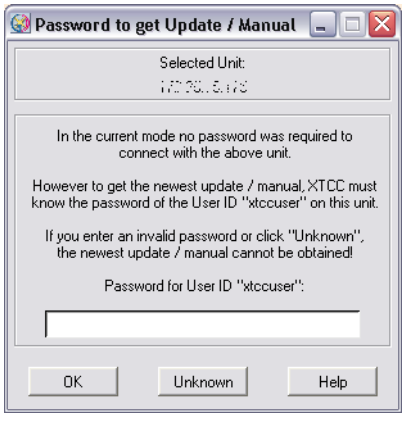
```
PCjoesmith            xtccobsv
PCjoesmith.mch.xyz.de xtccobsv
```

Releasing indivudual computers

The `/etc/hosts.equiv` file enables you to grant complete computer password-free access to CentricStor. Password-free access to all modes is permitted by entering the computer name or its IP address.

5.3.4.4 Additional password query

If GXCC or XTCC requires a password to transfer an update (see the section “Software updates” on page 118) or manual (see the section “Online Manual” on page 235), the following window appears:



This password query is made only when the user can access the system without a primary password query.

Information on this is provided in the sections “Optional access control for Observe mode” on page 99 and “Suppressing the password query” on page 100.

The window consists of an input field for the password and the following buttons:

OK
: The password entered is used if it is not empty. Its validity is not verified: the transfer fails if the password is invalid.

Unknown
: When you click on this button you exit the window. The update or manual is not accepted.

Help
: Displays a help text.

NOTES

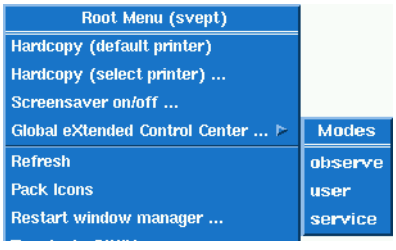
- Depending on the context, the term “XTCC” can be replaced by “GXCC” in the window displayed above. The user ID can be different.
- In Observe mode the password of the user ID “xtccuser” is requested.
- If an update from an earlier connection which has not yet been activated is already available locally, this is indicated by the message `Update <m.n> available`.

5.3.5 Starting the CentricStor console

- Position the mouse pointer to a neutral screen area.
- Press the right mouse button.
- The Root Menu appears, including the function “Global eXtended Control Center”.

If you select this item, you are offered the three modes of GXCC:

– Observe Mode
– User Mode
– Service Mode



When you have selected the required start mode GXCC is started.

5.3.6 Starting from an X11 server

Some X11 servers have difficulty with cascaded menus. The problem occurs when an attempt is made to move the mouse pointer from a menu entry onto an associated, cascaded submenu. The submenu is then closed immediately, with the result that the desired function cannot be selected. In this case an alternative X11 server should be installed.

5.3.6.1 General notes on the X11 server architecture

CentricStor is monitored and controlled by the interoperation of three components:

– the X11 server, which presents the graphics formatted by GXCC and controls the actual man/machine interface,

– the Global Extended Control Center GXCC, which on the one hand exchanges information with the InfoBroker and prepares this information in graphical form as required, and on the other hand responds to events at the man/machine interface (e.g. movements of the mouse pointer, keyboard input, etc.),

– and the RequestBroker of the connected ISP, which gathers information from all components and forwards commands from the man/machine interface to the respective recipients (XTCC, which only ever handles a single ISP, connects itself directly to the InfoBroker of this ISP).

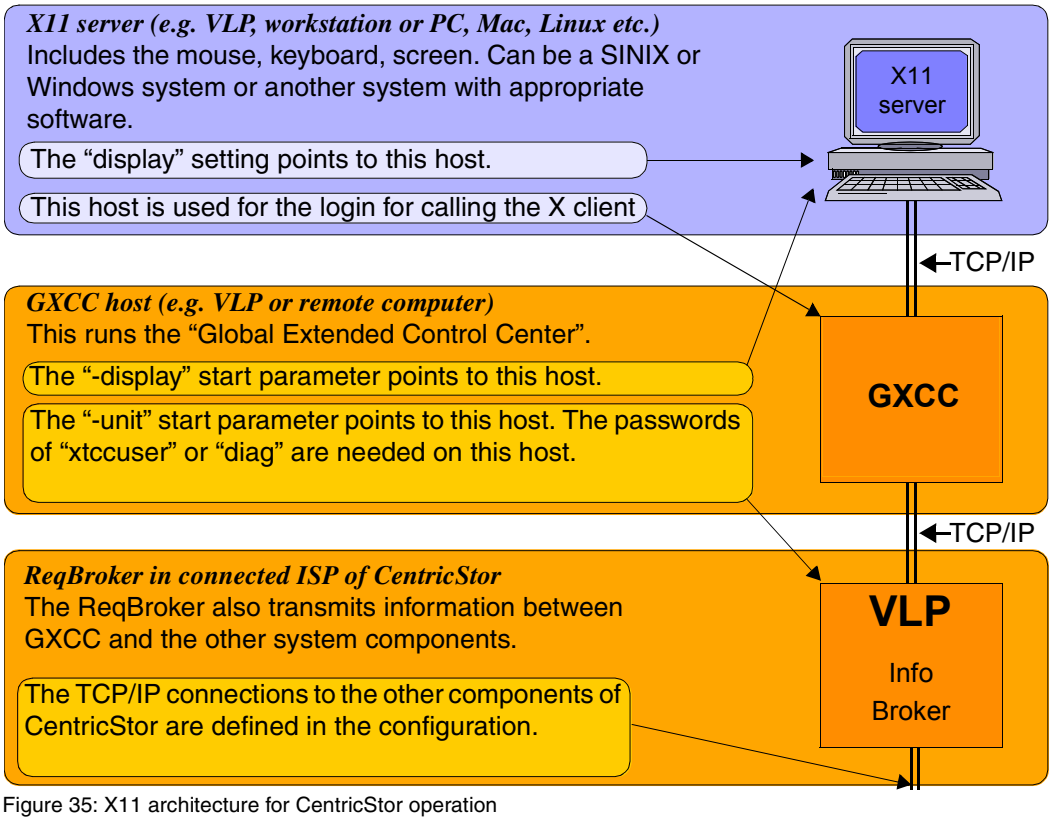


Figure 35: X11 architecture for CentricStor operation

The three components communicate with each other using the TCP/IP protocol. They can therefore be located on one or on up to three hosts.

If you operate GXCC at the CentricStor console for example, the X11 server, GXCC host and request manager/InfoBroker all run in the VLP of CentricStor.

If CentricStor is operated via a computer (workstation) outside CentricStor, GXCC runs on a host independent of CentricStor. The display console and consequently the X11 server can reside on the same computer as GXCC or on a subprocessor.

i A significantly higher transmission bandwidth is needed for the connection between GXCC and the X11 server than for the connection between GXCC and the InfoBroker.

5.3.6.2 Using the direct XDMCP interface

The full range of XDMCP (X Display Manager Control Protocol) functions cannot be used in CentricStor 2.1.

You are strongly recommended to use the X11 servers in Passive mode.

5.3.6.3 Starting from a UNIX system

1. Make sure that the ISP to be addressed is listed in the XHOST list of the calling system. If in doubt, enter its name or IP address with the “xhost” command (`/usr/bin/X11/xhost +<Name or IP address of the ISP>`).
2. Remote login, e.g. using `telnet`, to the desired ISP of CentricStor (in general, this should be the VLP) under the user ID “tele”. You will need the appropriate password.
3. Call GXCC using the command line described in the section “Command line” on page 95. Specify the IP address or host name for the `-display` parameter and, separated by “:”, the screen number of the calling system. It is advisable to terminate the line with “&”. The telnet screen then remains open and displays any errors that occur before the establishment of an X11 connection.

Common error messages:

```
# gxcc -user -size 80 -display 72.25.95.52:0 &
[1]     22433
# Xlib: connection to "72.25.95.52:0.0" refused by server
Xlib: Client is not authorized to connect to Server
Application initialization failed: couldn't connect to display "72.25.95.52:0"

Error in startup script: invalid command name "tk"
```

The X11 server is not running or the X11 host is not in the XHOST list of the GXCC host.

```
# gxcc -user -size 80 -display 72.25.15.13 &
Application initialization failed: couldn't connect to display "72.25.15.13"
Error in startup script: invalid command name "tk"
```

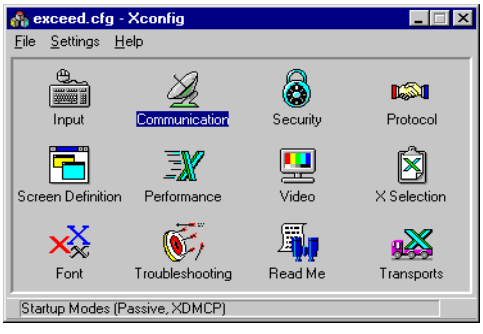
The screen number was forgotten in `-display`.

5.3.6.4 Starting from a Windows system via Exceed

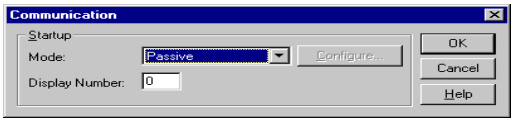
With appropriate preparation, GXCC can be started by clicking an icon on the desktop. More details can be found in the Exceed help information. This section only describes the GXCC-specific settings of Exceed.

Exceed preparations

- Open the following window by choosing “Programs” ➟ “Exceed” ➟ “Xconfig”:



- Click “Communication” in the Xconfig window.
- Set the startup mode “Passive” shown in the diagram below.

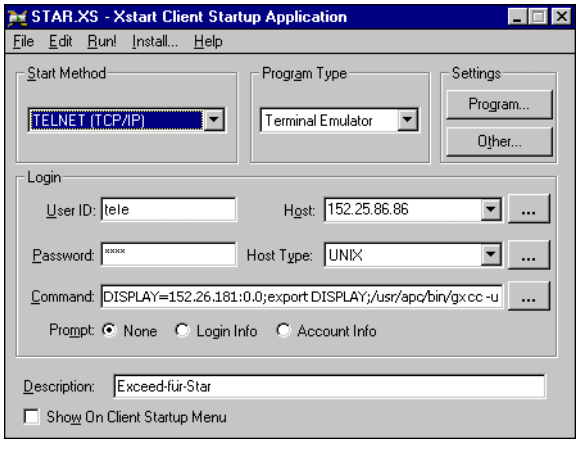


This prevents xdm from starting on the client. The specification in the display field designates the (partial) screen you desire.

- “Multiple Screens” must be set in the “Screen Definition” window.

Starting GXCC via Exceed

- Start Exceed (preferably via the Windows autostart function).
- Choose “Xstart”.
- Activate the Start menu as shown in the following example:



The user ID is `tele`, and the password entered must be the appropriate tele password. The GXCC password is requested later in accordance with the desired operating mode.

Host contains the IP address of the ISP to be addressed (generally the VLP).

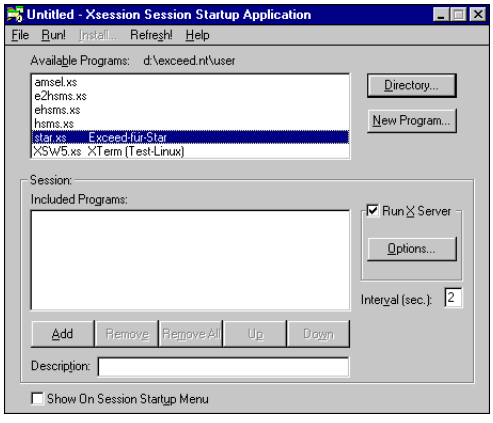
The “Command” input field contains a sequence of commands separated by “;”. The first command indicates the host IP address and screen number of the display to be selected. Following “`export DISPLAY`”, GXCC is called with all the start parameters you desire (apart from `-display`). You must specify the mode (here `-user`) if Observe mode is not desired. Other parameters are possible in accordance with the description in the section “Command line” on page 95.

The absolute path (`/use/apc/bin/gxcc`) must be used when calling GXCC.

You can enter any comment in the “Description” field.

- These settings can be saved by choosing “File” ➟ “Save” or “Save as”.

Choose the Windows Start menu “Programs” ➟ “Hummingbird Connectivity” ➟ “Exceed” and ➟ “Xsession” to display a selection of start files:



When you have selected the start file and chosen “Run!”, GXCC will be started on the selected unit.

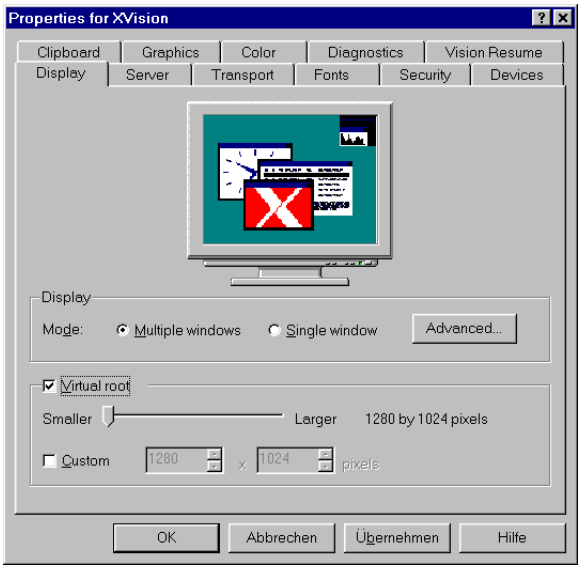
However, you can also drag the start file to the desktop as a shortcut or save it on the desktop. Then, the program is started as usual by double-clicking the icon.

5.3.6.5 Starting from a Windows/NT system via XVision

When installing XVision, the UNIX environment must also have been installed.

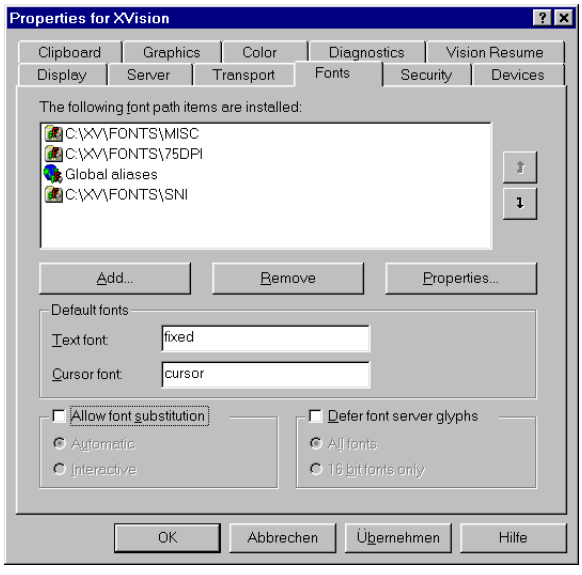
XVision setting

An example is shown in the following diagram:



It is important that the display mode “Multiple windows” is set.

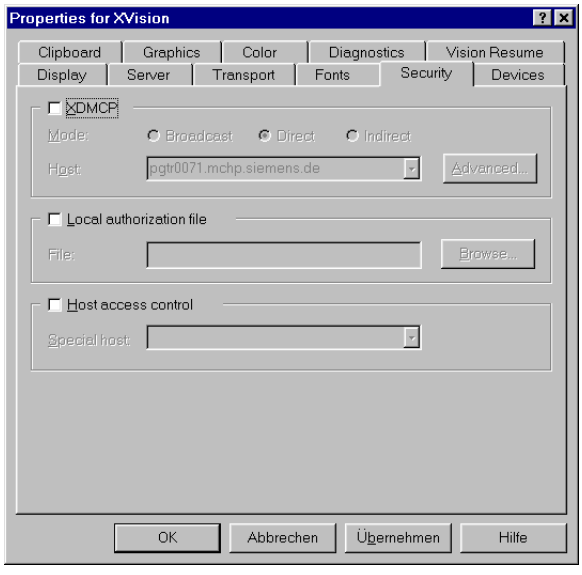
The diagram below shows an example of the fonts setting:



- The “Allow font substitution” option must be disabled.
- When specifying the font path items, the UNIX fonts must be listed before other fonts.

If different settings are defined, the layout of GXCC windows and dialog boxes may be corrupted.

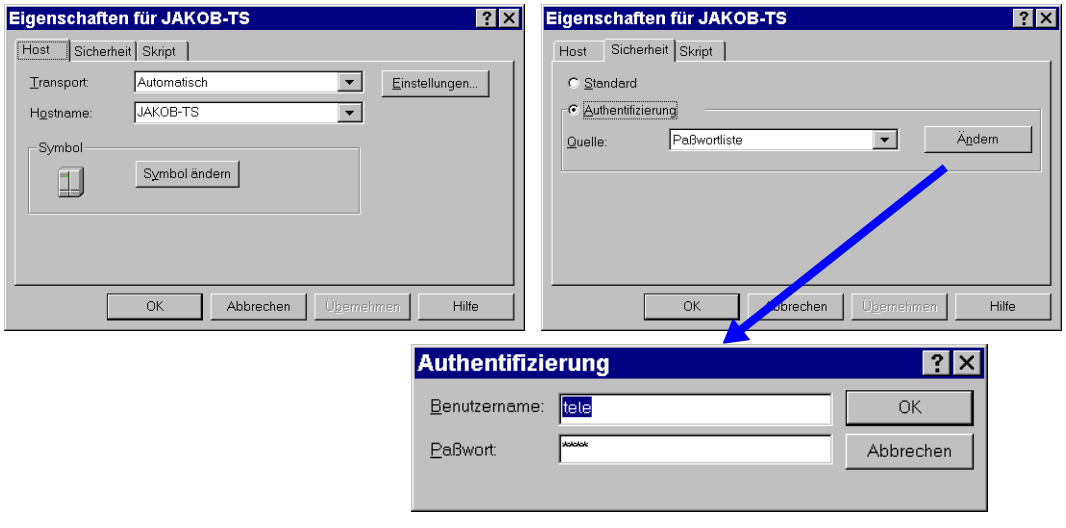
All options must be disabled in the “Security” tab. The “XDMCP” box may not be checked, to ensure that Passive mode is secure:



Settings for the client

The X11 server must be included in the host list of the computer on which the GXCC is running. This can be done using the XVision Services “Host Finder” or “Host Explorer”.

You must use the user ID “tele”. To automate the login process, the ID and password should be stored in the host characteristics.



Starting GXCC with the “Remote Program Starter”

Ideally, GXCC should be activated via the “Remote Program Starter”. This allows the process to be automated such that GXCC can be started by clicking an icon. When GXCC is started in Observe mode, no further dialog is then required.

Preparing the Program Starter:

An appropriate file (*.rps file) must be created. The characteristics must be set in accordance with the following example:

Host

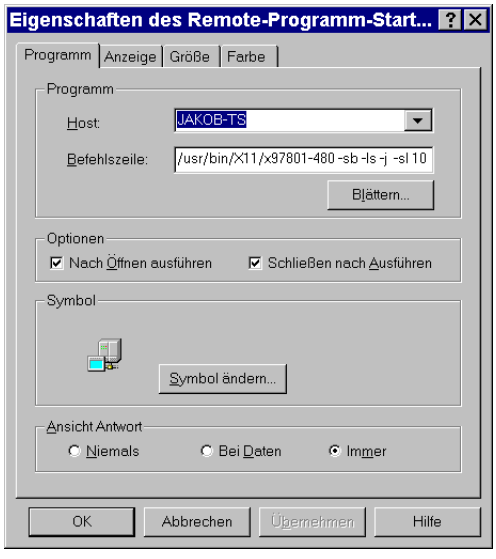
Specify the host on which GXCC is to run. If this host is not part of CentricStor, an additional host parameter must be specified in the command line to start GXCC.

Command line

The command line, which is only partially visible in the editing area of the sample screen, first starts a terminal emulation. Emulations of 97801-480 or VT420 terminals are recommended (as in the example).
The path specification must be absolute. The parameters visible in the screenshot relate to the alphanumeric terminal and serve as an example only.

-sb	Scrollbar
-ls	Login shell
-j	Jump scroll
-sl <no.>	Size of scroll area
-name <text>	Label of upper window margin
-display <IP address or hostname>:<digit>.<digit>	Address of the host running XVision: screen showing the display.
-e <command line>	This command line, which should be executed following login, is used to start GXCC. The line should not contain a “`-display`” specification. The closing “`&`” can be omitted. All entries after “`-e`” belong to this command line. Options for terminal emulation must therefore be entered before “`-e`”.

Example



The settings under “Options” and “View Response” should correspond to those shown in the example.

The full contents of the command line are shown in the “Display” tab:

The input field “Title” has no effect and should not be used. If you need the “-title” function (label on the window title bar only, not on the icon), specify “-title” <label> instead of “-name” in the command line.

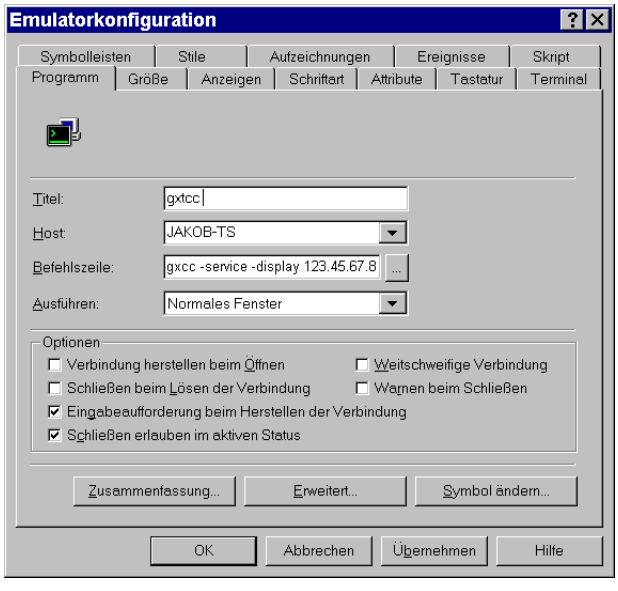
The settings can be saved in a file with an `.rps` extension. When you double-click the file, the Remote Program Starter is started and executes this file. If you create a link to this file on the desktop, you can therefore start GXCC by double-clicking the corresponding icon. Only the password for User or Service mode need then be entered manually.

In addition to the actual GXCC/XTCC windows, your screen also shows an alphanumeric console which displays logging information. You can save this data by setting the terminal emulation as appropriate.

Manual start via terminal emulation

Define the settings for the host as described above. In the case of a manual start, however, incomplete specifications are also possible.

Ideally, the emulator configuration should be set in accordance with the following example:



In the “Command Line” field, enter the command line you want to use to start GXCC. If you do not specify a value here, you can also enter the command following login. The `-display` parameter must point to your host.

If you do not specify an ID in the “Security” dialog box, you will run through the usual login dialog and must specify the ID and password.

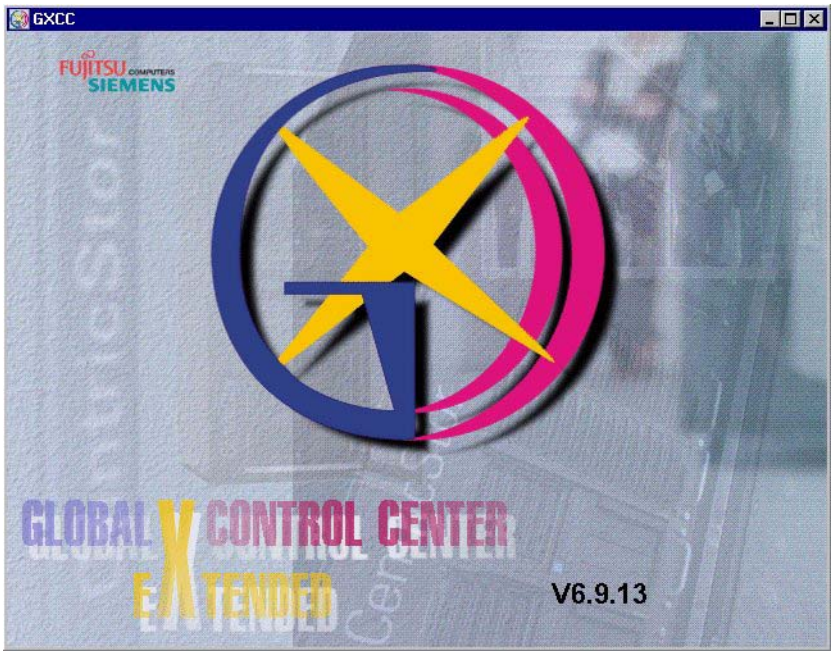
If you do not enter a password, the password dialog will be displayed following login.

This allows you to control whether everyone with access to your host can also start GXCC.

You can save the settings. After the terminal emulation has started, you can activate the saved settings and establish the connection.

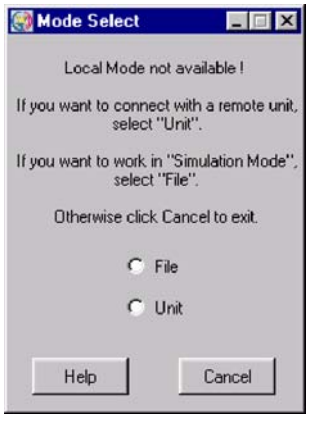
5.3.7 GXCC welcome screen

When a connection is setup up successfully to the X11 server a welcome screen appears (but not if the `-nointro` parameter was specified at GXCC startup):



When you see this screen, the connection between GXCC and the X11 server has been established. If any errors then occur, they will be displayed in info boxes. Each error notification must be acknowledged with “OK”.

If the local system is not part of a CentricStor network and no unit name is specified in the start parameters, a message box will be output leading you to the “Unit Select” menu (see the sections “Selecting the CentricStor system” on page 116 and “Unit” on page 147):



File	Clicking “File” starts GXCC in Test and Demo mode. In this mode, information is obtained from files taken from GXCC systems beforehand.
Unit	Opens the Unit Select menu.
Help	Opens a text box containing operating instructions.
Cancel	Shuts down GXCC.

If the local system is part of a CentricStor network, GXCC connects to the ISP’s Request-Broker. Authentication is then performed immediately (see section “Authentication” on page 117).

If an IP address or the unit name of a VLP is transferred in the start parameters, GXCC will attempt to open a connection to this processor. If the attempt fails, the “Unit Select” menu is opened (see page 116).

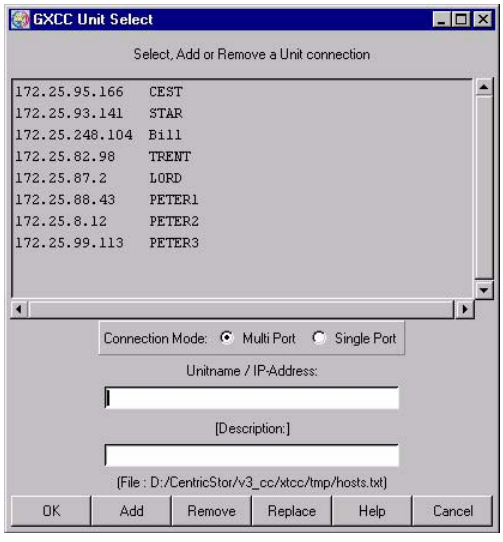
If a GXCC window appears without an overview and with only the “File”, “Unit”, “Profile” and “Help” functions are active, then you have addressed a completely new installation of a CentricStor system in which no configuration data has been set as yet.

Before the system administrator or maintenance staff has performed an “Initial Configuration” only a few functions are then open in User or Observe mode, such as selection of another CentricStor (“Unit” in the function bar), opening a profile file (“Profile” in the function bar), or exiting GXCC via “File” ➟ Exit”.

5.3.8 Selecting the CentricStor system

If the local system is not part of CentricStor, the Unit Select menu is displayed when GXCC is started.

Example



The operation and functions of Unit Select are described in the section “Select” on page 147. Errors that occur when a connection is established after clicking on “OK” are handled differently because no connection yet exists to CentricStor.

5.3.9 Establishing a connection after clicking on OK

An attempt is made to address the host selected in the list. If this is not possible, an error message will be displayed. As soon as you acknowledge this message, the “Unit Select” menu will reappear.

Once the connection has been established, GXCC checks whether or not an InfoBroker is running on the processor.

– If none is running, the connection will be shut down. Once the error message has been acknowledged, the “Unit Select” menu will be displayed again.

– If the computer contains an InfoBroker, a connection is set up between GXCC and the InfoBroker. After a brief interval and successful authentication (see the next section), the main window will appear on the screen.

Clicking the “Cancel” button allows you to exit GXCC. Any changes to the unit list made using “Add”, “Remove” or “Replace” will remain effective.

5.3.10 Authentication

As soon as a connection has been established, client authentication takes place. Password-based authentication is performed every time the program is started. When operating in User mode, you will be requested by the addressed system to enter the password of the user ID “xtccuser”. Passwords are normally not required (see the section “Operating modes” on page 90 and the section “Passwords” on page 98) when operating in Observe mode.

Characters in the password which you enter are displayed as “*”.

Any authorization (User or Observe) will be passed on to any downstream applications (e.g. XTCC for monitoring/operating the ISPs).

If you do not know the password, for example, you can choose Observe mode if no access protection is provided for Observe mode. Functions that are not available in Observe mode are either not displayed at all, or are disabled in the associated menus.

Once access has been authorized, the GXCC main window is opened.

If the password is entered incorrectly, an error message is output and you are asked to enter the password again:

If the password is entered incorrectly three times, GXCC will be started in Observe mode (but only if no password protection has been set for Observe mode).

5.3.11 Software updates

If you have contacted a “remote” CentricStor system, the InfoBroker checks whether its system contains more recent versions of GXCC and XTCC.

If required you will then be informed via a window that the InfoBroker has more recent versions. When you acknowledge this message, the newer version is passed to your local system and saved (under Windows the user must be logged on as the administrator to permit this).

The next time GXCC is started in Service mode, the current versions of GXCC and XTCC can be activated independently of each other.

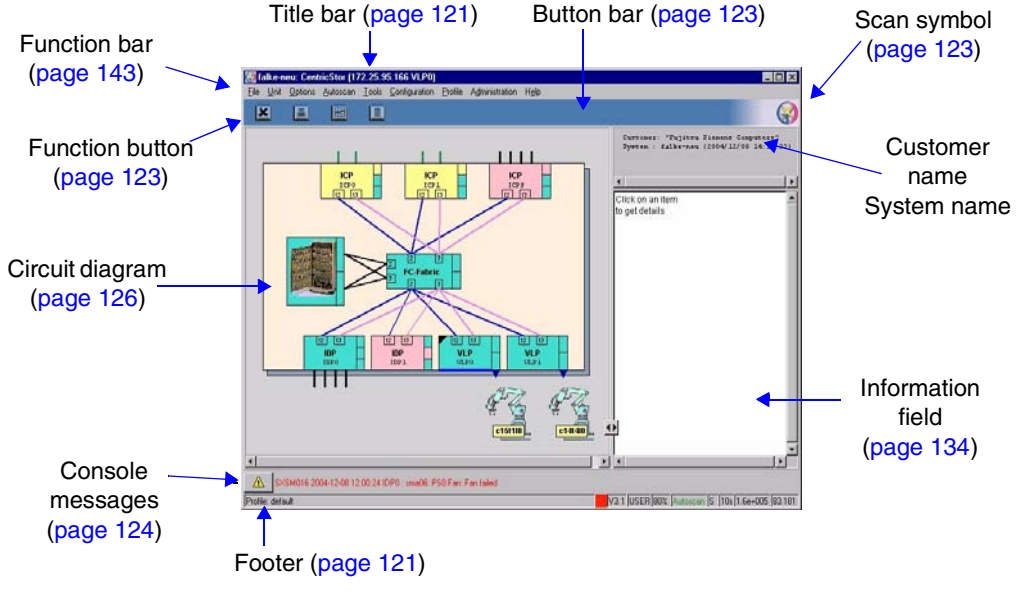
Problem-free operation of CentricStor and the user interface is guaranteed for all combinations of the InfoBroker and GXCC/XTCC software of a CentricStor line. All the functions of the interface will only be available with the most up-to-date versions.

6 GXCC

6.1 Main window

6.1.1 Standard

The GXCC main window shows a circuit diagram of CentricStor. If pictures of real products (robots, drives, RAID systems) are used, these are only symbols which bear no relation to the actual appearance of the product.



The main window consits of the following areas (from top to bottom):

- Title bar
- Function bar
- Line with special function buttons and information

- Left half of screen
  - Circuit diagram of CentricStor
- Right half of screen
  - System information
  - Information field
- Line with the last console alarm message and acknowledgment button
- Footer

6.1.2 Loss of a connection

If the connection to the InfoBroker is lost, the data displayed will no longer be current. An attempt is made to establish a new connection approximately every 20 seconds.

In the line for console messages a message will appear that the display is no longer up to date: “Displayed data invalid. Reconnecting”.

All the objects displayed are invalid during this waiting period. On the function bar, only “Unit” (selection of another CentricStor system) and “File” (to terminate GXCC) are active. These allow you to select a different CentricStor system or terminate GXCC. You can thus terminate GXCC or select another unit.

After the connection has been restored, the message “Reconnected” appears in the message line. This remains displayed until it is overwritten by a new console alarm message.

XTCC is not directly affected by the loss of the connection between the InfoBroker and GXCC.

In some cases, the main window displays exclusively ISPs that are not ready for operation (pink symbols) in this situation. This indicates that the loss of the InfoBroker connection was caused by this component being shut down.

6.1.3 Elements of the GXCC main window

6.1.3.1 Title bar

The title bar is laid out as follows:
`<systemname>: CentricStor(<IP-address><unit-name>)`

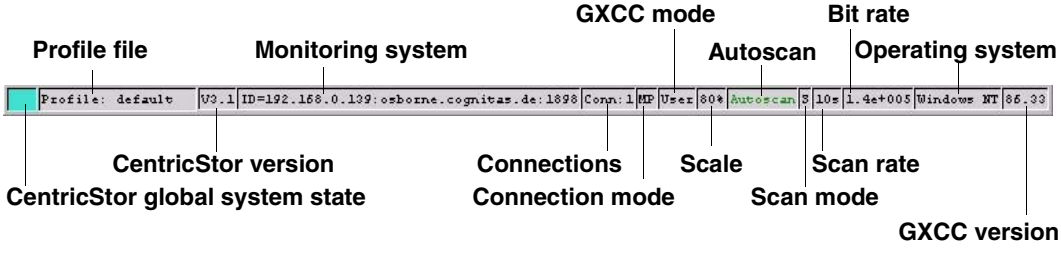
<systemname>:
System name entered during configuration. No display if no system name has been entered.

<IP-address><unit-name>
IP address and unit name of the ISP to which GXCC is connected. If GXCC is running on the VLP, this is set to “local”.

In Simulation mode the title bar contains only the display “Simulation”.

6.1.3.2 Footer

The figure below is merely an example and can vary slightly depending on the GXCC version.



The status bar at the bottom of your screen displays the following information from left to right:

– CentricStor global system state

The “Global System State” is shown by a colored square. With it a simple statement can be given about the operating condition of CentricStor:

turquoise: CentricStor is working (OK)
yellow: CentricStor is working with restrictions (degraded, attention)
pink: CentricStor is in fail state

If the mouse is positioned on this square, more details of the current state are shown in form of a Balloon Help.

> **i** An error flag (yellow or pink) can be displayed only if the Infobroker has been started and is operational. Consequently in certain situations, especially during the boot phase of individual ISPs, it can occur that an overall status of turquoise (OK) is displayed even though the status of individual ISPs is shown as not operational in the GXCC main window.

> **i** Further information is provided in section “GXCC as a monitoring tool without SNMP” on page 549.

– Profile file
Name of the profile file. This can be specified on startup using the `-profile` parameter, or selected from the function bar at any time.

– CentricStor version

– ID=<IP-address>:<host-name>:<port-numer>
Host features with which you monitor CentricStor

– Conn:n
Number of connections which exist to the monitored system

– Connection mode (MP: Multi-Port, SP: Single-Port)

– GXCC mode
Access permissions under which GXCC is currently running:

`SERVICE`	GXCC is running in Service mode
`USER`	GXCC is running in User mode
`OBSERVE/OBSV`	GXCC is running in Observe mode

– Scale
Display scale set under “Options Settings” (see the section “Settings” on page 153).

– Autoscan
Text color indicating the operating status of the Autoscan facility:

Green:	Autoscan active
Yellow:	Alignment with the InfoBroker currently in progress
Red, flashing:	Autoscan temporarily stopped
White:	Locked (Simulation mode)

The Autoscan process will also be stopped temporarily for certain operations. In this case, the text color switches back to green once the operation in question is completed.

> **i** The Autoscan facility is described in more detail on page 152.

– Scan mode

S	Scan rate determined automatically (self-adjusting)
M	Scan rate set manually (see the section “Settings” on page 153)

– Scan rate
  Interval between scans in seconds.

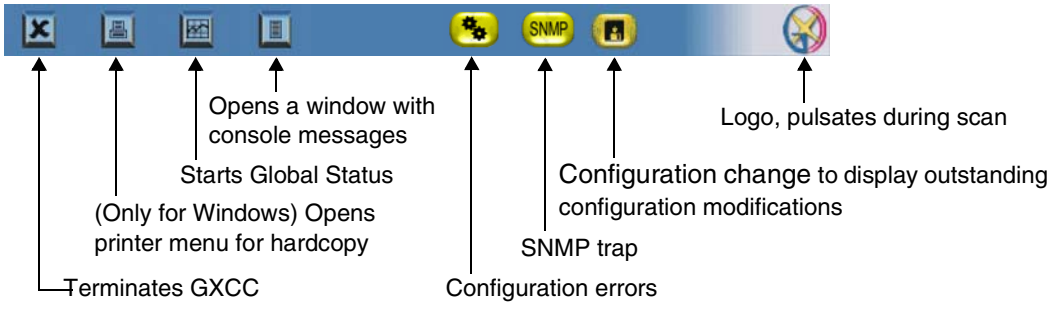
– Bit rate
  The floating point number shows the bit rate for communication with the InfoBroker. The rate is calculated using the length of time taken to transfer a status information package. This indicator is of particular interest in the case of a modem connection.

– Operating system of the host to be monitored

– GXCC version
  The GXCC version is shown in the last field.

6.1.3.3 Function buttons and displays in the button bar

This area with color highlighting contains the following function buttons:



Symbols indicating special operating states appear as required to the right of the function buttons. If you rest the mouse cursor over an icon the associated message is displayed in a text bubble.

The GXCC logo at the right-hand end of the bar indicates a scan process by pulsating.

In the case of a scan process the system only checks whether there are status changes in CentricStor; only approx. 20 bytes are transferred. Only if there are really status changes in CentricStor is the status data fetched. This process can be recognized by the word “Autoscan” at the lower edge of the screen changing color to yellow.

6.1.3.4 System information

The following system information is displayed in the right-hand part of the screen, above the information field:

– customer name (set during “Options”)
– system name (set during “Configuration” ➟ “System Name”)
– date and time

6.1.3.5 Console messages

Console messages are displayed above the footer. These can be:

– system messages
– messages relating to the system configuration
– messages relating to the connection between GXCC and the system

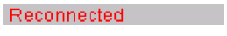
The last messsage is always displayed. You obtain the complete message log by clicking on the relevant function button (see the section “Function buttons and displays in the button bar” on page 123).

By clicking on the button to the left of the print line you acknowledge that you have read it. The button then disappears (only in your GXCC) and reappears with the next output. The message color changes to black.

In some cases you will see the text

in the message line. This is not an error message but merely indicates that no message has arrived since the GXCC has been connected to the unit selection.

The message line



indicates the the connection to the InfoBroker has in the meantime been interrupted and restored.

6.1.3.6 Function bar

The functions which can be accessed via the function bar are described in the section “Function bar” on page 143.

6.1.4 Message window

Many GXCC messages must be taken notice of and acknowledged by the user.

This prevents the same function or contradictory functions being started on one device.

Message windows with an “OK” button are closed after you click on this button.

Message windows without an “OK” button with texts such as “... Timeout is nn sec. Please wait ...” are displayed if Broker data is waited for at the same time as a device function is performed. The Autoscan process is stopped for the duration of this wait period. Such a window can - if absolutely necessary - be closed by clicking on the relevant button specific to the Window Manager at the top right or left in the window title bar. However, the Autoscan process remains stopped intil the associated function can be terminated or the maximum wait time (timeout nn sec.) has been exceeded.

6.1.5 Asynchronous errors

In the case of internal errors, such as those which occur as a result of missing (mandatory) variables of the InfoBroker, GXCC will if possible open a window with the title:

`"GXCC-unexpected Background Error".`

This window contains the error message and buttons for further activities:

Exit
: Terminates GXCC.

Stack Trace
: Opens a window with further information on the error. If you click on the “Cancel” button in this window the window is closed and a “Continue” attempted.

OK
: Continues the procedure in which the error occurred. This can lead to secondary errors, i.e. to further background errors. In this case GXCC must be terminated.

Skip Messages
: This button is optional. GXCC attempts to skip the errored procedure, which can naturally lead to secondary errors. In this case GXCC must be terminated.

6.1.6 Block diagram

The main window displays a circuit diagram of the CentricStor system with the ISPs, RAID systems and the connecting Fibre Channel system.

Processors

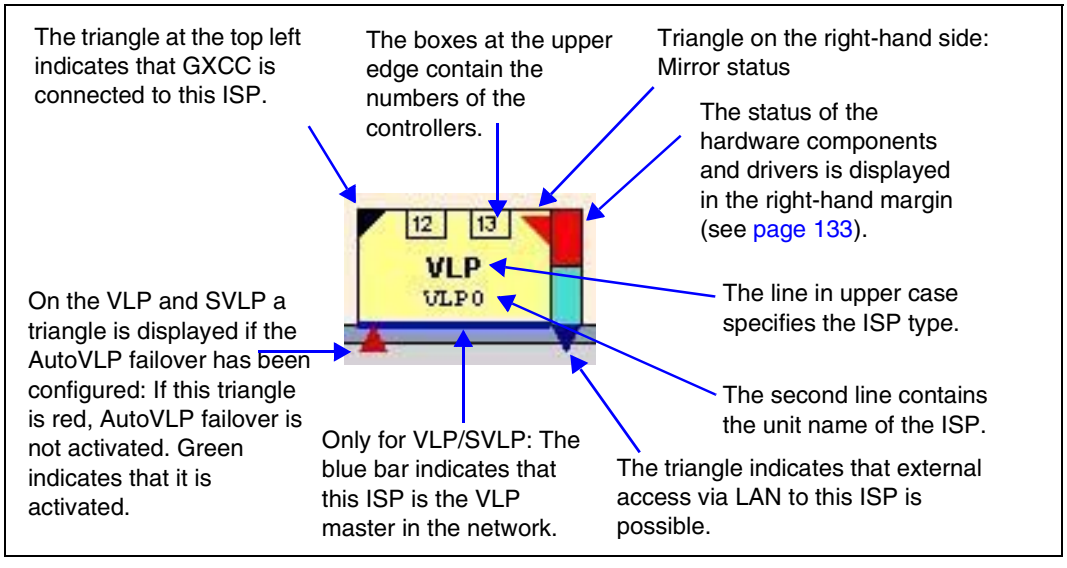
CentricStor is a group of processors, each running the SINIX-Z operating system. These processors are referred to collectively as the ISP (Integrated Service Processor).

Depending on the peripheral configuration and the software configuration, CentricStor recognizes various ISP types:

ICP	Integrated Channel Processor ISP with a host connection via ESCON, FICON and/or FibreChannel.
IDP	Integrated Device Processor ISP without a host adapter but with tape drives.
ICP_IDP	ICP and IDP in one ISP. An ICP_IDP has both a host adapter and a SCSI or FC controller for running real tape drives and robots.
VLP	Virtual Library Processor ISP with neither a host interface nor a device interface. This ISP hosts the VLM and the PLM.
SVLP	Standby VLP (optional) The SVLP is an optional processor which can take over the tasks of the VLP if the VLP should fail.

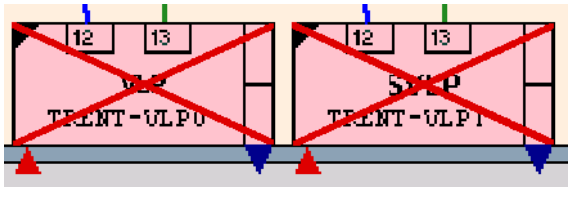
Hybrid forms are created when ISPs of the type ICP, IDP and ICP_IDP have the VLP or SVLP functionality. In these cases the VLP or SVLP functionality is then specified in parentheses after their ISP names. *Example:* ICP_IDP (VLP)

The ISP symbol contains a large amount of information. If you click on the symbol with the left mouse button, the status information is entered in the right-hand window area and there constantly updated (see the section “ICP object information” on page 134 and section “IDP object information” on page 135).



If the AutoVLP failover function has been configured, it can be activated. If the function was activated before a shutdown took place, VLP monitoring is activated automatically on this ISP by means of a reboot.

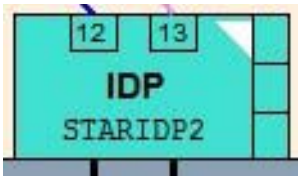
The CentricStor controller could not be determined:



If no configured VLP could be started as a master, the symbol for the VLPs is crossed through in red. In this case CentricStor is not operational.

This status also occurs temporarily during *Distribute and Activate*.

Mirror status:



A triangle on the right-hand side of the ISP symbol (turned inward) provides information on the mirror status in mirror mode. If the triangle is missing, the mirror status is OK. A white triangle indicates that the match has not yet been performed. A red triangle indicates that the mirror status is not up to date.

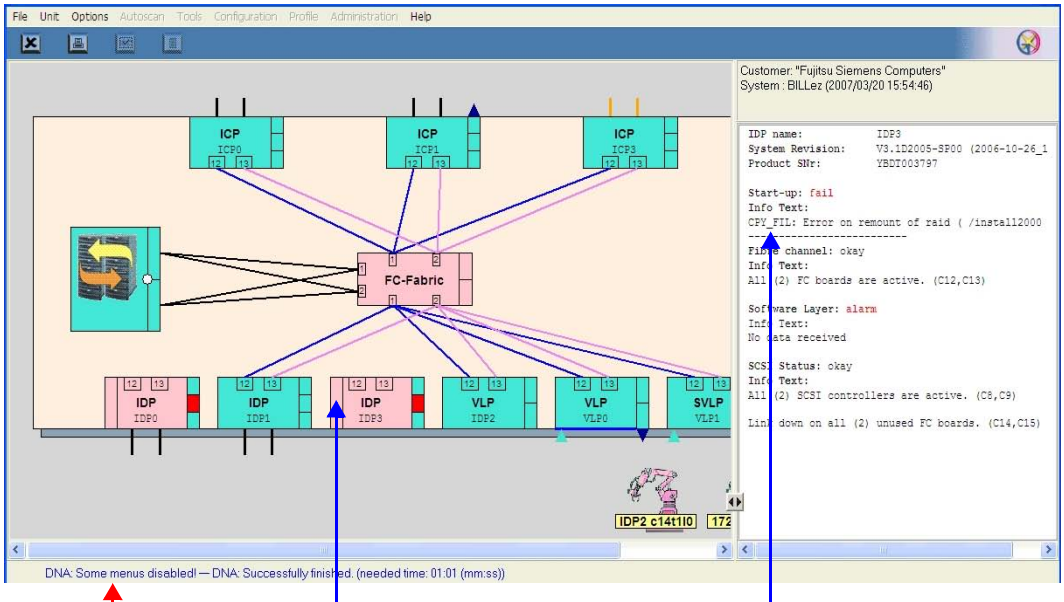
Special aspects when performing Distribute and Activate

The following special aspects must be borne in mind when performing *Distribute and Activate*:

- Some GXCC menu items are hidden.
- The current progress is displayed in blue script in the system message line.

  Messages are displayed here concerning the stage which the procedure has reached.
- The status (only in the event of an error) of each ISP is displayed.

  To obtain detailed information, you must click on the relevant ISP (unit), and the information is then provided in the info window of the GXCC.



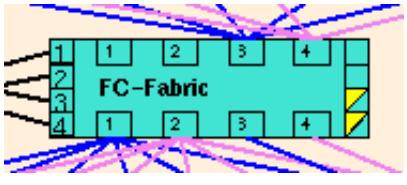
Fibre channel elements

The internal FC connections are represented in the form of an FC fabric in the center of the figure with connections to both the ISPs and the RAID system(s). FibreChannel connections to the FC switch which are faulty are drawn with dashed lines until the SNMP trap has been processed by the FC switch. These lines are then removed.

The VLP and the SVLP must be entered in the FC switch as the trap receiver, otherwise the lines cannot be removed.

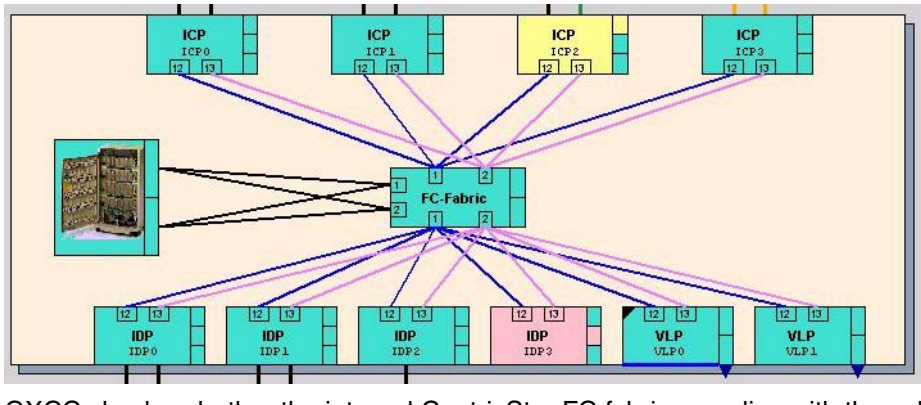
Each FC switch is symbolized by a box containing the domain number located at the edge of the fabric. As the image on the right shows, a switch can be shown twice, once at the upper edge and once at the lower edge of the fabric. This means that the connections can be seen more clearly, although this bears no relevance on the function.

In the figure below the switches with the domain numbers 3 and 4 have reported a trap:



Some of the CentricStor components shown (e.g. the Fibre Channel switches) are monitored with SNMP. If a message (=trap) from one of these components which no management station has yet taken notice of is present, a circle highlighted in yellow with the text “SNMP” appears in the button bar of the GXCC window.

The LAN via which the control of the system and communication with the InfoBroker runs in CentricStor is not displayed in GXCC.



GXCC checks whether the internal CentricStor FC fabric complies with the cabling rules. If the rules have been violated, a warning symbol (gears) is displayed in the button bar. The incorrect connections are displayed in red.

A check is made to see whether, in the case of redundant Fibre Channel systems, the connections go from every ISP to various switches and whether the FC adapter with the lowest number goes to the switch with the lowest number (throughput optimization).

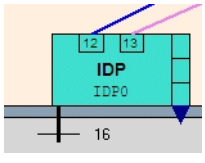
Host connections

In the overview screen, the connections to the hosts (ESCON/FICON or Fibre Channel) are depicted as short lines emerging from the inner frame:

black	ESCON connection
orange	FICON connection
dark green	FC connection

If there are more than 8 connections, only one intersected line is shown; in addition, the number of connections is specified.

The example below shows an IDP with 16 ESCON connections:

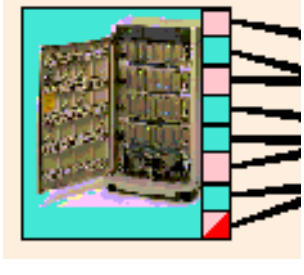


For Fibre Channel connections, the number of the controller is also displayed.

RAID systems

- RAID symbol without RAID mirroring

  The RAID systems are represented together as one RAID system in the left-hand half of the screen (in the center of the screen with VTA 1000):

  On the right-hand side of the symbol there is a row of boxes which represent the RAID systems (=cache file systems) and their FC ports.

The colors have the following meaning:

Green Operational

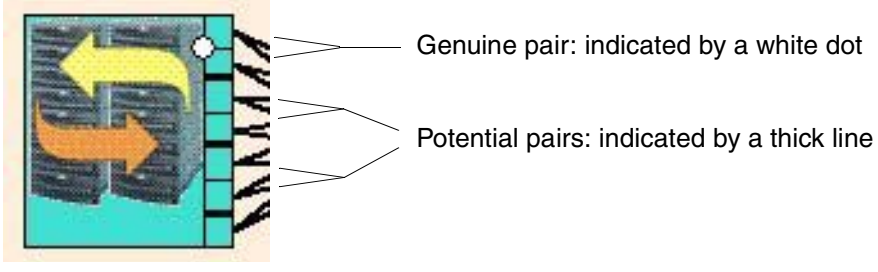
Pink Not operational, no cache file system affected

As in the case of the FibreCAT CX500/CX3-20 or Eternus 3000/4000 it is not possible to read the status via an FC port, the “operational” status (green) is displayed for these RAID systems.

Exception If an FC connection to the CX500/CX3-20 fails or if the HBA of an ISP has not been registered in the CX500/CX3-20, the CX500/CX3-20 is displayed in red (a corresponding error message is output in the CentricStor system messages).

- RAID symbol for mirror mode

  The RAID systems are represented together as a double RAID system with two arrows in the left-hand half of the screen:



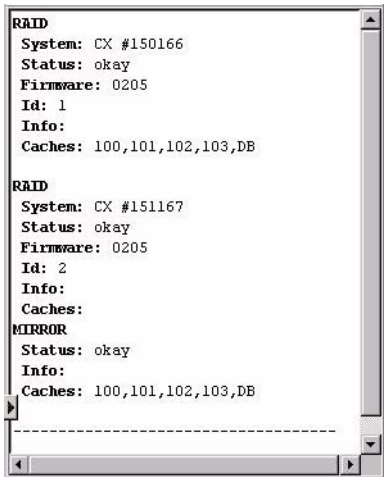
  In the event of mirror mode, additional indicators are output:

  – RAID systems which cannot form a RAID pair are separated in the RAID symbol by a thick black line. Two adjacent boxes without a thick separator line represent a potential or genuine RAID pair.

  – Genuine RAID pairs are also indicated by a white dot. Only if RAID pairs marked in this way can be seen is the prerequisite for mirror mode satisfied.

Left-clicking on the RAID symbol causes further information to be output in the right-hand part of the GXCC info window:

RAID symbol



RAID information in the info window

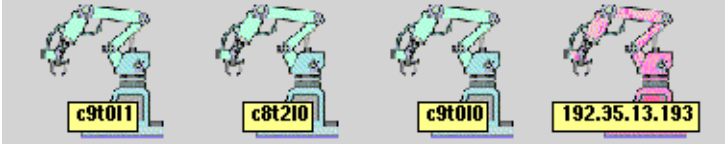
This example shows a CentricStor with two RAID systems (IDs: 1 and 2).

Information on both RAID systems is output in the info window:

The primary caches 100, 101, 102, 103 und DB are located on the RAID system with the ID 1. The associated secondary cache is located on the RAID system with the ID 2.

Archive systems

Each access system is depicted at the lower edge of the screen in the form of an industrial robot. A label shows the internal name in the case of SCSI-controlled archives and the IP address in the case of LAN-controlled systems.



An error has occurred on the robot shown on the right-hand side of this diagram.

6.1.6.1 Status information

The current operating status of CentricStor elements is indicated by the background color of the associated symbols. The bar on the right which is divided into several compartments shows the status of hardware components and drivers.

You can obtain detailed information in the right-hand part of the window by clicking on the object with the left mouse button.

Green: All subcomponents are online and ready to operate.
Yellow: Undefined. Some subcomponents are online and ready to operate, others are offline. In the case of some components yellow also signifies “Attention”.
Pink: The entire component is not ready to operate.
Red: The InfoBroker has not yet established contact with this component. The configuration is inconsistent.
Blue: The mouse pointer is located above the object. If you click a mouse button, the function or information displayed applies to the object.

If a component consists of several subsystems, possibly with different operating statuses, the status of each subsystem is indicated by the color of the small fields to the right of the symbol. The color of the symbol itself indicates the collective status.

In some CentricStor models, the ICP_IDP and VLP functions reside in a single ISP. The boxes may then have to be interpreted somewhat differently to what is described here.

6.1.6.2 Object information and object-related functions

When the mouse pointer is positioned on a object, the following functions can be called:

Left mouse button
Clicking on an object with the left mouse button causes the object information to be displayed in the info window in the right-hand half of the screen. This information is updated with each scan. The icon of the component whose status is displayed is highlighted in blue.

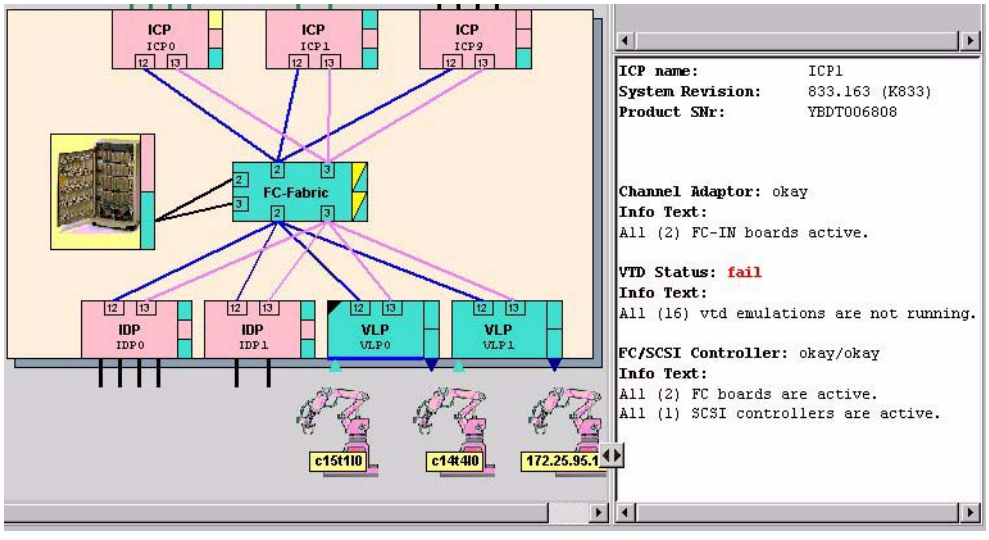
Shift + left mouse button
Displays object-related help.

Right mouse button
Opens the function menu.

Shift + right mouse button (on an ISP)
Opens a function menu for all objects of this class in the GXCC (e.g. all IDPs, all cartridge drives).

6.1.7 ICP object information

In order to be able to connect to various host types, ISPs can contain ESCON/FICON channel adapters, FC adapters or both types of connection. The object information will vary accordingly.

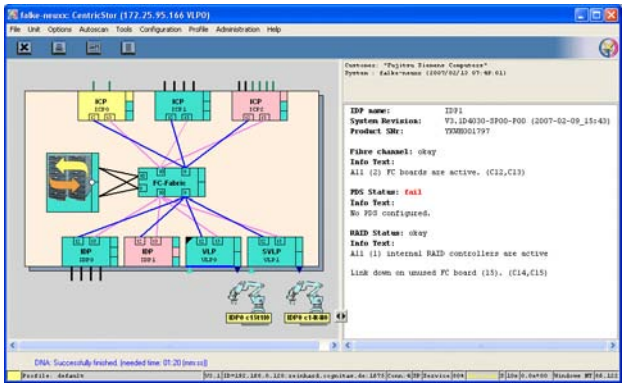


Object information of an ICP which contains only FibreChannel ports.

The following information is displayed:

- name and release version of the ICP.
- the operating status of the channel adapter(s) and the FibreChannel adapter for the host connection (= upper box).
- the operational readiness of the logical drives (emulations = middle box)
- the status of the FC controller for the connection to the cache (= bottom box)
- the status of the SCSI controller (connection of the internal hard disk)
- possibly information on undetected or unused components, for example

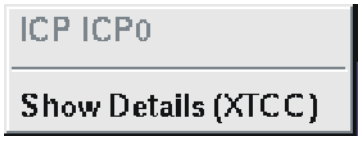
6.1.8 IDP object information



The following information is displayed:
- name and release version of the IDP
- if present: IP address of the external LAN port(in the example the external port is faulty)
- the status of the FC controller for the connection to the cache (= top box)
- the operating status of the physical device servers (= middle box)
- the operating status of the SCSI controllers for the tape drives (= bottom box)

6.1.9 Functions of an ISP

XTCC can be opened for each ISP to trace details in the ISPs (by right-clicking on the ISP icon).



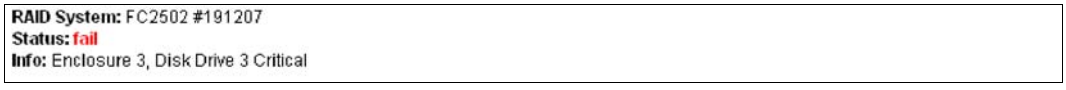
6.1.9.1 Show Details (XTCC)

An XTCC window is opened in which the details of the relevant CentricStor node are displayed. The display and operating functions of the ISP are described in the chapter “XTCC” on page 325.

6.1.10 Functions for all ISPs of a particular class

There are no such functions available in User/Observe mode.

6.1.11 Information about the RAID systems



This information box shows the following information for every RAID system (by a box symbol to the right of the RAID symbol):

– the type and target number of the RAID controller(s)
– the status of the RAID controller(s)
– any additional information available

If CentricStor has several RAID systems, the box to the right of the symbol is divided into the corresponding number of fields.

Each field is colored to indicate the status of the RAID controller:

Turquoise:	OK
Pink:	Error, stopped
yellow:	Attention
Red:	Configuration error

As in the case of the FibreCAT CX500/CX3-20 or Eternus 3000/4000 it is not possible to read the status via an FC port, the “OK” status (turqoise) is always displayed for these RAID systems.

Exception If the HBA of an ISP connected via FC switch has not been registed in the CX500/CX3-20, the CX500/CX3-20 is displayed in red (a corresponding error message is output in the CentricStor system messages).

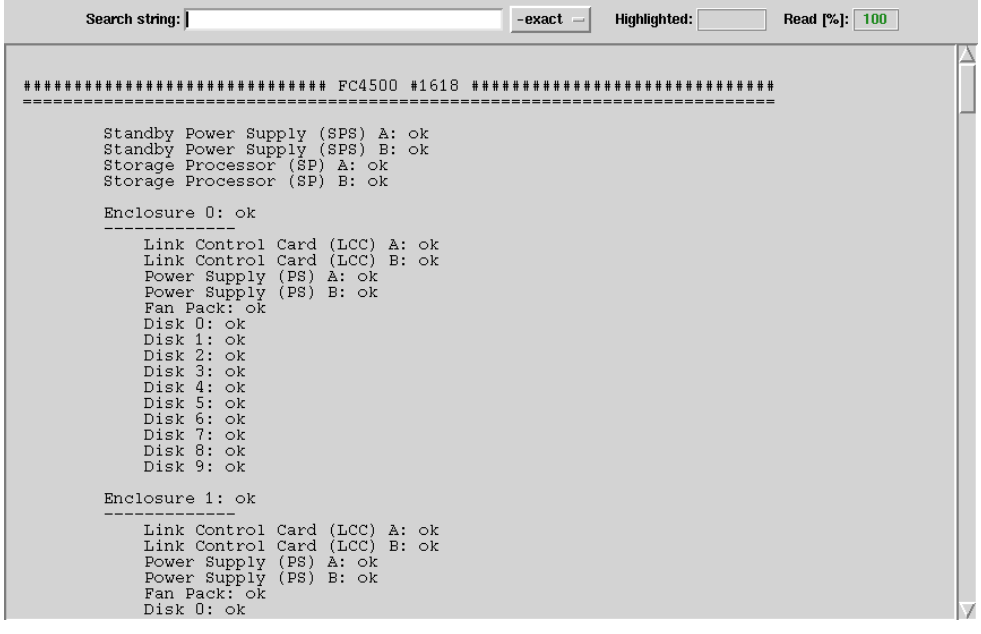
You will find more detailed information on the RAID system(s) in XTCC (see the section “RAID systems” on page 411). Other RAID systems run with CentricStor are also described there.

6.1.12 RAID system functions

The following window appears when you right-click on the RAID symbol:

6.1.12.1 Show complete RAID status

Selecting this option displays all the data of the RAID systems:



As in the case of the FibreCAT CX500/CX3-20 and Eternus 3000/4000 it is not possible to read the status via an FC port, “no information available” is always output for these RAID systems.

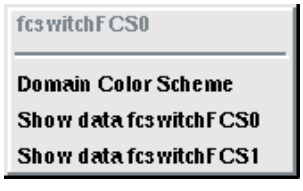
The full status display is described in the section “Object information on RAID systems” on page 411.

6.1.13 Information on Fibre Channel fabric

Information on FC switches can be obtained via SNMP (Simple Network Management Protocol). The mnemonic name, operating status, and contents of the last unprocessed trap are output. If the message “No data received” is displayed instead of this information, this indicates that there are no unprocessed traps present.

If there is an SNMP trap from one of the FC switches that has not yet been acknowledged, the button bar in the GXCC window will display an oval-shaped yellow symbol labeled “SNMP”. The associated information can also be displayed using the “Show data...” function which is described in the next chapter.

6.1.14 Functions of the Fibre Channel fabric



If one (or more) of the switches has triggered an SNMP trap, the appropriate line in the menu will also show that information (trap).

6.1.14.1 Controller Color Scheme

You can select whether you wish to display the FC connections in such a way that all connections to a single ISP are displayed in the same color (Controller Color Scheme) or so that all connections to a domain (a switch) are displayed in the same color (Domain Color Scheme).

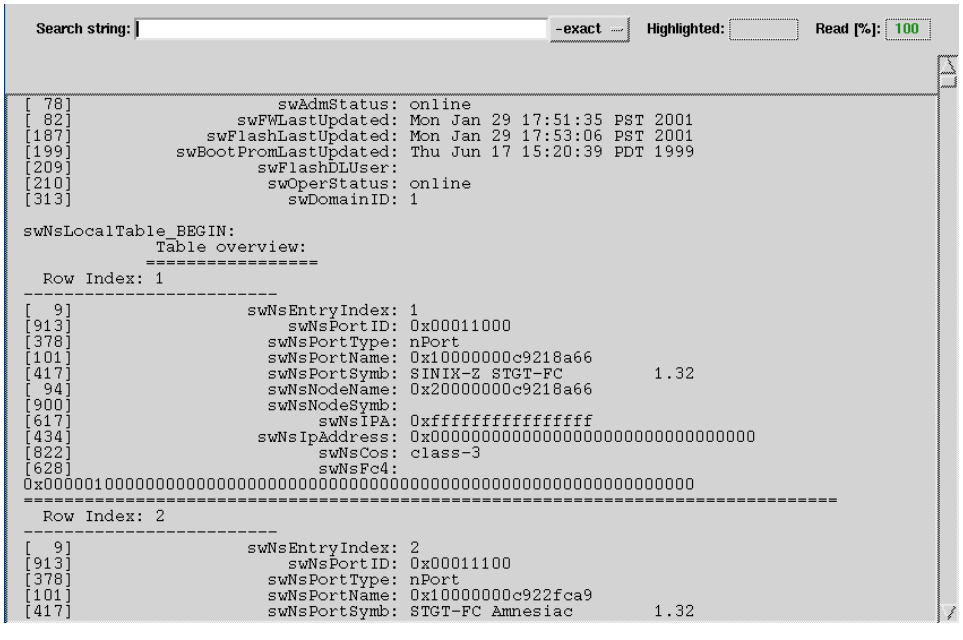
The mode that is not currently set will be offered. This setting is only relevant for the representation.

If incorrect cabling exists, the color setting will have no effect. The incorrect corrections will be shown in red, and the others will be shown in gray.

6.1.14.2 Show data fcswitch <Name of the switch> [(trap)]

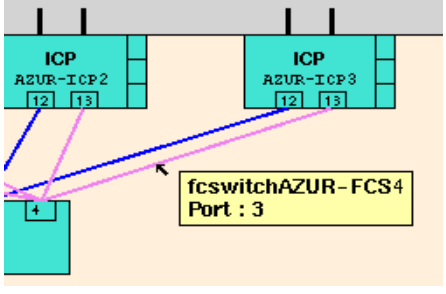
The information about the switch as obtained via SNMP is output in a text window. The name of the switch is given in the window title of the information about the Fibre Channel fabric.

If a trap existed for the switch, the information “(trap)” is deleted. If this outputs all traps that have not yet been read, then the yellow SNMP display on the fabric symbol disappears.



6.1.15 Information about the FC connections

If you hover the mouse pointer over an icon belonging to an FC connection, information about this line will be displayed.

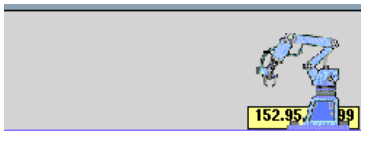


The following information is output:

– the name of the switch, as assigned during configuration, and
– the port that the line goes to.

The controller in the ISP can be read directly from the overview image (13 in the example shown above).

6.1.16 Information on the archive systems



The following are displayed:

– The IP address or system name of the access system.
– A list of the archive systems behind it, together with their operating statuses. In addition, the ISPs on which the PLSs run are also specified.

6.1.17 ISP system messages

If an important console message is entered in the log file (`/usr/apc/vtls/VTLS_MESSAGES`) of one of the CentricStor ISPs, this is displayed in the lower part of the GXCC window. Messages with the statuses “ERROR”, “CRITICAL” (red) and “ALERT”, “EMERGENCY” (red: flashing red) are considered critical.

By clicking on the button to the left of the message line you confirm you have read the message in your GXCC. You can thus recognize when a new message has arrived.

Clicking on the corresponding button in the button bar using the left mouse button or after calling the “Tools” ➟ “Show System Messages” function causes a text window with the console messages to be opened (see the section “Show System Messages” on page 158). This display is continuously updated. You can also modify it so that it is displayed in the foreground with each new entry (see the section “AutoPopup” on page 362).

Messages with the statuses “ALERT” and “EMERGENCY” (i.e. all messages that flash red) trigger a teleservice call if all the other requirements for this feature are fulfilled.

6.1.18 SNMP messages

If CentricStor components that are administered via SNMP (currently only FC switches) report an event (trap), an oval-shaped yellow symbol labeled “SNMP” will appear in the button bar. To display the SNMP message, simply click on this symbol.

The Fibre Channel switches are administered via SNMP. The following example shows an extract from the status of an FC switch:

```
  Row Index: 12
-------------------------
[244]                  swSensorIndex: 12
[388]                   swSensorType: power-supply
[140]!                swSensorStatus: nominal
[821]                  swSensorValue: -2147483648
[176]                   swSensorInfo: Power Supply #1
================================================================================
  Row Index: 13
-------------------------
[244]                  swSensorIndex: 13
[388]                   swSensorType: power-supply
[140]                 swSensorStatus: faulty
[821]                  swSensorValue: -2147483648
[176]                   swSensorInfo: Power Supply #2
================================================================================
swSensorTable_END

[898]            swFlashDLOperStatus: sw-current
[918]                  swDiagResult: sw-ok
[964]              swPrincipalSwitch: yes
.
```

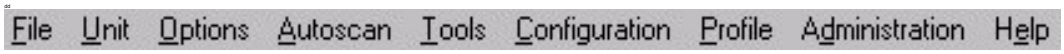
6.1.19 Configuration Changed

If a configuration change is currently being processed in CentricStor, a floppy disk symbol with a yellow background will appear in the button bar. This occurs if a menu item of the configuration complex is confirmed with “OK” after activation of the last configuration change.

When the InfoBroker is restarted, the latent configuration changes are deleted. You should thus not shut down the CentricStor system without an inquiry or without issuing the “Restart InfoBroker” command when the floppy disk symbol is displayed.

CAUTION!
To prevent the “Configuration Changed” symbol from being activated incorrectly, PVG settings should not be viewed using “Configuration”, but instead as far as possible by using the corresponding PLM function “Statistics » Physical Components » Physical Volume Groups” on page 283.

6.2 Function bar



The individual functions can be selected either by clicking on them with your mouse or by pressing the ALT key together with the accelerator key (underlined letter).

How exactly such shortcuts are handled depends on the operating system or the Window Manager, e.g. on whether the keys are pressed simultaneously or first ALT and then the key for the undescored character is pressed.

6.2.1 Overview of GXCC functions

6.2.2 File

Es stehen folgende Funktionen zur Verfügung:

- Save
- Open
- Show
- Print
- Exit

6.2.2.1 Save

Saves the current InfoBroker data. You can thus use this to recover the system display subsequently.

By default, configurations are saved as `.gxd` files.

With this function you save precisely the data which currently leads to the picture displayed. As a result you can practically retain a snapshot in the form of source files. This data can later be read into a GXCC. The same picture is then displayed again, even if the situation no longer exists. You can also transfer this data to a totally different system (arbitrary PC) and view it there with a GXCC without having access to a CentricStor. This is called Simulation mode. Naturally you can also use this option for analysis purposes.

Example

There is one display which cannot be understood. After the “Save” function has been called a file is generated which is sent to the Service department. Service can then use this data to ascertain what is wrong.

This method is better than a screenshot because Service is provided with the actual data, which it can use to inspect every individual variable with the current values.

6.2.2.2 Open

Opens a file selector window with which you can open a configuration that was generated with “Save” (see above).

The window contains the field for entering the file name plus the following function keys:

OK — Checks whether the specified file is a valid GXCC configuration file and, if so, outputs its contents in graphical format and is displayed in Simulation mode. If not, an error message is output.

> **i** You can only exit the simulation mode by terminating the GXCC program.

Browse — Opens a standard dialog box for searching for and selecting a file. The file type is preset to `*.gxd`, and the file name is transferred to the entry field.

Instead of accepting the proposed file, you can click on any other `.gxd` file and open it. If a `.gxd` file has been saved in a different directory then you can click the button next to the directory bar to change to any higher-level and, therefore, to any required directory.

Help — Opens the GXCC help file.

Cancel — Closes the window.

6.2.2.3 Show

Opens a file selector window for choosing a file which will then be displayed in the file viewer.

6.2.2.4 Print

Prints a hardcopy of the main GXCC window excluding the “Print” menu. The print dialog box is described in the section “File” on page 299. In Windows systems the “Print” function button must be used to create a hardcopy.

6.2.2.5 Exit

Shuts down GXCC. It is recommended that you use this function in preference to the button in the top left-hand corner of the window.

When GXCC is shut down, any global status processes started from GXCC will remain active.

6.2.3 Unit

In this manual the ISPs of a CentricStor are referred to as “units”. This is to prevent confusion with the BS2000, z/OS, OS/390 or Open Systems computers, the hosts, which are connected to CentricStor. IP protocol terms such as host name are naturally also applied to the units of CentricStor as the IP protocol is used for communication between GXCC/XTCC and the ISPs and also for intercommunication of the ISPs.

6.2.3.1 Select

Opens the “Unit Select” menu:

The “Unit Select” window is used for the following operations:

– to select an ISP from an address list
– to edit this address list

The first text box displays the unit name or IP address, while the second contains a freely definable description. This description will also appear in the title bar of the GXCC window.

Two types of connection can be defined:

- Direct connection:

  The connection entry comprises the IP address or the unit (=host) name in the form “mmm.nnn.ooo.ppp” or “unit_name” and - separated by at least one blank - an optional commentary.

  Such connections are displayed in the title bar of the configuration display in the form “unit_ip_address host_name”.

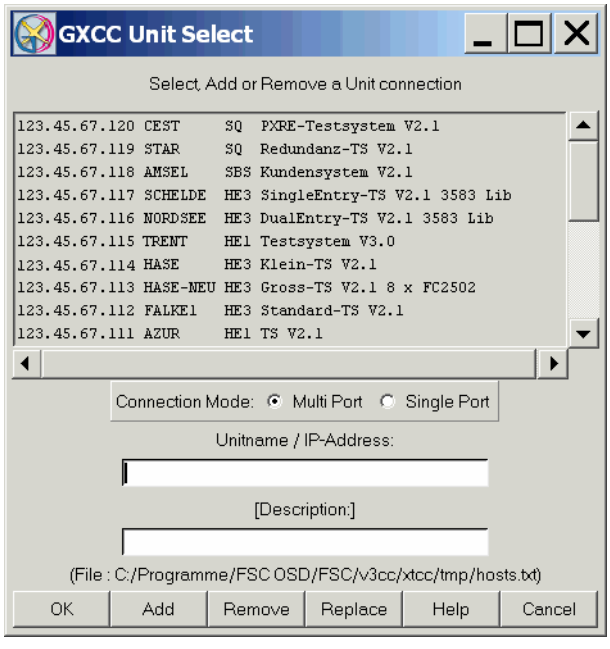
- Indirect connection (connection routing):

  The connection entry comprises two or more IP addresses or host names in the form “socket_host,target_host” or “socket_host,proxy_host,...,target_host” and - separated by at least one blank - an optional commentary.

The indirect connection is used to monitor systems which cannot be reached directly (*Example:* Modem connection to the “socket_host” with “target_host” connected to a LAN). In this case first a socket connection is set up to the “socket_host”, and this is then continued step-by-step via the “proxy_host” on to the “target_host”. A prerequisite for this is that the InfoBroker is available on every system of the connection chain.

Such connections are displayed in the title bar of the configuration display in the form “socket_host_ip_address ,..., target_host_name”.

You can sort the list (and the file this is based on) either in ascending or descending order by simultaneously pressing the keys CTRL+o.



The “Connection Mode” field displays or specifies which ports are used by the socket connection. Because of the firewall requirement GXCC/XTCC now connect to the RequestBroker in single port mode by default. Any connection to the InfoBroker which is required is initially set up on the remote system. This setting is not stored.

Multi Port

RequestBroker port:	permitted
Infobroker port:	permitted

Single Port

RequestBroker port:	permitted
InfoBroker port:	not permitted

This menu is also offered if you call the Global Status from GXCC and no InfoBroker connection exists.

Buttons at the bottom of the screen

OK — Establishes a connection to the ISP selected in the lise. If the unit address was only entered in the entry field, it will not be incorporated in the list.

Add — Adds the entered unit data to the list.

Remove — Removes the selected entry from the list.

Replace — Replaces the selected entry in the list.

Help — Opens a text window which contains Help information.

Cancel — Has two different effects depending on the context:

- If there is no connection to an ISP, it closes GXCC.
- If a connection exists, i.e. the menu was simply called to edit or check the address list, it closes the window.

Any changes to the unit list which were confirmed using “Add” or “Remove” will remain effective even after you click “Cancel”.

The Return key does not work in this dialog box. However, you can select a unit by double-clicking the relevant line.

The name and position of the unit file are displayed above the row of command buttons. If you take this file from another GXCC unit, copy its unit list.

Establishing a connection after clicking on OK

1. A check is carried out to establish whether or not the desired unit is accessible. If it is not, an existing connection will be retained and, once the error message has been acknowledged, the “Unit Select” menu is displayed again.
2. If the unit is accessible, an existing unit connection will be closed.
3. When the connection has been established, a check is carried out to determine whether the addressed unit is an element of a CentricStor network. If it is not, an error message will be output and, once acknowledged, the “Unit Select” menu is displayed again.
4. A check is carried out to see whether the addressed CentricStor has the software license for a connection to an external GXCC. If it does not, an error message will be output. Once this message has been acknowledged, the Unit Select menu will be displayed again.

As soon as a connection has been established with any ISP in a CentricStor network, the GXCC has access to all CentricStor elements via the request broker.

If the “Unit Select” menu is closed with “Cancel” while a connection is open, this connection will remain in place.

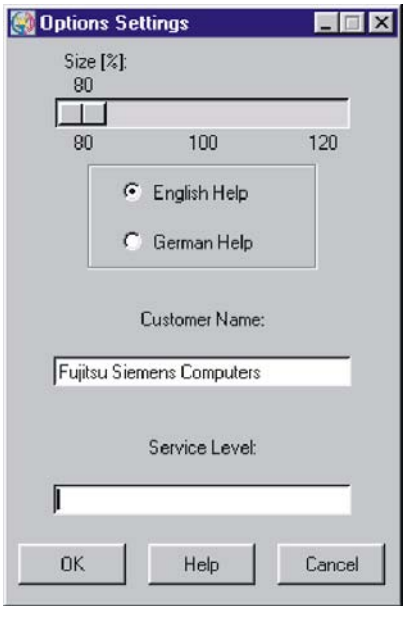
If it is closed with “Cancel” while there is no unit connection, GXCC will be shut down.

6.2.4 Options

Allows you to set the window size and the page ratio. When defining the graphic display settings, it is recommended that you stop the Autoscan process (see the section “Start Autoscan/Stop Autoscan” on page 152), since otherwise the display will always return to the original settings.

If GXCC is running under the control of a profile file that has been explicitly specified, all changes made using the “Options” and “Autoscan” functions will be saved to this profile file.

6.2.4.1 Settings



Size
: Allows you to set the scale of the display using the sliders provided.

  This function affects the size of the configuration display. You can vary the scale from 80% to 100% in 20% steps. The default setting is 100%.

English Help
: This displays the help information in English.

German Help
: This displays the help information in German.

Customer Name

This field contains a customer name that is a maximum of 60 characters long and which can be edited in User or Service mode. Special characters " \ $ [ ] ' will be replaced by underscores “_”. Each time a change is made to the string and the OK button is clicked, the information is saved on the monitored system.

If this field is deleted GXCC uses a default name which depends on the system type.

In Simulation mode this field is called “Data from file” and is used to display path and file names of the current configuration file.

Service Level

This is a field that is reserved for the purpose of authorizing the use of special functions that are not described here.

Buttons at the bottom of the screen

OK	Saves the settings. The window is closed.
Help	Opens a text window with help information. Any changes to the language setting will not come into effect until you press “OK”.
Cancel	Closes the window without saving any changes made.

6.2.4.2 Show Current Aspect

Displays the current aspect values, the window size, and the distance from the left-hand and top screen edges.

6.2.5 Autoscan

6.2.5.1 Start Autoscan/Stop Autoscan

An Autoscan is a process by means of which information is transferred periodically from the InfoBrokers to GXCC, and the graphical display is subsequently updated accordingly. It is either active (started) or inactive (stopped), its status indicated by the color of the text in the bottom right-hand corner of your screen. Green means that the Autoscan process is active, in which case the function bar offers the “Stop Autoscan” function. Red means that the Autoscan process is stopped, in which case the function bar offers the “Start Autoscan” process.

When an information window is output or a function menu called for an object, the Autoscan function will be stopped temporarily, as indicated by the red color of the Autoscan indicator. It will be resumed automatically after the window or object menu is closed. If “Move Pointer” is selected in the “Options” menu, however, the Autoscan function will not be interrupted when an information window is opened (see the section “Settings” on page 153). If the indicator is colored yellow, this indicates that a new data record is currently being received and edited by InfoBroker. The interval between two Autoscan periods is normally derived from the number of objects to be displayed, and is automatically set to a value in the range 4...20 seconds. This value may be adjusted manually. Furthermore the `-autoscan` start parameter can be used to specify a time value to increase the update rate when operating via VNC/Teleservice.

Before changing the window size or position of the configuration display on your screen, it is recommended that you first stop the Autoscan process manually. Otherwise, the ongoing process of updating the window contents will cause the window to jump back to its original position. The reason for this is that the application (GXCC/XTCC) will not be aware of your modifications (made via the Window Manager), and will always use the parameters stored most recently to build the display.

6.2.5.2 Settings

The slider controls the Autoscan interval for exchanging information with the InfoBroker. An Autoscan cycle consists of data transfer, display generation and autoscan delay.

The default setting is “Self Adjusting”. In this mode, the interval is automatically adapted to the number of objects to be displayed, and varies between 4 and 20 seconds. By selecting “Manual Adjusting” and moving the slider, you can also set the Autoscan interval manually. The current mode and the interval value ‘**t**’ will be displayed in the status bar at the bottom of the XTCC window in the form ‘S **t**s’ or ‘M **t**s’.

S GXCC optimizes the autoscan interval in accordance with the current configuration.
M The value set with the slider is used. Click “OK” to confirm the new value.

It is recommended that you operate GXCC in S mode (S = Self Adjusting).

Buttons at the bottom of the screen

OK	Saves the settings. The window is closed.
Help	Opens a text window with help information.
Cancel	Closes the window without saving any changes made.

6.2.6 Tools

The following functions are offered:

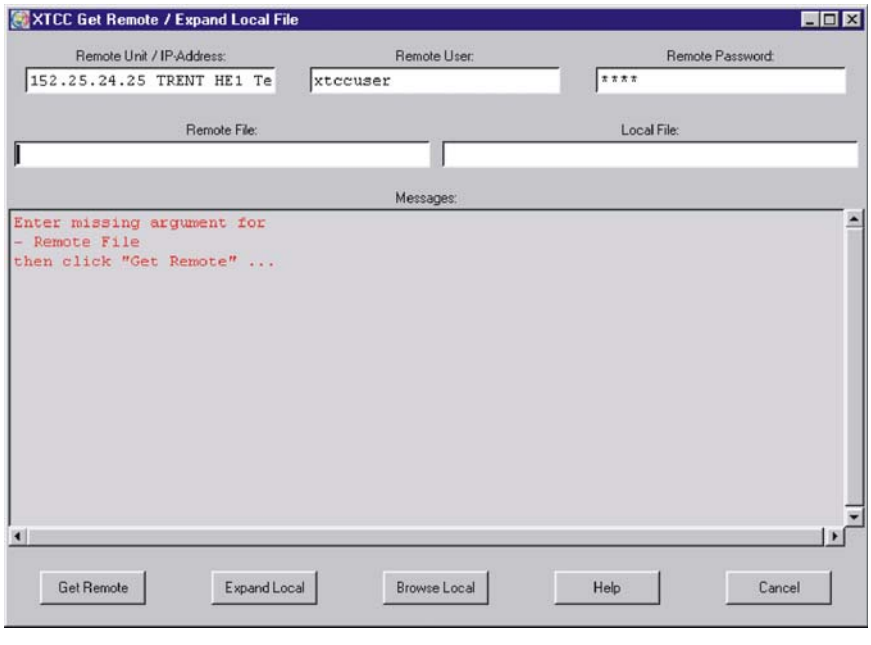
- Global Status
- Get Remote/Expand Local File
- Show Remote File
- Show System Messages
- GXCC Update/Revert Tool (only offered to authorized users)

6.2.6.1 Global Status

This function is used to call the Global Status Monitor (for a description see the chapter “Global Status” on page 237) on the connected CentricStor.

6.2.6.2 Get Remote/Expand Local File

Opens a menu consisting of several entry fields, a message window and various keys. With this menu you can transfer a file from a remote system to the local system, and expand it if necessary (in the case of compressed files, such as trace packages). The two functions can be handled separately.



The window contains the following fields:

Remote Host / IP-Address [Description]:
Name or IP address of the remote system together with an optional comment.

Remote User:
Remote system user ID under which file transfer is performed.

Remote Password:
Password (not visible) for the remote system ID under which file transfer is performed.

Remote File:
Path and name of the remote file.

Local File:
Path and name of the local file (created from the remote file). If the specified directory path does not exist on the local system, it will be created automatically. When the “Expand Local” button is clicked, the system attempts to expand this file.

Messages:
Field used to output messages from the components involved in file transfer. The following text colors are used: black and green for the process sequence, red for errors, and (in the event of errors) blue for associated messages resulting from platform-specific system calls or from the file transfer protocol.

The menu’s function buttons have the following meaning:

Get Remote
The following processes are started:

- Formal check of the entries
- Addressing of the remote host
- Password legitimation

In the event of problems error messages appear in the output window and you can correct your entry.

If the entry is successful the file transfer starts.

Expand Local
Starts the decompression and extraction process for the local file, which must be available as a compressed tar archive.

Messages indicating the success or failure of these processes are output in the output window.

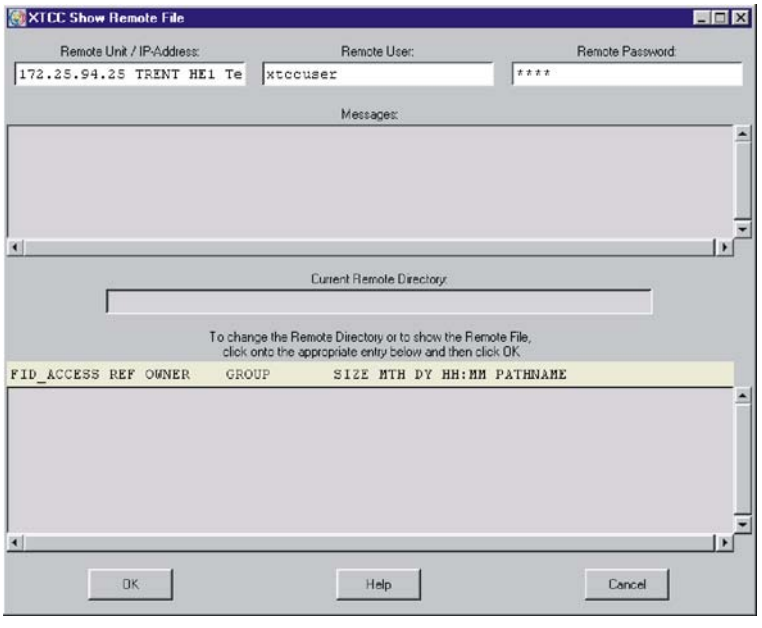
Browse Local
: Opens a dialog box in which you can select and open a local file for the “Expand Local” function.

Help
: Opens a window with help information.

Cancel
: Closes the menu.

6.2.6.3 Show Remote File

Opens a menu consisting of several entry fields, a message window, a list box and various buttons:



In this window you can transfer a file from a remote system to the local system and view it using a file viewer.

The menu’s entry fields have the following meaning:

Remote Host / IP-Address [Description]
: Name or IP address of the remote CentricStor server.

Remote User
: Remote system user ID under which the file transferis performed.

Remote Password
: Password (not visible) for the remote system ID under which data transfer is performed.

Messages
: Field used to output messages from the components involved in file transfer. The following text colors are used: black and green for the process sequence, red for errors, and (in the event of errors) blue for associated messages resulting from platform-specific system calls or from the file transfer protocol.

Current Remote Directory:
: Absolute path name of the current remote directory displayed in the list box underneath, starting from the root directory `/`. The list box provides a static display of the contents of the current remote directory.

If the menu remains open for a long period of time, you can refresh the field contents by selecting an entry with the path name "." (single dot in the "PATHNAME" column) and clicking the "OK" button.

The blue title bar explains the meaning of the different columns in the list box:

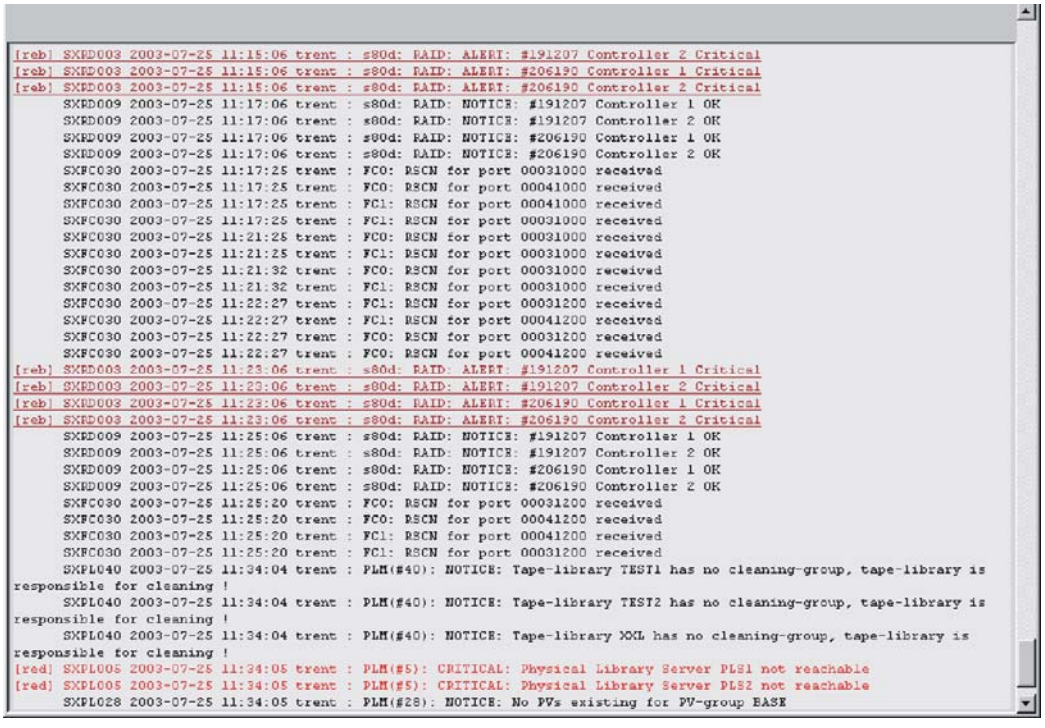
FID_ACCESS	–	File ID and access permissions
REF	–	Link counter
OWNER	–	Owner
GROUP	–	Group
SIZE	–	Size
MTH	–	Month
DY	–	Day
HH:MM	–	Time
PATHNAME	–	Path name (name of the file, directory, link)

Use your left mouse button to select entries in the list box. Depending on the type of entry, clicking the "OK" button will either start file transfer to the local system or cause a change of directory. You can also start this function by double-clicking the entry. Once data transfer to the local system has been successfully completed, the "Show" text viewer is started automatically. Its "Save As" function can be used to copy the file to the local system.

A subdirectory of the type `<host-name>.rhost` is created for the remote system in the local system's temporary XTCC directory. The name of the local file corresponds to the name of the remote file. However, the remote subdirectory structure is not mapped. Any obligatory entries that are missing must be entered manually afterward. The default remote user ID is `service`. In the event of access problems (`Permission denied` message), `root` can be entered as an alternative ID.

6.2.6.4 Show System Messages

Opens a text window to display the ISP system messages. The window is automatically positioned on the last outputs.



The console messages of all CentricStor systems are listed by priority and in the order in which they occurred.

You can also display the system messages by clicking the symbols in the title bar.

The messages are identified by different colors depending on their urgency:

[blu]	Blue	WARNING	Warning
[red]	Red	ERROR	Error message
		CRITICAL	Critical (e.g. serious device error)
[reb]	Flashing red	ALERT	Alarm: eliminate error immediately
		EMERGENCY	Alarm: system is unstable

A message comprises the following elements:

Attribute [blu],... [reb] specifies the display mode. This means that important messages can also be identified in a black/white display.

MsgNumber ID of the message, maximum 7 characters.

DateTime Date and time in the form YYYY-MM-DD HH:MM:SS.

ISP-Name Name of the ISP from which the message originates.

Separator One or two characters (for their meaning see page 441)

Message text

In addition to the functions available in all text windows, the function bar of the system message window also contains “AutoUpdate” and “AutoPopup”. These functions of the text viewer are described on page 362.

Certain alerting actions are predefined for the messages in accordance with their priorities. For example, the priorities EMERGENCY and ALERT (i.e. all flashing messages in red) trigger a teleservice call (among other things) when the other requirements for this are satisfied.

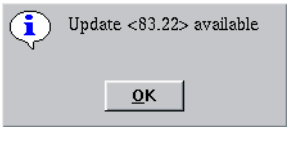
6.2.6.5 GXCC Update/Revert Tool

Principle behind software updating

The software for the user interface of CentricStor runs on a wide variety of platforms. The delivery package of CentricStor includes a CD containing the user interface software and installation utilities. Following initial installation the updating of the software is largely automated.

When reading in software updates to a CentricStor system, any new versions of GXCC/XTCC are also read in there automatically. The corresponding program files will also be stored in compressed form. When GXCC/XTCC sets up a connection to a CentricStor system, a check is made to see whether the CentricStor system contains newer versions of GXCC/XTCC. If this is the case, the compressed files are transferred to the GXCC system (usually a workstation) and saved there in an update folder.

A message is then output to the user interface. *Example:*



The same notice is issued to all GXCC applications that are active at the time. The same info box is issued at the start of GXCC and each XTCC if the update folder contains a version that is newer than the one that has just been started.

If the online manuals have to be updated as well, the manuals are transferred in the background after the program files. If the transfer is completed successfully, the new manual is activated automatically and the older edition deleted. Thus, if you do not activate a new software version immediately, it can happen that the online manual is more up to date than the user interface software.

You can use the update/revert tool to:

– display the saved software versions and delete versions that are not required from the update folder
– activate (update) a version saved in the update folder
– revert GXCC to the status it had at installation

With the update/revert tool you always remain in the same main version of GXCC/XTCC (e.g. in version 2.xx). The installation process via CD is required to upgrade to another main version (e.g. 3.xx).

On a workstation, the latest GXCC/XTCC version from all the monitored systems is thus loaded automatically and activated on request. An update installation from CD is thus not necessary on the workstation.

If GXCC is operated on a workstation by multiple users simultaneously, activation of a new version concerns all users. The update/revert tool offers assistance to facilitate coordination and communication between the users.

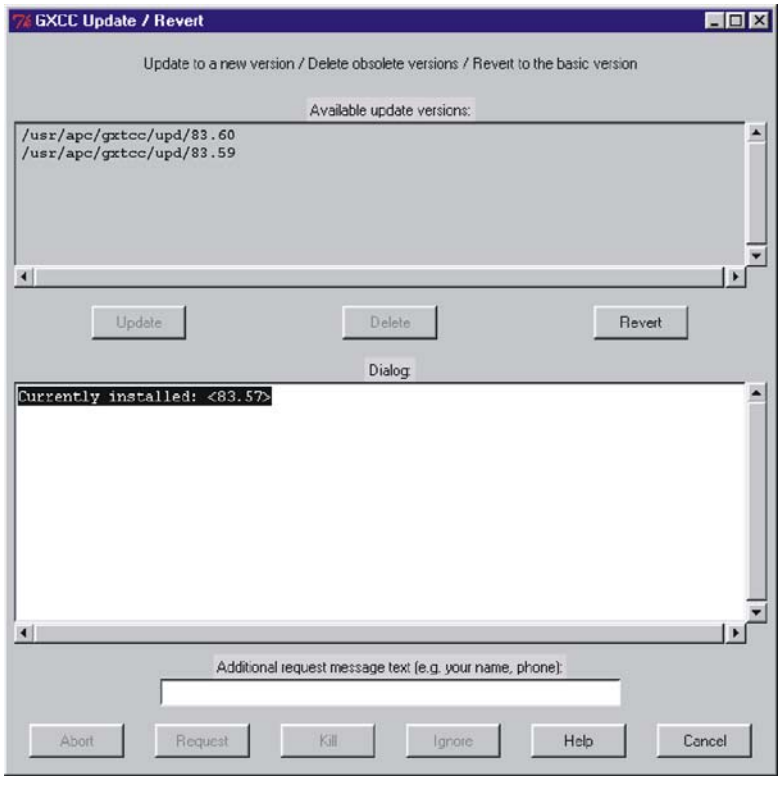
Only one revision of GXCC/XTCC can be run on a computer (ISP/workstation).

A corresponding tool with the same user interface is also offered for XTCC.

– Within a product line (CentricStor V2.x or CentricStor V3.x) there are no restrictions regarding the compatibility of different GXCC and XTCC versions. Even if a workstation is to operate with older CentricStor versions you can upgrade the GXCC/XTCC software to the latest version.
– The graphical user interfaces of CentricStor V2.x and V3.x are separate software lines. They can thus be operated independently of each other on the workstation. Updates only affect the particular line which is being used. It is not possible to upgrade GXTCC (CentricStor V2.xx) to GXCC (CentricStor V3.xx).

Carrying out a software update

When you choose the menu command, the following window appears:



A list of the GXCC versions in existence is displayed in the upper part of the window, starting with the most recent version.

The version of GXCC (or XTCC) that they are currently using is displayed in the first line of the “Dialog” box.

“Revert” reverts to the status brought about by the initial installation.

After you select a file from the list, you can:

– choose “Delete” to delete this file
– choose “Update” to activate this status of GXCC

The installation version is not displayed in the overview and cannot be removed.

To activate a different version of GXCC, your current GXCC plus all subapplications and any GXCCs started by other users plus all subapplications must be closed. Only the update/revert tool remains open. GXCC applications which run on other GXCC systems and are connected to the same CentricStor are not affected.

A monitor program keeps track of all the GXCCs and their ramifications. It initiates the termination of subapplications and brings it to your attention if other users are also using GXCC.

The lower half of the screen contains the output area “Dialog”, which displays the update status and context-sensitive instructions, and an input area for messages to other GXCC users.

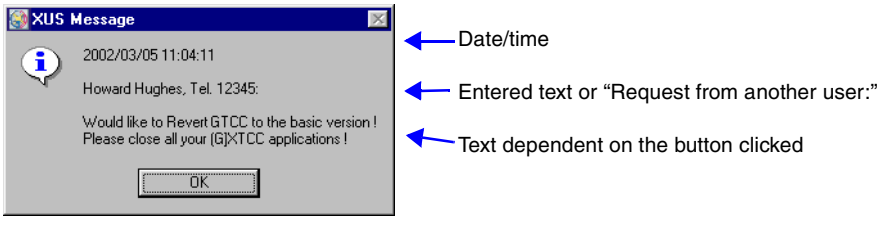
Different text colors indicate different types of text:

Black	General text, instructions
Green	Positive acknowledgment
Red	Important text, error message, response required
Blue	Messages of participating components

The buttons arranged along the lower border allow you to influence the update operation and control communication with other users.

Abort — Cancels the update/revert operation. Closes the window.

Request — Sends a message to all active GXCC/XTCC applications.
As the following example shows, the message consists of a line with the date and time, the text entered in the “Additional Request Message” field and a text relating to the action planned.



If the applications are not closed, the following options are available to you:

Abort	Aborts the operation and closes the update tool.
Kill	Closes the applications and the update tool.

Kill — Terminates all the active GXCC/XTCC applications. This button is only enabled when an update/revert operation has been stopped because other GXCC/XTCC applications are active. “Kill” also terminates the GXCC application from which the update tool was called.

The function should only be used when, in the event of an update/revert operation, other GXCC/XTCC users do not respond to the message distributed with Request within an appropriate period of time.

Ignore — Skips the application test. This button is only enabled if the central monitor that checks for active GXCC/XTCC applications is not working. It is advisable before clicking this button to ensure that there are no GXCC/XTCC applications running.

Help — Opens a text window containing help information. This is also an active GXCC/XTCC application, and it is thus closed when the update operation is executed. You thus cannot keep the window open during the update. This should not be a problem because there are context-sensitive explanations and instructions given, where necessary, in the dialog box.

Cancel — Terminates the update tool. Before a GXCC application is started after an update, the update tool should always be terminated with “Cancel”.

The update tool must be terminated with “Cancel” so that updates of the tool itself can become effective immediately.

Your own GXCC/XTCC application is also recognized as a running application. Using a “Kill” on this application does **not** terminate the update/revert tool.

If for any reason the GUI software cannot execute, you can often use a repair tool to download an intact version from a CentricStor or a workstation. The repair tool is described after the application examples.

Application example

Let’s assume you want to update GXCC. There are other GXCC/XTCC applications active in your system.

You have to carry out the following steps:

- You open the update/revert tool and check that the version you want is there.
- You close GXCC, from which you started the update tool, and a Global Status Monitor if you have one open.
- You select the desired GXCC version.
- You click the “Update” button.
- The first steps of the update process are logged in the “Dialog” field. If you have a Help window open, this is now closed.
- Other applications belonging to the GXCC/XTCC family are active. This is indicated to you by a red output text in the “Dialog” field. You enter your name, phone number and planned update time in the optional message field, and click the “Request” button. A message appears on all users’ screens requesting them to close the application (see page 162). This also closes the update tool.
- You start the update tool again at the agreed time. One user has not terminated GXCC. Because you really have to carry out the update today, you click the “Kill” button. This closes the application.This also closes your GXCC. The update tool continues to run.

- You restart again. This time the process ends with the green message “Update done”.
- It now makes sense to terminate the update tool by means of the “Cancel” button. The service that monitors all the applications of the GXCC/XTCC family is thus restarted with the updated version the first time one of these applications is started.

Repairing a faulty GXCC/XTCC version

In case the GXCC or XTCC version is faulty and you can therefore no longer call the associated “Update / Revert” function and an installation CD is not available, a repair tool has been provided as an emergency measure.

The prerequisites for using it are that you can access a system on which an operational GXCC or XTCC version exists and that the faulty version provides a degree of basic functionality.

If the tool cannot be run because the functionality of the faulty software is not sufficient or one of the activities described below cannot be performed successfully, the only option is to reinstall the GUI software from CD.

Call under SINIX/UNIX

To execute this you must switch to the XTCC directory <xtcc_path>.

```
cd <xtcc_path>
./repair &
```

Call under WINDOWS

If the following start menu entry is available:

Start » Programs » Fujitsu Siemens Computers » V6 Control Center » Setup » Try to repair inoperable GXCC or XTCC

Otherwise:

Start » Execute » Browse
Select the file: <xtcc_path>\osd\Windows\repair.bat
» Open » OK

To do this on the WINDOWS NT/2000/XP platforms you require an ID with administrator rights.

Procedure

If you were able to start the tool, first a window will open which explains the further procedure. This procedure consists of the following steps:

1. Select the component to be repaired: GXCC or XTCC
2. Select the remote system from which the compressed archive of the selected component is to be fetched.
3. Execute the “Get Remote / Expand Local File” tool:
   Here only the “Remote Password” need be entered; all other parameters are already specified and may NOT be changed.
   Click on “Get Remote” to start data transfer from the remote to the local system. If this is completed successfully the message “Ready for Expand Local” appears.
   Click on “Expand Local” to extract the files from the archive into the master directory of the selected component.
   If this is completed successfully the message “Extraction finished” appears. Then close the window with “Cancel”.
4. Execute the “Update / Revert” tool:
   Click on “Revert” to use the files just extracted to create a GXCC or XTCC version which corresponds to the version of the remote system. After the message “Revert done” has appeared click on “Cancel” to close the window.

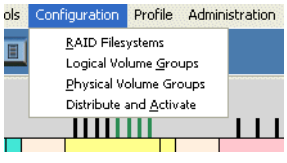
6.2.7 Configuration

PVGs and LVGs can be configured, i.e. created, modified and deleted, in User mode.

Changed parameters are stored in the file `/usr/apc/broker/vtls_vg.conf.new`. The floppy disk symbol appears in the CentricStor main window.
The changed data is activated using the “Distribute and Activate” function.

> **i** Changes to the LVGs affect VLM and PLM, changes to the PVGs affect only thePLM. These components are stopped and restarted during “Distribute and Activate”.

Afterward the file `/usr/apc/conf/vtls_vg.conf` contains the modified data. The floppy disk symbol in the GXCC window disappears if no further configuration changes are in preparation in Service mode.



When the configuration menu is opened and the InfoBroker started the configuration data is checked for consistency. If inconsistencies are found or if files are missing, you will not be offered to configuration menut when Configuration is selected, but you will instead be offered the “Status Configuration” function:

If you click this function, you will be provided with information about the error and further instructions, if available.

➟ Configuration menu on the function bar

Clicking the “Configuration” button in the toolbar opens a drop-down menu with the following items:

– RAID Filesystems
– Logical Volume Groups
– Physical Volume Groups
– Distribute and Activate

Selecting the required function provides access to a series of dialog boxes for displaying and setting the configuration parameters. Functions marked “!” and colored yellow in the drop-down menu indicate settings that are not consistent with the configuration currently active.

Disabled functions (colored white) indicate settings that are currently being edited by other GXCC users.

In User mode PVGs and LVGs can be configured without restrictions as in Service mode. When operating in Observe mode, however, the configuration may not be changed in any way.

Elements of the configuration dialog boxes

Command buttons along the lower border:

All dialog boxes used to change the configuration have the same set of buttons:

OK — Temporarily saves your changes to `/usr/apc/broker/vtls.conf.new` or `/usr/apc/broker/vtls_vg.conf.new` and ensures that they are taken into consideration in the other dialog boxes of the configuration group. If the `…conf.new` files do not yet exist, they are created by copying over the configuration file currently active and modifying it in accordance with your entries. The menu item remains selected, and further changes are possible.

In the GXCC main window a diskette icon indicates that the work file in `/usr/apc/broker` no longer matches the active configuration file.

Cancel — Closes the dialog box without applying your changes.

Reset — Resets all fields to the values set when the dialog box was opened. The dialog box remains open.

Help — Opens a text box containing operating instructions alongside the dialog box.

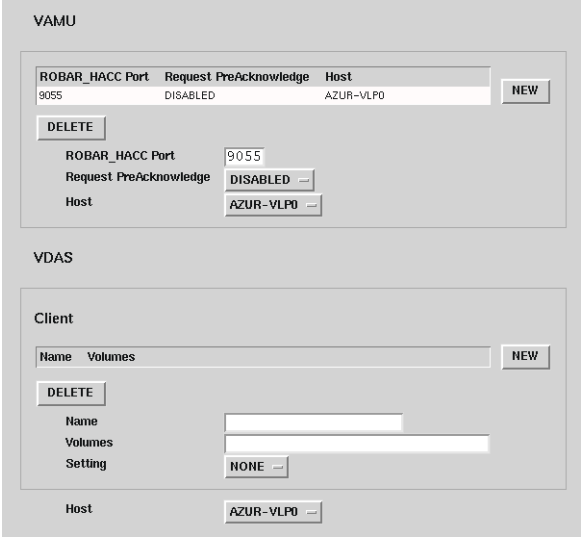
Any configuration changes not yet activated with “Distribute and Activate” are stored temporarily by the InfoBroker when you click “OK” and will be retained even if GXCC is shut down.

Important:
If the system’s InfoBroker is shut down before the configuration changes have been activated, any changes not yet activated will be lost. The same applies to any changes not yet activated when CentricStor is shut down.

If the `vtlsconf_use_new` file exists in the `/usr/apc/broker` folder when the InfoBroker restarts, the .new files are not deleted and the `vtlsconf_use_new` file is deleted. Thus, if you want to prevent the deletion of latent configuration changes at restart of the InfoBroker, you must create a file with this name by using the appropriate shell commands. The action must be repeated after every startup of the InfoBroker. This allows you to rescue extensive configuration entries, for example, if you discover at an initial configuration that the system has to be restarted.

List editor

The following example displays a configuration dialog box containing two lists:



Several objects of the same type often have to be defined at configuration (e.g. Virtual Library Servers, PVGs, LVGs). The list editor in the configuration dialog boxes is used for this.

An editor area consists of a list of the objects already defined and a number of elements such as display windows, text entry fields, command buttons and radio buttons. If you click a line in the list, it is highlighted and the data associated with the selected object is copied to the associated elements. The dialog box thus displays all the information relating to the object selected from several objects of the same type.

A dark gray border shows that the list and the associated elements belong together.

The “NEW” button and, after you select a line, the “DELETE” button belong to the list. These buttons are only offered when the associated functions can actually be executed.

“NEW” adds a new object, while “DELETE” deletes the objects displayed in the selected line.

The data offered in text areas and as labels for buttons is also either displayed or not displayed, depending on the context. If a name can no longer be changed, for example, it appears as text. If it can be changed, it appears in an editable field. All the command buttons are only offered when the function behind them can be used. Radio buttons are only offered when there really is a choice. If there is no longer a choice, the valid setting is displayed as text.

Adding a new object:

Click the “NEW” button. An empty entry field appears in which you can enter a name. Depending on the type of the object, further entry fields will also be displayed. These are filled with defaults wherever this is possible or useful.

If you enter a formally correct text in the name field and then display it by pressing the Return key or by clicking another field or button, the new object is defined. A selected line appears for it in the list, containing the name you entered. You then have to complete your entries in the entry fields.

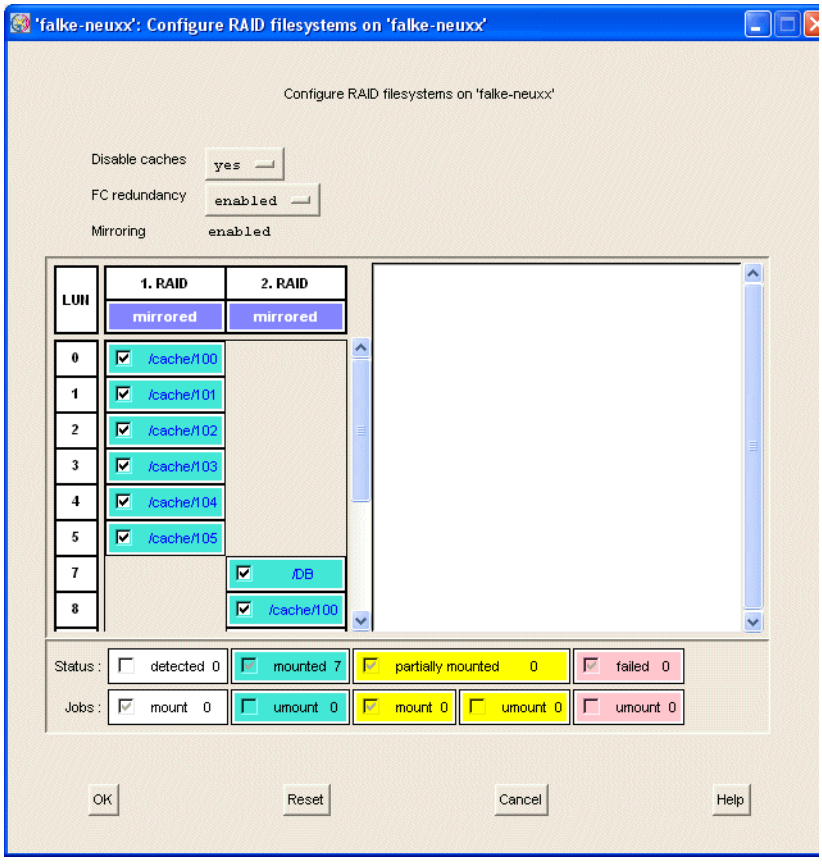
If no new object can be added because the maximum number of objects has been reached, “NEW” is not offered.

Deleting an object:

Select the corresponding line in the list and click the “DELETE” button. This item disappears from the list. “DELETE” is only offered for items in the list that can still be deleted.

6.2.7.1 RAID Filesystems

After you have selected this function a form for configuring the RAID system is displayed:



In Observe and User mode the *OK* button is not present and all the checkboxes are *disabled*.

Buttons

Disable caches
: Some tests on empty file systems and consistent LVG assignments are skipped (no) or executed (yes).

FC redundancy (appears only if the function is installed in CentricStor)
: Here you can enable or disable the FC redundancy function in CentricStor.

Information

Mirroring

Whether the mirror function is enabled or disabled in CentricStor is specified here.

The attributes of a RAID system with the mirror function enabled, whether and how it is mirrored, are defined by the assignment of the LUNs during RAID configuration.

Configuration window

In the table the columns represent the RAIDs and the rows represent the LUNs (the rows can also contain disk numbers in the case of internal RAIDs). The file systems are contained in the cells.

The print color indicates the mirror status:

black	Not mirrored
blue	Mirrored

The cells are color coded:

white	The conditions have been recognized. However, the file system is not yet configured.
green	The file system is configured and mounted on all ISPs.
red	The file system is configured but has not been mounted due to an error.
yellow	The file system is configured but has been mounted on only some of the ISPs.

In Observe or User mode, the checkboxes cannot be modified by the user.

Mouse functions in the configuration window

Mouse click

Detailed information on the cell or RAID system selected is displayed in the infobox to the right.

After you click on the “mirrored” or “unmirrored” header field all file systems in the column are selected.

1. Left mouse click
2. Shift key + left mouse click

Clicking on one of the cells with the shift-key held down and then clicking on another cell causes the entire range to be selected. The selection is made for columns.

Ctrl key + left mouse click

Clicking on one of the cells with the Ctrl-key held down will result in a cell being added (or removed) from a range.

Key

Status The meaning of the various colors and checkbox conditions is explained. The cells also contain a summary (e.g. “mounted 85”).

Command buttons along the lower border

Cancel
Closes the window.

Reset
The setting is reset to the value when the window was opened. The window remains open.

Help
Shows a help file.

6.2.7.2 Logical Volume Groups

In this step at most 512 LVGs can be incorporated in CentricStor.

The top part of the form contains a list of the LVGs that have already been incorporated. Clicking in the list selects a group.

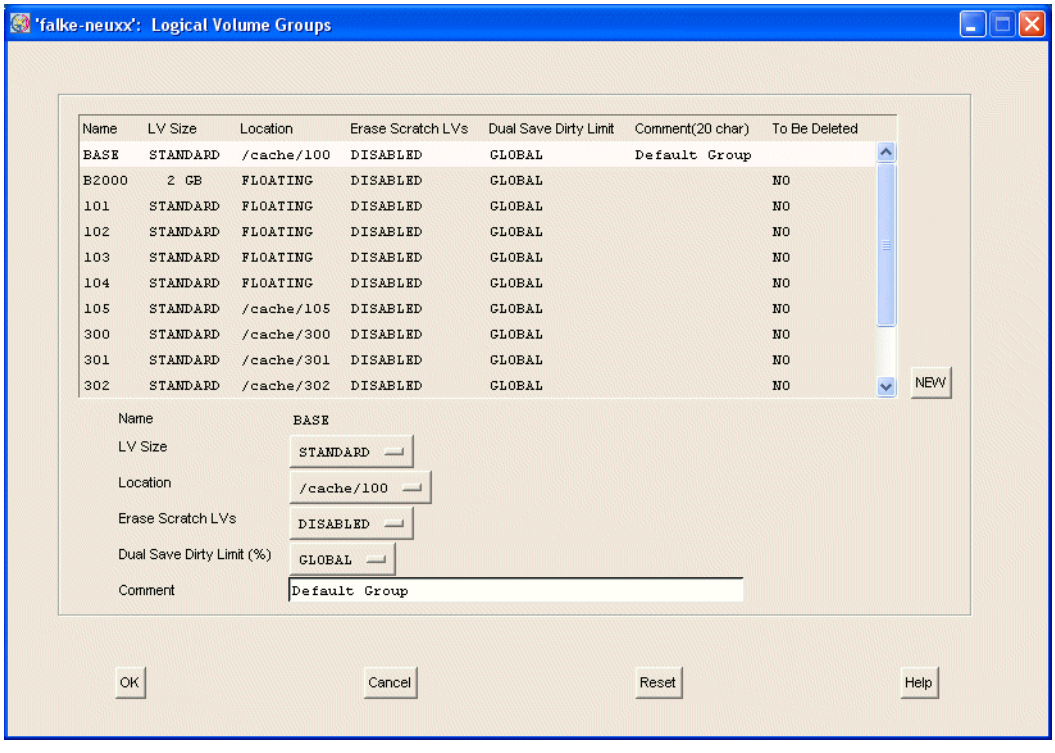
The entry for the selected LVG has a light background. As a default the entry fields contain the values of the selected group. You can now change these.

When you change the group selection the contents of the entry fields are buffered. They are not yet entered in the configuration file. Only when you click on “OK” are all changes entered which were made since the form was opened.

The following fuinctions can be implemented in this window:

- Definition of the LV size
- Setting up a cache location (location setting not equal to FLOATING, which enables quasi-residence of the LVs to be achieved)
- Deleting LVGs (To Be Deleted)
- Changes to the comment field (Comment)

Buttons and entry fields



In the case of LVGs already distributed with “Distribute and Activate”, the “To Be Deleted” button is offered (as in the form above), in the case of newly entered LVGs the “DELETE” button.

The “BASE” LVG is always present and cannot be deleted. The transfer LVG with the name TR-LVG is also always present, but not shown in this menu.

“NEW” button:

Adds a new LVG.

When you click on “NEW” the entry field for the name is opened. The button for the LV type and the DELETE button appear. The button “NEW” is not offered if the maximum number of LVGs (= 512) has been reached. After you have entered a name in the entry field (and click “Enter” or any button) a line containing the newly entered name appears in the list.

When the groups have been established the assignments of logical to physical disks must be specified in a further step. This is done using operating functions of the PLM while CentricStor is running (see section “Physical Volume Operations » Link/Unlink Volume Groups” on page 221).

“DELETE” button:

Appears only if a line is selected and the selected LVG has not yet been made known to the system. This is typically the case if you have just created an LVG and have not yet selected “Distribute and Activate”. Not to be confused with the “Delete LVGs” function (for details see “Input areas” ➟ “To Be Deleted”).

Deletes the selected LVG.

An LVG entry can only be removed with “Delete” if the configuration has not yet been activated with “Distribute and Activate”. “Delete” is consequently not offered for groups that have been activated in the system, but “To Be Deleted” instead (an explanation is provided below).

Input areas

To Be Deleted

You use this button to change the setting of “NO” (= default = LVG is not to be deleted) to “YES” (= LVG is to be deleted). This enables an LVG to be deleted which has already been made known to the system with “Distribute and Activate”.

To permit this function to be used a few conditions must be met:

– The LVG concerned may not be linked to any PVG.
– No LVs may be contained in the LVG.

If the condition “no LVs in LVG” is not satisfied the request to delete the LVG is rejected with a corresponding error message. This condition is checked twice, once when you click on “OK” in this window and once when “Distribute and Activate” is used. In both cases the action is rejected.

The condition “LVG may not be linked to PVG” does not lead to the action being rejected if it is not met. but an attempt is made to perform an unlink automatically. If this proves unsuccessful this leads to the LVG being marked as “intended for deletion”.

While PVs still exist which contain a reference to the LVG to be deleted, the action will be rejected. This case can occur if, for example, you have assigned LVs from the LVG to be deleted to another LVG using “Change Volume Group”. Until these LVs have been saved again under the new LVG, they are still entered in the PLM data maintenance system with their previous LVG name.

If an LVG is marked for deletion and if this configuration data has been activated in the system, no further actions (add LV, create new link) at all are permitted on this LVG. If a “Distribute and Activate” is performed again at any time, the condition is automatically checked again. If it is then satisfied, this LVG is deleted once and for all. These procedures are fully automatic; the user need

take no action. Once the request to delete an LVG has been successfully issued and activated in the system, the action is an asynchronous action and cannot be influenced by the user.

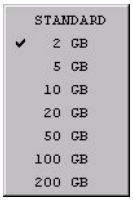
Name

Name of the LVG. The data of the LVG is kept under this name in CentricStor. The LVG is defined by entering a name. The name contains a maximum of 6 characters (only letters, numbers and "_").

This field can only be modified until the LVG has been activated using "Distribute and Activate".

LV Size

This is used to specify the size of the LVs in an LVG. The following options are available:



"STANDARD" corresponds to 900 MB.

For CentricStor systems which were configured with version 3.1A or earlier the DTV file system must be migrated before larger logical volumes are supported. If you have not yet done this the assignment of an LV size > 2 GB is rejected and the following message is issued:

```
LVGs with LVG-Type > 2 GB rejected because DTV-FileSystem has not
yet been migrated: <LVG name>
```

If LVs larger than 5 GB are used, adequate TVC dimensioning (caches) must be ensured.

If large LVs are used and the TVC is too small, this results in more frequent displacement. This can have a significant effect on the LV mount times depending on the volume size and the drive type (e.g. with 200 GB approx. 90-120 min.).

The cache partition must be at least as large as the size assigned to the LVG. If this is not the case the assignment is rejected and the following message is issued:

```
LVG(s) rejected because at least one cache partition is too small
```

Further information

Reducing the LV size of an existing LVG:

It is not possible to reduce the LV size of an existing LVG in CentricStor.

If you want a smaller LV size, you must create a new LVG with the required LV size. The data which was written to the large LVs must then be written to the new, smaller LVs using the customer's (or customer system's) backup tools (host resources).

Increasing the LV size of an existing LVG:

This is possible provided that the PVs of the LVG offer the required minimum capacity, otherwise the assignment is rejected with the following message:

```
The following LVG was(s were) rejected because PV(s) in a linked PVG are
too small to store LVs of the requested LVG-Type size: <LVG_1> <LVG_2>.
```

Location

You can use this setting to define the assignment of the cache file system to the LVG. An LVG can be assigned to precisely one cache file system. However, you can assign multiple LVGs to a cache file system.

If you select "FLOATING" this means that the LVs of this LVG can be distributed over all caches to which no LVGs have been explicitly assigned. In addition to "FLOATING" the names of all the system's caches (e.g. `/cache/101`) are offered in the selection field. If you select a specific cache name for an LVG, the LVs of this LVG are moved to or created in this cache only. This enables you to achieve quasi-residence. Here "quasi-residence" means that the LVs remain in this cache provided the capacity of the cache is not exceeded. For example, 250 LVs of 2 GB can be placed in a cache with a size of 500 GB. If you enter a 251st LV in this cache this results in some LV of the other 250 being displaced from the cache. You should always bear this in mind when filling an LVG which is to contain quasi-resident LVs.

The following should also be taken into consideration in this context: If a logical volume is mounted, it is always expanded to the maximum size.

Example of an LVG with 2-GB volumes

If, for example, you have already occuppied 248 GB of the available 250 GB and now mount 4 logical volumes simultaneously each of which only occupied 1 GB in the cache beforehand, not 4 GB but 8 GB are now required for these 4 volumes, which exceeds the maximum size of the cache. Other logical volumes must therefore be migrated out of this cache, thereby canceling their cache residence.

Erase Scratch LVs

This specifies how the data of scratch volumes is to be handled:

ENABLED Only the stub data (volume header) is to be retained.

CAUTION!
With this setting it must be assumed at all times that the data on scratch volumes - and also on the physical volumes - will automatically be deleted and consequently be irretrievably lost. This behavior was implemented as the default in early CentricStor versions without the option of changing it by means of configuration. This is contrary to the behavior of real library services.

DISABLED No data is deleted. However, the logical volumes are displaced from the TVC. This behavior is preset and corresponds to that of real library services.

This affects the following operations of the Virtual Library Services:

VACS	“set scratch” command
VAMU	“CVA” command (change volume attribute)
VDAS	Not used
VLMF	Not used
VJUK	Not used

Dual Save Dirty Limit (%)

Determines the maximum share which logical volumes of this LVG which are “dirty” may be assigned in the cache file system. When this value is exceeded and the selected LVG is connected to 2 PVGs, CentricStor will switch from dual save to single save in the event of problems on the backend, e.g. a robot error. As soon as the LVs of this LVG have been saved their cache is released. In this way a cache overflow is prevented. As soon as the backend errors have been corrected the second backup is performed.

DISABLED	The function is disabled, i.e. no change to single save for this LVG.
GLOBAL	The “Global Dual Save Dirty Limit” setting in the ”Control Components” menu (only service mode,) should be used.
90, ... ,10	Value in percent as of which single save is switched to.

The default setting is GLOBAL.

Comment

Freely selectable text, up to 50 characters long. The following special characters are not permitted: ’ : $ { } .

Command buttons along the lower border

OK
: Accepts the entry. It becomes effective with “Distribute and Activate”. The “Configuration Changed” symbol (floppy disk symbol) appears in the GXCC main window. The changed configuration data is stored, even after GXCC has terminated. If the InfoBroker is restarted or the VLP is shut down without a preceding “Distribute and Activate”, the data which was changed is lost.

Cancel
: Closes the window without accepting the entries. All the entries made since the last time the window was opened are thus lost.

Reset
: All data is reset to the status when the window was opened, even if it affects list entries that are currently not selected. All the entries made since the last time the window was opened are thus lost.

Help
: Opens a text window containing help information.

Information on the cache management settings

The “Location” function enables individual cache file systems to be reserved for exclusive use by certain LV groups.

Benefit: This permits cache residence of the logical volumes.

If you have ensured that the volume of data on the volumes which are assigned to a particular cache file system does not exceed the capacity of the cache file system, these will never be displayed from the cache. Short access times are then guaranteed for these volumes.

Rules

– An assignment of cache file system to LV group is defined by a configuration.
– An LV group can be assigned to precisely one cache file system.
– Multiple LV groups can be assigned to a cache file system.

This has the following effects for the cache management:

– Cache file systems to which LV groups are assigned for exclusive use are reserved only for these LV groups: The mechanisms for distributing logical volumes over the cache file systems (when creating logical volumes, for load balancing between cache file systems, etc.) are not used here.
– All other cache file systems are handled as before: The remaining logical volumes are distributed over all the other caches, and load balancing takes place.

The settings for the cache file system can be modified later at any time. After a modification a “Distribute and Activate” operation is required in which, however, only the VLM and the PLM must be restarted if this was the only change.

If assignments between cache file systems and LV groups are modified, this can result in certain logical volumes having to be moved from one cache file system to another because the old assignment no longer applies. This operation is performed automatically by the system.

Examples

– An LV group is subsequently assigned to a cache file system which has so far not been used exclusively:

  All logical volumes which were contained in this file system but did not belong to the assigned LV group must be moved to other file systems. Furthermore, any existing logical volumes of the exclusively assigned LV group must now be moved into this cache file system.

– The assignment of an LV group to a cache file system is changed, i.e. it is assigned to another cache file system:

  All logical volumes of this LV group must be moved into the other cache file system. It may be necessary to remove logical volumes which do not belong to the assigned LV group from this cache file system.

– The assignment of an LV group to a cache file system is canceled:

  If further LV groups are assigned to this cache file system, the logical volumes of the LV group whose assignment has been canceled must be moved to other cache file systems.

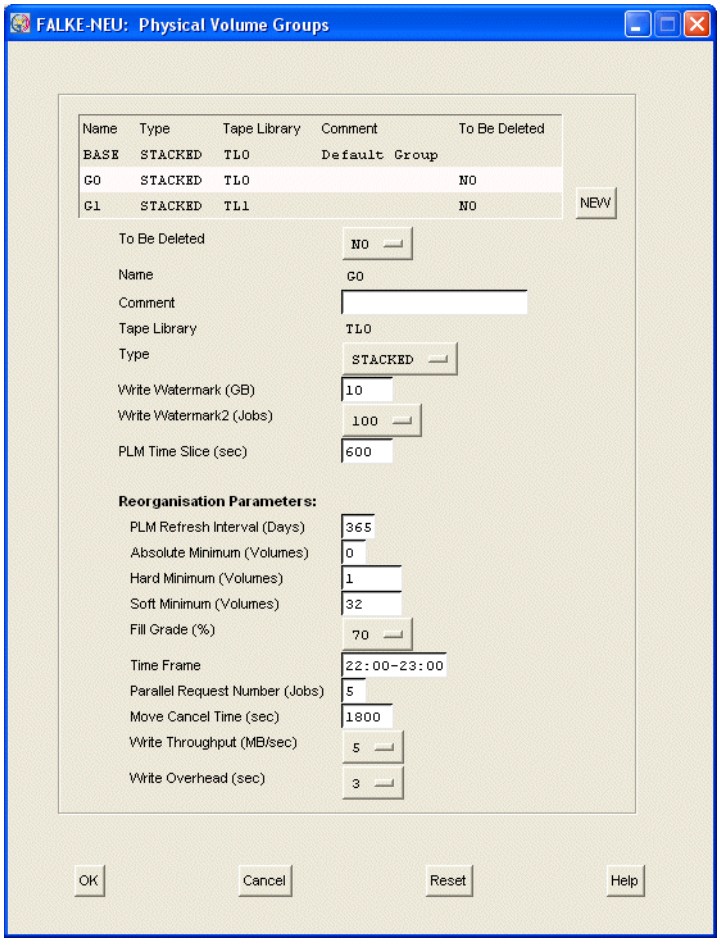
Logical volumes are moved automatically in the background. The following points must be noted here:

– It can take several minutes before the logical volumes have reached their destination and the operation is terminated.

– Logical volumes which are currently in use cannot be moved (mounted volumes, volumes which are currently required for reorganizing physical volumes). The move takes place when the volumes are no longer being used.

6.2.7.3 Physical Volume Groups

In this window volume groups of the physical volumes can be created, deleted or modified. When the window is called the existing physical volume groups are initially displayed:



In the case of PVGs already distributed with “Distribute and Activate”, the “To Be Deleted” button is offered (as in the form above), in the case of newly entered PVGs the “DELETE” button.

The “BASE” PVG is always present and cannot be deleted. The transfer PVG with the name TR-PVG is also always present, but not shown in this menu.

Cleaning PVGs which can be created for the tape libraries are not shown either.

List area

At the top of the form there is a list area with data regarding PVGs that have already been integrated. The following is displayed:

Name	Name of the PVG
Type	Type of the PVG
Tape Library	Tape library assigned
Comment	Comment
To Be Deleted	Marking for deleting the volume group

You mark a line by clicking on it. The data of the selected PVG is presented in the entry fields and buttons below.

When you change the group selection the contents of the entry fields are buffered. They are not yet entered in the configuration file. Only when you click on “OK” are all the changes made since the last time the form was opened entered in the configuration file.

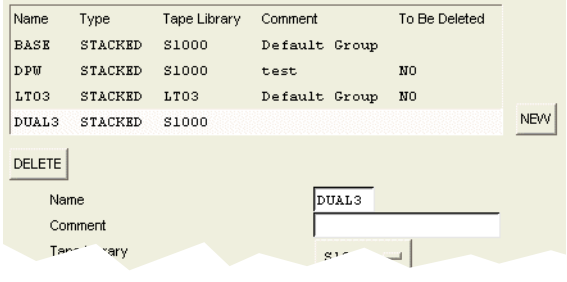
“NEW” button:

This button is not offered if the maximum number of PVGs (100) has been reached.

Creates a new PVG.

When you click on “NEW” the entry field for the name is opened. The fields with which you can define the new PVG are still displayed, as is the DELETE button. After you have entered a name in the entry field (and then press “Enter” or click any button) a line containing the newly entered name appears in the list.

Example



The buttons and entry fields show default values.

“DELETE” button:

Appears only if a line is selected and the selected PVG has not yet been made known to the system. This is typically the case if you have just created a PVG and have not yet selected “Distribute and Activate”. Not to be confused with the “Delete PVGs” function (see below: “Entry area” ➟ “To Be Deleted”).

Deletes the selected PVG.

A PVG entry can only be removed with “DELETE” if the configuration has not yet been activated with “Distribute and Activate”. “DELETE” is consequently not offered for groups that have been activated in the system, but “To Be Deleted” instead (an explanation is provided below).

Entry area

To Be Deleted

You use this button to change the setting of “NO” (= default = PVG is not to be deleted) to “YES” (= PVG is to be deleted). This enables a PVG to be deleted which has already been made known to the system with “Distribute and Activate”.

To permit this function to be used a few conditions must be met:

- The PVG concerned may not be linked to any LVG.
- No PVs may be contained in the PVG.
- The PLM must be running.

If one of these conditions is not satisfied the request to delete the PVG is rejected with a corresponding error message.

These conditions are checked twice, once when you click on “OK” in this window and once when “Distribute and Activate” is used. In both cases the action is rejected if appropriate.

The BASE PVG cannot be removed.

Name

Name of the PVG. The data of the PVG is kept under this name in CentricStor. The PVG is defined by entering a name. The name contains a maximum of 6 characters (only letters, numbers and “_”). This field can only be modified until the PVG has been activated using “Distribute and Activate”. As the name change is implemented by means of a restart there is no assignment of <old name> <-> <new name> and the data saved under the old name would no longer be accessible.

In principle the name is freely selectable. However, to prevent confusion with a clean PVG the name should not begin with “CLNP”.

Comment

Freely selectable text, up to 50 characters long. The following special characters are not permitted: ' , : $ " { } .

Tape Library
: The volumes of the group are stored in this physical archive. The archives defined in the configuration are offered. This field can be changed only until the PVG has been activated using “Distribute and Activate”.

Type
: Type of the PVG. A PVG can be of the type “STACKED” or “VAULT”. STACKED means that no external influence on the PVs is possible. VAULT means that logical deletion or reentry of PVs in CentricStor is possible.

  The default settting is “STACKED”.

Write Watermark (GB)
Write Watermark 2 (Jobs)
: These two parameters control the number of drives used for the write jobs.

  Write Watermark: Maximum write data volume per drive (5-digit)
  Write Watermark 2: Maximum number of write jobs per drive

  Explanation

  The drive assignment is determined by the maximum ascertained from Watermark and Watermark 2.

  The number of drives used for save requests is defined by the PLM according to the following formula:

  n = int (1 + max (Write_data_volume/WriteWatermark,
  Number_of_write_jobs/WriteWatermark_2))

  n = 0 if no write jobs are present.

  Only LVs with a current size of less than 10 GB are used for the calculation. Because of the anticipated backup time, LVs with a size of more than 10 GB always require a separate drive.

  Write Watermark value range: min: 5, max: 99999, default: 10

PLM Time Slice (sec)
: Time in seconds for which a PDS remains assigned to a PV group. After this time has elapsed an active job is terminated and the drive may be unloaded if required. Depending on the load situation it is then assigned to another PVG.

  The value must be >= 600 seconds.

  Assignment of the physical drives to the PVGs can be controlled by different sized time slices.

  Value range: min: 600, max: 99999, default: 600

Reorganisation Parameters

PLM Refresh Interval (Days)
: Number of days after which this group's volumes are to be refreshed. This value must be defined in accordance with the tape manufacturer's recommendations.

  Value range: min: 90, max: 999, default: 365

Absolute Minimum (Volumes)
: Absolute minimum number of free volumes. When this minimum is reached all resources are used with priority for reorganization. The following hierarchy applies: Soft Minimum > Hard Minimum > Absolute Minimum.

Hard Minimum (Volumes)
: If the number of free volumes specified here is not reached, a reorganization run is started regardless of the time.

Soft Minimum (Volumes)
: If the number of free volumes specified here is not reached, reorganization takes place in the specified reorganization time.

Fill Grade (%)
: During reorganization volumes are recorded in which the share of the capacity occupied by valid volume images falls below the specified percentage.

Time Frame
: Time in which reorganization runs should usually take place. Times with a low productive load should be chosen here.

Parallel Request Number (Jobs)
: When a PV is reorganized, a movement request for each LV of this PV is sent to the VLM.
  The parameter defines the number of such movement requests which can be processed in parallel. It is the same as the number of parallel movement requests for the corresponding PV group as at most one PV of a PV group can be reorganized at the same time.
  It must be pointed out that disc space in the TVC will be allocated for this number of LVs. If the parameter selected is too high, other LVs may be unnecessarily displaced from the TVC.

  Range: min: 2; max: 99; default: 5

Move Cancel Time (sec)
: If a move request issued by the PLM to the VLM remains in an unchanged status beyond this time (in seconds) it is canceled by the PLM. This does not apply for moves started by an operator command.

  Value range: min: 1800, max: 99999, default: 1800

Write Throughput (MB/sec)
Write Overhead (sec)

The PLM uses the Write Throughput and Write Overhead parameters to select the physical volume which it can release in the shortest time in the event of a reorganization. Write Throughput specifies the estimated write performance of the write drive in MB/sec, Write Overhead the estimated overhead in seconds per volume to be written.The values proposed should be changed only by an expert who is fully aware of the effects of the settings.

Command buttons along the lower border

OK

Accepts the entry. It becomes effective with “Distribute and Activate”. The “Configuration Changed” symbol (floppy disk symbol) appears in the GXCC main window.

The changed configuration data is stored, even after GXCC has terminated. If the InfoBroker is restarted or the VLP is shut down without a preceding “Distribute and Activate”, the data which was changed is lost.

Cancel

Closes the window without accepting the entries. All the entries made since the last time the window was opened are thus lost.

Reset

All data is reset to the status when the window was opened, even if this concerns list entries which are currently not selected. All the changes made since the last time the window was opened are thus lost.

Help

Opens a text window containing help information.

Creating a new physical volume group

A new PVG is created by clicking on the NEW button. In the PVG list an empty line is opened and highlighted. All editing fields except for “Name” and “Comment” are filled with default values.

The physical volume group is set up by entering a name in the text field provided. In addition, the location must be selected from the “Tape Library” drop-down menu.

In each CentricStor the PVG “BASE” is permanently specified.

If you do not want to use the default values, you must specify the group’s other parameters.

The physical volume group thus generated is empty. You must incorporate the envisaged number of volumes in the archive and log it on in the PLM (see “Administration” ➟ “Physical Volume Operations” ➟ “Add Physical Volumes”).

You must plan the addition of physical volume groups carefully.

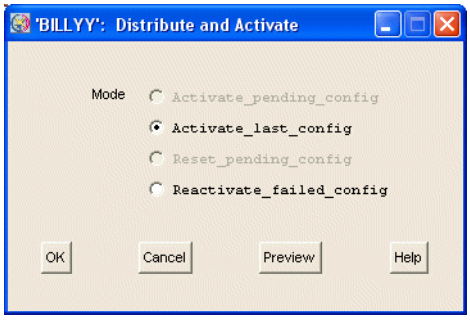
Important information

- The name of a PVG cannot be subsequently changed. If you want to change a name you can only delete a PVG and then create a new PVG with a different name.
- The tape libraries and the PLSs in which the PVG is located can neither be deleted nor can their names be changed.
- A PVG can be removed immediately using the Delete button before a “Distribute and Activate” operation. It is also possible to change names and assign another library.

6.2.7.4 Distribute and Activate

Then Distribute and Activate function is normally called after a change has been made to the configuration.

The changed configuration files are distributed to all the CentricStor processors. The software licenses in the VLP are distributed as required.



Options for “Mode”

Activate_pending_config
: This setting is always selected by default. It causes the current configuration changes to be distributed and activated. After this function has been executed, the identifier for configuration changes (diskette icon) is deleted.

Activate_last_config
: When this option is selected, the current configuration is stored, and then the last configuration is distributed and activated. If this function is then selected once more, you return to the starting point which existed before the first time *Activate_last_config* was selected.

Reset_pending_config
: This selection causes the configuration data which has not yet been activated to be discarded. After this function has been executed, the identifier for configuration changes (diskette icon) is deleted.

Reactivate_failed_config
: This option causes the configuration to be activated without it being distributed. Activation without distribution is permitted only for ISPs which are marked by an error flag. In the case of ISPs without an error flag, this action is an empty command. The purpose of reactivation is to provide the option of rebooting after the original error situation on the ISP concerned has been cleared.

Buttons

OK
: If the configuration data is correct, a security query is displayed. When you acknowledge this, “Distribute and Activate” is executed. The new configuration data is distributed to all ISPs. Depending on the type of change CentricStor processes are stopped and restarted. The connection to the InfoBroker is retained. If the configuration of the FC boards of an ISP has been changed, this ISP is rebooted.

Cancel
: Closes the message window. “Distribute and Activate” is not executed.

Preview
: If a configuration change which has not yet been distributed in the system exists when this function is called (displayed by the diskette icon at the top right in the GXCC), the difference between the configuration which has not yet been distributed and the current configuration (vtls.conf) is output. If there is no change, the difference between the current configuration (vtls.conf) and the last configuration (vtls.conf.bak) is always output.

Only the changes in the configuration are output via the preview function, not the action delta. This means that other processes may well be started in the event of *Distribute and Activate* although they in no way result in any change to the configuration and are not displayed via *Preview*. This is always the case when processes were not running before or during *Distribute and Activate* (because they had been stopped).

Help
: Opens a text window containing help information.

Functions triggered by “OK”

Because of the restart the configuration data in all ISPs is set up in accordance with the new status and evaluated by the individual processors. The software licenses present in the VLP are distributed to all ISPs. Thus the key disks need only be installed in the VLP. The license for 64 virtual devices/ISP is needed for configuration. If you do not want to install the key in the ICPs you can initially only integrate 32 devices and then configure further devices after the first “Distribute and Activate” operation.

This concludes the configuration change. The floppy disk symbol in the main window is now no longer visible and there is no longer an item marked in the Configuration menu.

After contact is reestablished with CentricStor, the configuration must be checked, in particular to ascertain that all the components have started up again. If this is not the case, the log files have to be checked for messages. These messages ought to indicate errors in the configuration file. The errors must be corrected.

Notes on naming the configuration files

The active configuration files `/usr/apc/conf/vtls.conf` and `/usr/apc/conf/vtls_vg.conf` are renamed in all ISPs of the CentricStor to `/usr/apc/conf/vtls.conf.yyyymmddhhiiss` and `/usr/apc/conf/vtls_vg.conf.yyyymmddhhiiss` (`yyyymmdd` = YearMonthDay, `hhiiss` = HourMinuteSecond).

The working files `/usr/apc/broker/vtls.conf.new` and `/usr/apc/broker/vtls_vg.conf.new` are transferred to the active configuration files `/usr/apc/conf/vtls.conf` and `/usr/apc/conf/vtls_vg.conf` and distributed to all ISPs of CentricStor.

6.2.8 Profile

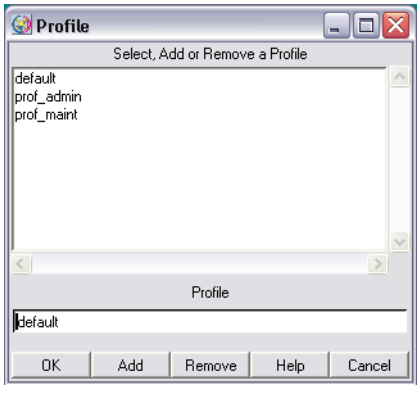
The term “profile” encompasses the following:

– the settings chosen under “Options”
– the settings chosen under “Autoscan”
– the window size and position as set using the graphical user interface

The screen size can be predefined as a start parameter (-size). All other options are set to their default values by GXCC on startup.

6.2.8.1 Add/Select Profile

The “Add/Select Profile” function is provided under “Profile”, and opens the following dialog box:



A profile file can be selected at startup with the `-profile <filename>` option or by choosing this menu command. If no profile file was selected explicitly, GXCC runs under the control of the default file.

The name of the active profile file is shown at the bottom margin of the GXCC window.

The upper part of the window contains a list of available profile files. Click a file to select it. The name of this file is then copied to the editing area. It is also possible to enter a new name or change an existing name in the editing area.
If the special characters / \ [ ] " ' $ * : ? < > | are used, they are replaced by underscores “_”.

Each user can access all GXCC profile files.

Buttons at the bottom of the screen section

OK

Applies the selected profile file. The display is immediately adapted to the new profile settings. The newly selected file is shown at the bottom of the GXCC screen. All changes to the profile data for the current session are recorded in this file.

Add

The file name specified in the editing field is added to the list and is also displayed at the bottom of the GXCC screen. From now on, profile data is saved to this file.

Remove

The selected file is removed.

The profile file currently active cannot be deleted. The following message then appears: “Actual profile cannot be deleted”.

Help

A text window is opened with help information.

Cancel

Closes the window without saving any changes made.

If you wish to save special settings, the following procedure is recommended:

- Start GXCC with the usual profile file.
- Define a name for the new file and activate it with “Add”.
- Define the special settings using the “Options” and “Autoscan” functions. These settings are automatically stored in the new file.
- If you wish to return to the “normal” settings, you simply activate them by selecting the “default” profile file and clicking “OK”.

If GXCC is started with the `-profile <filename>` option, the settings saved under this name are effective from the very beginning. However, if the command line arguments -aspect, -autoscan, -lang, -size were specified at startup, these are given priority over the values already stored.

Each time the main menu functions

- “Unit-Select”,
- “File-Select”,
- “File-Exit” and
- “Profile-Select”

are called, a system-specific backup of the option settings currently used takes place implicitly.

6.2.9 Administration

The following functions are offered:

- Show WWN's
- Show Optional Functions
- Show CS Configuration
- Diagnostic Snapshots
- Logical Volume Operations [1]
- Physical Volume Operations [2]
- Setup for accounting mails

[1] If the VLM is not running, this menu item is displayed against a gray background and cannot be selected.

[2] If the PLM is not running, this menu item is displayed against a gray background and cannot be selected.

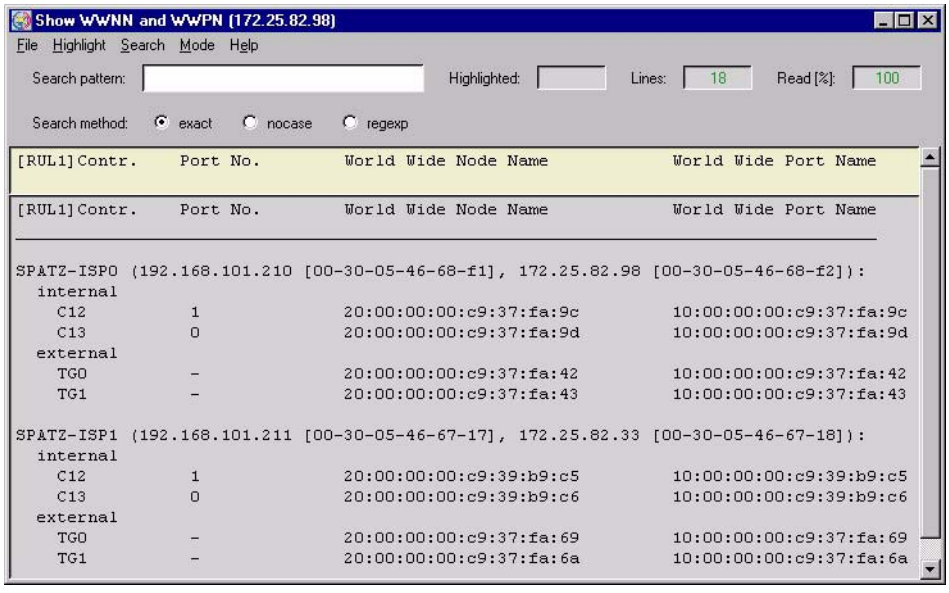
Depending on authorization and/or the version of the connected CentricStor system, individual menu items are not available. The table below shows which menu items are available in which mode:

	Service mode	User mode	Observe mode
Shutdown CS System	x		
Destroy RAID Filesystems	x		
Start/Stop CS Processes	x		
Commit SYS_MSG	x		
Show WWN's	x	x	x
Show Optional Functions	x	x	x
Show CS Configuration	x	x	x
Diagnostic Snapshots	x	x	
Create Snapshot(s)	x	x	
Show survey / Delete snapshots	x	x	
Modify threshold values	x	x	
Install CS System	x		
Save CS Configuration	x		
Reset CS Configuration	x		
Reread Licence Keys	x		
Logical Volume Operations	x	x	x
Show Logical Volumes	x	x	x
Show Logical Volumes (physical view)	x	x	x
Change Volume Group	x	x	
Add Logical Volumes	x	x	
Erase Logical Volumes	x	x	
Physical Volume Operations	x	x	x
Show Physical Volumes	x	x	x
Link/Unlink Volume Groups	x	x	
Add Physical Volumes	x	x	
Erase Physical Volumes	x	x	
Reorganize Physical Volumes	x	x	
Setup for Accounting Mails	x	x	x

6.2.9.1 Show WWN's

The following information is listed for all ISPs: the IP addresses, the World Wide Node Names, the World Wide Port Names and the connection number of the FC connections to the FC switches of all FC controllers.

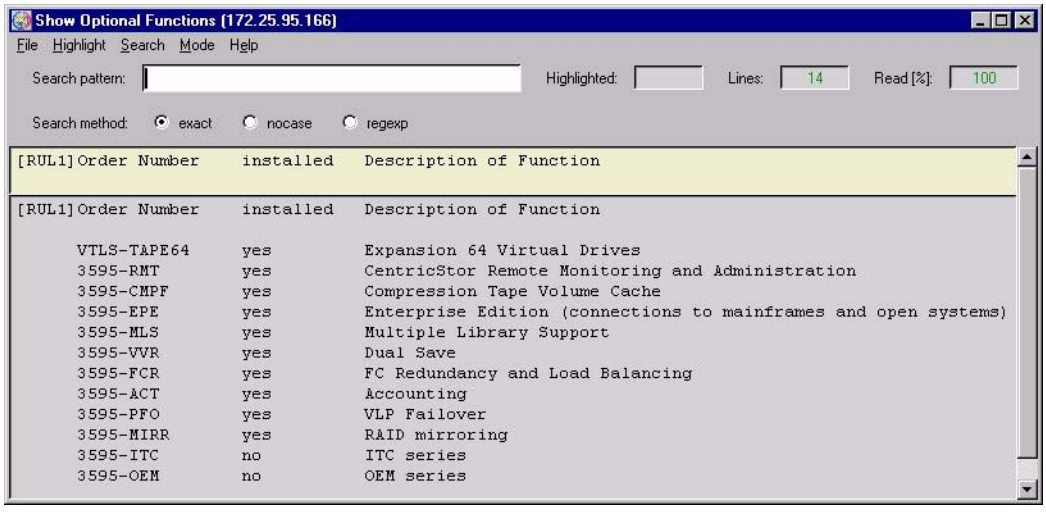
Example



6.2.9.2 Show Optional Functions

The optional functions (licenses which must be released using a key) are listed in a text window with a note indicating whether or not they are licensed and installed in this system.

Example

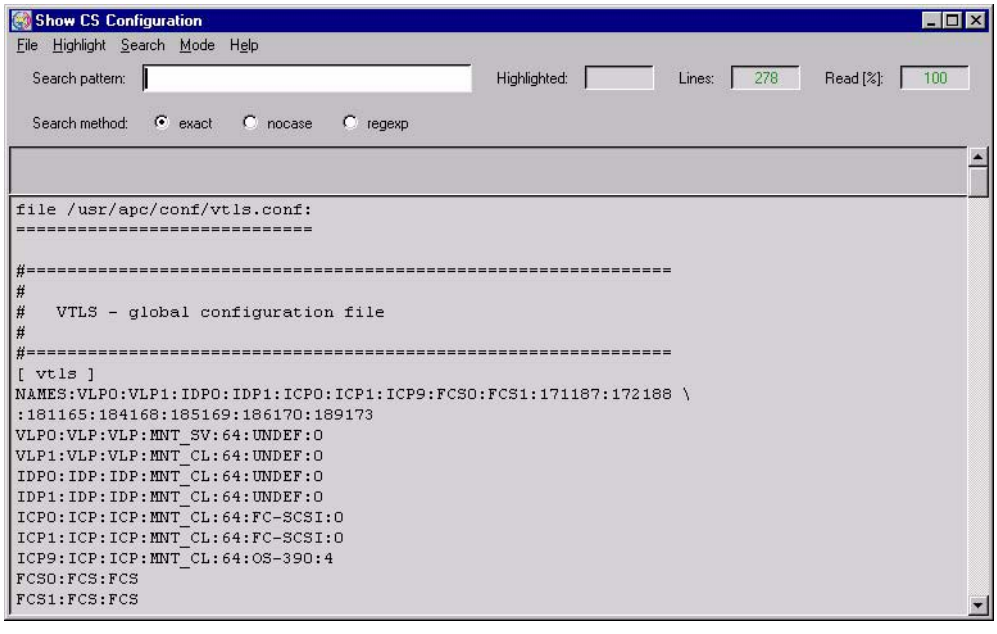


Subsequent installation of individual keys is performed under SINIX-2000-Z using SYSADM.

6.2.9.3 Show CS Configuration

This function outputs the contents of the configuration files `/usr/apc/conf/vtls.conf`, `/usr/apc/conf/vtls_vg.conf` and, if present, `/usr/apc/conf/vtls_add.conf`.

Example



6.2.9.4 Diagnostic Snapshots

This function is not offered in Observe mode.

This function performs a similar task to the *vtrc* script, but in contrast to vtrc permits selection of the ISPs on which the function is to be performed.

A “Diagnostic Snapshot” is a collection of diagnostic data which the system stores in the following situations:

– When the “Diagnostic Snapshots / Create Snapshot(s)” function is called
– Automatically when certain error situations occur

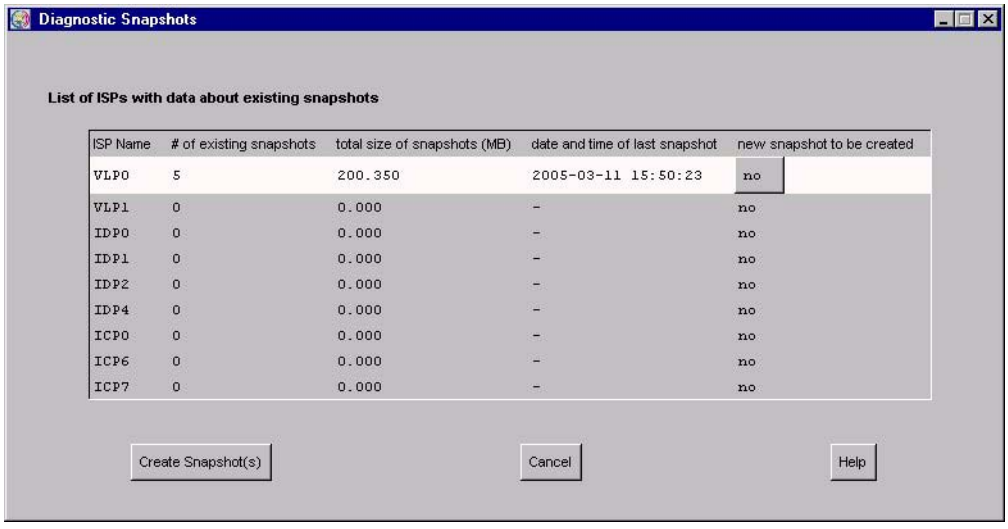
Each Diagnostic Snapshot contains data only of the ISP on which it was generated. The system selects the files which are to be saved.

Submenus:

– Create snapshot(s)
– Show survey / Delete snapshots
– Modify threshold values

Create snapshot(s)

When you select this function, the “Diagnostic Snapshots” window is output which contains an overview of all ISPs in the system and the Diagnostic Snapshots there:



The columns contain the following information:

ISP Name	Names of the ISPs
# of existing snapshots	Number of snapshots which already exist on this ISP
total size of snapshots (MB)	Total memory space in MB occupied by the snapshots saved on the ISP
date and time of last snapshot	Date and time of the last snapshot on the ISP
new snapshot to be created	The user can select “yes” or “no” to decide whether or not a Diagnostic Snapshot should be generated and saved on this ISP.

“Create Snapshot(s)” button:

If you have switched the “new snapshot to be created” option to “yes” (default: “no”) on the ISPs concerned and then press the “Create Snapshot(s)” button, the snapshots are generated and saved on the selected ISPs. The system acknowledges the user input with an information window containing a list of the selected ISPs and the name of the directory in which the snapshot files are saved. If you press “Create Snapshot(s)” without marking one or more ISPs beforehand, the message “saving snapshot on 0 hosts: nothing to do” is issued.

The snapshot files are compressed before they are saved.

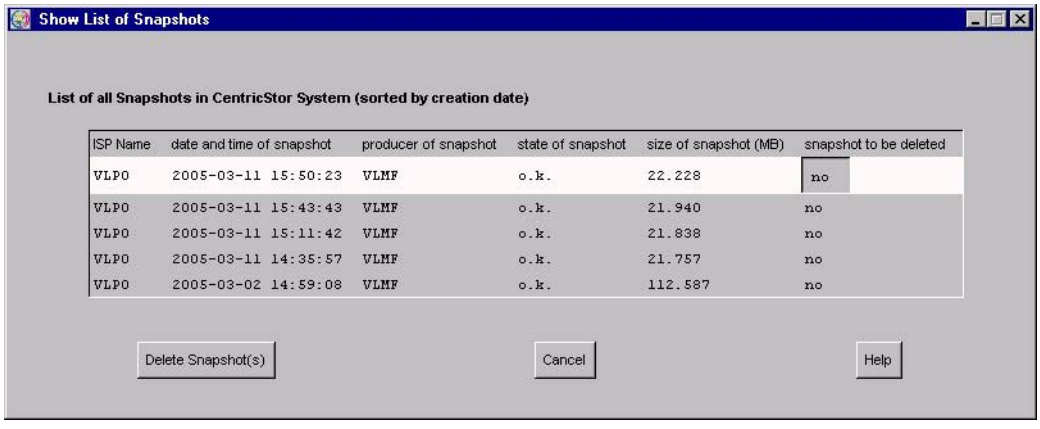
Depending on the size and number of files to be save, it can take several seconds to save them.

If you call the “Create snapshot(s)” function before a preceding call has been fully processed, the text “snapshot in progress” appears in the second column and a dash ´-´ in columns 3 and 4 of the lines for the ISPs concerned in the table above to indicate that temporarily no meaningful values are available for these columns for the ISPs involved.

If in the event of a “Create Snapshot(s)” call snapshots are saved on multiple ISPs, the directory involved has the same name on all ISPs. This enables snapshots which were generated with a “Create Snapshot(s)” call to be identifed easily.

Show survey / Delete snapshots

This function outputs the “Show List of Snapshots” window:



The window contains a list of all snapshots in the system. The most recent snapshot is contained at the top of the list, the oldest at the bottom.

The columns contain the following information:

ISP Name
: Name of the ISP on which the snapshot is saved

date and time of snapshot
: Date and time of snapshot generation

producer of snapshot
: Producer of the snapshot

  If snapshot generation was initiated via the “Create snapshot(s)” window (see the preceding section), the producer of the “user” text is entered. If the snapshot was generated because an error has occurred, the name of the component on which the error occurred is shown here.

state of snapshot
: Status of the snapshot:

  o.k. The snapshot could be output in full.

  empty No snapshot could be saved as storing the snapshot would cause the amount of free memory to drop below the configurable minimum (see the next section for details).

size of snapshot (MB)
: Size of the snapshot in megabytes.

snapshot to be deleted
: Here you can specify whether (“yes”) or not (“no” = default) you wish to delete the snapshot.

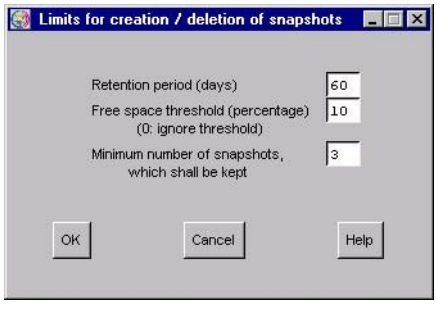
“Delete Snapshot(s)” button:

Clicking on this button causes all snapshots which are marked with “yes” to be deleted. The system acknowledges the user input with an information window containing the information ”snapshot(s) will be deleted”. If you press “Delete Snapshot(s)” without marking one or more ISPs beforehand, the message “no snapshots selected for deletion or deletion failed” is issued.

Modify threshold values

The snapshots may require a large amount of memory, and as they can also be generated automatically mechanisms have been implemented which are designed to prevent a memory overflow being caused by the writing of snapshots. These mechanisms use threshold values which you can adapt to your requiremetns using the “Modify threshold values” function. Each of the defined values appies for the entire CentricStor system.

When the function is called, the “Limits for creation / deletion of snapshots” window is opened:



Meaning of the individual fields:

Retention period (days)

Snapshots which are older than the number of days specified are deleted automatically.

Free space threshold (percentage)

This field shows the percentage of free memory which must not be fallen below when snapshots are saved.

– If storing a snapshot would cause the percentage to drop below the value entered, no snapshot is saved. However, a snapshot directory is created which is assigned the status “empty” (see the preceding section “Show survey / Delete Snapshot(s)”).

– A routine which runs periodically checks whether the free memory in the file systems in which the snapshots are saved has fallen below the specified value. If this is the case, the oldest snapshots are deleted: either until enough free memory is available again in the file system or until only the number of snapshots defined in the field “Minimum number of snapshots, which shall be kept” (see below) are present.

A “Free space threshold” value of 0 is ignored.

Minimum number of snapshots, which shall be kept:

This field is used to define the minimum number of snapshots which are to be retained when the periodic check of the memory space detects that the percentage has fallen below the threshold value specified for free memory in the field “Free space threshold” and snapshots are therefore deleted.

6.2.9.5 Logical Volume Operations

This submenu offers the following operations:

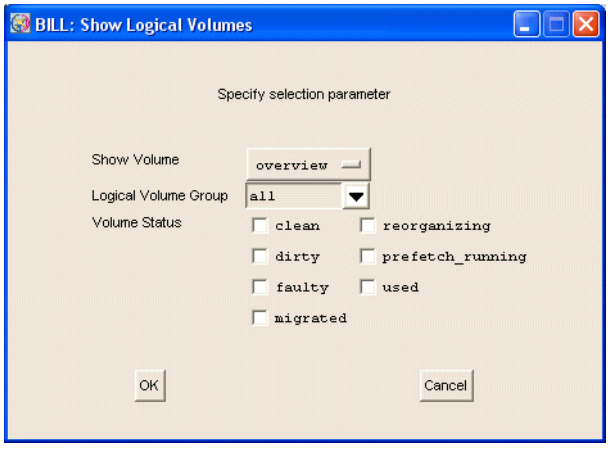
– Show Logical Volumes
– Show Logical Volumes (physical view)
– Change Volume Group
– Add Logical Volumes
– Erase Logical Volumes

These menu items are offered only if the VLM is running.

6.2.9.6 Logical Volume Operations » Show Logical Volumes

As a CentricStor can contain up to 500 000 logical volumes selection tools are offered.

A menu containing a large number of filter functions for selecting logical volumes is opened:



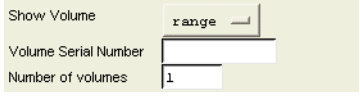
If you use the settings in the screenshot above and click on OK, a list of all logical volumes is output which match the selected filters. In large CentricStor configurations (up to 500 000 volumes) this places a significant load on the system and should only be done in exceptional cases.

Show Volume

The following display types can be selected here:

overview
This setting outputs an overview of the LVs (see example on page 204).

range
With this display type, the LV range to be displayed which is determined by the first LV and the number of LVs must be selected (see example on page 206). When this setting is selected, further input fields are displayed:



Volume Serial Number

The first volume to be displayed is specified with this entry.

Number of volumes

This value specifies how many volumes from the sorted volume list are to be displayed.

Logical Volume Group
: You can select either a logical volume group or “all”.

Volume Status
: With the checkboxes you can specify that only volumes with the selected status are to be displayed.

  If no checkbox is selected all the selected volumes of the specified volume group(s) are displayed.

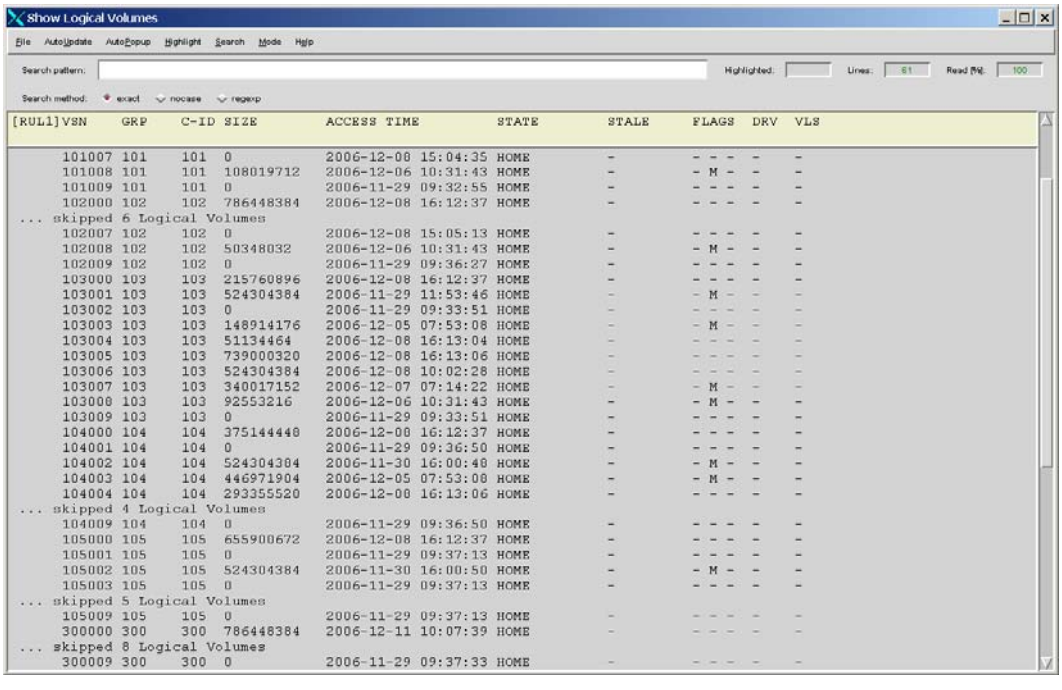
A message box is used to indicate whether a volume set selected in this way is empty. After you have acknowledged with “OK” you can start a new selection.

OK/Refresh — After you have clicked on “OK”, a new window with the required data opens. The OK button is changed to a Refresh button. If you now make a change in the “Show logical Volumes” form and click on “Refresh”, the output screen is updated with the new settings.

Cancel — The *Show Logical Volumes* function is terminated.

Example 1

Output window when *overview* is set:



[RUL1]VSN	GRP	C-ID	SIZE	ACCESS TIME	STATE	STALE	FLAGS	DRV	VLS
101007	101	101	0	2006-12-08 15:04:35	HOME	-	- - -	-	-
101008	101	101	108019712	2006-12-06 10:31:43	HOME	-	- M -	-	-
101009	101	101	0	2006-11-29 09:32:55	HOME	-	- - -	-	-
102000	102	102	786448384	2006-12-08 16:12:37	HOME	-	- - -	-	-
... skipped 6 Logical Volumes									
102007	102	102	0	2006-12-08 15:05:13	HOME	-	- - -	-	-
102008	102	102	50348032	2006-12-06 10:31:43	HOME	-	- M -	-	-
102009	102	102	0	2006-11-29 09:36:27	HOME	-	- - -	-	-
103000	103	103	215760896	2006-12-08 16:12:37	HOME	-	- - -	-	-
103001	103	103	524304384	2006-11-29 11:53:46	HOME	-	- M -	-	-
103002	103	103	0	2006-11-29 09:33:51	HOME	-	- - -	-	-
103003	103	103	148914176	2006-12-05 07:53:08	HOME	-	- M -	-	-
103004	103	103	51134464	2006-12-08 16:13:04	HOME	-	- - -	-	-
103005	103	103	739000320	2006-12-08 16:13:06	HOME	-	- - -	-	-
103006	103	103	524304384	2006-12-08 10:02:28	HOME	-	- - -	-	-
103007	103	103	340017152	2006-12-07 07:14:22	HOME	-	- M -	-	-
103008	103	103	92553216	2006-12-06 10:31:43	HOME	-	- M -	-	-
103009	103	103	0	2006-11-29 09:33:51	HOME	-	- - -	-	-
104000	104	104	375144448	2006-12-08 16:12:37	HOME	-	- - -	-	-
104001	104	104	0	2006-11-29 09:36:50	HOME	-	- - -	-	-
104002	104	104	524304384	2006-11-30 16:00:48	HOME	-	- M -	-	-
104003	104	104	446971904	2006-12-05 07:53:08	HOME	-	- M -	-	-
104004	104	104	293355520	2006-12-08 16:13:06	HOME	-	- - -	-	-
... skipped 4 Logical Volumes									
104009	104	104	0	2006-11-29 09:36:50	HOME	-	- - -	-	-
105000	105	105	655900672	2006-12-08 16:12:37	HOME	-	- - -	-	-
105001	105	105	0	2006-11-29 09:37:13	HOME	-	- - -	-	-
105002	105	105	524304384	2006-11-30 16:00:50	HOME	-	- M -	-	-
105003	105	105	0	2006-11-29 09:37:13	HOME	-	- - -	-	-
... skipped 5 Logical Volumes									
105009	105	105	0	2006-11-29 09:37:13	HOME	-	- - -	-	-
300000	300	300	786448384	2006-12-11 10:07:39	HOME	-	- - -	-	-
... skipped 8 Logical Volumes									
300009	300	300	0	2006-11-29 09:37:33	HOME	-	- - -	-	-

The following data is output:

VSN	Volume serial number, name of the logical volume.
GRP	Logical volume group. A cartridge migrated from CentricStor Version 1 belongs to the BASE group.
C-ID	Cache ID (this column appears only when “CacheID” has been enabled)
SIZE	Amount of user data on the volume (decimal, in bytes).
ACCESS TIME	Date and time of the last access, empty if uninitialized.
STATE	State of the logical volume:

Faulty	The logical volume is faulty. It can no longer be used.
Home	The logical volume is currently not being used.
Mounted	The logical volume has been inserted in a logical drive.
Mount Pending	The logical volume has just been inserted in a virtual tape drive. There is still no confirmation for this.
Mnt. Queued	A mount request for the logical volume was queued by the VLM due to a lack of resources.
Restoring	The logical volume is just being read in by the physical volume.

STALE	Volumes which are being restored as a result of a canceled mount request:

R “restoring”:	Volume is being restored

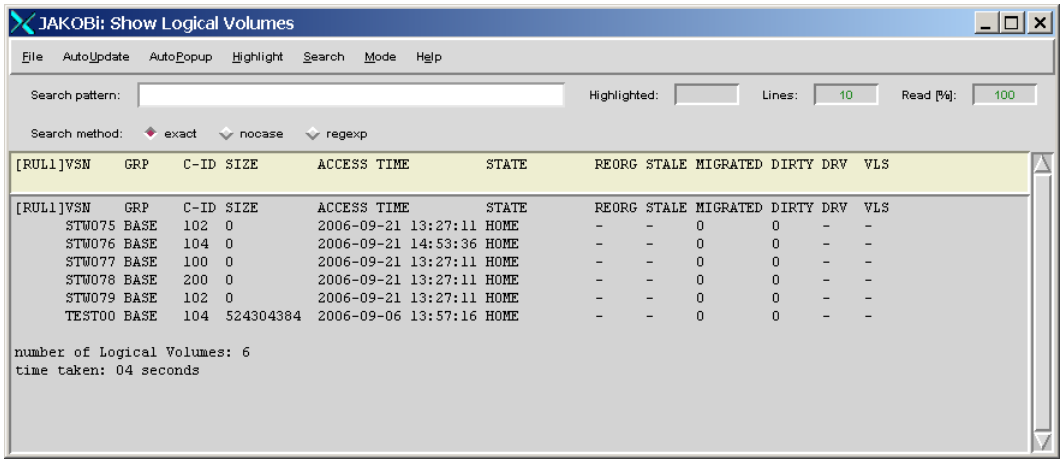
FLAGS	Flags:

D “dirty”:	The volume is located in the cache but has not been saved since the last change.
M “migrated”:	The volume is no longer located in the cache and must therefore be read in from the physical tape before it is next accessed.
Q “queued”:	Job was queued
R “restore”:	Volume is being restored
S “save”:	Volume is just being saved

DRV	Virtual drive if MOUNTED or IN_TRANSIT. If present, an alias name is also output.
VLS	Virtual library service to which the LV is assigned.

Example 2

Output window when *range* is set (Volume serial number: *STW075*; Number of volumes: *6*):



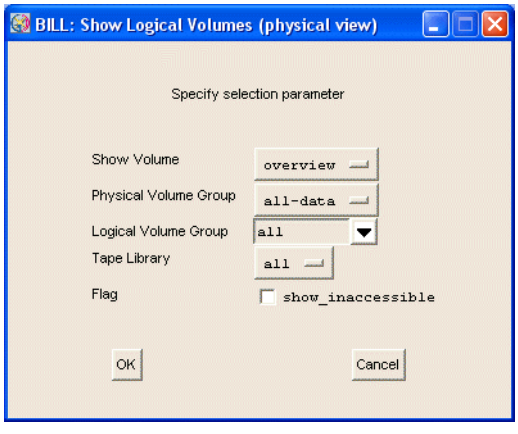
The meaning of the columns is explained in example 1.

6.2.9.7 Logical Volume Operations » Show Logical Volumes (physical view)

You use this call to display the logical volumes which are known to the PLM together with their statuses.

You obtain statistcs on the logical volumes by calling the function of the same name for “logical view”.

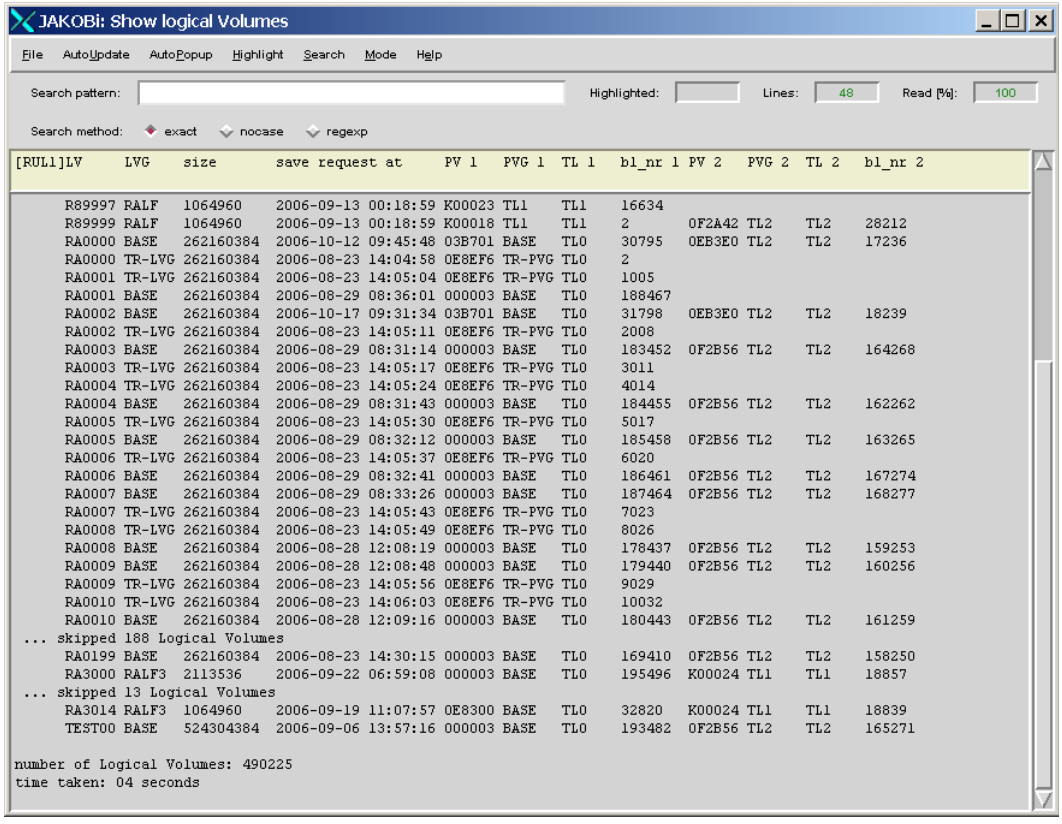
In contrast to the VLM call the PLM call does not permit the use of wildcards, allowing instead filtering according to PVG, LVG and tape library.



This statistics function supports the refresh function. Information on this function and the “OK” and “Cancel” buttons is provided on page 267.

If you only want logical volumes which cannot be accessed to be displayed, you must activate the “show_inaccessible” button.

The logical volumes are displayed in the following window:



PLM-specific data of the LVs is output:

LV	Name of the LV
LVG	Name of the LV group
size	Size of the LV
save request at	Save date and time: The save request for the LV was accepted by the PLM at this time.
PV 1	PV on which the current map of the LV is stored. This PV is located in the PVG which is specified in the *PVG 1* column.
PVG 1	PVG to which the LV is connected.
TL 1	Tape library in which the PV specified in the *PV 1* column is located.
bl_nr 1	Block in the PV which is specified in the *PV 1* column.
PV 2	PV on which the current map of the LV is stored a second time (Dual Save).
PVG 2	Second PVG to which the LV is connected (Dual Save).
TL 2	Tape library in which the PV specified in the *PV 2* column is located.
bl_nr 2	Block in the PV which is specified in the *PV 2* column.

6.2.9.8 Logical Volume Operations » Change Volume Group

This function is not available in Observe mode.

Changes the assignment of logical volumes to a logical volume group.

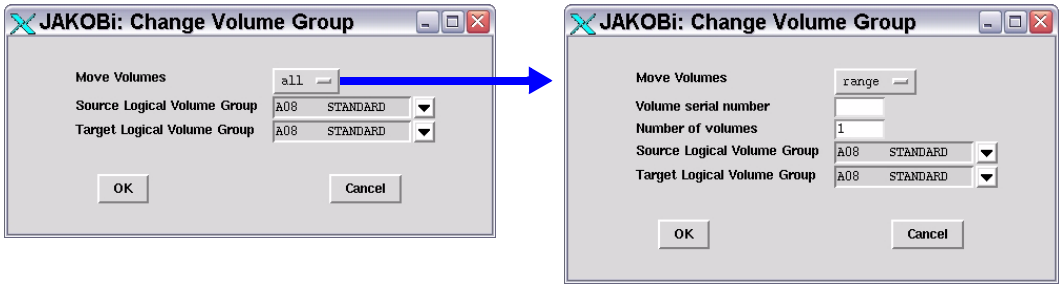
The data maintenance system of the VLM keeps a record for each logical volume, showing where it is currently stored and on which physical volume group(s) it is to be backed up, if necessary. The latter piece of information is contained implicitly in the name of the logical volume group to which the volume belongs. “Change Volume Group” only changes the entry of the logical volume group. The new assignment does not come into effect until a “Save” operation is performed on the volume, i.e. data on the volume is modified or the physical volume on which the newly assigned logical volume is currently located is reorganized.

If the newly assigned LVG uses the Dual Save function, this is not activated until the first “Save” operation.

Each LVG contains information on the maximum size (“Type”) of the logical volumes to be added (see the section “Logical Volume Groups” on page 173). Thus only LVs which are the same size as or smaller than the LV size for the target LVG defined with “Type” can be assigned to a target LVG.

Change of group affiliation can result in LVs being moved from one cache file system to another cache file system and possibly being set to “migrated”.

Initially, the left-hand window is offered:

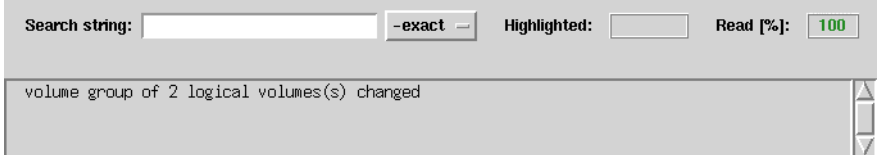


If you wish to move a complete LVG, enter the names of the source and the target LVG.

If only certain volumes are to be moved, select the first option, “range”, from the drop-down menu instead of “all”. This will open the window on the right, where you can enter the name of the first logical volume, the number of logical volumes in the name range (see the following section), plus both the old and the new volume group. The drop-down menus list all the logical groups defined in the system.

The “Number of Volumes” field a name range determined by “Volume Serial Number” and incrementing the numbers indicated to the right of the name. For example, Volume Serial Number “VABC07” and Number of Volumes “25” stand for the volume names VABC07,

VABC08,...,VABC031. If any volumes do not exist in the name range defined by the start name and number specifications, then this is indicated in a ready message and the operation is continued. Thus, in this example, the volumes VABC032 ff. would not be moved.



This acknowledgement only indicates that the data maintenance system in VLM has been modified accordingly. The storage location of each of the volumes is only changed the next time that a save is actually performed. The time can be shortened by issuing reorganization jobs for the physical volumes which have, until now, contained the images of the changed logical volumes. This can be carried out by issuing an explicit call (see “Physical Volume Operations » Reorganize Physical Volumes” on page 228) or by temporarily shortening the refresh time (this can only be done in Service mode).

At the latest after the refresh time has elapsed all logical volumes will have been moved.

You can follow the progress of the action using “Statistics » Physical Components » Reorganization Status” on page 291 or “Statistics » Logical Components »Logical Volumes (physical view)” on page 271. Productive operation continues normally except for the increased load caused by additional copy operations. Access to the moved volumes is also possible at any time.

You can use the same procedure to move data inventories to other libraries and to other media.

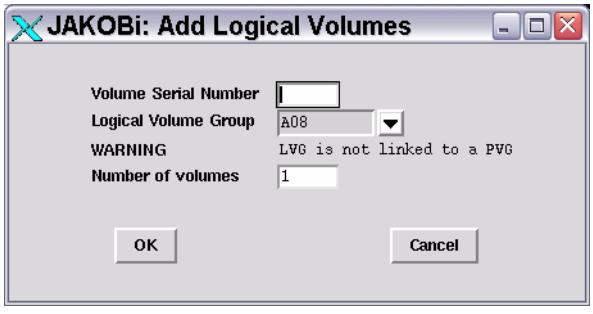
Buttons along the bottom border

OK
: The process for changing the group affiliation of the volumes is started.

Cancel
: The window is closed without any further activity.

6.2.9.9 Logical Volume Operations » Add Logical Volumes

This function is not available in Observe mode.



Input parameters

Enter the following information in the dialog window:

Volume Serial Number

Name of the logical volume (VSN or VOLSER). Any combination consisting of a maximum of 6 characters. The following are permitted:

- Alphabetic characters in upper case.
- The special characters #, $, @, _, %, +, - (the plus and minus characters may not be the first).
- Numbers: The end of the name must contain as many numbers as can be added in view of the value specified in <Number of Volumes>. For more information refer to the section “Logical Volume Operations » Change Volume Group” on page 209.

The volume serial number must be unique in the entire CentricStor network.

CAUTION!
Depending on the system fonts selected, the letter “O” may be extremely difficult to distinguish from the digit “0” when LV names are displayed on the graphical user interface. It is consequently advisable not to use the letter “O” in LV names. This prevents confusion later.

Logical Volume Group

Here you specify the logical volume group to which the new volumes belong. The logical volume groups set up in the VLM are listed. The BASE group is always set up.

Number of Volumes

Name range of the volumes that are to be added. The Volume Serial Number specified in the first line must possess enough numbers at the end to ensure that, starting from the entered name, the number selected in the “Number of Volumes” selection field can be reached.

Example

VXYZ21 results in an error message if Number of Volumes > 78.

If an existing logical volume is to be replaced by an empty volume of the same name, it must first be deleted (see next section) and then added again.

The assignment of logical volume group to one or two physical volume group(s) is described in the section “Physical Volume Operations » Link/Unlink Volume Groups” on page 221.

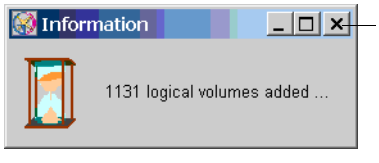
Buttons along the bottom border

OK	The add operation is started.
Cancel	The window is closed without any further activity.

Actions linked with “OK”

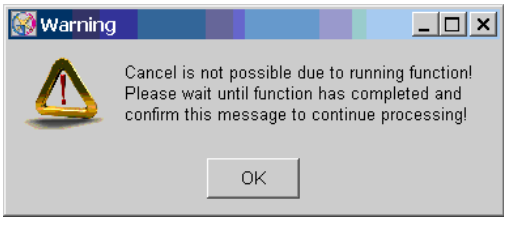
If logical volumes already exist in the range defined by means of the start VSN and number of volumes, these remain unchanged. However, they are taken into account in the number.

If a larger number of logical volumes are added, you will first see a message box in which the number of volumes already added is displayed:



It is not possible to abort the function. You must therefore wait until all the volumes have been added!

If you attempt to close the message box using the Cancel button, an additional message window with a warning is displayed:



After the function has been completed, a message box with an OK button appears:

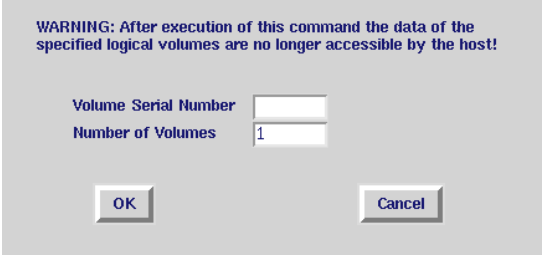
When you click “OK”, the entry form and the message box disappear.

6.2.9.10 Logical Volume Operations » Erase Logical Volumes

This function is not available in Observe mode.

This function enables logical volumes to be removed from the library and their contents to be deleted.

Make sure that the volumes to be erased have been released from the pool managed by the host(s).



The conventions described in the section “Logical Volume Operations » Add Logical Volumes” on page 211 apply for specifying the VSNs and number of volumes. Wildcards are not permitted in the entry. The volume group does not need to be specified because all volume names are unique throughout the entire CentricStor.

Buttons along the bottom border

OK
: The delete operation is started.

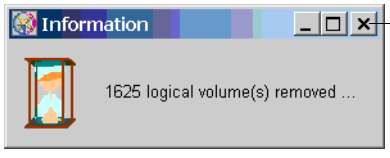
Cancel
: The window is closed without any further activity.

Actions linked with “OK”

The designated logical volumes are removed from the VLM data maintenance system. Images of the LVs on physical volumes are not deleted but merely marked as invalid.

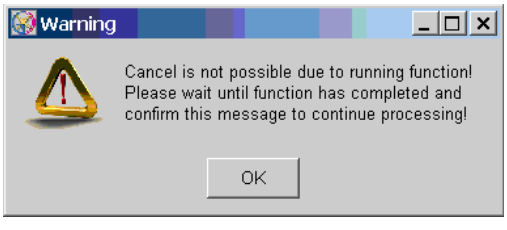
If some volumes are not contained in the specified name range, the delete operation is continued. The number of volumes actually deleted is specified in the completion message.

If a large number of logical volumes is to be deleted, a message box appears in which the number of volumes already deleted is displayed:

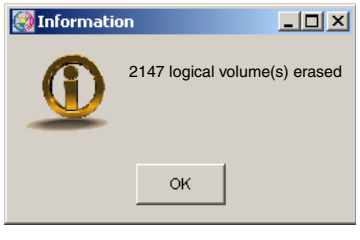


It is not possible to abort the function. You must therefore wait until all the volumes have been added!

If you attempt to close the message box using the Cancel button, an additional message window with a warning is displayed:



After the function has been completed, a message box with an OK button appears:



When you click “OK”, the message box and the entry form disappear.

It takes a long time to delete a large quantity of LVs.
Rule of thumb: One hour per 100000 LVs

6.2.9.11 Physical Volume Operations

This submenu offers the following functions:

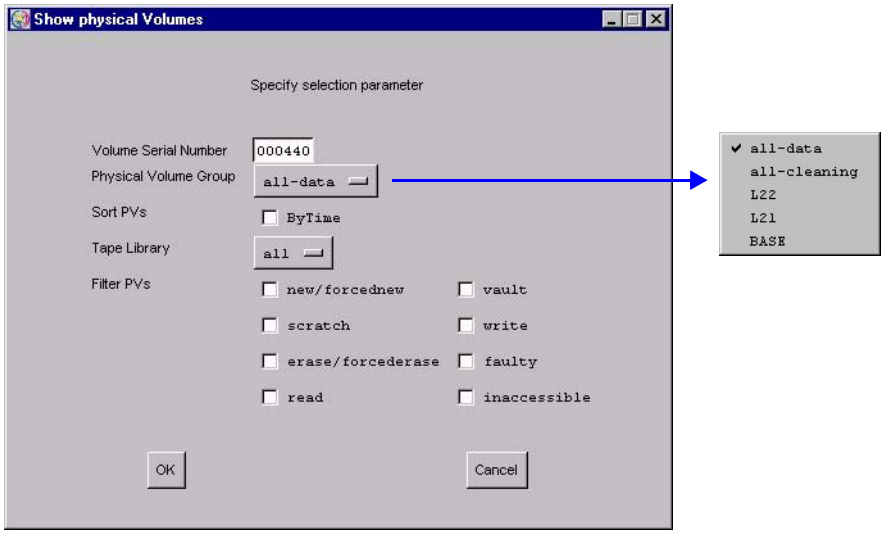
- Show Physical Volumes
- Link/Unlink Volume Groups
- Add Physical Volumes
- Erase Physical Volumes
- Reorganize Physical Volumes

These menu items are offered only if the PLM is running.

6.2.9.12 Physical Volume Operations » Show Physical Volumes

An identical function is offered in the Global Status under “Statistics” (see page 257).

An intermediate menu makes it possible to identify the physical volume or volumes:



You must specify the volume ID either in full or not at all. The drop-down menus for the specification of the volume group or library also contain the lines “all-data” and “all-cleaning”. If you specify “all”, this means that the group or library assignment is of no importance for the selection of the volumes that are to be displayed.

Therefore, you can choose to display:

- A specific physical volume (specify only the volume ID)
- All the volumes in a physical group (specify only the physical volume group)
- All the volumes in a library (specify only the library)
- All physical volumes (specify “all-data”)
- All cleaning volumes (specify “all-cleaning”)

You can also set certain criteria for the display:

new/forcednew	Volumes that have not yet been initialized. “forcednew” means that they have been added with the option “Omit Header Check”.
scratch	Empty volumes
erase/forcederase	The volume has been deleted. “forcederase” means that a volume that contains user data has been removed using the “ReorganizeFirst” option, but that the reorganization process has not yet been completed.
read	Read volume, completely written volume
vault	Exported volumes
write	Write volume, can still be used to migrate logical volumes.
faulty	Faulty volume, if this is a cleaning cartridge this signifies that the number of possible cleaning cycles has been exhausted.
inaccessible	Volumes which cannot be accessed

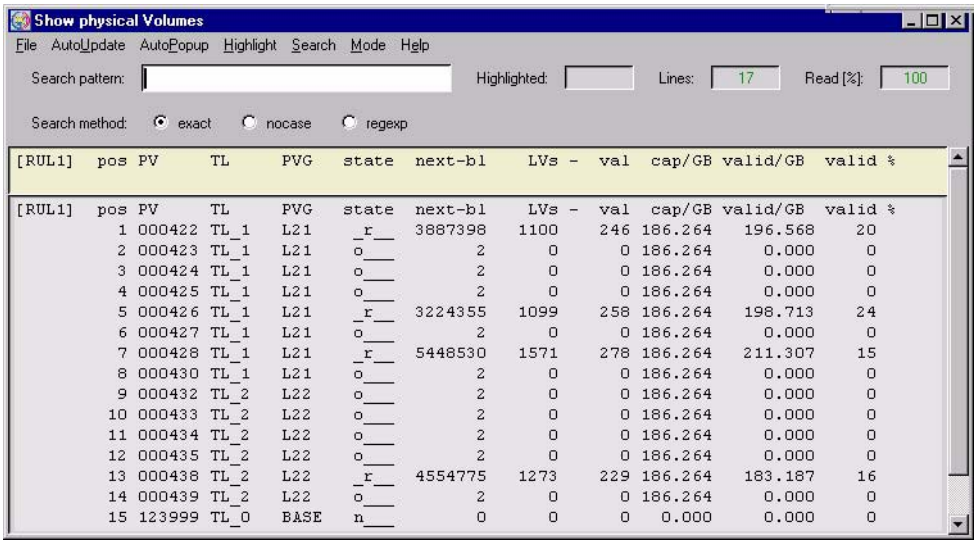
If you select the “ByTime” button, the list of physical volumes will be sorted according to the age of their oldest write entry. The PLM keeps track of these times in order to be able to trigger refresh copy processes, if necessary.

The specification of a volume number is optional. However, if you do decide to enter a specification then this must be precise (wildcards such as ?, *, etc. are not permitted).

After you have clicked on “OK”, a new window with the required data opens. The OK button is changed to a Refresh button. If you now make a change in the “Show physical Volumes” form and click on “Refresh”, the output screen is updated with the new settings.

When you click on “Cancel”, both windows are closed.

If the query relates to multiple volumes, the following overview is displayed:



[RUL1]	pos	PV	TL	PVG	state	next-bl	LVs -	val	cap/GB	valid/GB	valid %
[RUL1]	pos	PV	TL	PVG	state	next-bl	LVs -	val	cap/GB	valid/GB	valid %
	1	000422	TL_1	L21	_r__	3887398	1100	246	186.264	196.568	20
	2	000423	TL_1	L21	o___	2	0	0	186.264	0.000	0
	3	000424	TL_1	L21	o___	2	0	0	186.264	0.000	0
	4	000425	TL_1	L21	o___	2	0	0	186.264	0.000	0
	5	000426	TL_1	L21	_r__	3224355	1099	258	186.264	198.713	24
	6	000427	TL_1	L21	o___	2	0	0	186.264	0.000	0
	7	000428	TL_1	L21	_r__	5448530	1571	278	186.264	211.307	15
	8	000430	TL_1	L21	o___	2	0	0	186.264	0.000	0
	9	000432	TL_2	L22	o___	2	0	0	186.264	0.000	0
	10	000433	TL_2	L22	o___	2	0	0	186.264	0.000	0
	11	000434	TL_2	L22	o___	2	0	0	186.264	0.000	0
	12	000435	TL_2	L22	o___	2	0	0	186.264	0.000	0
	13	000438	TL_2	L22	_r__	4554775	1273	229	186.264	183.187	16
	14	000439	TL_2	L22	o___	2	0	0	186.264	0.000	0
	15	123999	TL_0	BASE	n___	0	0	0	0.000	0.000	0

Meaning of the information

pos Line number

PV Number of the physical volume

When the number is prefixed with a plus or minus sign:
+ = LVs written but not yet securely on the PV
− = LVs invalidated but new version not yet securely on the PV

TL Tape Library: Name of the archive

PVG Name of the physical volume group

state Status; possible values:

- e___ Volume ready for invalidation
- E___ The PV is reorganized and then invalidated
- f___ An error occurred while working with this tape: it is not reused and automatically reorganized
- f_d_ A tape fault has occurred (PV is faulty) but an attempt is still made to write the directory onto the tape
- i___ Inaccessible: the physical volume cannot currently be accessed
- n___ New volume: the PV still has to be initialized before it can be used
- N___ New volume; the PV was added using the “OmitHeaderCheck” option and must be initialized before it can be used
- o___ Initialized and empty

_r__ Read volume on which no space is available for further data
_rd_ The cartridge is full but an attempt is still made to write the directory onto the tape
s___ The PV must be scanned (used for transfer).
_v__ Ejected in the case of vault groups
_w__ Write volume that can still be used for save operations
_wd_ The cartridge is not yet full; currently there is no directory on the tape
____ Unknown: status in the case of Transfer-In for a PV that must still be scanned

next-bl Block number of the free range. This indicates the physical utilization level.

LVs Number of saved logical volumes

val Number of valid saved logical volumes; copies of volumes not included here are no longer relevant

cap/GB
Gross capacity without data compression. This is not specified for volumes prior to initialization (State = new).

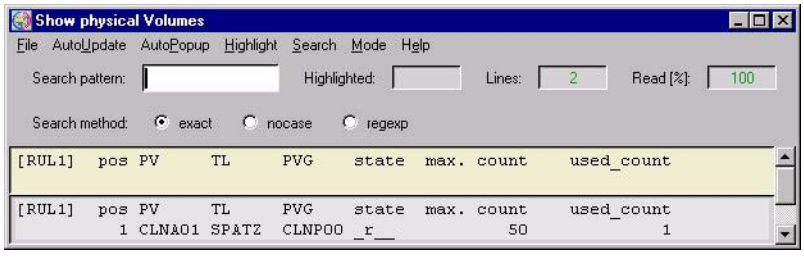
This value is only indicated if supplied by the drive. Otherwise, the value 0 is displayed.

valid/GB
Used capacity; volume of data actually stored. Due to data compression, this value may exceed the total capacity (previous column).

This only takes into consideration the data compression of the drive. The data compression of the device emulations can be displayed in “Global Status” along with the cache data. In many cases, the compression indicated by PLM is lower if the cache data has already been compressed.

valid %
Utilization; specifies the percentage of the stored data that is currently still relevant. This percentage determines whether the volume is to be included in the next reorganization.

If you have selected “all-cleaning”, you will see, for example, the following overview:

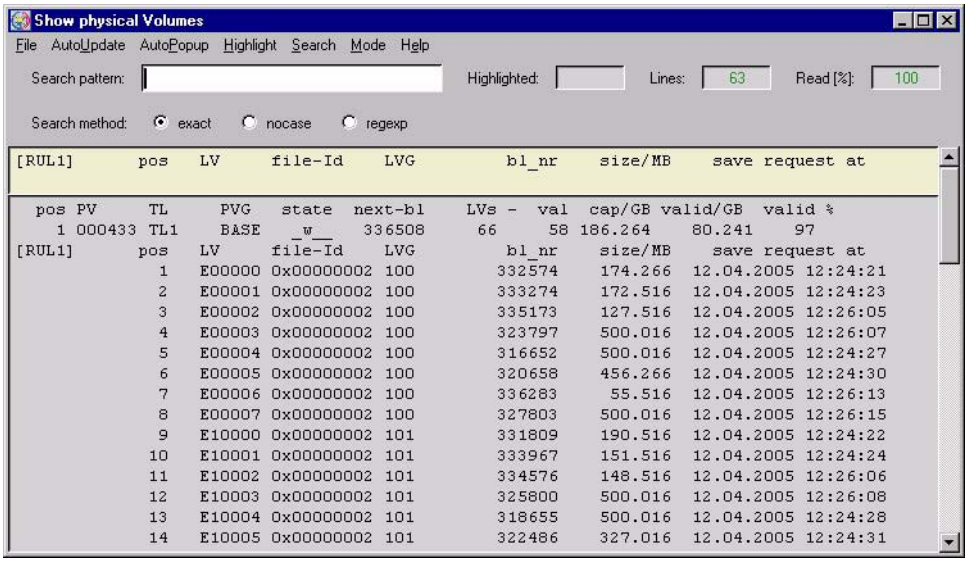


Meaning of the information:

pos Line number
PV Number of the physical volume
TL Name of the archive
PVG Name of the physical volume group, usually starts at “CLNP”.
state status
The following values are possible for cleaning cartridges:
o___ (“scratch”) when the volume has only just been added,
_r__ Read volume, has no more space for additional data. This is the normal state of a cleaning cartridge.
f___ (“faulty”) when all the cleaning cycles have been used up.
max. count
Initial number of cleaning cycles
used_count
Number of cleaning cycles used

The PLM uses the cleaning cartridges in such a way that one cartridge is used up fully before the next one is started. However, if a number of cleaning requests are to be carried out at the same time, the cartridges that are available will be used simultaneously.

When a specific physical volume is queried (volume number specified in the query box) a detailed overview is output:

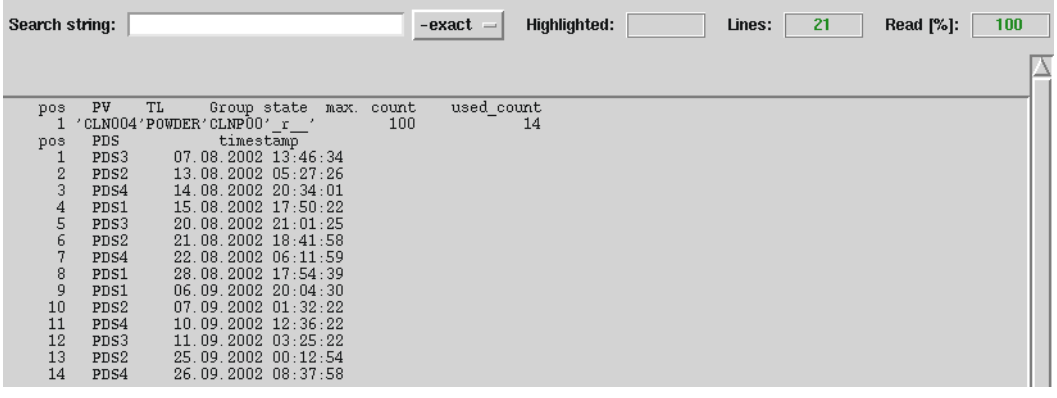


The data for the selected PV is output in the title bar.

This is followed by a list of the (valid) logical volumes stored on the PV:

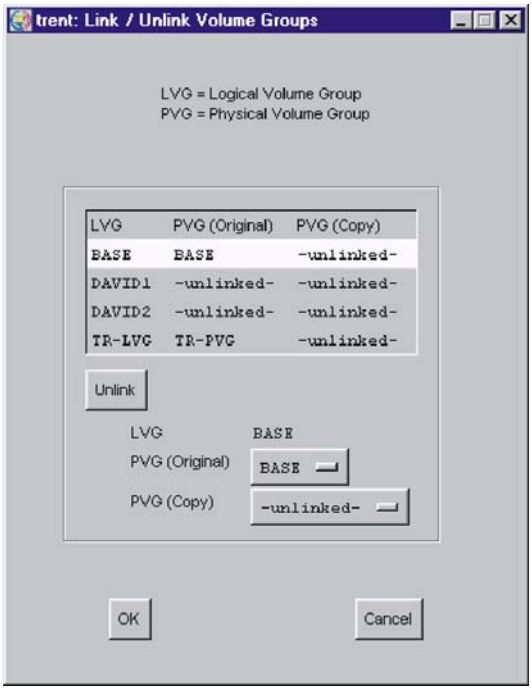
pos	Line number
LV	Name of the logical volume
file-Id	Hexadecimal: internal version number in the TVC
LVG	Name of the group to which the logical volume belongs
bl_nr	Number of the first block of the logical volume on the PV
size/MB	Size
save request at	Time at which the PLM received the save job. This timestamp allows the Disaster Recovery mechanism to identify which of the various different copies of a logical volume is the most recent.

The information for a cleaning cartridge contains a list showing all the cleaning runs carried out using this cartridge along with the time and PDS of each run:



6.2.9.13 Physical Volume Operations » Link/Unlink Volume Groups

This function is not available in Observe mode.



The assignments of LVG to one or two (with Dual Save) PVGs are established, resolved, or changed. The list in the upper screen section contains the logical volume groups.

LVG	Name of the LVG, as defined in the configuration.
PVG (Original)	Name of the originally assigned PVG, or “-unlinked-”. “-unlinked-” means that no PVG has been assigned yet.
PVG (Copy)	Name of the PVG for the backup copy, or “-unlinked-”. “-unlinked-” means that no PVG has been assigned yet.

Click a line to select the desired PVG. The line is highlighted and the entries for the PVG are copied to the “LVG” label and to the buttons.

Buttons

Unlink	All of the assignments of the LVG are deleted. Following Unlink, the list item of the LVG displays “-undefined-” for both PVGs.
PVG (Original)	Primary assignment of a PVG.
PVG (Copy)	Secondary assignment of a PVG. This button is only activated when the dual copy software licence is available.

Buttons along the bottom border

OK
: Link/Unlink is started.

Cancel
: The window is closed without any further activity.

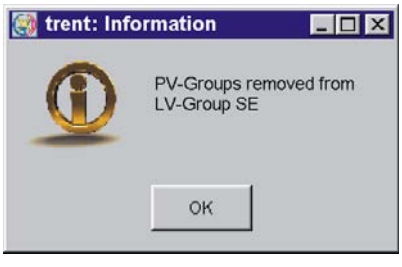
Actions linked with “OK”

1. Before the PVG is linked, the logical volume size is checked: If the LV size is > 2 GB, the capacity of the PVs already assigned must be twice as large as the LV size, otherwise the assignment is rejected with the following message:

   ```
   Attempting to link PVGs (<PVG1>,>PVG2>) to LVG (<LVG>): The capacity of
   the PVs of PVG <PVG1> is too small
   ```

2. The actions entered at the graphical interface are resolved in one or more commands to the PLM. A change in assignment leads to an “Unlink” followed by a “Link” with the new PVG name.

   The responses of the PLM, including any error messages, are displayed in an info box. This box lists the results of all PLM commands that were initiated with “OK”.



Please note:
- After pressing “OK”, wait for the info box with the acknowledgments. The action is not actually concluded until this box appears.
- Before logical volumes are linked again following an LVG Unlink, the LVG must be linked to a (different) PVG.

If the LVG-PVG assignment is to be changed in exceptional cases, you can proceed as follows:

1. Use the VLM command “Change Volume Group” to change the LVG association of all logical volumes of the LVG.
2. Assign the now emptied LVG to a different PVG.
3. Reestablish the original assignment by issuing further “Change Volume Group” commands.

Note for linking

If practically the same number of drives is configured for the robots in dual save, restores can be optimized through the following distribution and crossed-over PVG sequence:

Example of linking

LVG1 PVG1 PVG2
LVG2 PVG2 PVG1

Distribution to two LVGs with a crossed-over PVG sequence ensures that all drives are available for restores. The restore times can thus be considerably reduced (but not in all cases; e.g. multiple restores of one PV).

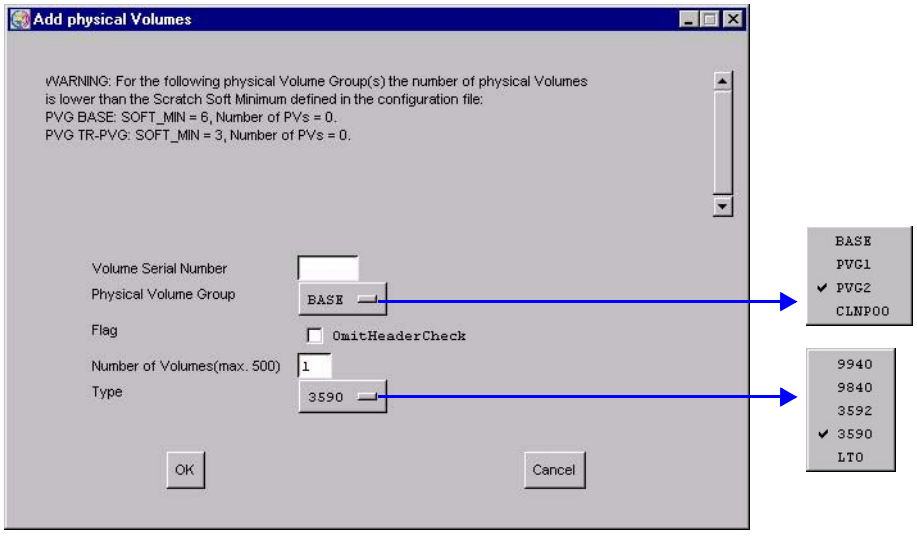
6.2.9.14 Physical Volume Operations » Add Physical Volumes

This function is not available in Observe mode.

The specified physical volumes are added to the selected physical volume group. If more than one volume is to be added, then the volume serial number of the next volume is generated by incrementing the final digit of the entered VSN. This means that a sufficient number of digits must be defined as digits at the end of the VSN. If insufficient digits are present then the entire job is rejected.

The volumes must previously have been introduced into the tape archive. For information on how to do this, refer to the instructions for the robot archive in question.

Window for entering physical volumes:



The form shows whether levels have dropped below the defined minimum numbers for a Volume Group. In the same way, a warning is output for cleaning cartridges when the number of cleaning cycles left drops below the defined minimum.

In order to add one or more new volumes, you must make the following specifications.

Volume Serial Number
: (First) number of the volume(s)

Physical Volume Group
: PVG to which the volume is to be assigned. To add cleaning cartridges you must select the appropriate cleaning PVG.

Type
: Volume type, as selected from the range offered by the drop-down menu.

  Note that in the case of a linked LVG with an LV size > 2 GB the PV must be correspondingly large (see below: “Actions linked with “OK”):

Drive	Possible volume capacities in GB
9940	60, 200
9840	20, 40
T10K	120, 500
3592	60, 300, 500
3590	10, 20, 30, 40, 60
LTO	100, 200, 400 (in preparation)

Number of Cleaning Cycles

Only applies to cleaning cartridges: the number of cleaning cycles still possible for the inserted cartridge (decimal value).

Flag “Omit Header Check”

Only applies to data cartridges: The header of an added volume is always overwritten with a CentricStor header without exception. This means that you can also add volumes that have been taken out of CentricStor but that have not been deleted using “Erase” (see the section “Physical Volume Operations » Erase Physical Volumes” on page 226).

CAUTION!
This flag should only be used under exceptional circumstances. If you use this flag and accidently specify the number of an active volume, the user data of this volume will be overwritten without exception.

Buttons along the bottom border

OK

The cartridges are checked (see below: “Actions linked with “OK”) and, in the event of a positive result, included in the PLM data maintenance system.

Cancel

The window is closed without any further activity.

Actions linked with “OK”

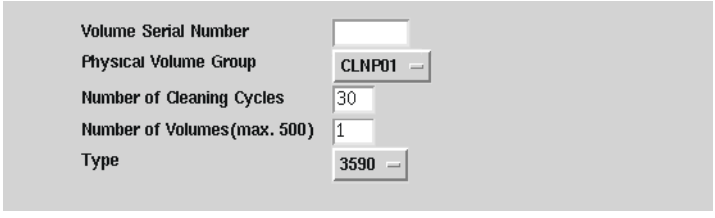
1. If the PVG is already assigned to an LVG and the LV size of this LVG is > 2 GB, the capacity of the new PV must be >= the defined LVG capacity. Here it must be borne in mind that a PVG can be assigned to multiple LVGs and that the largest LV size is used for the capacity check. If the PV capacity is lower, the assignment is rejected with the following message:

   ```
   PLM(#55): WARNING: Capacity of PV 0F3171 is too small for PVG RALF;
   PV-file will be removed!
   ```

2. A check is made to see whether the cartridge type (cleaning or data) is correct. The number of cleaning cycles cannot be verified for all cartridge types.

   As cleaning cartridges are consumables a suitable number of cleaning cycles should always be available in the libraries. When the soft limit is reached, 10 cleaning cycles are available per drive.

The PLM normally uses the cartridge with the fewest available cycles for cleaning to avoid shelves being occupied unnecessarily by partially used cartridges. An exception to this strategy is made only if multiple cleaning requests are handled simultaneously.

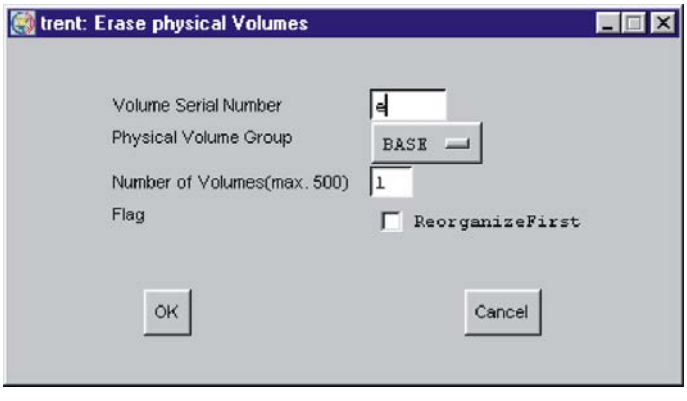


It can take some time to complete this job. Processing takes place asynchronously. After a while it is thus, for example, advisable to check in the “Global Status” to see whether the volumes have actually been included. Any errors are displayed using system messages (see the section “Show System Messages” on page 158).

6.2.9.15 Physical Volume Operations » Erase Physical Volumes

This function is not available in Observe mode.

The following window allows you to remove physical volumes from the PLM data maintenance system so that they are not be to used in the future.



The volume is identified by the name and physical volume group. Number specification is based on the usual CentricStor convention that you do not assign numbers but, instead, volume names which are formed by incrementing the right-hand digits of the specified start name. If volumes within this name space cannot be deleted, these volumes nevertheless “count”.

The “ReorganizeFirst” option controls the process if a volume that is to be deleted still contains valid data.

Option is not set:
If a volume contains valid data, an error message is output and the volume is not deleted.

Option is set:
A “Move” is carried out automatically for volumes containing valid data. The volume is then removed from the data maintenance system.

Buttons along the bottom border

OK
The specified volumes are removed from the PLM data maintenance system.

Cancel
The window is closed without any further activity.

Actions linked with “OK”

In the event on an Erase, the first record of the volume (tape header) is overwritten in such a way that the entire contents of the volume can no longer be accessed using CentricStor resources.

When removing the cleaning cartridges, the number of cleaning cycles that remain are modified if the cartridge has not been used completely.

You must make sure that the deletion of the volumes does not result in the number of empty volumes falling below the minimum level. If this occurs a warning will be output.

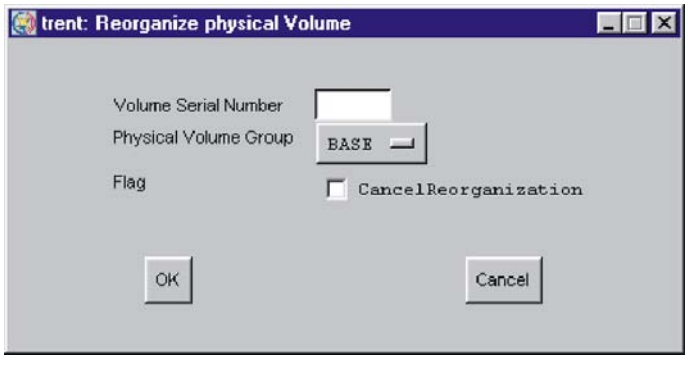
Before removing volumes from the archive physically, you must remove them logically from the PLM data maintenance system. This process can take some time since each volume must be loaded into a drive so that its tape header can be overwritten. If the “ReorganizeFirst” flag is set, you must also add the time required for reorganization. With “Show Physical Volumes” you can determine whether the action has been completed.

6.2.9.16 Physical Volume Operations » Reorganize Physical Volumes

This function is not available in Observe mode.

It allows you to manually copy the contents of a physical volume to one or more volumes in the same physical group or to interrupt such a reorganization.

After reorganization, the physical volume is empty. It is then usually available for subsequent writing by the PLM. However, it also possible to delete this empty physical volume (see the section “Logical Volume Operations » Erase Logical Volumes” on page 213).



You enter the group and name of the physical volume in the window. The complete name must be entered without wildcards.

If you have to stop an initiated reorganization run, you must also click the “Cancel Reorganization” button.

Unlike automatic reorganization, the copy operation is continued even if a non-skippable read error has occurred. Consequently this function can be used to retrieve the greatest possible amount of data from logical volumes on a damaged tape.

Buttons along the bottom border

OK
: After the name has been checked the reorganization run is included in the relevant queues or the reorganization of the specified volume is terminated.

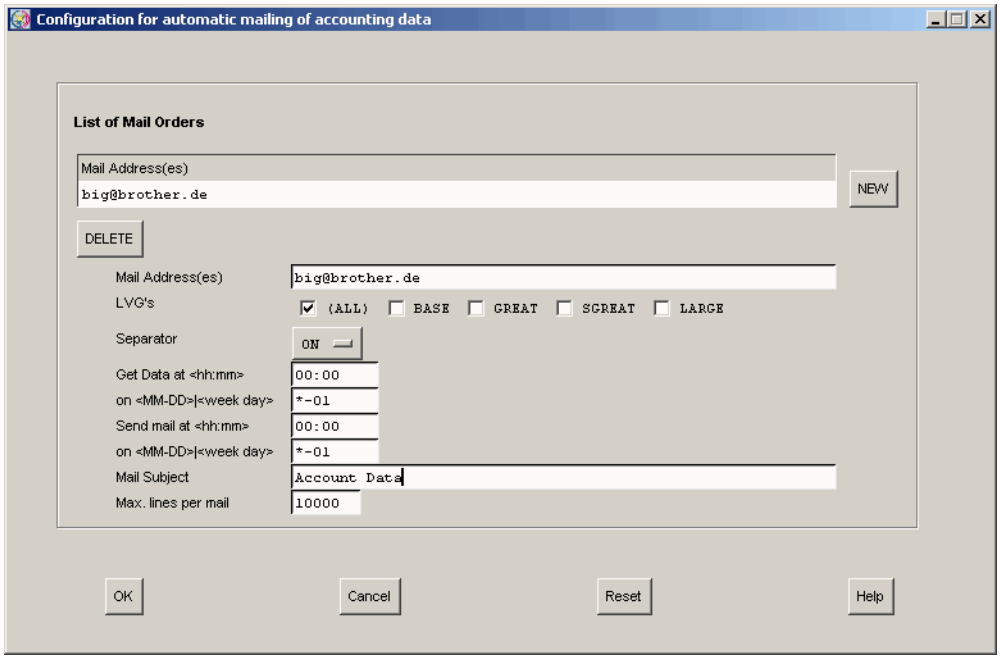
Cancel
: The window is closed without any further activity.

6.2.9.17 Setup for accounting mails

This function is displayed only if an accounting license is installed.

This menu permits orders to be configured which automatically send accounting data by e-mail.

CAUTION!
sendmail must have been configured for this function to be effective) (see section “Sendmail configuration” on page 558).



Displaying input options in the list area

List of Mail Orders:	All orders that have already been defined are displayed.
“NEW” button:	A new order can be defined.
“DELETE” button:	This function enables an order defined in the “List of Mail Orders” list field to be deleted.

Mail Address(es):

In this field the user can enter one or more e-mail addresses (separated by blanks and/ or commas) to which the accounting data is to be sent.

LVGs (Logical Volume Groups):

A number of radio buttons is displayed here which enable the user to define the LVGs for which accounting data is to be requested. The first button is labeled “(ALL)”. If this button is enabled, accounting data is requested for all LVGs known in the system. In this case all the other buttons are ignored. The “(ALL)” button is followed by a button each for every LVG known in the system. Any number of LVGs can be selected. However, selection of individual LVGs becomes effective only if the (default setting) of “(ALL)” enabled is reset.

Default: (ALL)

“Separator” drop-down list:

The “Separator” drop-down list enables the users to have accounting data sent to them in a format in which the individual fields are separated either by blanks (ON) or commas (OFF).

Default: ON

Get data at <hh:mm>:

This field is used to define the time (in hours and minutes) at which the accounting data is to be ascertained.

To enable accounting dara to be sent at the send time (Send mail at <hh:mm>), the CentricStor system must be *running* (e.g. no *Distribute and Activate* may be started at this time) at the time when the accounting data is ascertained (Get data at <hh:mm>).

Default: 00:00

on <MM-DD>|<week day>:

Here the user can define the day on which the accounting data is to be ascertained in the follow formats:

<MM-DD> Month (MM) and day (DD) can be specified as single- or two-digit decimal numbers. Alternately, specification with * meaning “wildcard” is also permitted. The specification *-* would thus result in the accounting data being ascertained on avery day of every month, while *-1 would cause the data to be ascertained on the first day of each month.

<week day> The following specifications (not case-sensitive) are permitted: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, or the abbreviations sun, mon, tue, wed, thu, fri and sat.

Default: *-1 (i.e.: first day of each month)

Send mail at <hh:mm>:
This field is used to define the time (in hours and minutes) at which the accounting data is to be sent by mail.

Default: 00:00

on <MM-DD>|<week day>:
Here the user can define the day on which the accounting data is to be sent by mail.

Format and default value: See above.

Mail subject:
Here you can enter the subject which is to be used when the mail lis sent. The system may supplement the subject specified here by the suffix “(part <i> of <j>)” (see “Max. lines per mail”), where <j> is the number of mails required to send the complete accounting data and <i> is a consecutive number (starting with 1).

Default: Account Data

Max. lines per mail:
This number is used to define the maximum size of a mail. If the accounting data comprises more than the number of lines specified here, the data is spread over more than one mail. If the individual mails do not arrive at the receiving end in the order in which they were sent, the recipient can reconstruct the original order of the mails using the suffix “(part <i> of <j>)” in the subject (see: “Mail subject”).

Default: 10000

Command buttons along the lower border

OK	Accepts the entries.
Cancel	Closes the window without accepting the entries. All the entries made since the last time the window was opened are thus lost.
Reset	All data is reset to the status when the window was opened. All the changes made since the last time the window was opened are thus lost.
Help	Opens a text window containing help information.

6.2.10 Help

The following entries can be selected in the “Help” menu:

- Readme / LIESMICH
- Direct Help / Direkthilfe
- System Messages
- About GXCC...
- Revision Summary
- Hardware Summary
- Online Manual
  CentricStor User Guide (in Observe or User mode) or Service Manual (in Service mode). This item appears only if a suitable manual is available in the language set.

6.2.10.1 Readme / LIESMICH

A text window containing the CentricStor Operating Manual (README) is opened. A detailed description of working with text windows is provided starting on page 360.

6.2.10.2 Direct Help / Direkthilfe

This function enables you to obtain a description of the direct help.

6.2.10.3 System Messages

The structure and content of the system messages window are explained. The menu items available in this messages window are also described.

6.2.10.4 About GXCC...

A copyright note and the current version of GXCC are displayed.

6.2.10.5 Revision Summary

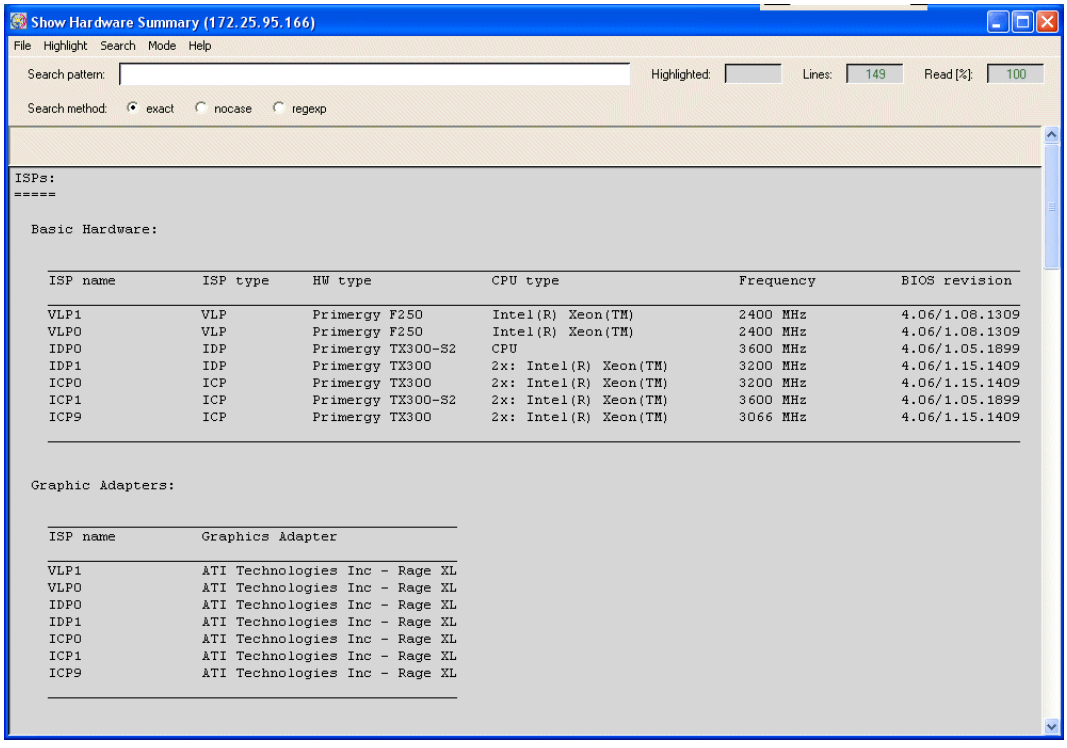
A text window with information on the installed software of all CentricStor ISPs is displayed:

```
[RUL1]   System Name     IP Number                    Revision (Production Date)

[RUL1]   System Name     IP Number                    Revision (Production Date)

         ICP0            192.168.101.10               V3.1D1000 (2006-07-05_12:08)
         ICP1            192.168.101.11               V3.1D1000 (2006-07-05_12:08)
         ICP2            ( N/A )                      V3.1D1000 (2006-07-05_12:08)
         IDP0            192.168.101.110              V3.1D1000 (2006-07-05_12:08)
         IDP1            192.168.101.111              V3.1D1000 (2006-07-05_12:08)
         VLP0            172.25.248.150               V3.1D1000-SP00 (2006-07-05_12:08)
         VLP1            192.168.101.211              V3.1D1000 (2006-07-05_12:08)
```

System Name	name of the ISP
IP Number	IP address
Revision	revision level of the software
Production Date	production date of the software

6.2.10.6 Hardware Summary

A window with information on the hardware components installed in the system is opened:



Information on the following hardware components is output:

- ISPs
  - Basic hardware
  - Graphic adapters
  - Internal RAID controllers
  - ESCON boards
  - FC boards
  - SCSI boards
  - Robots
- RAID systems
- FC switches

6.2.10.7 Online Manual

This function starts a PDF reader and the most up-to-date version of the manual which is available is displayed in the language set. If no manual is available in the language set this menu item is omitted. When GXCC connects with a CentricStor, any more up-to-date version of the manual which is present there is automatically transferred and enabled.

One of the menu items

– CentricStor Vm.n User Guide (complete)
– CentricStor Vm.n User Guide (GUI Part)

is displayed if

– GXCC is running in User or Observer mode and
– a PDF file is available which matches the CentricStor Version m.n and the selected language.

In User mode the local documentation is updated by GXCC when either a new connection is set up or the language is changed and a more recent version is found on the partner system. In this case a more recent “User Guide (GUI Part)” has priority over an older “User Guide (complete)”. The user is notified of the change by a message. In Observe mode this function is not available because of the absence of the password, and this is also the case in Simulation mode.

> When GXCC connects with an InfoBroker the latter checks whether it has more recent versions of the online manuals on its system. After transfer of a more recent software version the manuals are also transferred to the GXCC computer if required. Once the transfer has been completed successfully the new manuals are enabled automatically.

If new software is only activated with a delay (this only happens interactively, see the section “GXCC Update/Revert Tool” on page 159) the manual may temporarily be more up-to-date than the GXCC/XTCC software.

7 Global Status

7.1 General

The Global Status Monitor outputs all important operating data in graphical format, and allows you to display important system data over configurable periods.

There are several options for starting “Global Status”:

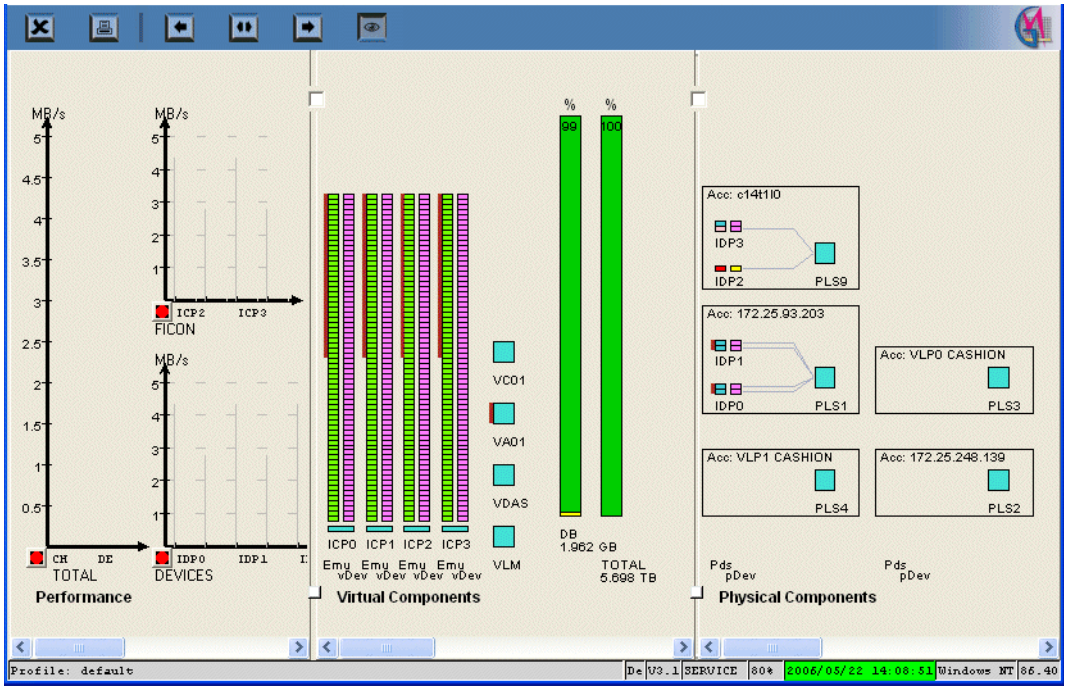
– using the optional start parameter `-globstat` parallel to GXCC
– using the corresponding button on the button bar of the GCXX window or
– using the function bar: Tools ➟ Global Status
– from the Root menu on the CentricStor console

The Global Status Monitor is independent of GXCC and must be terminated separately.

If there is no connection to an InfoBroker when Global Status starts up, a selection window appears. You proceed here as described in the section “Unit” on page 147. You can use it to select either the same CentricStor you are currently working with under GXCC or a different one. The same unit file is used as for the GXCC unit selection.

If you select the same CentricStor to which GXCC is connected, you can then terminate GXCC and restart it again with a mouse click (see section “Global eXtended Control Center” on page 242).

When “Global Status” is started, a window like the one shown below will be opened:



The figure above is just an example, it can be arranged as you wish.

Footer

The components are, from left to right:

Profile	Name of the profile file. A profile file can be selected with the `-profile` parameter at startup time or at any time via the function bar.
Language	Language selected: E (English), D (German)
CS Version	CentricStor version
Operating mode	The access rights with which the Global Status Monitor is currently running are displayed here: SERVICE Service mode USER User mode OBSERVE/OBSV Observe mode
Size	The imaging scale set with “Options Settings” (see the section “Settings” on page 150) is displayed.
Scan Time	Timestamp of the last data update
Platform	Operating system of the monitoring computer
Version	Version of the Global Status Monitor

7.2 Operation of the Global Status Monitor

CentricStor comes with a performance monitor, which constantly records and saves component operating data at intervals of a few seconds.

Your service staff can specify in which file system and for which time period the data is to be stored.

The Global Status Monitor analyzes the performance data and displays individual readings, either as they stand at present or their course over time.

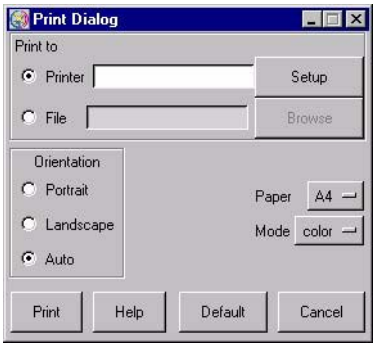
7.3 Function bar of the Global Status Monitor

7.3.1 File

7.3.1.1 Print

When Global Status is running under Windows, use of the print function button is recommended instead of this function (page 246). This opens the usual Windows print menu.

Opens a form for printing the display:



Setting options

Print to

– Printer
Output is to a PostScript printer.

After you click on the “Setup” button a window is displayed for entering the printer setup:

In this form you can make the printer default settings. After you click on the “Save” button the settings are transferred to the previous window.

– File
Output is to a file in PostScript format.

Orientation
You use “Orientation” to select “Portrait” format, “Landscape” format or “Auto” (automatic adjustment).

Paper
Here you can select “A4” or “letter”.

Mode

Setting options: “color” or “grayscale”.

Buttons along the lower border

Print	Printout takes place with the values set.
Help	A help text is output.
Default	Saves all current settings.
Cancel	The window is closed without the changes being accepted.

7.3.1.2 Exit

Exit terminates “Global Status”.

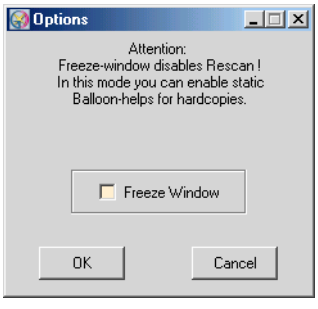
7.3.2 Config

"Config" allows you to control the appearance of the display.

When you click on "Save" in the "Config" menu the position of the GLOBSTAT window on the screen and the position of the subwindow in this window are stored and reused each time the "Global Status" is opened again. A separate data record is created for each monitored CentricStor.

"Reset" resets the screen settings to the values when the software was supplied.

Clicking on "Options" opens the window below:



If you activate the "Freeze Window" button and then click "OK", the display of "Global Status" has the following characteristics:

– Updating of the display is suppressed. This is shown by the red label "Frozen" across all three parts of the image.

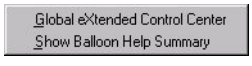
– You can left-click a field and make the associated Balloon Help permanently visible. Click the field again to make the Help disappear again.

– The screen division can be set in the usual manner. Permanent recording of operating data is not affected.

> **i** Some objects are symbolized using relatively small fields, which makes it more difficult to position the mouse. The mode described here is designed to be used to record certain operating statuses and to describe these using the Balloon Help fields for the purposes of training and documentation. Configuration information can be more easily obtained using “Tools” ➟ “Show Balloon Help Summary”.

If you deactivate “Freeze” using Config ➟ Options, the display is updated to show the current status and the Balloon Help fields and the “Frozen” label will disappear.

7.3.3 Tools



7.3.3.1 Global eXtended Control Center

This function is only offered when Global Status is started from GXCC and GXCC is then terminated. Global Status is an application that is independent of GXCC. Unlike XTCC, Global Status remains active when GXCC is terminated.

You use this function to start GXCC for the CentricStor system monitored by means of Global Status. GXCC is called in the same mode and with the same options as the GXCC from which Global Status was started.

7.3.3.2 Show Balloon Help Summary

If you position the mouse pointer over the corresponding icons, Global Status displays status information (“Balloon Help”). The display disappears if you click the left mouse button on a neutral area of the Global Status window.

> **i** All the data of the virtual devices and libraries you need to create configuration data in the BS2000/OSD, z/OS, OS/390 or open system hosts connected to CentricStor is summarized by the “Balloon Help Summary” in a text file.

Click the “Show Balloon Help Summary” menu command to output a text window with a snapshot of status information. The information relates to the “Physical Components” and “Virtual Components” areas of the Global Status window.

The window header shows the data and time of the snapshot.

The following data is listed:

`Emulations`

```
AZUR-ICP0:

  emu name       lib. device     virt. device    mounted volume   special state
                                                                  (emu./ dev.)
  ------------------------------------------------------------------------------
  10             10              L000
  11             11              L001
  12             12              L002
  13             13              L003
  14             14              L004
  15             15              L005
  16             16              L006            BS2222
  17             17              L007
  18             18              L008
  19             19              L009
  1A             1A              L00A            BS0032           running+trace
  1B             1B              L00B            BS0065           running+trace
  1C             1C              L00C
  1D             1D              L00D            BS0174
  1E             1E              L00E            BS0093
```

Arranged according to ICP:

emu/vid name	Number of the emulation (390 emulation) / LUN (FC SCSI device).
lib. device	Archive name/address of the device.
virtual device	System name of the virtual tape device.
mounted volume	VSN of a mounted volume; empty if no volume is mounted.
special state (emu/device)	Status of the emulation/device; in the example, two of the emulations are running with activated trace.

`virtual library processes`

```
virtual library processes:
--------------------------

  vlm process:
      member name: VLM      ; host: IDP0

  vls process(es):
      member name: VC01     ; host: IDP0            ; type: VACS
      member name: VA01     ; host: IDP0            ; type: VAMU
      member name: VDAS     ; host: IDP0
```

vlm process	Displays which ISP is running the VLM.
vls processes	vls processes name, ISP and type of the VLS with VJUK also: controller and LUN number via which the relevant VJUK is addressed.

`Physical Devices`

```
physical devices:
_________________

  AZUR-IDP0:

    pds name   scsi device   special state
                             (pds        / scsi dev.)
    ------------------------------------------------------------
    PDS1       c11t5l0                   / not loaded
    PDS2       c11t4l0
    PDS3       c10t3l0
    PDS4       c10t2l0
    PDS5       c9t1l0
    PDS6       c9t0l0                    / not loaded
```

Arranged according to IDP:

pds name	Name of the PDS.
scsi device	CTL (controller, target, LUN) of the device.
manufacturer	Self-explanatory
device type and model	Self-explanatory
prod. rev.	Firmware status
special state (pds/dev)	Status information of PDS/device.

`Physical Library Processes`

```
plm process:
    member name: PLM     ; host: AZUR-VLP0

pls process(es):
    member name: PLS4    ; host: AZUR-VLP0       ; type: STKCSC
    member name: PLS3    ; host: AZUR-VLP0       ; type: STKCSC
    member name: PLS2    ; host: AZUR-VLP0       ; type: STLACI
    member name: PLS7    ; host: AZUR-IDP3       ; type: SCSI
    member name: PLS8    ; host: AZUR-IDP1       ; type: SCSI
    member name: PLS9    ; host: AZUR-IDP0       ; type: SCSI
```

plm process	ISP running the PLM.
pls processes	Name of the PLS.
host	ISP running the PLS; in the case of SCSI PLS this is the ISP that controls the SCSI interface (here PLS7-PLS9), in the case of Cashion PLS the ISP to which the RS232C interface of the Cashion robot is connected.
type	Type of archive system.

Cache Data

```
cache data:
___________

  /cache/11       : uncompressed =     561.5_GB, compressed =     498.5_GB
                    ratio uncompressed : compressed = 1.1
  /cache/12       : uncompressed =     581.4_GB, compressed =     499.6_GB
                    ratio uncompressed : compressed = 1.1
  /cache/13       : uncompressed =     550.8_GB, compressed =     499.3_GB
                    ratio uncompressed : compressed = 1.1
  /cache/21       : uncompressed =     323.7_GB, compressed =     247.3_GB
                    ratio uncompressed : compressed = 1.3
  /cache/22       : uncompressed =     247.1_GB, compressed =     243.5_GB
                    ratio uncompressed : compressed = 1.0
  /cache/23       : uncompressed =     285.1_GB, compressed =     253.0_GB
                    ratio uncompressed : compressed = 1.1
  /cache/31       : uncompressed =     516.3_GB, compressed =     492.6_GB
                    ratio uncompressed : compressed = 1.0
  /cache/32       : uncompressed =     511.0_GB, compressed =     483.7_GB
                    ratio uncompressed : compressed = 1.0
  TOTAL           : uncompressed =       3.4_TB, compressed =       3.1_TB
                    ratio uncompressed : compressed = 1.1
```

The cache utilization data is displayed.

7.3.4 Statistics

The following menu options are available:

- History of (page 264)
- Logical Components (page 267)
- Physical Components (page 276)
- Usage (Accounting)[1] (page 293)

Both records of operating data (history) and the current operating mode (statistics) can be displayed and sorted according to various criteria. Statistical data can be displayed via menus in the function bar or directly via object-related menus.

A detailed desription is provided in the section “History data” on page 257.

7.3.5 Help

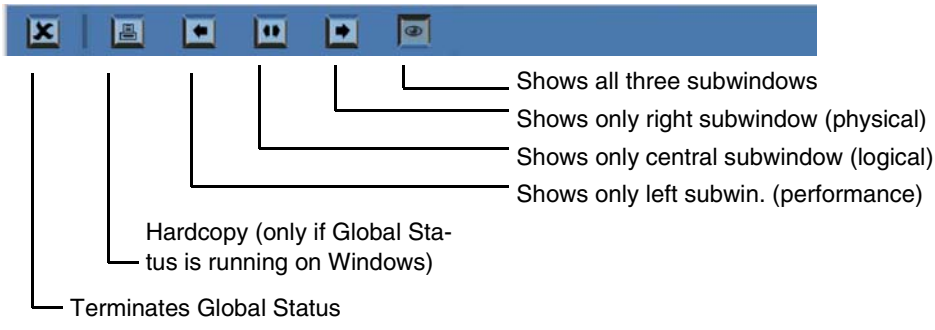
README / LIESMICH
: Shows a text window with help information.

About GLOBSTAT ...
: Shows a copyright note and the revision level of “Global Status”.

[1] This function is displayed only if an accounting licence is installed.

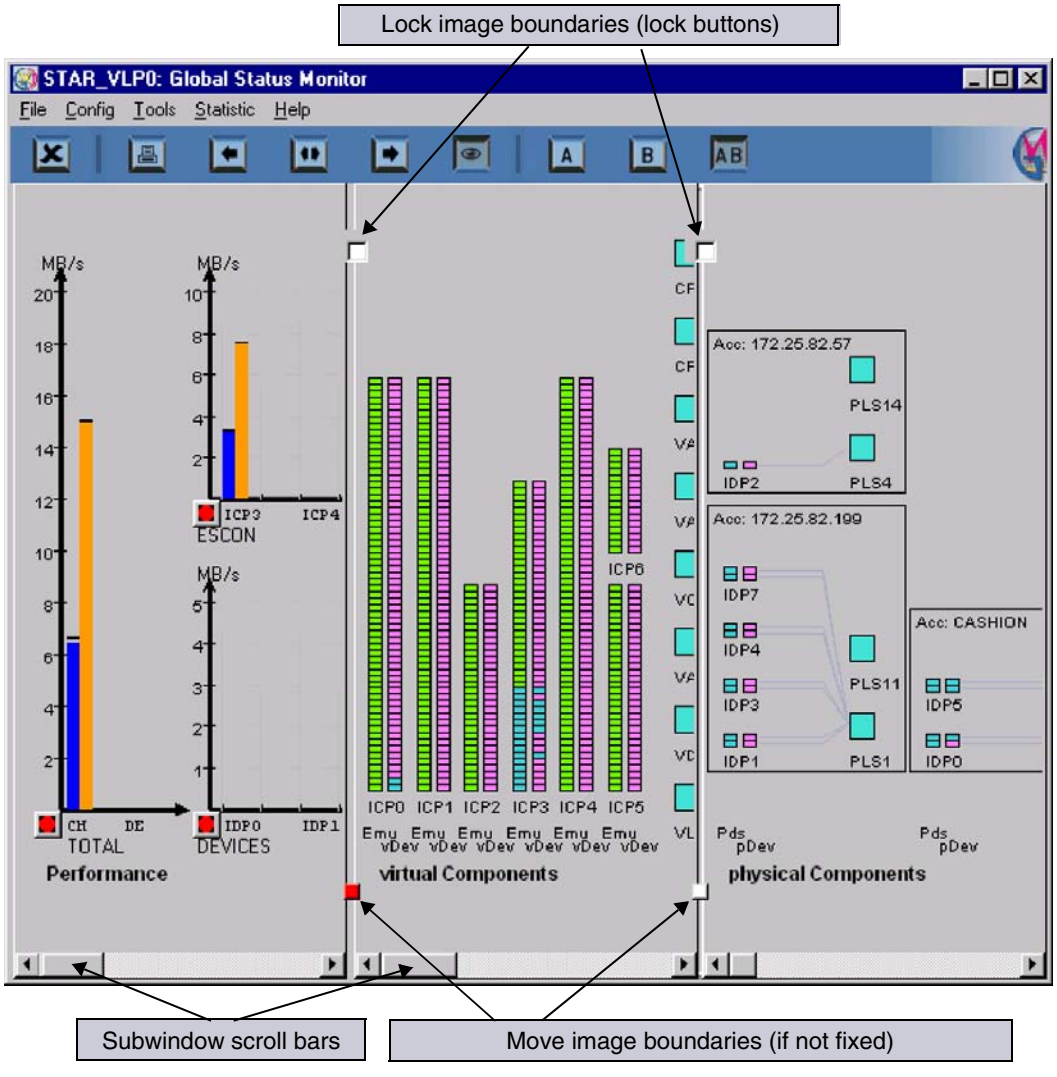
7.4 Global Status button bar

Frequently used functions can be accessed immediately after you have clicked on the relevant button:



7.5 Display of the Global Status Monitor

The Global Status Monitor window consists of three vertically aligned subwindows separated from one another by gray lines:



The subwindows show (from left to right):

- the throughput through the host interfaces and the device SCSI or FC controllers
- the status of the virtual components (drives, tape volume caches)
- the status of the physical devices and physical control processes as well as data on the physical volume groups (not available in the evaluation model)

You can set the visible section of the subwindow by dragging the handles on the separating lines. The visible part of the subwindow can be moved in the horizontal direction for each subwindow separately by means of the scroll bar.

The boundaries between the subwindows can be fixed by clicking on the upper control points. Fixed boundaries are displayed with red control points. The absolute size of a subwindow between fixed separating lines remains the same even if the size of the overall window changes.

The analog sizes are displayed in the form of a bar chart. The current values are displayed.

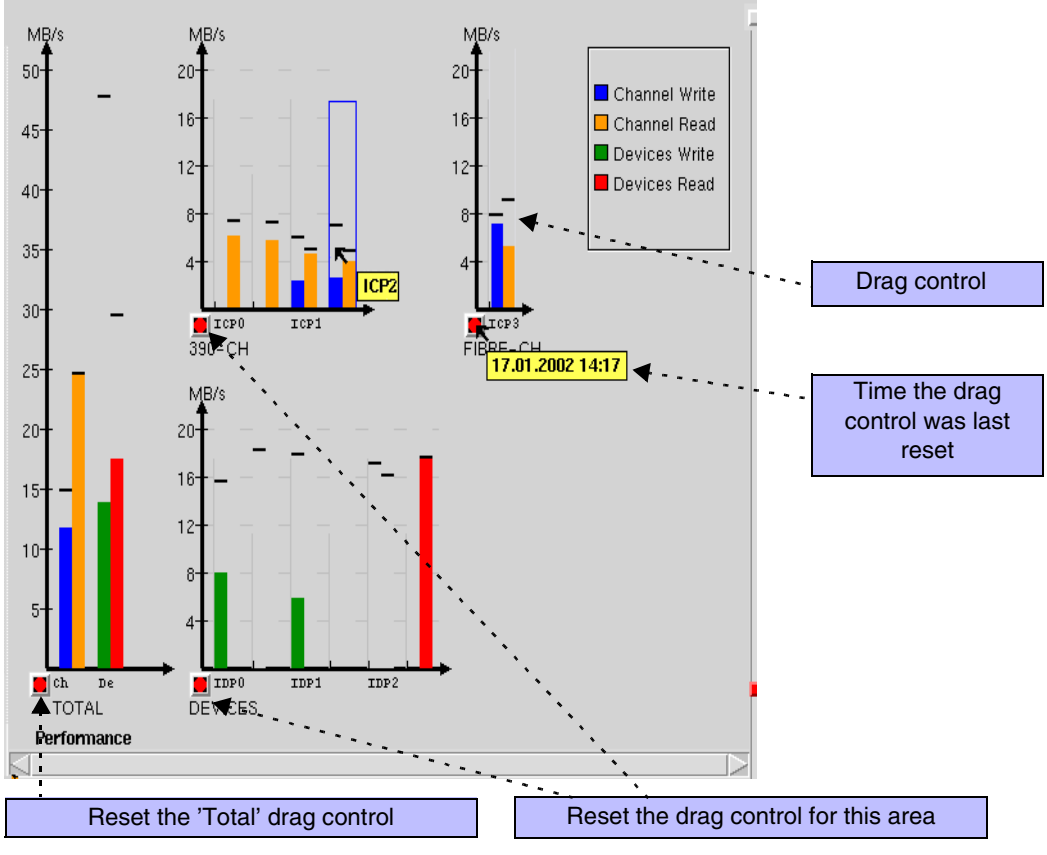
When you right-click on an area in the current value display and select *Show Statistics*, the temporal development of the measured variable is displayed over a user-definable period in the form of a line chart (see the section “History data” on page 257).

The statuses are indicated by the color of the display. The key is present in the associated subwindows to ensure that the display remains comprehensible even if there is a difference in colors.

7.5.1 Performance

The left-hand part of the window displays the current data throughput at the external interfaces. i.e. the ESCON/FICON channels and/or FC interfaces to the hosts and the SCSI or FC controllers forthe tape drives.

The display area becomes visible when the mouse pointer is positioned near the maximum display bar. The maximum bar outline is then temporarily displayed. In this way, you can still select the corresponding measured variable for displaying temporal progress even if the current display is zero.



The left-hand diagram which covers the entire image height represents the entire throughput via all external interfaces.

The smaller diagrams on the right indicate the data rates via the ESCON/FICON host connections (= 390-CH) or FC host connections (=FIBRE-CH) to the virtual drives (top diagrams) and the data rates via the SCSI or FC controllers to the physical drives (bottom diagram) for each controller and transfer direction. The ICPs/IDPs are identified by their names. Long vertical, gray lines indicate the boundaries between the individual ISP areas, whereas short lines indicate the boundaries between external controllers of a host. If you rest the mouse pointer on an area, the exact designation will be displayed.

Diagrams relating to host adapter throughput are displayed only for components actually present. For instance, if CentricStor has no FC host adapter, the top right diagram will be omitted. There are no device controllers in the evaluation model.

A horizontal line above the bar indicates the maximum value attained since the window was opened or since the last reset (drag control). The vertical scale of the display (MB/s) is adapted to the measured data.

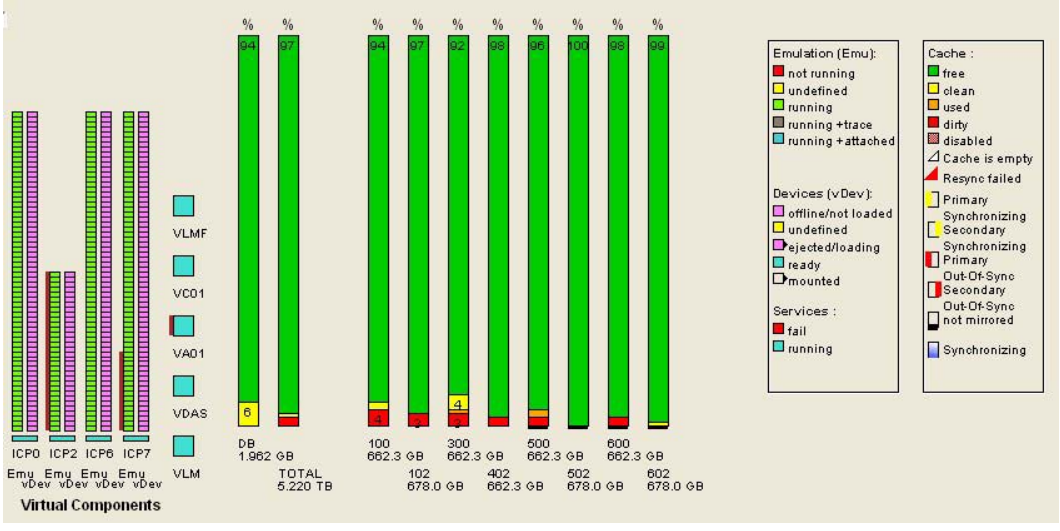
– To reset the drag control for total throughput, click the “Reset” button at the bottom left of the subwindow.

– The drag controls for the individual host interfaces or drive interfaces are reset using the buttons displayed under the relevant chart.

– When the mouse pointer hovers above the reset button, an information field appears telling you the last time it was reset. The system time that is displayed is taken from the system on which “Global Status” is running. If the drag control has never been reset, the field displays the time Global Status was started.

7.5.2 Virtual Components

The middle window section displays the current statuses of the tape emulations, the virtual devices and the occupancy of the tape volume cache(s):



Emulations and virtual drives

Emulations and virtual drives are displayed in the left-hand part of the picture and are arranged by ICP. Each emulation and each virtual device is represented by a box. The bottom box in a bar always represents the consecutive number 0 or the object displayed at the outside left of the XTCC window.

The status displays for the emulations and devices are self-explanatory.

If a drive symbol is displayed with a black triangle to the right, this indicates that a virtual volume has been loaded onto that drive or that the drive is currently being mounted or unmounted.

If you click the left mouse button on a box which symbolizes a virtual drive, the name of a mounted volume will also be displayed next to the name of the drive.

If you click the left mouse button on a box which symbolizes an emulation, the name of the emulation and its address in the archive system (LibDevice) will be displayed.

At the bottom of the columns for the emulations and virtual drives a box is displayed for each ISP as a status display for the VMD. The colors have their familiar meanings. The following also applies: A white, empty box indicates that no VMD description data was found.

Virtual library servers

The middle column indicates the operating statuses of the VLM and virtual library servers (VLSs).

If you click the left mouse button on on an object, an info box is output containing further details. In the case of control components, for example, this would indicate the host on which the component runs.

Tape volume caches

The display of the tape volume cache occupancy in the right-hand column should be interpreted as follows:

free	Free storage space
clean	Data of virtual volumes which are no longer mounted but which have been saved to tape, i.e. valid duplicates of these volumes are available on tape. The “clean” area can be used at any time for data recording, without the need to rewrite the data, if the “free” area is not sufficient.
used	This area contains maps of currently mounted virtual volumes.
dirty	Modified data of virtual volumes which are no longer mounted. Although this data has been changed, the changes have not yet been written back to tape. This area cannot be made free for other volumes until the data has been written back to tape and therefore been made “clean”.

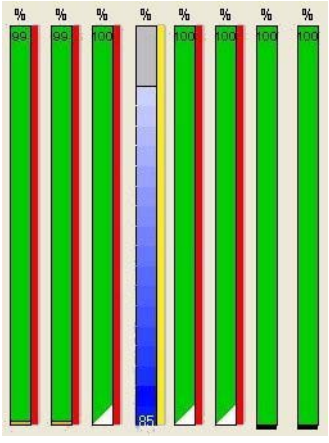
The proportions of the individual classes are displayed in the appropriate field of the bar, if there is enough space.

If you click the left mouse button on a cache column, the size of the occupied area (used + clean + dirty) and the corresponding unpacked data volume are displayed. Due to data compression, the saved data volume can be greater than the capacity.

In the steady state, the proportion of “free” data in the cache is low. When unloading a written volume (“dirty”), CentricStor attempts to “clean” its data as soon as possible by rewriting and then retain it in the cache for as long as possible. CentricStor automatically adapts the resources used for rewriting to the number and scope of write requests: the more the cache is occupied with “dirty” data, the more drives are used for Save requests.

If you click the right mouse button on a cache column, a context menu appears which you can use to output statistical data (“Show Statistics”). Information on this is provided in the section “Data which can be called via objects of the Global Status” on page 297. The /DB column represents the ufs file system containing the CentricStor metadata.

Additional displays for mirrored systems



- Red bar on a cache column: The cache is no longer mirrored (“out of sync”).

  Left: Primary cache
  Right: Secondary cache

- Yellow bar on a cache column: The cache concerned is being resynchronized and is still in the “out of sync” status.

  Left: Primary cache
  Right: Secondary cache

- Progress display on the cache column (a bar that goes from blue to white and expands upward): This displays the current progress during resynchonization.

- Trinagle at the bottom right of the column:

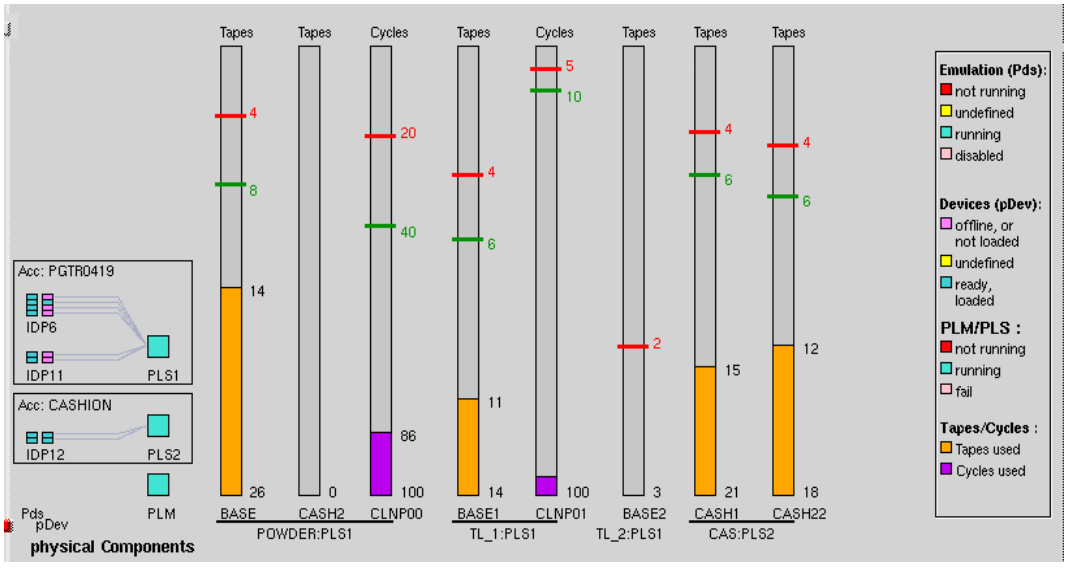
  White: Cache is empty (contains no LVs)
  Red: Error during resynchronization

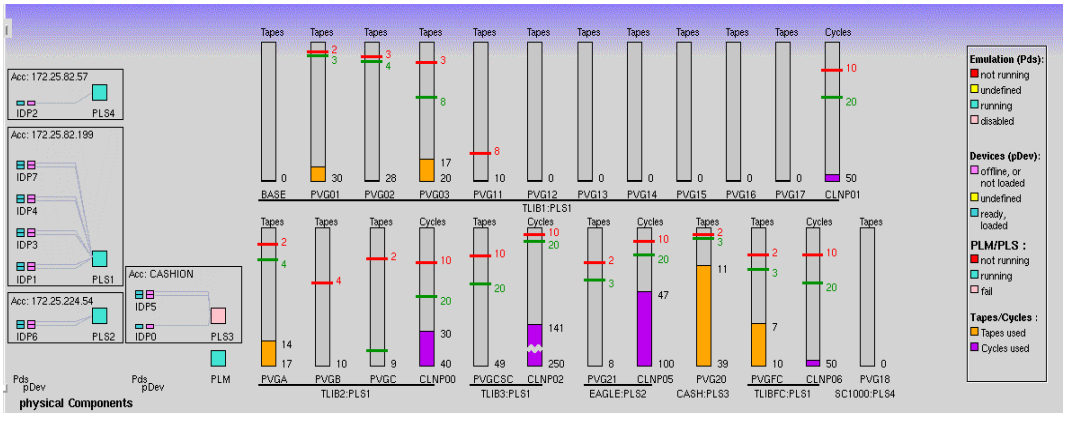
- Black line below a column: The cache is not mirrored.

- Cache brown: The cache is in the “disabled” status.

7.5.3 Physical Components

This screen displays the operating status of CentricStor's physical resources. These consist of the cartridge drives, the physical robot controllers and the physical volumes. This part of the display is not available in the evaluation model. The second example shows how the screen layout changes when there are a large number of PVGs.





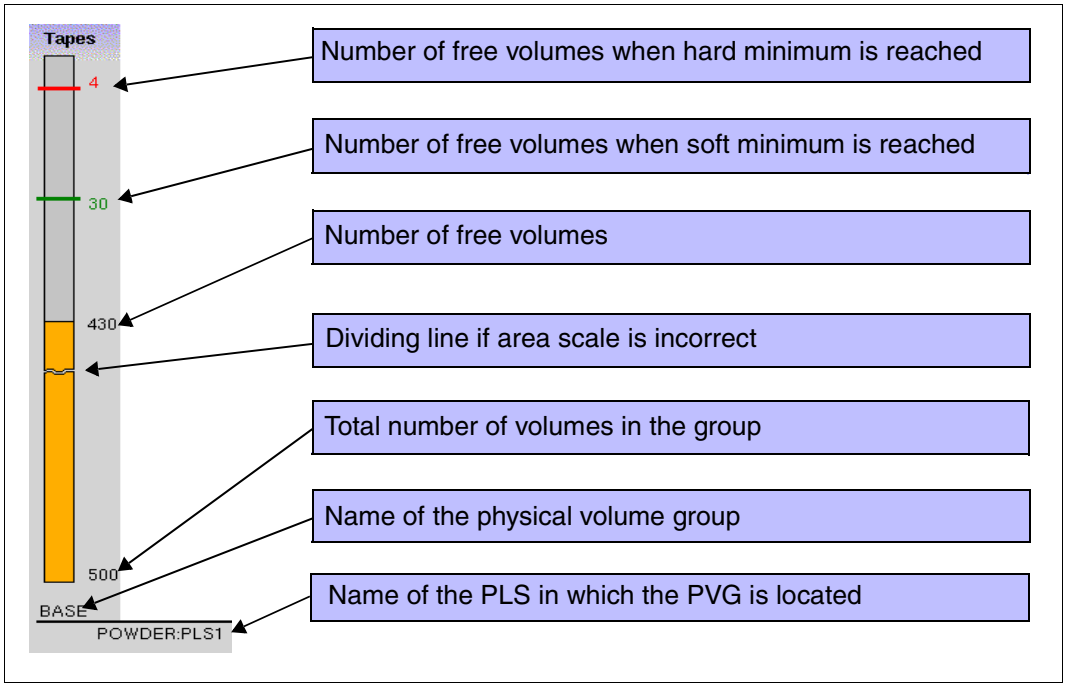
The display shows (from left to right) the PDS and the associated cartridge drives (pDev). The assignment of devices to access systems is represented by a frame. An access system consists of both the robot that handles the cartridges and the associated PLS (Physical Library Service). Thin lines connect each pDev to the associated PLS. The status of the

drives, the PDS, the PLS, and the PLM are color-coded in accordance with the key displayed at the right-hand edge of the screen section. Left-clicking on an object causes information to be displayed.

The address (host name or SCSI Controller:Target:LUN) of the access system is specified at the top of the box.

The bar charts in the right-hand half of the screen indicate the user statistics for the physical volume groups and the degree to which the cleaning cartridges have been used. Separate statistics and limit values are maintained for each physical volume group. The name of the PVG displayed appears under each bar. PVGs from a shared library are arranged alongside each other connected by a short line, under which the name of the library and of the associated PLS are displayed.

Each bar represents the total number of volumes available. The proportion of used volumes is displayed against a colored background.



The display indicates numerical scales on the right-hand side of the bar chart. In each case, the number of volumes available is specified (on the baseline) together with the number of free cartridges. Next to this, at the edge of the bars, the absolute numerical values for the minimum number of available cartridges (soft minimum, hard minimum) are indicated. These upper limits are predefined during system configuration. They are described in detail in the section “Statistics » Physical Components » Physical Volume Groups” on page 283.

Newly added volumes are not available until they have been initialized by the PLM.

The height of the bar represents the number of volumes. If less volumes are available than the minimum values usually displayed for “Hard Minimum” and “Soft Minimum”, then the minimum values cannot be displayed using this form of representation and thus do not appear on the diagram. This situation occurs regularly when the PVG is being filled.

If CentricStor controls cleaning of the drives in a library, the degree of use of the cleaning PVG will be shown to the right of the PVG of the library. The representation is, in principle, identical to that of the PVG. The overall number given under the bar shows the total number of cleaning cycles that are available. The counter shows how many of these cycles have already been used. The “Soft Minimum” (green number, green line) specifies how many cycles must still be available when the soft minimum is achieved. The “Hard Minimum” (red number, red line) specifies the minimum for the “Hard Minimum”. These values are specified by CentricStor according to the number of tape drives, and cannot be modified at the user interface.

If “Hard Minimum” and “Soft Minimum” are violated, a message is output on the operator console indicating the degree of urgency.

How to use and administer the physical volumes in CentricStor is described in the section “Administering the tape cartridges” on page 35.

7.6 History data

History data is system data which has been collected over a lengthy period. For this purpose a Performance Monitor constantly runs in CentricStor. The Performance Monitor collects and stores the operating data of the components, e.g. performance, mount, availability of the devices and the device assignment, at intervals of a few seconds. The customer service can determine the files system and period in which measured data is to be saved.

- Global Extended Control Center (GXCC) is a program which supplies a graphical map of a CentricStor system.
- The GXCC component *Global-Status-Monitor* (GLOBSTAT) evaluates the measured performance data and presents the current values.
- The GXCC component *Global History Viewer* (GLOBHIST) is used to present the chronological progress.

The following options are therefore available for the history data of a CentricStor system:

– The data can be displayed graphically using the GLOBHIST program.

  600 pixels are available for a line graph. In a presentation period of one hour the pixel corresponds to 6 seconds; in a week, it corresponds to approx. 1000 seconds. The stored measured values from this period are evaluated and displayed in accordance with the specification (Min, Max, Average). If no measured value occurs in the period, zeros are entered. 0 values therefore occur for periods in which CentricStor was not active. When the presentations for a period of 1 hour are interpreted, it must be borne in mind that only 0 - 2 measured values apply for a pixel. It is therefore normal if there is sometimes no difference between Min, Max and Average in this presentation and if lines occasionally yield “0”.

– The data can be exported from the GLOBHIST program into a file as text.

– The data can be extracted from the binary recording files on the CentricStor system using a shell script and be stored in a text file.

When the data is available in a file, this file can then be transferred to another system and be presented with an evaluation program or integrated into customer-specific controlling processes. A macro is supplied for the Microsoft program Excel which generates a presentation which is suitable for GXCC.

7.6.1 General

7.6.1.1 Recording analog operating data

If you move the mouse to a Global Status display and click on the right button, “Show Statistics” is offered. When you select this function a window opens for presenting the chronological progress. A description of how to operate this is provided on page 262.

The chronological progress of the following measured data can be displayed:

– data rates of the host interfaces and device controllers for each physical path or globally, separately for each transfer direction.
– cache statistics

It is possible to create a separate chart for each channel and each device controller. Read and write operations are both plotted on the same screen.

The various cache occupancy statuses (clean, used, dirty etc.) are displayed in the same screen for each cache.

It can take some time to build up the diagrams because a large volume of measured data must be analyzed to present long time periods, e.g. approx. 240 000 samples for one week’s channel throughput. It is thus possible to abort diagram setup using “Cancel” so as to avoid quasi-blockages.

7.6.1.2 Overview of the displays

The table below shows the operating data for which chronological recording or tabular analyses are available.

Explanation

2nd column: Type
H History: Recording over a selecteable period.
T Table with current values.

3rd column: Call
Statistics » .....<menu item>
Submenu of Statistics on the function bar
or
Object: <description of the object>.
Here you must position the mouse cursor on the object until blue highlighting appears (the object is outlined in blue or the device name is colored blue). When you click on the right mouse button a popup menu appears containing the entry “Show Statistics”. Select this menu item using the left button.

Measured value	Type	Call	Description
Scratch Volumes of a PVG	H	Object: PVG column in right-hand part of screen	page 313
Cache Usage	H	Object: Cache column in central part of screen	page 265
Usage of Overall Cache	H	Statistics » History of » Cache Usage or Object: Column for overall cache in central part of screen	page 265
Throughput of a PDS or Host Adapter	H	Object: Column for PDS or host adapter of an ICP in left-hand part of screen	page 304
Overall Throughput	H	Statistics » History of»Channel Device Performance or Object: “Total” column in left-hand part of screen	page 303
Jobs of Logical Volume Groups	T	Statistics » Logical Components »Jobs of Logical Volume Groups	page 275
Jobs of Physical Volume Groups	T	Statistics » Physical Components » Jobs of Physical Volume Groups	page 289
Logical Drives	T	Statistics » Logical Components »Logical Drives	page 268
Logical Drives Utilization	H	Object: Logical Drives of a ICP in central part of screen	page 305
Logical Volume Groups	T	Statistics » Logical Components » Logical Volume Groups	page 273
Logical Volumes (physical view)	T	Statistics » Logical Components » Logical Volumes (physical view)	page 271
Logical Volumes (logical view)	T	Statistics » Logical Components » Logical Volumes (logical view)	page 272
Physical Drives	T	Statistics » Physical Components » Physical Drives	page 277
PDS Utilization	H	Object: PDS/pDev in right-hand part of screen	page 310
Physical Drives Utilization	H	Object: PDS/pDev in right-hand part of screen	page 310
Physical Volume Groups	T	Statistics » Physical Components » Physical Volume Groups	page 283

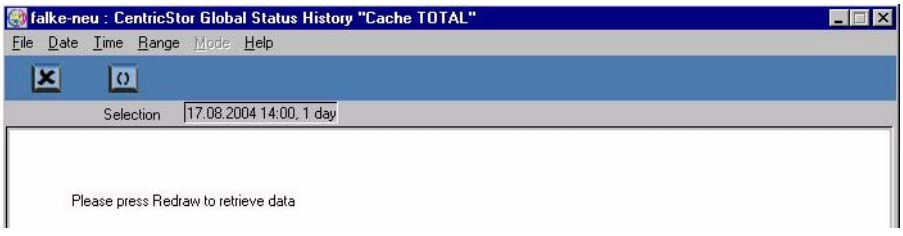
Measured value	Type	Call	Description
Physical Volume Groups Tape Statistics	H	Object: PVG column in right-hand part of screen	page 313
Physical Volumes Occupancy	T	Statistics » Physical Components » Physical Volumes	page 279
Reorganization Status	T	Statistics » Physical Components »Reorganization Status	page 291
Usage (Accounting)	T	Statistics » Usage (Accounting)	page 293

The table below shows the selection and control options for the history data:

	Range	Min/Max/Aver.	Channel	By Device	By ICP	By IDP	By cache	By PVG	By System
CentricStor virtual Components									
CentricStor Virtual Mounts									
number of Mounts	x				x				
cumulated MountTime	x				x				
CentricStor Total Mount Time (% of Range)									
virtual drives	x				x				
CentricStor Concurrent VTDs usage (Histogram)									
% of virtual drives	x				x				
CentricStor Cache									
% free	x						x		x
% clean	x						x		x
% used	x						x		x
% dirty	x						x		x
CentricStor physical Components									
CentricStor physical Mounts									
number of Mounts	x					x			
cumulated MountTime	x					x			
CentricStor Total Mount Time (% of Range)									
physical drives	x					x			
CentricStor Concurrent VTDs usage (Histogram)									
% of physical drives	x					x			
CentricStor PVGs									
used	x							x	
total	x							x	
CentricStor Data Transfer (Performance)									
Data Read by Mainframe/Open system	x	x	x						x
Data Write by Mainframe/Open system	x	x	x						x
Data Read from physical device	x	x		x					x
Data Write to physical device	x	x		x					x

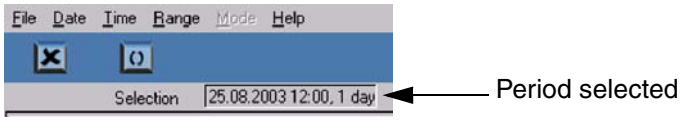
7.6.1.3 Selecting the time period

The recording period or analysis period must be selected for displays of the type H. When you have selected one of these displays a window with an empty page appears.



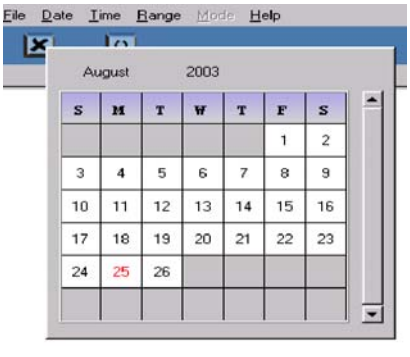
The function bar contains tools for defining the time period (day, time, range).

The period selected (day, time, range) is displayed in a small field below the button bar. The default value is “the last 24 hours” or “the current hour”.



You can select the period using the tools in the function bar.

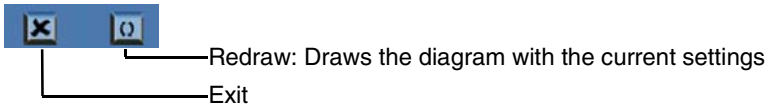
Date



Time

Range

The button bar below these options allows you to select the functions “Exit” and “Redraw”:



If you have selected a long recording period (e.g. months) a very large volume of data must be analyzed and transferred. In the wait time you are offered an info box containing the “CANCEL” button.

You should click on this button if you have accidentally selected this long recording period. The repeated calling of large data volumes in particular can have a negative effect on the operating behavior of CentricStor.

Hardcopy

You can print the diagrams using » File » Print in the function bar (page 239) or, if “Global Status” is running on Windows, with the function button available in the button bar (page 246).

7.6.1.4 Selecting the presentation mode

After the diagram has been built up some time diagrams enable you to specify (function bar » Mode) whether the the maximum value (max), the spread (min/max) or the average value (average) should be recorded for each display period. If you select min/max the maximum and minimum values are separated by a slash.

7.6.2 Data which can be called via the function bar

The following menus and submenus can be called under “Statistics”:

- History of
  - Cache Usage (page 265)
  - Channel/Device Performance (page 266)
- Logical Components
  - Logical Drives (page 268)
  - Logical Volumes (physical view) (page 271)
  - Logical Volumes (logical view) (page 272)
  - Logical Volume Groups (page 273)
  - Jobs of Logical Vol. Groups (page 275)
- Physical Components
  - Physical Drives (page 277)
  - Physical Volumes (page 279)
  - Physical Volume Groups (page 283)
  - Jobs of Physical Vol. Groups (page 289)
  - Reorganization Status (page 291)
- Usage (Accounting)[1] (page 293)

7.6.2.1 Statistics » History of

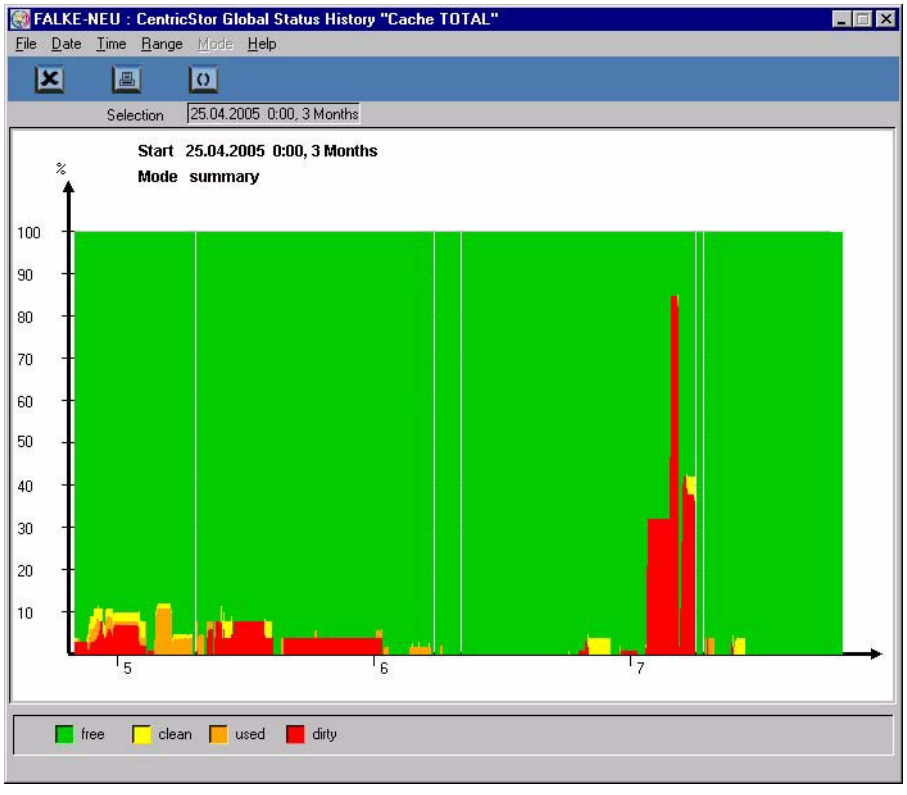
The following submenus are available:

- Cache Usage (page 265)
- Channel/Device Performance (page 266)

[1] This function is displayed only if an accounting licence is installed.

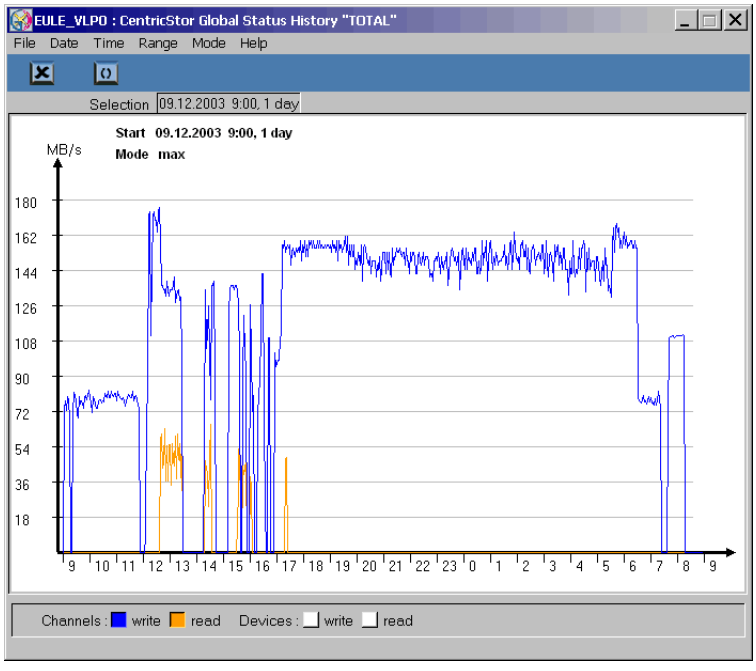
7.6.2.2 Statistics » History of » Cache Usage

The history of cache usage is output in accordance with the cache total values of the virtual components subwindow.



7.6.2.3 Statistics » History of » Channel/Device Performance

Statistics on the overall throughput as they are presented continuously in the left-hand bar of the Performance subwindow are output.



You can use the four checkboxes at the lower edge of the screen to determine what data is presented.

The following options are offered:

Channel Read/Write (also for FC host adapters): Front-end throughput.
Device Read/Write: Back-end throughput.

In the example the back-end data is masked out.

7.6.2.4 Statistics » Logical Components

The following submenus are available:

- Logical Drives (page 268)
- Logical Volumes (physical view) (page 271)
- Logical Volumes (logical view) (page 272)
- Logical Volume Groups (page 273)
- Jobs of Logical Vol. Groups (page 275)

Notes on the refresh function:

All statistics functions support the refresh function:

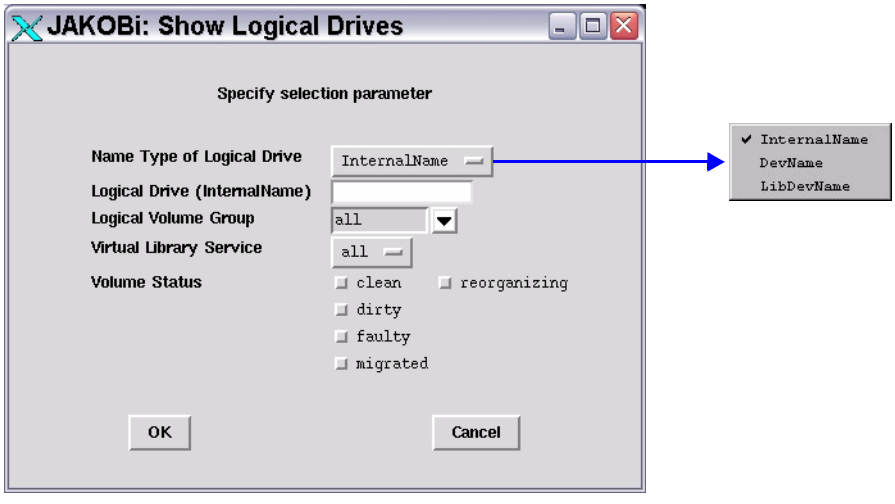
After the function has been executed, i.e. after the result has been displayed in the text window, the dialog window with the selection criteria (function window) is retained for further searches. The “OK” button at the lower edge of the function window is replaced by the “Refresh” button, which enables the search to be repeated. The search criteria can be modified before another search takes place.

The previous text window is then used to display the result, in which case the previous contents are deleted. The function window is closed only when the user clicks on the “Cancel” button. In this case the text window with the result is also closed implicitly.

7.6.2.5 Statistics » Logical Components » Logical Drives

You obtain statistics on the utilization of the logical drives by selecting an ICP in the central section of the Global Status display and calling the object-related statistics function.

Displays the occupied status of the logical drives. You can select drives in particular statuses using a selection window:



This statistics function supports the refresh function. Information on this function and the “OK” and “Cancel” buttons is provided on page 267.

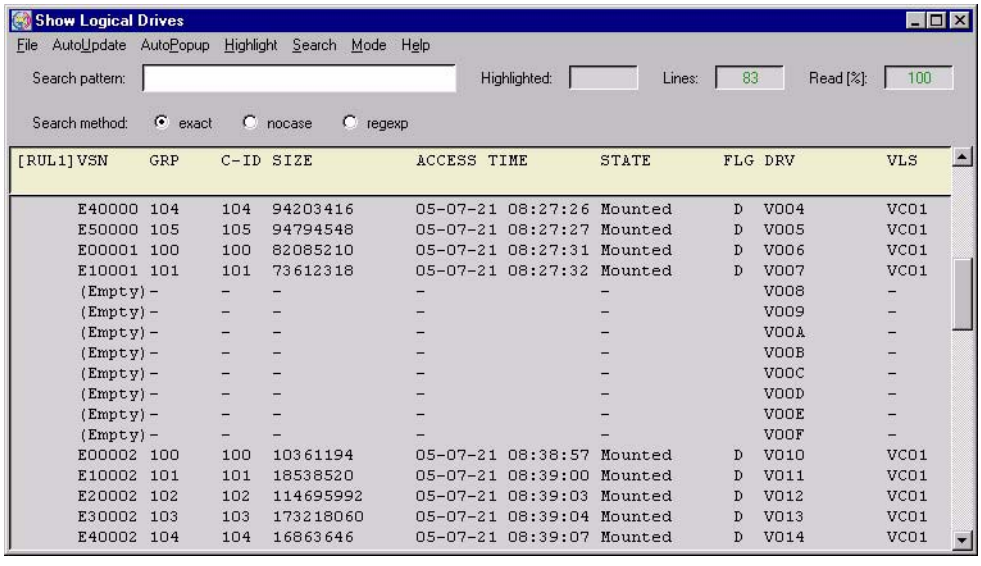
You can select whether the internal name, the device name or the archive address of the device is to be displayed.

Specification of the name is optional. You can also use wildcards.

For LVGs you can specify “all” or one particular LVG.

Volume Status See the section “Logical Volume Operations » Show Logical Volumes” on page 203

The list of logical drives is output in a text window after you click on the “OK” or “Refresh” button:



The following information is output:

VSN
: VSN of the volume mounted in a drive or “Empty”

GRP
: LVG of a mounted volume or -

C-ID
: Number of the cache (=Cache-ID) to which the mounted volume is assigned or -

SIZE
: Size of the data contained in the volume or -

ACCESS TIME
: Timestamp of the last access or -

STATE

Faulty	The logical volume is faulty. It can no longer be used.
Home	The logical volume is currently not being used.
Mounted	The logical volume has been inserted in a logical drive.
Mount Pending	The logical volume has just been inserted in a virtual tape drive. There is still no confirmation for this.
Mnt. Queued	A mount request for the logical volume was queued by the VLM due to a lack of resources.
Restoring	The logical volume is just being read in by the physical volume.

Rest. Canc. The reading in of the logical volume by the physical volume was canceled (occurs with a scratch mount).

Unld. Pend. The logical volume has just been ejected from a logical drive (emergency unload). There is still no confirmation for this.

FLG

Flags:

D “dirty”: The volume is located in the cache but has not been saved since the last change.

M “migrated”: The volume is no longer located in the cache and must therefore be read in from the physical tape before it is next accessed.

When the `r` flag is specified (i.e. `-fr`: displays volumes which are currently being reorganized) an additional column with the following flags is output:

P “pending”: Reorganization running

Q “queued”: Job was queued

R “restore”: Volume is being restored

C “cancelled”: Restore is canceled

S “save”: Volume is just being saved

When the `s` flag is specified (i.e. `-fs`: displays volumes which are being restored because a mount was canceled) an additional column with the following flags is output:

R “restore”: Volume is being restored

C “cancelled”: Restore is canceled

DRIVE

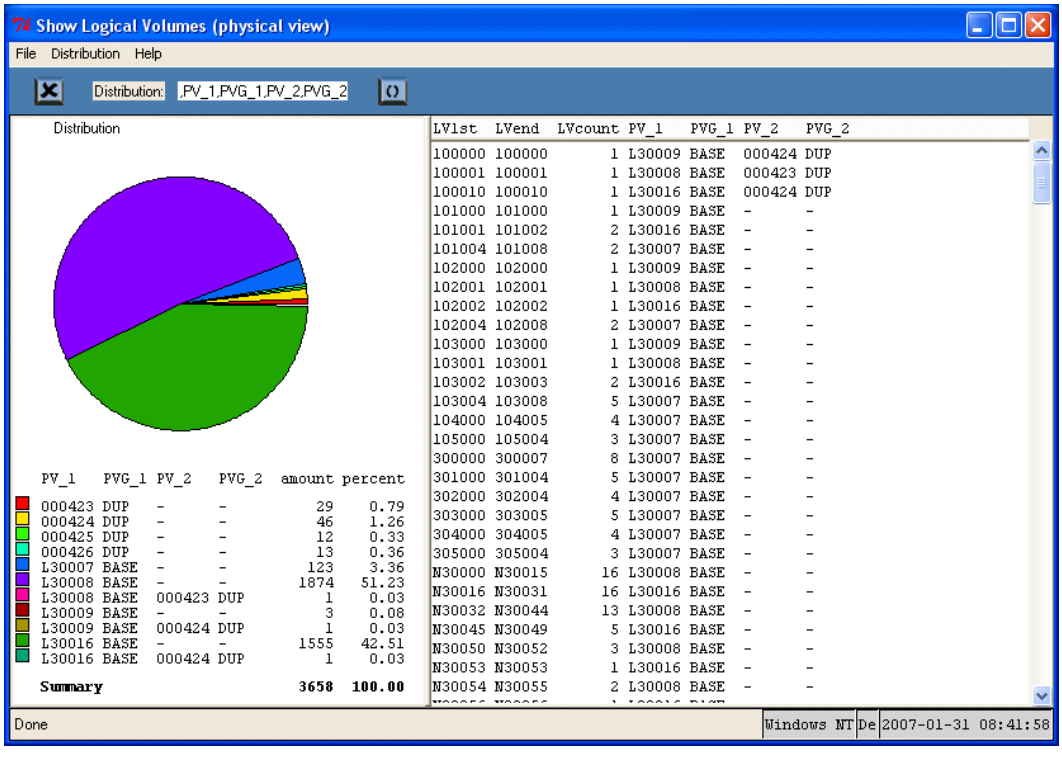
Designation of the logical drive

VLS

Library to which the mounted logical volume is assigned.

7.6.2.6 Statistics » Logical Components »Logical Volumes (physical view)

You use this call to display the logical volumes which are known to the PLM together with their statuses.



The right-hand part of the window displays all the output data in tabular form.

LV1st VSN of the first logical volume of a name group (see below)
LVend VSN of the last logical volume of a name group (see below)
LVcount Number of LVs in the name group extending from LV1st to LVend

A name group consists of a sequence of logical volumes whose VSNs differ only in a serial number which is incremented by 1, e.g. XXX001,XXX002,...XXX099)

The left-hand part of the window shows the distribution data, both in the form of a pie chart and in a distribution table.

The number of LVs in the total quantity with the same distribution paramaters is used as the ditribution function. The menu item *Distribution* can be used to define not only the parameters but also their order; the current setting and order is displayed in the toolbar.

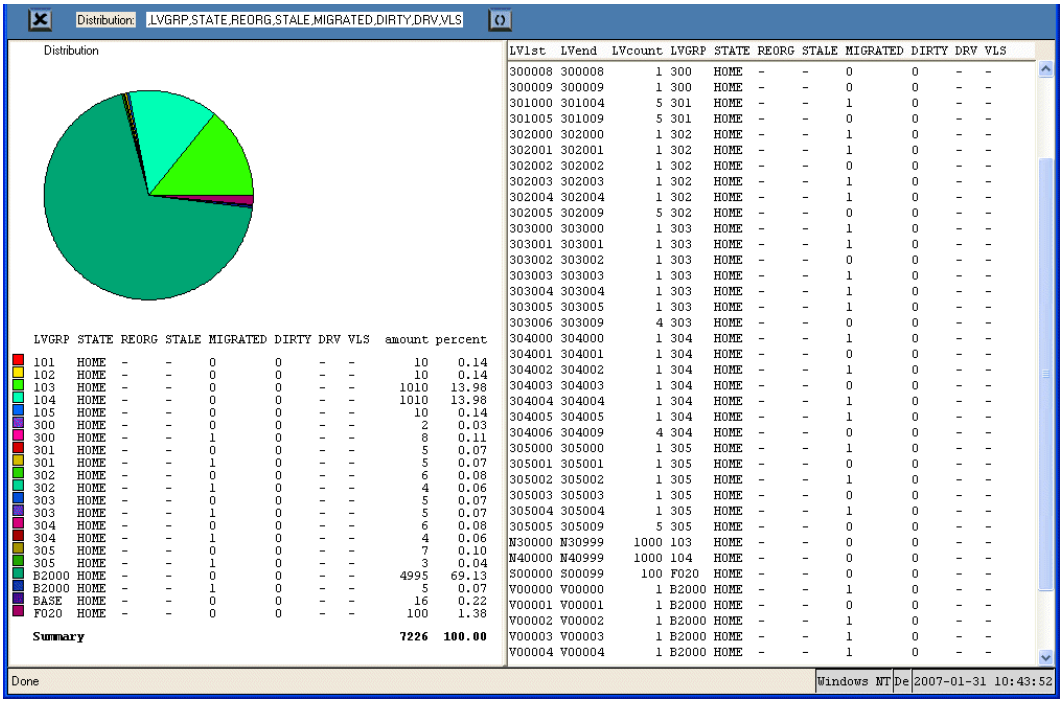
The columns of the distribution table contain the associated values of the distribution parameters. The columns containing the number of LVs to which the various distribution parameter values relate and their percentage share in the total quantity are also visible.

The pie chart is a graphical presentation of the distribution table.

Clicking on a pie segment or a line in the distribution table highlights the related entries in the overall data table.

7.6.2.7 Statistics » Logical Components » Logical Volumes (logical view)

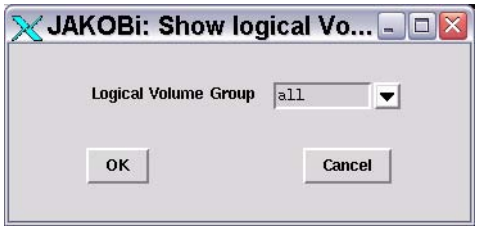
After the function has been called, the statistics and the distribution data gathered from these are displayed in a new window:



The right-hand part of the window displays all the output data in tabular form. The left-hand part of the window shows the distribution data, both in the form of a pie chart and as a distribution table.

7.6.2.8 Statistics » Logical Components » Logical Volume Groups

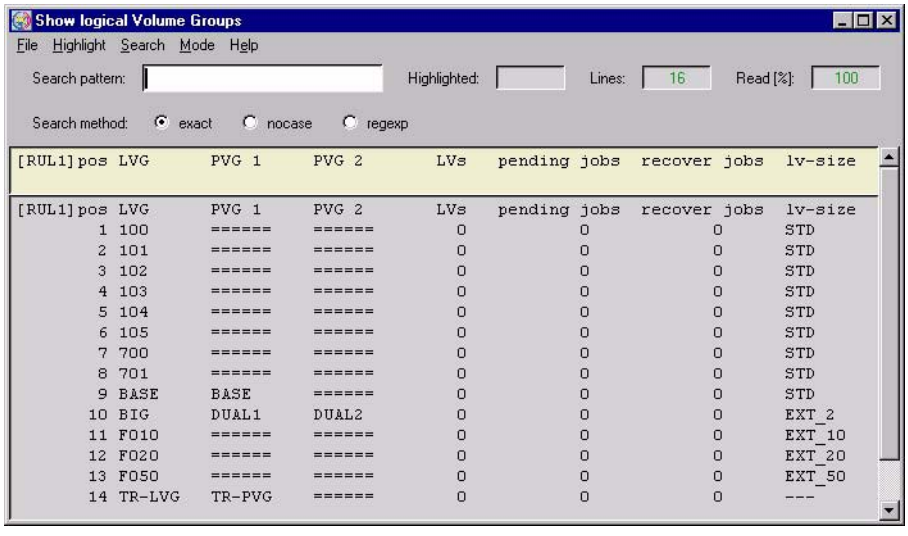
If multiple logical volume groups exist an intermediate menu is then displayed for selecting the volume group:



This statistics function supports the refresh function. Information on this function and the “OK” and “Cancel” buttons is provided on page 267.

You can select either all groups or a specific group.

After you click on “OK” or “Refresh” the following window appears:



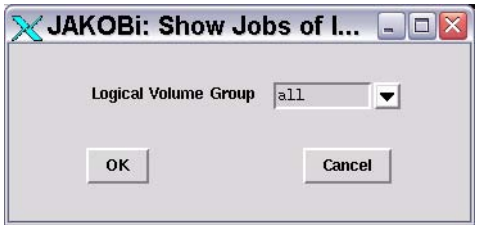
[RUL1] pos	LVG	PVG 1	PVG 2	LVs	pending jobs	recover jobs	lv-size
[RUL1] pos	LVG	PVG 1	PVG 2	LVs	pending jobs	recover jobs	lv-size
1	100	======	======	0	0	0	STD
2	101	======	======	0	0	0	STD
3	102	======	======	0	0	0	STD
4	103	======	======	0	0	0	STD
5	104	======	======	0	0	0	STD
6	105	======	======	0	0	0	STD
7	700	======	======	0	0	0	STD
8	701	======	======	0	0	0	STD
9	BASE	BASE	======	0	0	0	STD
10	BIG	DUAL1	DUAL2	0	0	0	EXT_2
11	F010	======	======	0	0	0	EXT_10
12	F020	======	======	0	0	0	EXT_20
13	F050	======	======	0	0	0	EXT_50
14	TR-LVG	TR-PVG	======	0	0	0	---

The following data is displayed:

pos	Line number
LVG	Name of the logical volume group
PVG1	Name of the first or only assigned physical volume group, or -===== if empty
PVG2	Name of the second assigned PVG (if assigned - Dual Save), or -===== if empty
LVs	Number of logical volumes in this group
pending jobs	Number of jobs which the PLM has accepted for this LVG.
recover jobs	Number of logical volumes in a dual-save group detected when starting the PLM for which only a single save has been performed. Another save is performed automatically so that 2 copies are avilable again. The list of these LVs can be viewed when a special LV group is output.
lv-size	Size of the logical volumes: STD Standard = 900 MB EXT_x Extended: x specifies the volume size in GB (2, 5, 10, 20, 50, 100 or 200)

7.6.2.9 Statistics » Logical Components » Jobs of Logical Volume Groups

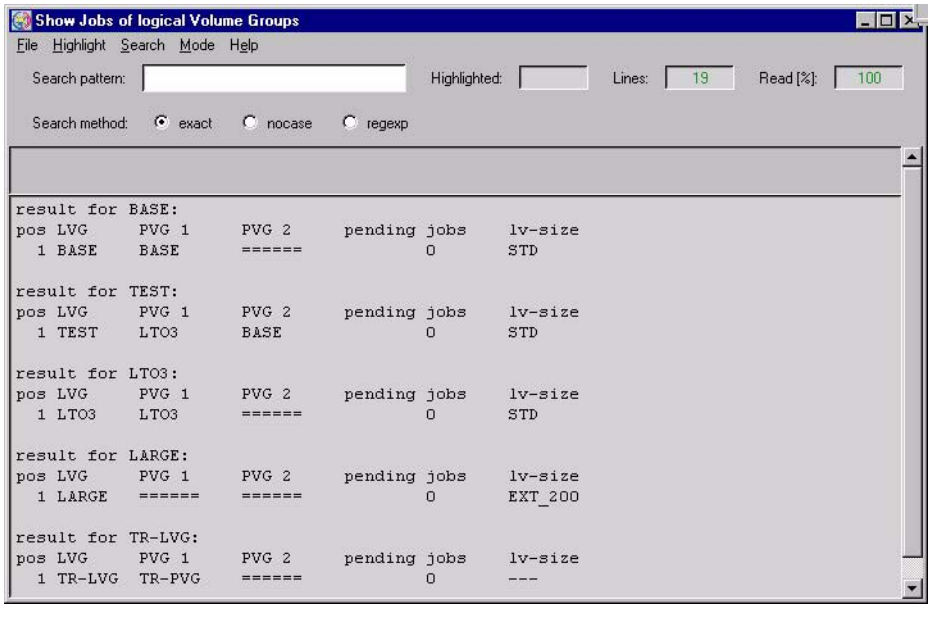
If CentricStor contains more than one logical volume group (LVG) the required group is entered using an intermediate menu:



This statistics function supports the refresh function. Information on this function and the “OK” and “Cancel” buttons is provided on page 267.

If only one group is defined this intermediate step is skipped.

The job data for the selected group(s) is displayed:



Meaning of the columns:

The job data (result for ... :) is output separately for each LVG.

pos	Serial number
LVG	Name of the logical volume group
PVG 1	Name of the first assigned physical volume group If '======' is specified as the name, no PVG is assigned to the LVG.
PVG 2	Name of the second assigned physical volume group If '======' is specified as the name, only a single save is performed for the LVG (no Dual Copy).
pending jobs	Number of jobs which have been accepted for this LVG
lv-size	Size of the logical volumes: STD Standard = 900 MB EXT_x Extended: x specifies the volume size in GB (2, 5, 10, 20, 50, 100 or 200)

7.6.2.10 Statistics » Physical Components

The following submenus are available:

- Physical Drives (see below)
- Physical Volumes (page 279)
- Physical Volume Groups (page 283)
- Jobs of Physical Vol. Groups (page 289)
- Reorganization Status (page 291)

Notes on the refresh function:

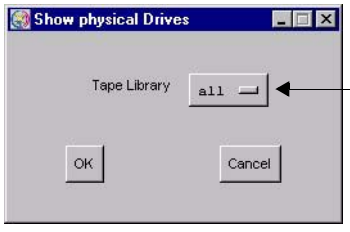
All statistics functions support the refresh function:

After the function has been executed, i.e. after the result has been displayed in the text window, the dialog window with the selection criteria (function window) is retained for further searches. The “OK” button at the lower edge of the function window is replaced by the “Refresh” button, which enables the search to be repeated. The search criteria can be modified before another search takes place.

The previous text window is then used to display the result, in which case the previous contents are deleted. The function window is closed only when the user clicks on the “Cancel” button. In this case the text window with the result is also closed implicitly.

7.6.2.11 Statistics » Physical Components » Physical Drives

First of all the library involved is queried:

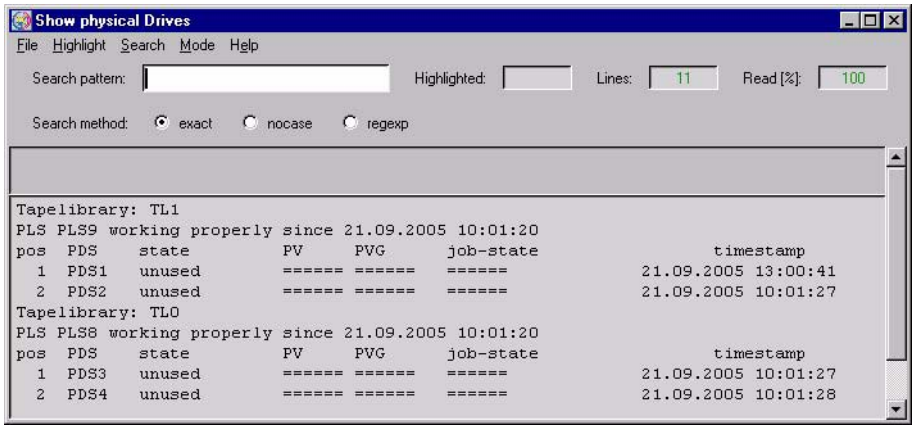


If only one tape library exists, the name of this tape library appears here.

This statistics function supports the refresh function. Information on this function and the “OK” and “Cancel” buttons is provided on page 276.

The library required is selected via the drop-down menu.

A list of the device statuses is displayed:



The output field contains a line with the name of the archive system. The next line specifies the time of the last status change of the PLS (Physical Library Server) responsible for the library.

This is followed by a table of the drives:

pos Line number

PDS PDS name. Further information on the drive can be called in the XTCC menu under this name.

state Current status of the drive. Possible values:

unused	Free, no PVG assigned
occupied	Occupied; where relevant, the next columns show the name of the mounted volume, the PVG, and the job status.
disabled	Not used, possibly faulty
unreachable	The PDS cannot be reached.
dis./unreach.	The PDS is disabled and cannot be reached.

PV VSN of the physical volume

PVG Physical volume group

job state

Status of the ongoing operation. Possible values:

=====	Nothing being processed
DONE	Job completed
PLS_INSPECT_SENT	Inspect command to a PLS
PDS_INSPECT_SENT	Inspect command to a PDS (Transfer-In)
MOUNT_SENT	Mount command
UMOUNT_SENT	Unmount command
INIT_SENT	Init command
INIT_NEW_SENT	Reinitialization of a PV
ERASE_SENT	Invalidating of a PV
READ_SENT	Restore command
WRITE_SENT	Save
WDIR_SENT	Writing the directory
RDIR_SENT	Reading the directory
CUR_SENT	Check unit ready
UNLOAD_SENT	Unload
CLEAN_SENT	Drive being cleaned

If the command specified in the message was not executed in the time provided, one of the following messages appears:

PLS_INSPECT_DELAY
MOUNT_DELAY
INIT_DELAY
INIT_NEW_DELAY
ERASE_DELAY
UNLOAD_DELAY
UMOUNT_DELAY
CLEAN_DELAY
...

timestamp

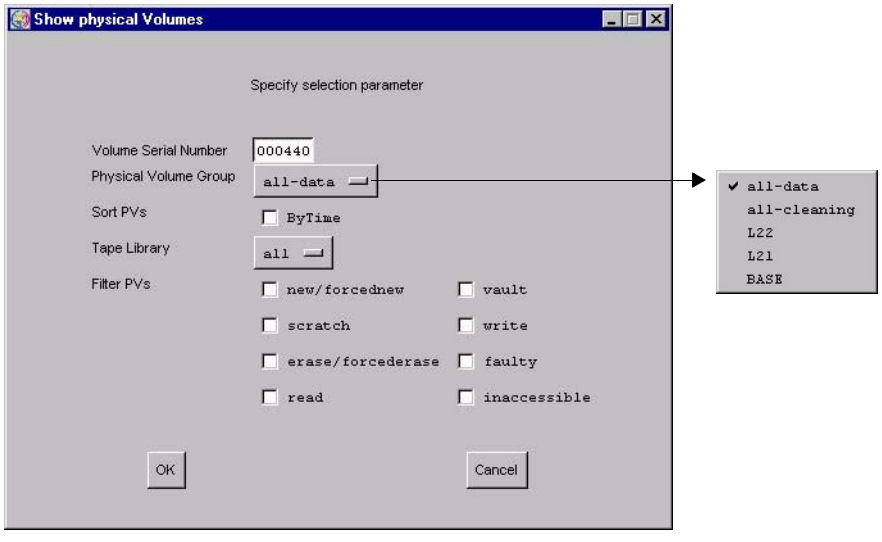
Time at which the current status was entered.

If you right-click on a library in the right-hand part of the Global Status screen and select “Show Statistics” you are shown an overview of the drive utilization in graphical and table form.

7.6.2.12 Statistics » Physical Components » Physical Volumes

Depending on the setting of the volume selection an overview of one or more physical volumes and a statistical analysis are displayed.

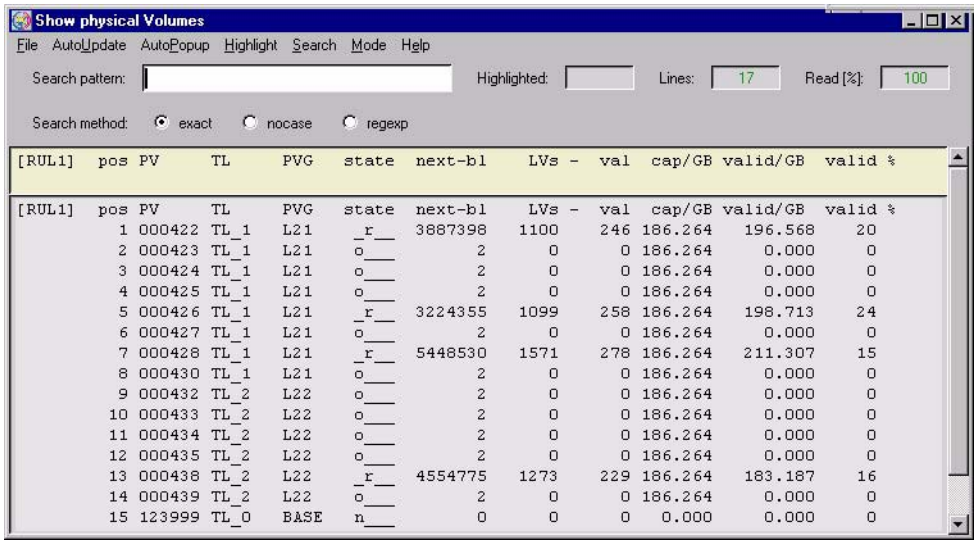
The physical volume(s) can be identified in an intermediate menu:



This statistics function supports the refresh function. Information on this function and the “OK” and “Cancel” buttons is provided on page 276.

See “Physical Volume Operations » Show Physical Volumes” on page 215 for a description of how to use the filter functions and the meaning of the statuses.

An overview in table form is then shown



[RUL1]	pos	PV	TL	PVG	state	next-bl	LVs -	val	cap/GB	valid/GB	valid %
[RUL1]	pos	PV	TL	PVG	state	next-bl	LVs -	val	cap/GB	valid/GB	valid %
	1	000422	TL_1	L21	_r__	3887398	1100	246	186.264	196.568	20
	2	000423	TL_1	L21	o___	2	0	0	186.264	0.000	0
	3	000424	TL_1	L21	o___	2	0	0	186.264	0.000	0
	4	000425	TL_1	L21	o___	2	0	0	186.264	0.000	0
	5	000426	TL_1	L21	_r__	3224355	1099	258	186.264	198.713	24
	6	000427	TL_1	L21	o___	2	0	0	186.264	0.000	0
	7	000428	TL_1	L21	_r__	5448530	1571	278	186.264	211.307	15
	8	000430	TL_1	L21	o___	2	0	0	186.264	0.000	0
	9	000432	TL_2	L22	o___	2	0	0	186.264	0.000	0
	10	000433	TL_2	L22	o___	2	0	0	186.264	0.000	0
	11	000434	TL_2	L22	o___	2	0	0	186.264	0.000	0
	12	000435	TL_2	L22	o___	2	0	0	186.264	0.000	0
	13	000438	TL_2	L22	_r__	4554775	1273	229	186.264	183.187	16
	14	000439	TL_2	L22	o___	2	0	0	186.264	0.000	0
	15	123999	TL_0	BASE	n___	0	0	0	0.000	0.000	0

Meaning of the columns:

pos Line number

PV Number of the physical volume

TL Tape Library: Name of the archive

PVG Name of the physical volume group

state Status; possible values:

- e___ Volume ready for invalidation.
- E___ The PV is reorganized and then invalidated.
- f___ An error occurred while working with this tape. It is not reused and automatically reorganized.
- f_d_ A tape fault has occurred (PV is faulty) but an attempt is still made to write the directory onto the tape
- i___ The PV is currently not accessible
- n___ New volume: the PV must still be initialized before it can be used.
- N___ New volume: the PV must still be initialized before it can be used. Initialization was started with the OmitHeaderCheck parameter.
- o___ Initialized and empty.
- _r__ Read volume on which no space is available for further data.
- _rd_ The cartridge is full but an attempt is still made to write the directory onto the tape

s___ The PV must be scanned (used for transfer).
_v__ The PV is in “vault” state.
_w__ Write volume that can still be used for save operations.
_wd_ The cartridge is not yet full; currently there is no directory on the tape.
____ The state is unknown (used for Transfer-In).

next-bl

Block number of the free range. This indicates the physical utilization level.

LVs Number of saved logical volumes

val Number of valid saved logical volumes; copies of volumes not included here are no longer relevant.

cap/GB

Gross capacity without data compression. This is not specified for volumes prior to initialization (State = new).

i This value is only indicated if supplied by the drive. Otherwise the value 0 is supplied.

valid/GB

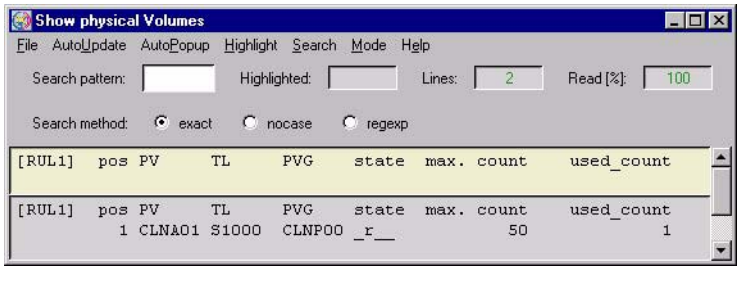
Used capacity; volume of data actually stored. Due to data compresion this value may exceed the total capacity (previous column).

i This only takes into consideration the data compression of the physical drive. The data compression of the device emulations is displayed in “Global Status” along with the cache data. In many cases the compression indicated by PLM is lower if the cache data has already been compressed.

valid %

The percentage of valid data.

If you have selected several cleaning PVGs, you will see the following overview:

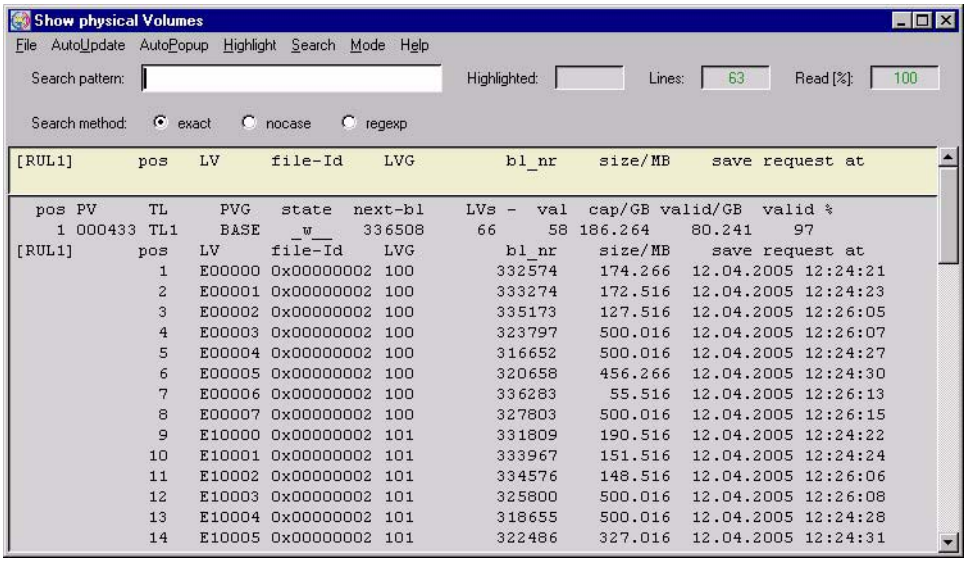


Meaning of the columns:

pos Line number
PV Number of the physical volume
TL Tape Library: Name of the archive
PVG Name of the physical volume group, usually starts at “CLNP”.
state status
The following values are possible for cleaning cartridges:
o___ (“scratch”) when the volume has just been added.
_r__ Read volume, has no more space for additional data. This is the normal state of a cleaning cartridge.
f___ (“faulty”) when all the cleaning cycles have been used up.
max. count
Initial number of cleaning cycles
used_count
Number of cleaning cycles used

The PLM uses the cleaning cartridges as far as possible in such a way that one cartridge is used up fully before the next one is started. However, if a number of cleaning requests are to be carried out at the same time, the cartridges that are available will also be used simultaneously.

When a specific physical volume is queried (volume number specified in the query box) a detailed overview is output:



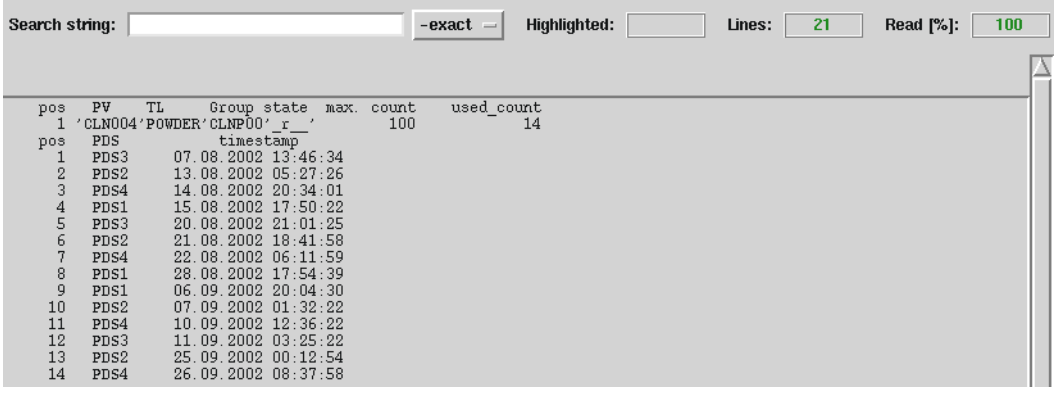
The data for the selected PV is output in the title bar (see page 279).

This is followed by a list of the (valid) logical volumes stored on the PV.

Meaning of the columns:

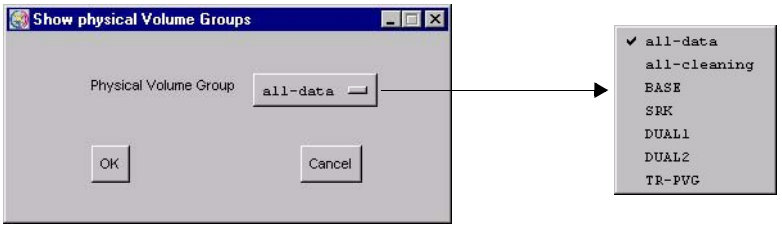
pos	Line number
LV	Name of the logical volume
file-Id	Hexadecimal: a type of version number in the TVC
LVG	Name of the group to which the logical volume belongs
bl_nr	Number of the first block of the logical volume on the PV
size/MB	Size
save request at	Time at which the PLM received the save job. This timestamp allows the Disaster Recovery mechanism to identify which of the various different copies of a logical volume is the most recent.

The information for a cleaning cartridge contains a list showing all the cleaning runs carried out using this cartridge with the time and PDS of each run:



7.6.2.13 Statistics » Physical Components » Physical Volume Groups

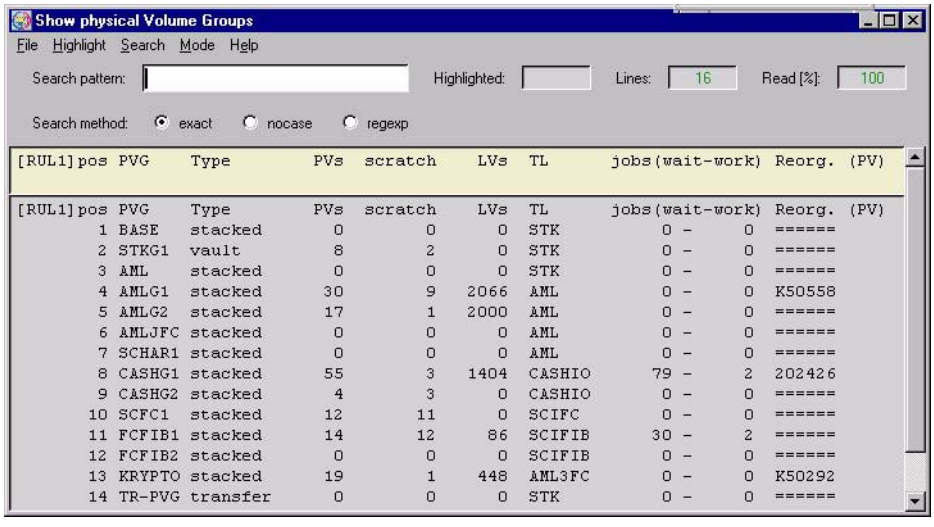
If more than one physical volume group exists an intermediate menu is then displayed for selecting the PVG:



This statistics function supports the refresh function. Information on this function and the “OK” and “Cancel” buttons is provided on page 276.

You can select each individual PVG, all data PVGs, or all cleaning PVGs.

When you select all data PVGs the following overview is displayed:

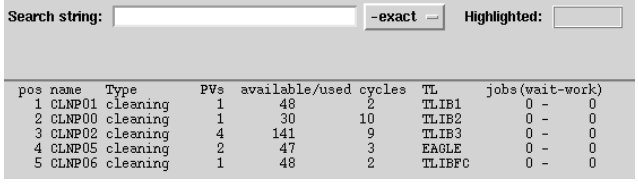


[RUL1] pos	PVG	Type	PVs	scratch	LVs	TL	jobs (wait-work)	Reorg. (PV)
1	BASE	stacked	0	0	0	STK	0 - 0	======
2	STKG1	vault	8	2	0	STK	0 - 0	======
3	AML	stacked	0	0	0	STK	0 - 0	======
4	AMLG1	stacked	30	9	2066	AML	0 - 0	K50558
5	AMLG2	stacked	17	1	2000	AML	0 - 0	======
6	AMLJFC	stacked	0	0	0	AML	0 - 0	======
7	SCHAR1	stacked	0	0	0	AML	0 - 0	======
8	CASHG1	stacked	55	3	1404	CASHIO	79 - 2	202426
9	CASHG2	stacked	4	3	0	CASHIO	0 - 0	======
10	SCFC1	stacked	12	11	0	SCIFC	0 - 0	======
11	FCFIB1	stacked	14	12	86	SCIFIB	30 - 2	======
12	FCFIB2	stacked	0	0	0	SCIFIB	0 - 0	======
13	KRYPTO	stacked	19	1	448	AML3FC	0 - 0	K50292
14	TR-PVG	transfer	0	0	0	STK	0 - 0	======

Meaning of the columns:

pos	Line number
PVG	Name of the physical volume group
Type	Type of PV group (stacked, transfer, vault or cleaning)
PVs	Total number of physical volumes in the group
scratch	Number of empty PVs
LVs	Number of logical volumes stored in this group
TL	Name of the archive to which this group is assigned
jobs (wait-work)	Number of jobs in the queue - number of active jobs
Reorg. (PV)	Number of PV(s) which are being reorganized

When you select all cleaning PVGs the following overview is displayed:



pos	name	Type	PVs	available/used	cycles	TL	jobs (wait-work)
1	CLNP01	cleaning	1	48	2	TLIB1	0 - 0
2	CLNP00	cleaning	1	30	10	TLIB2	0 - 0
3	CLNP02	cleaning	4	141	9	TLIB3	0 - 0
4	CLNP05	cleaning	2	47	3	EAGLE	0 - 0
5	CLNP06	cleaning	1	48	2	TLIBFC	0 - 0

Meaning of the columns:

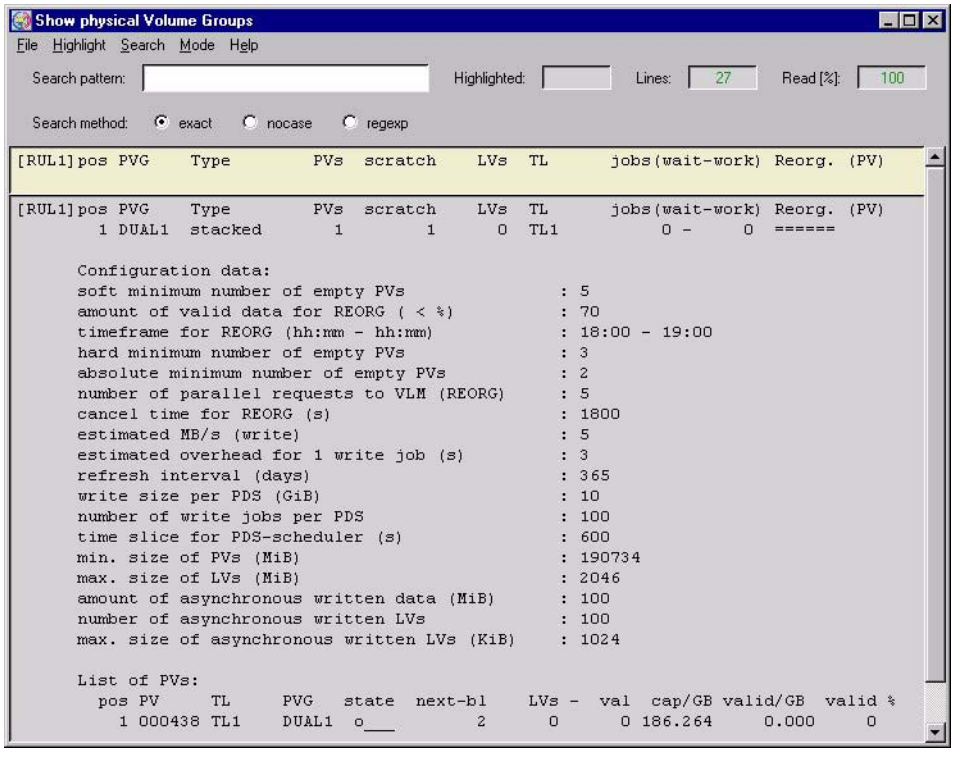
pos	Line number
PVG	The name of the PVG.
Type	Always clean.
PVs	The number of PVs.

available/used cycles
: Number of available cleaning cycles for the physical volumes / number of cleaning cycles which are executed.

TL
: The tape library.

jobs (wait-work)
: Number of waiting jobs / number of working jobs.

When you select only one data PVG the settings for the PVG and a list of the PVs stored on it are displayed:



PVG statistics are displayed in the first line.

Name	Meaning	Example
PVG	Name	AMLG1
Type	Type of the PVG	stacked
PVs	Number of physical volumes	30
scratch	Number empty	19
LVs	Number of logical volumes	2066
TL	Tape Library: Name of the archive	AML
jobs (wait-work)	Number of jobs in queue or being processed	0 jobs in queues, 0job being processed
Reorg. (PV)	Indicates whether a reorganization is running for the PV group	No reorganization being processed

The next block contains the parameters for controlling reorganization.

soft minimum number of empty PVs:
: If the number of free volumes specified here is not reached, reorganization will take place in the reorganization time shown further below.

amount of valid data for REORG
: In the event of reorganization between the soft and hard limits, volumes are recorded whose occupancy level (data volume of the valid cartridge images / data volume of all cartridge images, specified in %) fall below the value set here.

timeframe for REORG
: Time in which the reorganization runs should usually take place. Times with a low productive load should be chosen here.
Currently only a timeframe common to all weekdays can be selected on the graphical user interface.

hard minimum of empty PVs
: If the number of free volumes specified here is not reached a reorganization run is started immediately regardless of the occupancy level.

absolute minimum number of empty PVs
: If this number of empty volumes is reached or fallen below, all resources are used for a reorganization run. Save and restore requests from the VLM which are not related to the reorganization are not accepted. This considerably restricts the productive operation of CentricStor.
The following hierarchy applies:
Soft Minimum > Hard Minimum > Absolute Minimum.

number of parallel requests to VLM (REORG)

Number of “Move Requests” to be processed simultaneously which the PLM sends to the VLM for the purpose of reorganizing PVs. The higher this value, the more resources are reserved by the reorganization.

cancel time for REORG

If a move request issued by the PLM to the VLM remains in an unchanged status beyond this time it is canceled by the PLM. This does not apply for a PV reorganization started by an operator command.

estimated MB/s
estimated overhead for 1 write job

With the “estimated MB/s” and “estimated overhead for 1 write job” parameters the PLM selects the physical volume which it can release in the shortest time in the event of a reorganization. MB/s specifies the estimated write performance of the write drive, “Write Overhead” the estimated overhead per volume to be written.

refresh interval

Threshold value in days. If the first write job for a PV was executed before more than the specified value, the PV will be reorganized in the time range specified in “timeframe”.

write size per PDS
number of write jobs per PDS

These two parameters control the number of drives to be used for write jobs.

– write size:
  Maximum write data volume per drive.
– number of write jobs
  Maximum number of write jobs per drive.

The drive assignment is determined from the maximum value ascertained from the two values. The number of drives used for save requests is defined by the PLM according to the following formula:

n = int (max ((Write_data_volume/WriteWatermark_1), (Number_of_write_jobs/WriteWatermark_2)) +1)

n = 0 if no write jobs are present.

time slice for PDS-scheduler

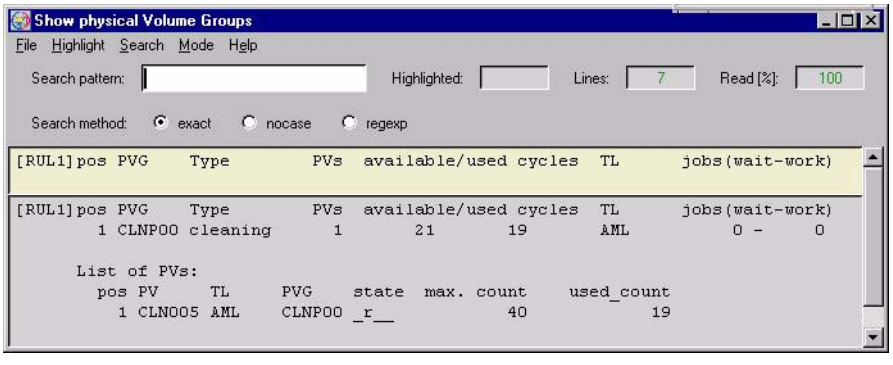
Time in seconds for which a PDS remains assigned to a PV group. After this time has elapsed an active job is terminated and the drive may be unloaded. Depending on the load situation it is then assigned to another PVG.

The value must be greater than or equal to 600 seconds.

Assignment of the physical drives to the PVGs can be controlled by different sized time slices. The larger the time slice of a PVG, the greater its share in the use of the drives.

The layout of the subsequent list of PVs is the same as that described on page 219.

When you select only one cleaning PVG you are shown the following data:



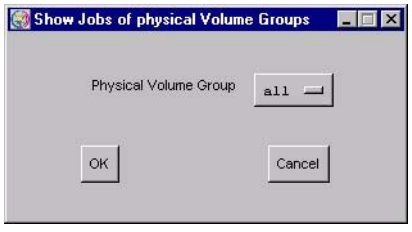
Statistical data of the cleaning PVG:

PVG Name of the PVG
Type Type of the PVG
PVs Number of PVs
available/used cycles
Total avaialble/used cleaning cycles
TL Library in which the PVG is located
jobs (wait-work)
Pending/active cleaning runs

Then follows a list containing the data of the individual volumes.

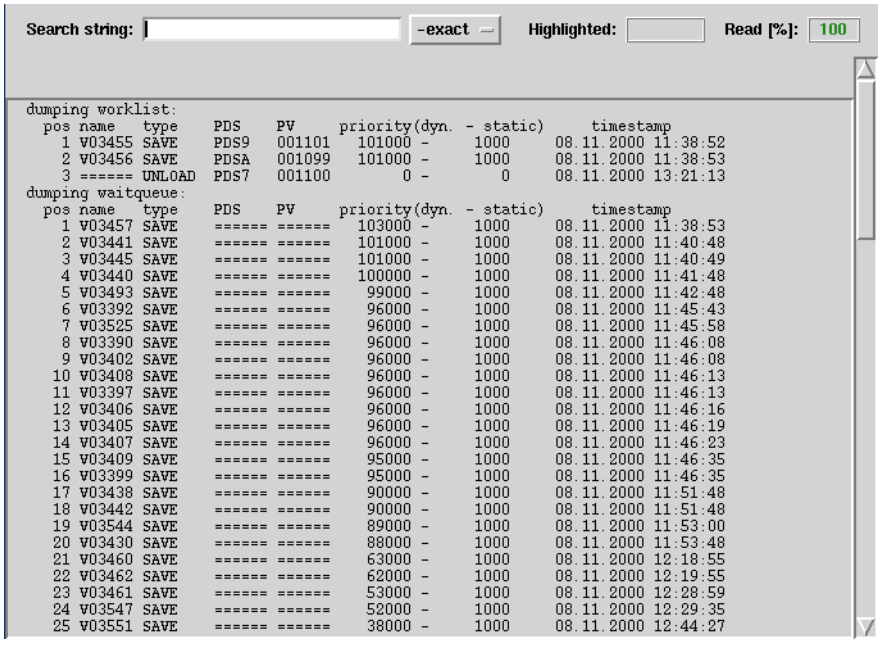
7.6.2.14 Statistics » Physical Components » Jobs of Physical Vol. Groups

A window for selecting one or all PVGs is opened:



This statistics function supports the refresh function. Information on this function and the “OK” and “Cancel” buttons is provided on page 276.

The job data for the selected group(s) is displayed:



The top part of the text field shows the jobs that are being processed, the lower part the queue.

Meaning of the columns:

pos Serial number

LV Name of the logical volume for which the job is or is to be performed. Empty for jobs with no reference to the LV.

type Type of job

ERASE	Invalidate PV header
INIT	Load and initialize PV
INITNEW	Add new PV, write header
RDIR	Reads the directory.
REST	Restore an LV from the physical tape to the “Tape Volume Cache”
SAVE	Save an LV from the “Tape Volume Cache” to a physical type
UNLOAD	Unload PV from PDS
WDIR	Writes the directory.

PDS The name of the PDS which processes the job.
As long as a job is in the queue and no PDs is yet assigned to it, this column contains ’======’.

PV The name of the physical volume.
As long as no PV was assigned with saving jobs, this contains ’======’.

priority (dyn. - static)
Dynamic priority of the job (see below) / static priority

timestamp
Time at which the status shown was entered.

Explanation of the priority

Each job is assigned a static priority when it is created. This is dependent on the following:

– the type of job,
– the current situation (scratch tapes over/under hard limit),
– the procedure for which the job is executed (depending on the number of empty tapes a SAVE job for a reorganization can have a different priority from the SAVE job started by the VLM for clearing the cache),
– for some jobs, the volume of data to be moved.

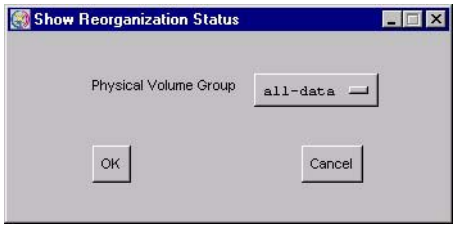
The dynamic priority is obtained by multiplying the wait time (in minutes) by the static priority. This calculation is updated every 60 seconds or whenever a new job in entered in the queue.

The example shows the following situation:

– The PVG is using three drives: PDS9, PDSA and PDS7.
– PV 001100 is being unloaded in PDS7.
– LV V03455 in PDS9 is being written to PV 001101, and LV V03456 in PDSA to PV 001099.
– Below this is a list (not shown in full here) of the LVs which are waiting to be rewritten.
– The queue for “SAVE” is relatively long and (probably) also contains large volumes of data. Consequently two drives are already being used for writing.

7.6.2.15 Statistics » Physical Components » Reorganization Status

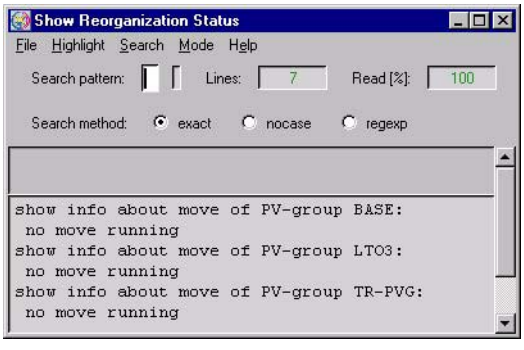
A window for selecting one or all PVGs is opened (naturally the clean PVGs are not offered):



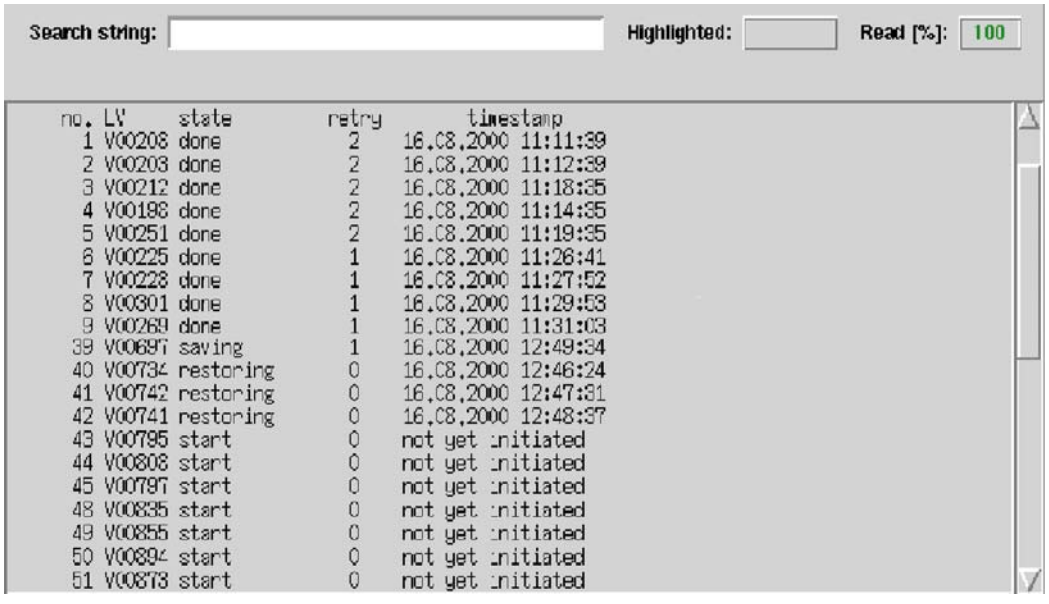
This statistics function supports the refresh function. Information on this function and the “OK” and “Cancel” buttons is provided on page 276.

If only one group is defined this intermediate step is skipped.

If no reorganization is running the following window is displayed:



Otherwise the status of the reorganization of the physical volume group(s) is displayed:



Meaning of the entries:

no.	Line number
LV	Name of the logical volume
state	Status of the reorganization:

done	Completed
failed	Aborted; can only occur with runs started manually
initiated	Job sent to VLM
restoring	Being moved back to the cache
restore done	Moved back to the cache; rewriting has not yet started
saving	Being written to tape
start	Not yet started

retry	Number of command retries; after more than 2 the job is aborted.
timestamp	Time at which the current status was entered.

The number specified in the retry column also relates to command retries at the PLM-VLM interface. If the high load on the VLM means that a PLM request could not be satisfied within this time limit, the job is issued again.

Retries are alarming only if a particular PV is repeatedly connected with a large number of retries. In this case the logical volumes on the PV must be moved and the PV must be removed (see the section “Physical Volume Operations » Erase Physical Volumes” on page 226).

The frequent occurrence of retries can also indicate that the reorganization times coincide with peak loads. In this case the reorganization times should be moved (“Scratch Time Frame” field, see the section “Physical Volume Groups” on page 181).

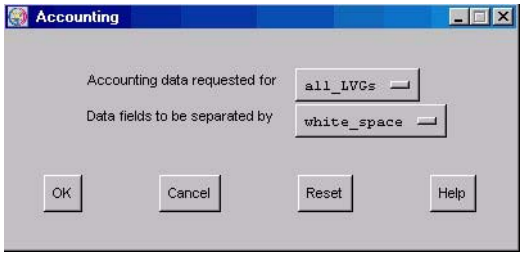
More detailed information on the retry causes is provided in the system messages (see the section “Show System Messages” on page 158).

7.6.2.16 Statistics » Usage (Accounting)

This function is displayed only if an accounting license is installed.

This function is also available in Observe.

It enables the accounting data for logical volume groups (LVGs) to be displayed. When the entry is activated, the “Accounting” window is displayed:



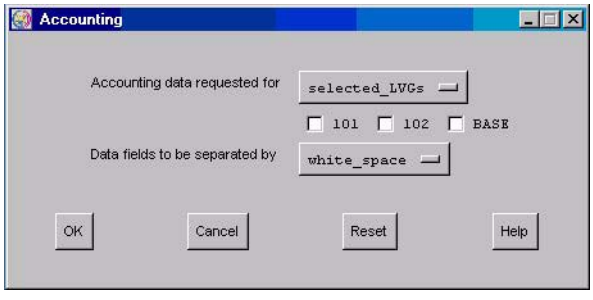
Selection fields

Accounting data requested for

Here you can choose between the following options:

all_LVGs	The accounting data for all LVGs in the system is output.
selected_LVGs	Initially all the LVGs known in the system are displayed as check buttons.

Example



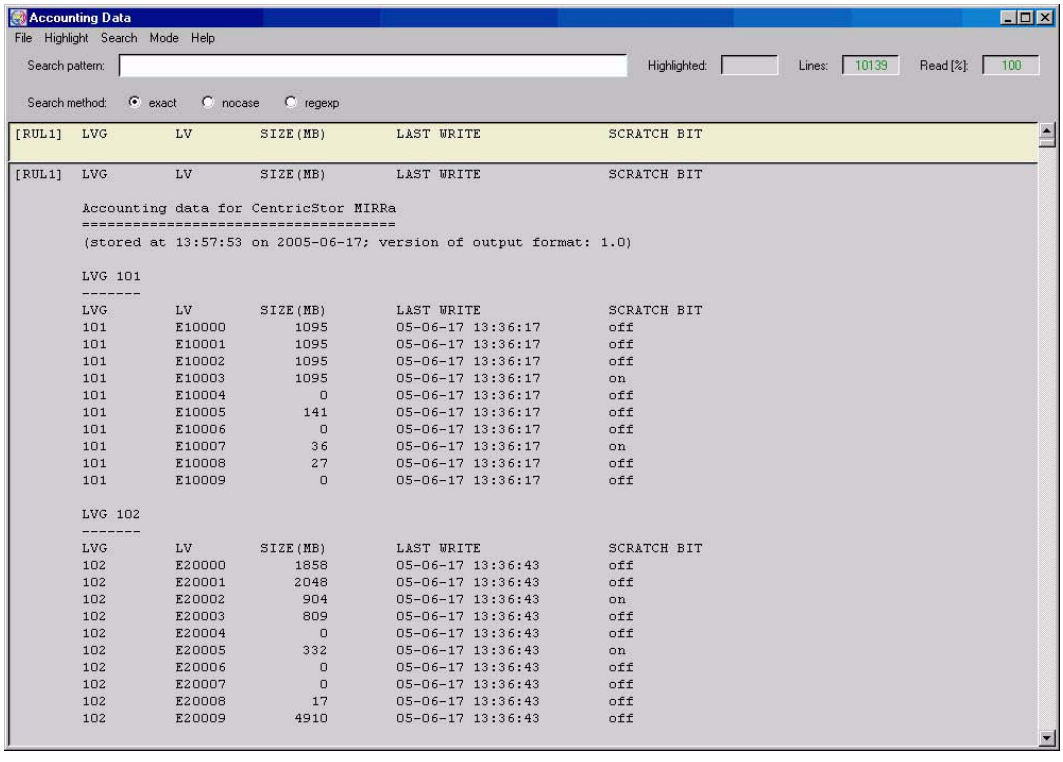
You can then select those LVGs whose accounting data you are interested in.

Data fields to be separated by

Here you are given the opportunity of outputting the accounting table(s) in a format in which the individual fields are separated either by white space or by a comma.

Accounting Data

When you click on the “OK” button the account information is displayed in a text field (here with the option “Data fields to be separated by white space”):




```
[RUL1]  LVG        LV        SIZE(MB)        LAST WRITE              SCRATCH BIT

[RUL1]  LVG        LV        SIZE(MB)        LAST WRITE              SCRATCH BIT

        Accounting data for CentricStor MIRRa
        ======================================
        (stored at 13:57:53 on 2005-06-17; version of output format: 1.0)

        LVG 101
        -------
        LVG        LV        SIZE(MB)        LAST WRITE              SCRATCH BIT
        101        E10000          1095        05-06-17 13:36:17       off
        101        E10001          1095        05-06-17 13:36:17       off
        101        E10002          1095        05-06-17 13:36:17       off
        101        E10003          1095        05-06-17 13:36:17       on
        101        E10004             0        05-06-17 13:36:17       off
        101        E10005           141        05-06-17 13:36:17       off
        101        E10006             0        05-06-17 13:36:17       off
        101        E10007            36        05-06-17 13:36:17       on
        101        E10008            27        05-06-17 13:36:17       off
        101        E10009             0        05-06-17 13:36:17       off

        LVG 102
        -------
        LVG        LV        SIZE(MB)        LAST WRITE              SCRATCH BIT
        102        E20000          1858        05-06-17 13:36:43       off
        102        E20001          2048        05-06-17 13:36:43       off
        102        E20002           904        05-06-17 13:36:43       on
        102        E20003           809        05-06-17 13:36:43       off
        102        E20004             0        05-06-17 13:36:43       off
        102        E20005           332        05-06-17 13:36:43       on
        102        E20006             0        05-06-17 13:36:43       off
        102        E20007             0        05-06-17 13:36:43       off
        102        E20008            17        05-06-17 13:36:43       off
        102        E20009          4910        05-06-17 13:36:43       off
```

The data is output in the following form for each CentricStor computer:

- Title

  “Accounting Data for CentricStor <Name des CentricStor-Systems>”

- Subtitle

  Date and time and format of the output

- Table

  One or more tables with the accounting data depending on whether the data for all, for one or for multiple logical volume groups (LVGs) was requested.

  Each table consists of the following:

  – Title

all LVGS	Display of all LVGs
LVG <LVG-name>	Display of the selected LVG

  – Columns

    The individual columns are separated by white space or commas (no white space) .

LVG	Name of the LVG to which the volume belongs
LV	Name of the volume
SIZE (MB)	Amount of data stored on this volume (in MB)
LAST WRITE	Date and time of the last write access
SCRATCH BIT	Value of the scratch bit[1]: on Volume may be overwritten. off Volume may not be overwritten.

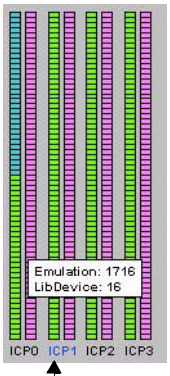
- Termination

  The end of the entire output is indicated by the character string “end of accounting data”. This indicator permits a check to ensure that the accounting data is complete.

[1] Dieses *Scratch-Bit* ist ein CS-internes Merkmal und hat nichts tun mit einem *Scratch-Volume* aus der Sicht einer Host-Anwendung, welches durch ein (zufällig) gleichgenanntes *Scratch-Bit* gekennzeichnet ist.

7.6.3 Data which can be called via objects of the Global Status

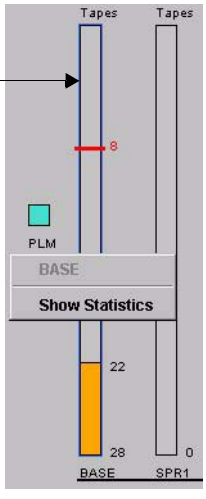
The chronological progress and statistical data can be displayed via some Global Status objects. To do this position the mouse cursor over the object. If data is present for the object, this is indicated by a blue border or the device designation is colored blue. If you press the right mouse button a context menu with the menu item “Show Statistics” is opened.



Blue device designation

Left mouse button: Device information is displayed.

Blue border



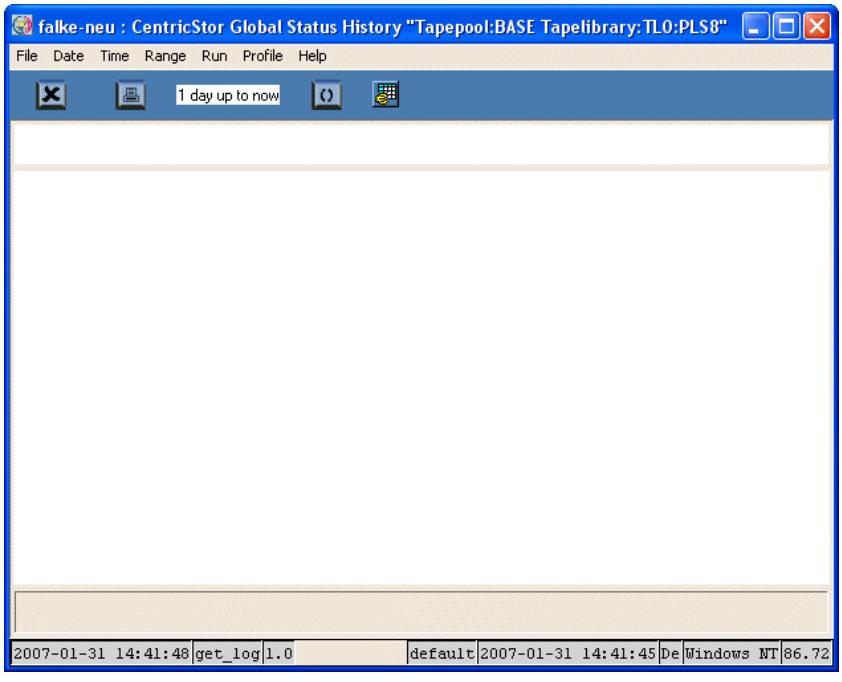
Right mouse button: A menu appears which contains the function“Show Statistics”.

If you select the “Show Statistics” function an empty statistics window opens in which you can enter the required time specifications, as described in the section “Selecting the time period” on page 262. After you have clicked on the “Redraw” button the statistics graph is displayed.

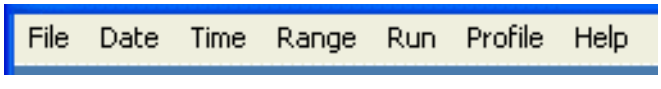
Detailed information on this subject is provided in the section “History diagrams” on page 298.

7.7 History diagrams

After a statistic has been selected, first of all a window with an empty page appears. The window is structured as follows:



7.7.1 Function/menu bar



7.7.1.1 File

The following functions are available:

- Export
- Print
- Exit

Export

This function causes the history data to be read in as specified by the current settings. The data is then written to a file.

Details on this are provided in the section “Exporting history data” on page 314.

Print

Prints the chart or saves the print image to a file.

If Global Status is running under Windows it is advisable to use the print function button (page 246). This opens the usual Windows print menu.

A printer setup menu is displayed:

Setting options

Print to

– Printer
  Output is to a PostScript printer.

  After you click on the “Setup” button a window is displayed for entering the printer setup:

  In this form you can make the printer default settings. After you click on the “Save” button the settings are transferred to the previous window.

– File
  Output is to a file in PostScript format.

Orientation
: You use “Orientation” to select “Portrait” format, “Landscape” format or “Auto” (automatic adjustment).

Paper
: Here you can select “A4” or “letter”.

Mode
: Setting options: “color” or “grayscale”

Buttons along the lower border

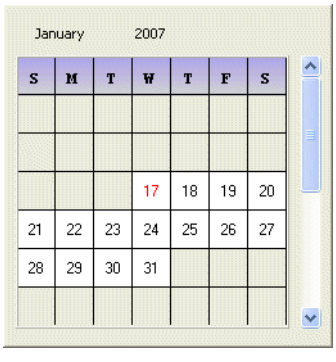
Print	Printout takes place with the values set.
Help	A help text is output.
Default	Saves all current settings.
Cancel	The window is closed without the changes being accepted.

Exit

This closes the window.

7.7.1.2 Date

This function opens a window which enables the start date for a display area to be defined:



You can select the month using the scroll bar.

After you have clicked on a valid date field, the window is closed and the date is taken over.

7.7.1.3 Time

A pull-down menu with the values 0 - 23 is opened in which you can define the start time for a display area.

After you have clicked on the required time, the window is closed and the value selected is taken over.

7.7.1.4 Range

A pull-down menu is opened in which you can define the the display period:

The duration of the display period is defined with the values at the bottom.

The values at the top are used to select whether the display period should start on the date set and at the time selected (from date/time) or end with the current time (up to now).

After you have clicked on the required field, the window is closed and the value selected is taken over.

7.7.1.5 Run

Draw

The statistics are presented again in the window using the data from *Date*, *Time* and *Range*.

Export

A browser is opened which enables you to save the current graphics as a text file.

7.7.1.6 Mode

After the diagram has been built up, some diagrams enable you to specify whether the maximum value (max), the spread (min/max) or the average value (average) should be presented for each display period. If you select min/max, the maximum and minimum values are separated by a slash.

7.7.1.7 Profile

Profile enables the current settings, e.g. for the analysis period, to be stored and reused the next time the program is called.

Specifically this means:

– Managing profiles (submenu: Add/Select Profile)
– Importing options from a profile file (submenu: Add/Select Profile)
– Storing options in a profile (submenu: Save)

Automatic storing/import:

When the Viewer has been terminated, the current settings are saved in the current profile. The next time the Viewer is called, the settings from this profile are used again.

7.7.1.8 Help

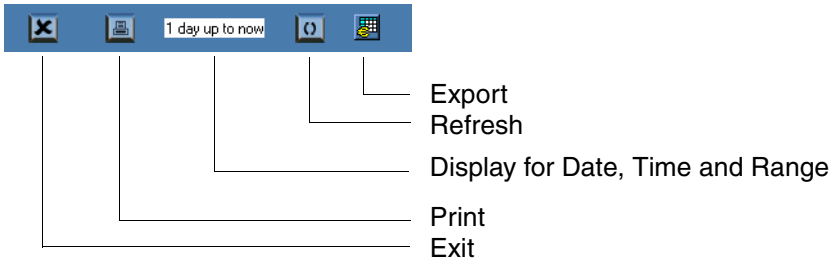
Readme

Displays a text window with helps.

About

Displays a copyright notice and the revision level of the program.

7.7.2 Toolbar



The toolbar is used to start frequently used functions without having to take the detour via the menu. The settings which are currently applicable for the analysis period are also displayed.

7.7.3 Status bar

The status bar at the bottom of the screen displays (from left to right) the following information:

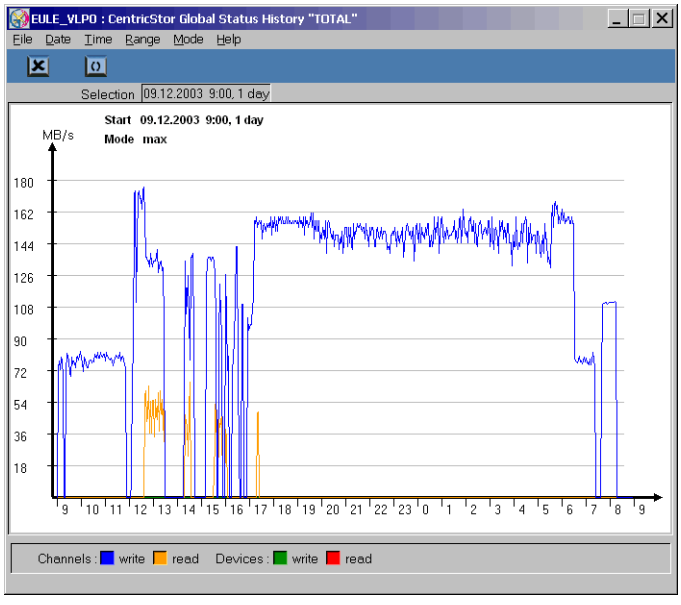
remote_time	Time stamp of the last history call on the connected CentricStor
protocol	Type of protocol used: *get_log* or *read_log*
Protocol version	Version number of the protocol
Profile	Name of the profile currently used
last history call	Time stamp of the last history call on the GUI computer
Language	Language set for the helps
Platform	Operating system
Version	Version of the program

7.7.4 Diagrams for the throughput (left-hand part of the screen)

Overall throughput

This function can also be reached via the function bar (see the section “Statistics » History of » Channel/Device Performance” on page 266). The chronological progress for the host adapter and device throughput is displayed. The buttons along the lower border can be used to mask out individual data types.

Mode selection (max, min/max or average, see section “Selecting the presentation mode” on page 263) is supported.



Host adapters

For each host adapter a column showing the current throughput for read and write operations of the host - arranged according to ICP - is displayed in the upper half of the left-hand subwindow. As described above, you can have the chronological progress of these values displayed for each host adapter.

Mode selection (max, min/max or average, see section “Selecting the presentation mode” on page 263) is supported.

Device ports

For each tape drive controller a column showing the current throughput for read and write operations of the CentricStor backend - arranged according to IDP - is displayed in the lower half of the left-hand subwindow. As described above, you can have the chronological progress of these values displayed for each tape drive controller.

Mode selection (max, min/max or average, see section “Selecting the presentation mode” on page 263) is supported.

7.7.5 Diagrams for virtual components (central part of the screen)

7.7.5.1 ICP emulations

A distinction must be made here between whether the *readlog* or *getlog protocol* is being used on the connected CentricStor. This depends on the CentricStor version currently installed:

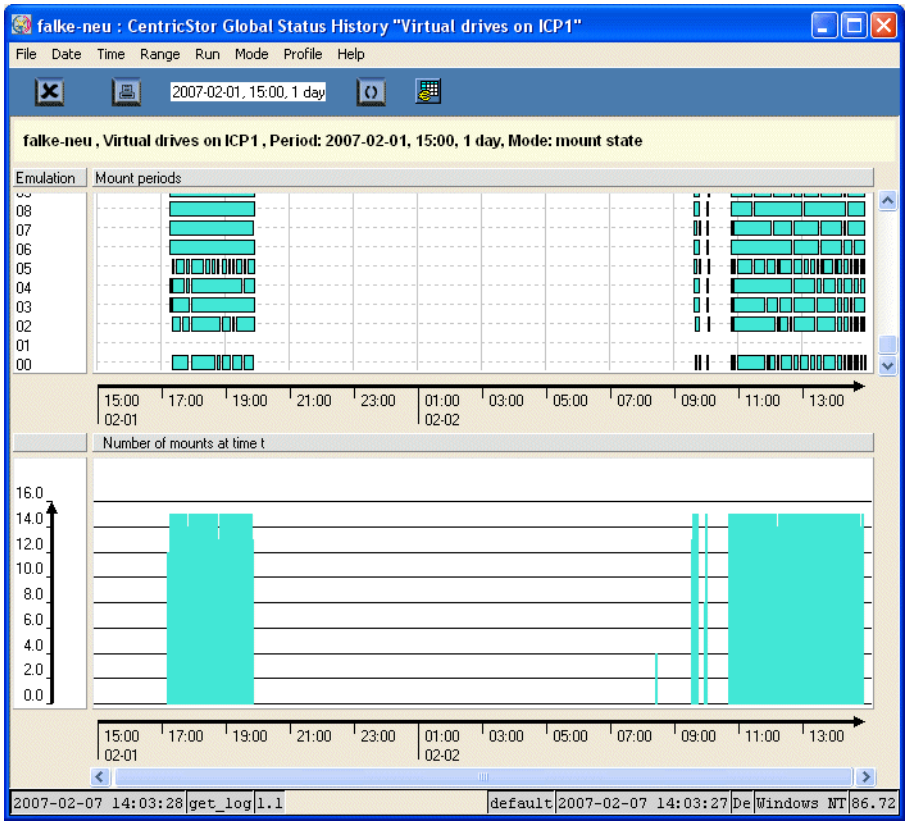
= V3.1D: get_log protocol
< V3.1D: read_log protocol

Outputs for CentricStor V3.1D or higher (get_log protocol)

The following diagrams are offered depending on the mode selected (see the section “Mode” on page 301):

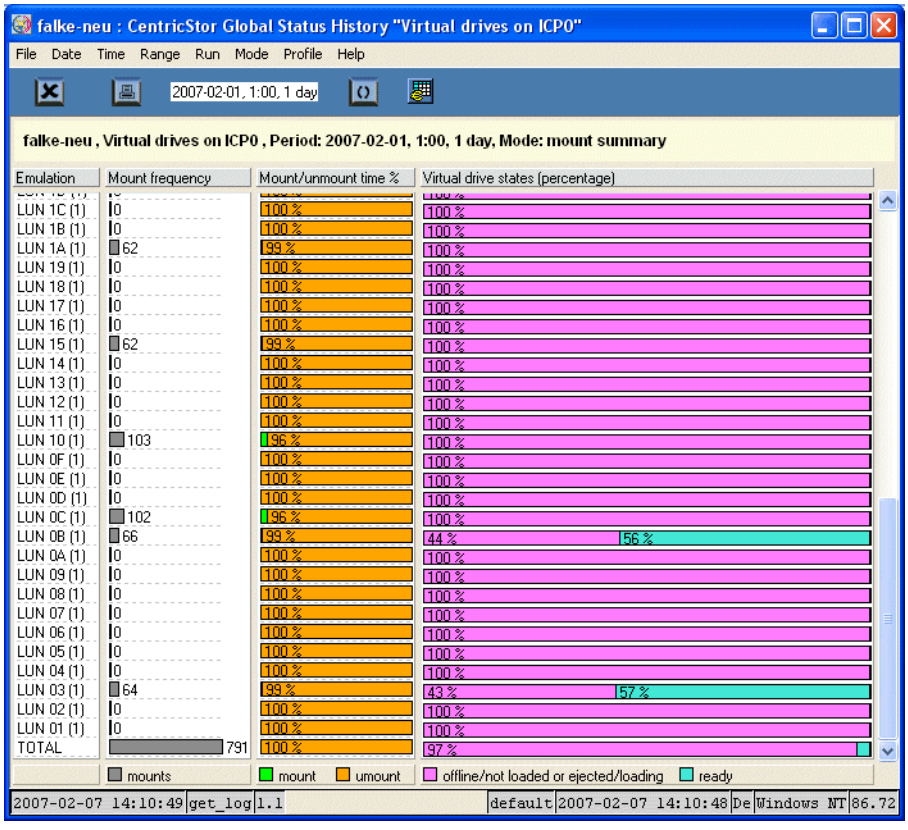
- Mount state diagram

  The *mounted* state is displayed for each emulation/PDSs in the selected period. This shows the time when a cartridge was mounted:

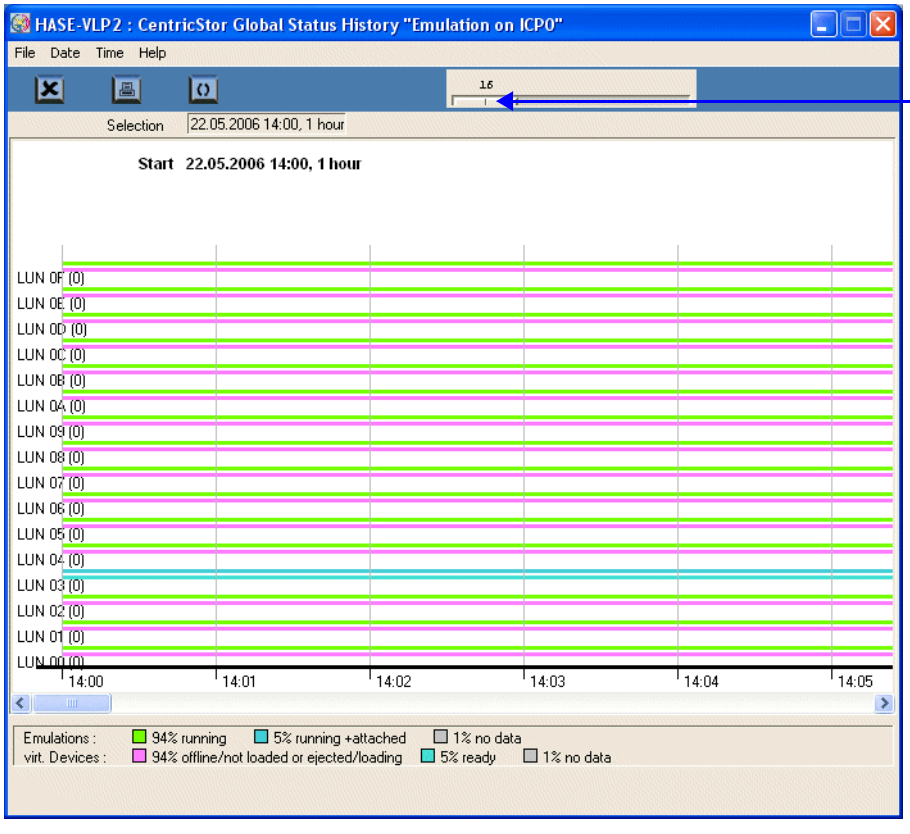


- Mount summary diagram

  The number of emulations/PDSs in the *mounted* state at any given time is shown here. This shows how many tapes were unmounted at a particular time:



Outputs for CentricStor < V3.1D (read_log protocol)



Slider

If more than 16 emulations are defined, a slider is displayed in the button bar. You can use this to select which group of 16 emulations is to be displayed.

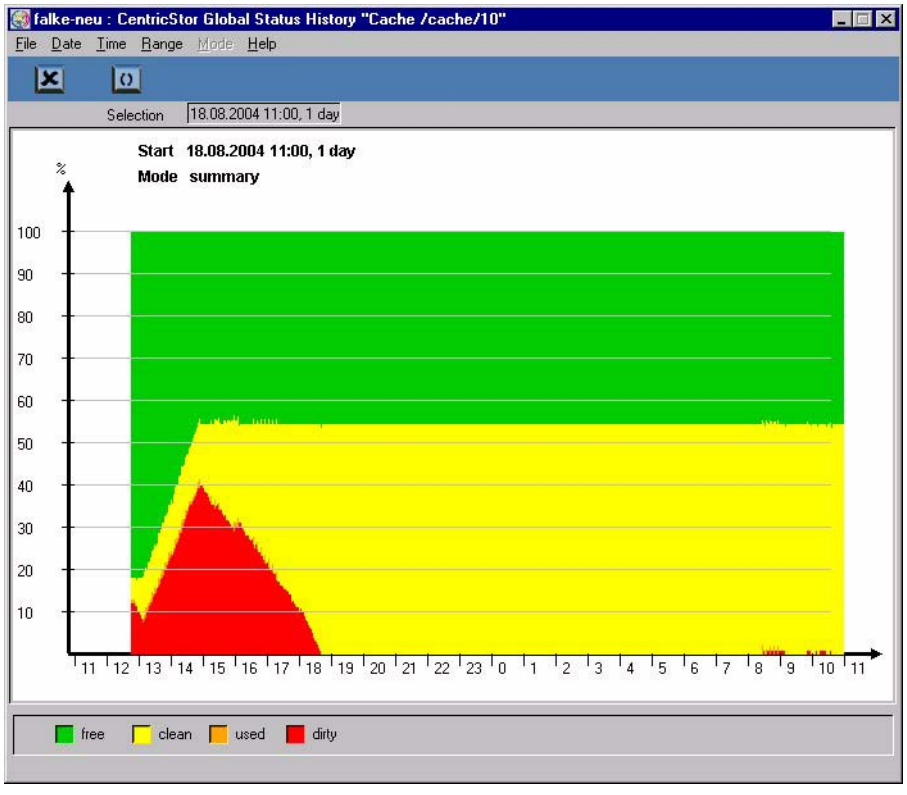
The presentation period is set permanently to one hour.

The key at the bottom of the window describes the meaning of the colors of the lines in the picture, i.e. statuses. The percentage share of each status in the period shown is also displayed.

Each line pair shows the status of the emulation (upper line) and that of the relevant virtual drive (lower line).

7.7.5.2 Cache Usage

The progress of the cache usage can be displayed for each individual cache file system or for all caches together. To do this, right-click on the relevant cache column in the central section and select “Show Statistics” in the context menu. After you have specified the required time period you are shown a presentation of the cache usage:



The color presentation of the cache statuses in your system may differ from this example. You should therefore refer to the key along the lower border.

Meaning of the statuses

free	Not used. This area can be used immediately for saving volume images.
clean	Contains valid volume images. The volumes are unchanged compared to their images saved on tape (either not yet written or already saved). If another mount takes place for a volume from this area, this can be performed without a delay. If the storage space is required for other volumes, it can be used without delay.
used	In use. The images of volumes which are being loaded are saved in this area.
dirty	The volumes imaged here have changed compared to their contents saved on tape. When the data is saved to tape, the status changes to “Clean”.

7.7.6 Diagrams of the physical components (right-hand part of the screen)

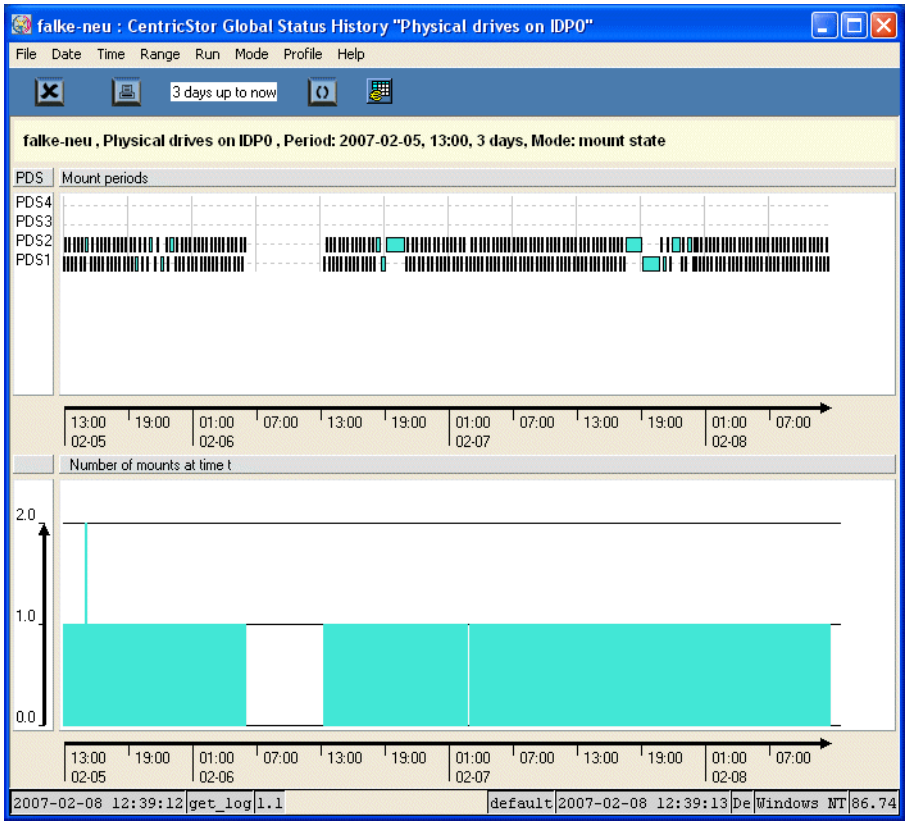
7.7.6.1 IDP statistics

When you click on an IDP (left-hand half of the screen) with the right mouse button and select “Show Statistics” a window containing the IDP’s statistical data appears.

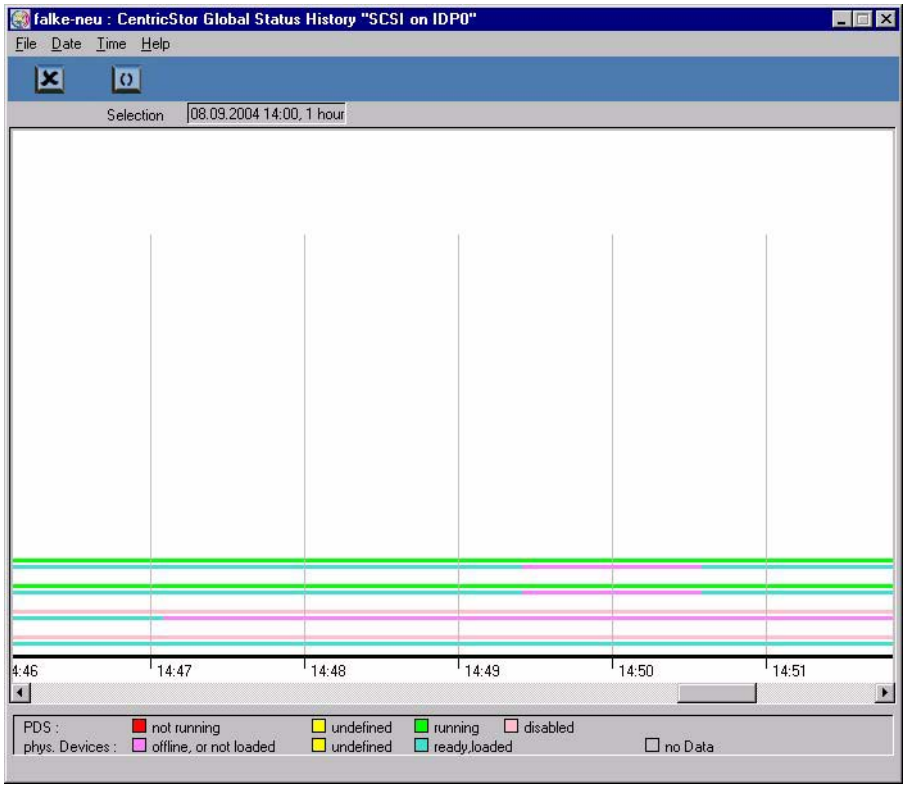
A distinction must be made here between whether the *readlog* or *getlog protocol* is being used on the connected CentricStor. This depends on the CentricStor version currently installed:

= V3.1D: get_log protocol
< V3.1D: read_log protocol

Example for V3.1D



Example for < V3.1D



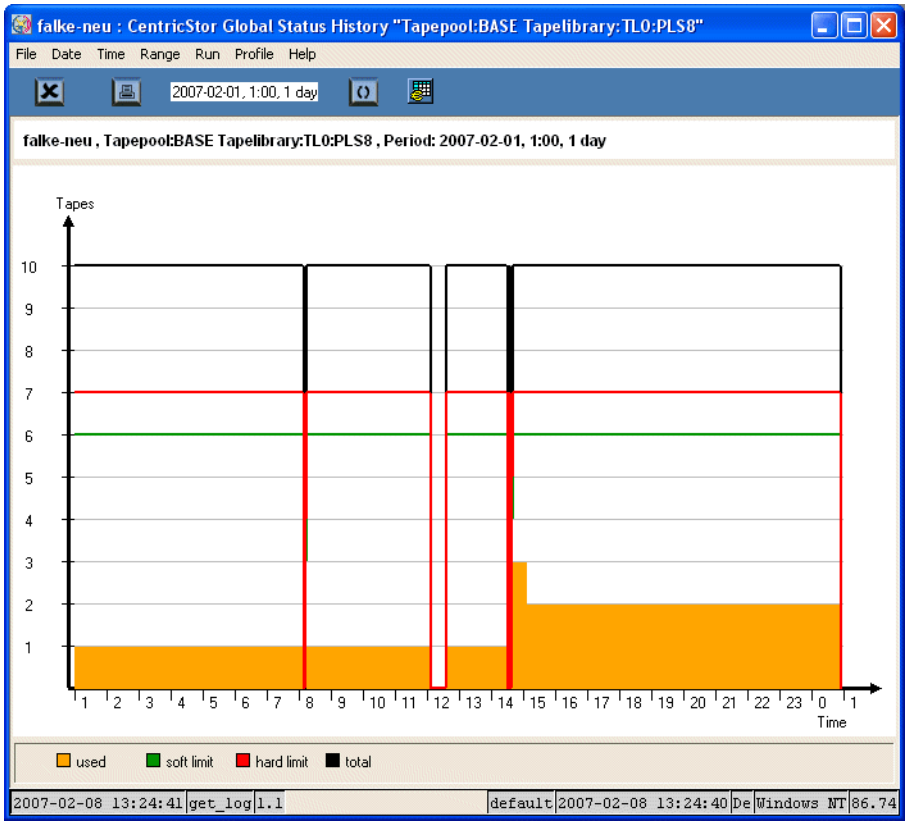
The presentation period is set permanently to one hour.

Each line pair shows the status of the PDS (upper line) and that of the relevant physical drive (lower line).

7.7.6.2 Tape pool values

When you click on a column in the right-hand part of the screen with the right mouse button and select “Show Statistics” a window containing the tape pool values appears.

Example



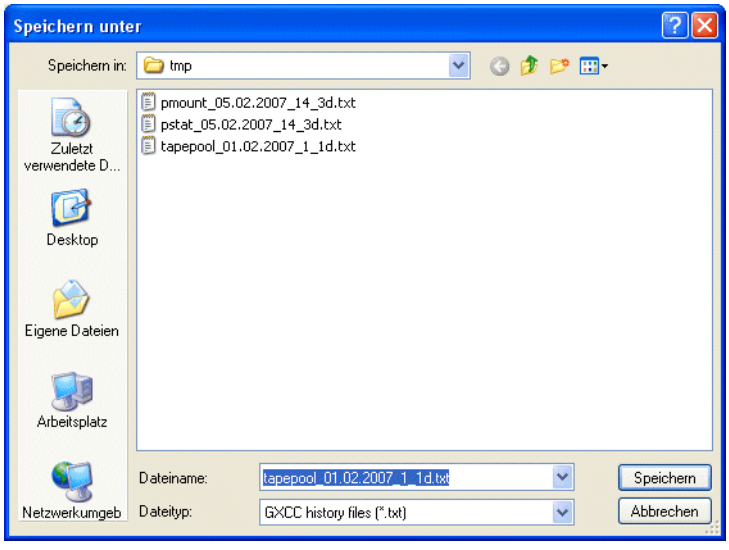
The presentation shows the progress for the physical volumes used.

Start date, start time and range can be selected for this display.

7.7.7 Exporting history data

This function causes the history data to be read in as specified by the current settings. The data is then written to a file. This can involve considerably more data than would be needed to draw the diagram currently selected (see the example below).

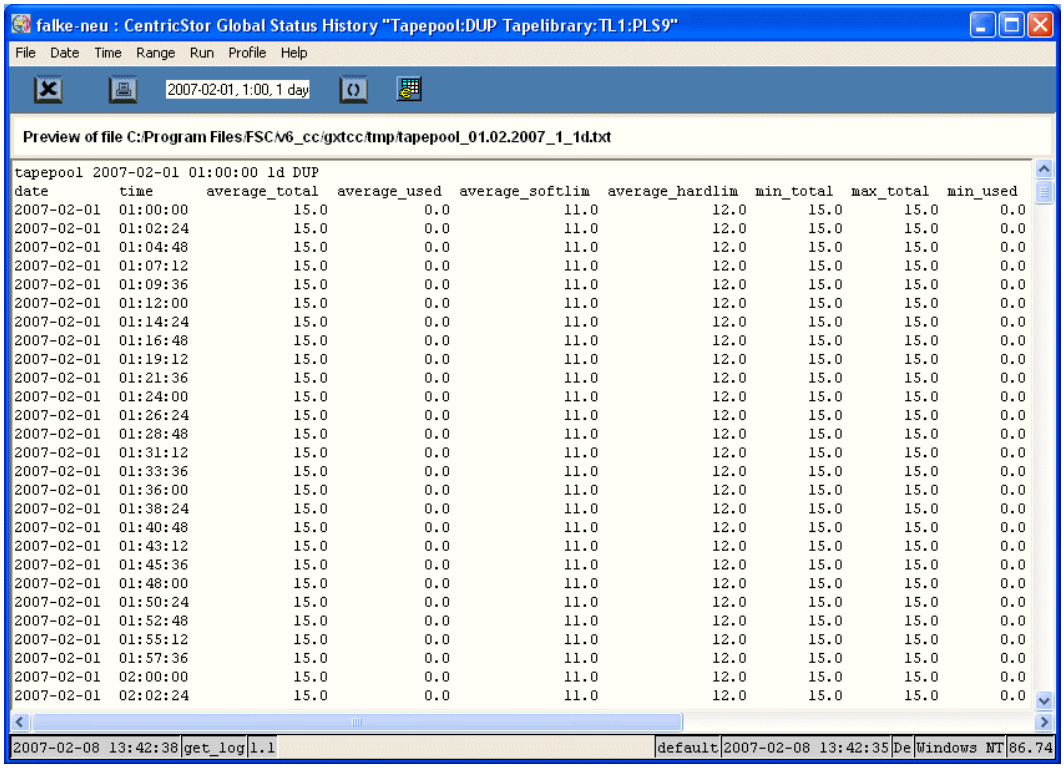
To save the data a selection dialog is offered which enables you to switch the directory and assign a name to the file which is to be stored:



Preset directory: The temporary GXCC directory
Preset file name: <historytype>_date_time_range.txt

After the file has been saved, the content of the written file is displayed in the main window.

Example



Scope of output:

It is possible that more data fields are written to the file than would be shown on the screen, namely all data fields which were read in for the presentation selected (i.e. the raw data supplied at the interface).

Example: If the presentation mode *average* is selected, the min/max data fields are nevertheless imported and exported in addition to the average data fields.

7.7.8 Command line tool for generating the history data

The shell script *get_hist.sh* was created to permit the history data of a CentricStor system to be made available in a text format (e.g. for the spreadsheet program Excel).

This script is contained in the `/usr/apc/bin` directory. It can be used to analyze the current history data of the system on which it is called (Case a), or the imported data of a foreign system (Case b).

In Case a) the script can be called on any ISP of the CentricStor system concerned. The same applies for Case b) if the imported history files were saved on the RAID. Otherwise *get_hist.sh* must be called on the computer whose local hard disk contains the files.

The script's output is directed to *stdout* and can consequently be written to the `history.csv` file (the file name is arbitrary) by adding the suffix `>history.csv` to the script call.

The script call has the following format:

```
get_hist.sh  <history-type> <additional-parameter>
```

Explanation:

The history type must be specified as the 1st parameter. This specification corresponds to clicking on an object in the Globstat window in the case of graphical output.

The following history types are supported:

History type	Corresponds to clicking on the following in the Globstat window
cache	A cache in the *Virtual Components* subwindow
escon	A channel in an ESCON graphic in the *Performance* subwindow
Fc	A channel in an FC graphic in the *Performance* subwindow
ficon	A channel in a FICON graphic in the *Performance* subwindow
pmount	A PDS box in the *Physical Components* subwindow
tape	A device in the DEVICES graphic in the *Performance* subwindow
tapepool	A tape pool in the *Physical Components* subwindow
total	The bar in the TOTAL graphic in the *Performance* subwindow
vmount	An emulation box in the *Virtual Components* subwindow

All values which can be selected in the graphical call of the history function can also be specified as additional parameters. The `-hd` parameter, which is described further below, is also accepted. Which parameters can or must be specified differs according to the history type. The correlation is shown by a matrix which the script outputs when the help function (`-h` or `-?` parameter) is called:

```
get_hist.sh -?

call: get_hist.sh <history type> <parameters for specified history type>

The following history data will be delivered for the specified period of
time:
-------------------------------------------------------------------------------
History type | data delivered
-------------------------------------------------------------------------------
cache        | partitioning of cache states free, clean, used, and
             | dirty for specified cache
escon        | average, minimal, and maximal read and write performance for
             | ISP and ESCON channel specified
fc           | average, minimal, and maximal read and write performance for
             | ISP and fiber channel specified
ficon        | average, minimal, and maximal read and write performance for
             | ISP and FICON channel specified
pmount       | number of mounts, mount time and time spent in different
states
             | for each pds process on ISP specified
tape         | average, minimal, and maximal read and write performance for
             | ISP and tape device specified
total        | average, minimal, and maximal read and write performance for
             | the entirety of channels and devices
vmount       | number of mounts, mount time and time spent in different
states
             | for each virtual drive (emu or vtd) on ISP specified

History type and related parameters can be extracted from matrix below
("opt." means "parameter is optional"):
-------------------------------------------------------------------------------
           history type: | cache | escon   | vmount | tape | tapepool | total
                         |       |  or     |        |      |          |
                         |       | fc      |  or    |      |          |
                         |       |  or     |        |      |          |
param.:                  |       | ficon   | pmount |      |          |
-------------------------------------------------------------------------------
-ca <cache name as       | x     |         |      |      |          |
   found in globstat or  |       |         |      |      |          |
   wild card term>       |       |         |      |      |          |
-ch <channel name as     |       | x       |      |      |          |
  found in globstat(*1)  |       |         |      |      |          |
```

```
  or wild card term>     |       |         |      |      |          |
-da <start date          | opt.  | opt.    | opt. | opt. | opt.     | opt.
   (YYYY-MM-DD)>         |       |         |      |      |          |
-dv <device name as found|       |         |      | x    |          |
   in globstat(*2) or    |       |         |      |      |          |
   wild card term>       |       |         |      |      |          |
-hd <history directory,  | opt.  | opt.    | opt. | opt. | opt.     | opt.
   e.g. /usr/tmp/\       |       |         |      |      |          |
   hist_log> (*3)        |       |         |      |      |          |
-ho <start hour          | opt.  | opt.    | opt. | opt. | opt.     | opt.
   (>=0 and <24)>        |       |         |      |      |          |
-in <ISP name, e.g. ICP0 |       | x       | x    | x    |          |
  or wild card term>     |       |         |      |      |          |
-pt <period of time      | opt.  | opt.    | opt. | opt. | opt.     | opt.
   (1h, 2h, 3h, 6h, 12h, |       |         |      |      |          |
   1d, 3d, 1w, 1m, 3m,   |       |         |      |      |          |
   6m, or 1y)>           |       |         |      |      |          |
-tn <tapepool name as    |       |         |      |      | x        |
   found in globstat>    |       |         |      |      |          |
-------------------------------------------------------------------------
(*1) click left mouse button in globstat window on channel, which you are
     interested in, and take string, which appears behind ':' in the balloon
     help
(*2) click left mouse button in globstat window on device, which you are
     interested in, and take string, which appears behind ',' in the balloon
     help
(*3) This parameter is needed, if history files were imported from a foreign
     CentricStor system. It specifies the directory in the local system, in
     which the foreign history files were stored.

Sample calls:
get_hist.sh escon -ch ca0 -in ICP1 -da 2006-02-22 -ho 13 -pt 3h
get_hist.sh tape -dv c15t12l0 -in IDP0 -da 2006-03-31 -ho 20 -pt 1d
```

To process the generated history data using Excel or a program which can interpret Excel data (referred to as the *evaluation program* below), the data must be transferred (e.g. using `ftp`) to the computer on which the evaluation program is called. The files generated are generally 50 KB in size.

Presentation of the data in Excel

In order to permit the history data to be presented on a graphical interface of a type similar to CentricStor, an Excel macro has been created which is supplied with the GXCC product. This macro is only intended as an example and in no way provides a 1:1 map of the GXCC graphical interface.

The macro is contained in the following directory:

```
<GXCC-installation-directory>/osd/Windows/Excel_Performance_Makro.xls
```

Example

```
c:/Programs/FSC/v6_cc/gxtcc/osd/Windows/Excel_Performance_Makro.xls
```

Procedure:

1. Starting the macro

   The macro can be started either by means of a double-click (if a link exists between xls files and the evaluation program) or by starting the evaluation program and then opening the macro. If necessary, click on the *Activate macros* button to confirm.

2. Generally a dialog for opening a file is then offered to select the history file. Select a file and then click on OK.

3. A number of dialog pages will be created and offered for display.

4. If you want to evaluate another history files, you can do so using the menu item *GlobalHistory/Historyfile* (on the far right of the menu bar in Excel) or by rebooting.

5. ...

6. Terminate the macro

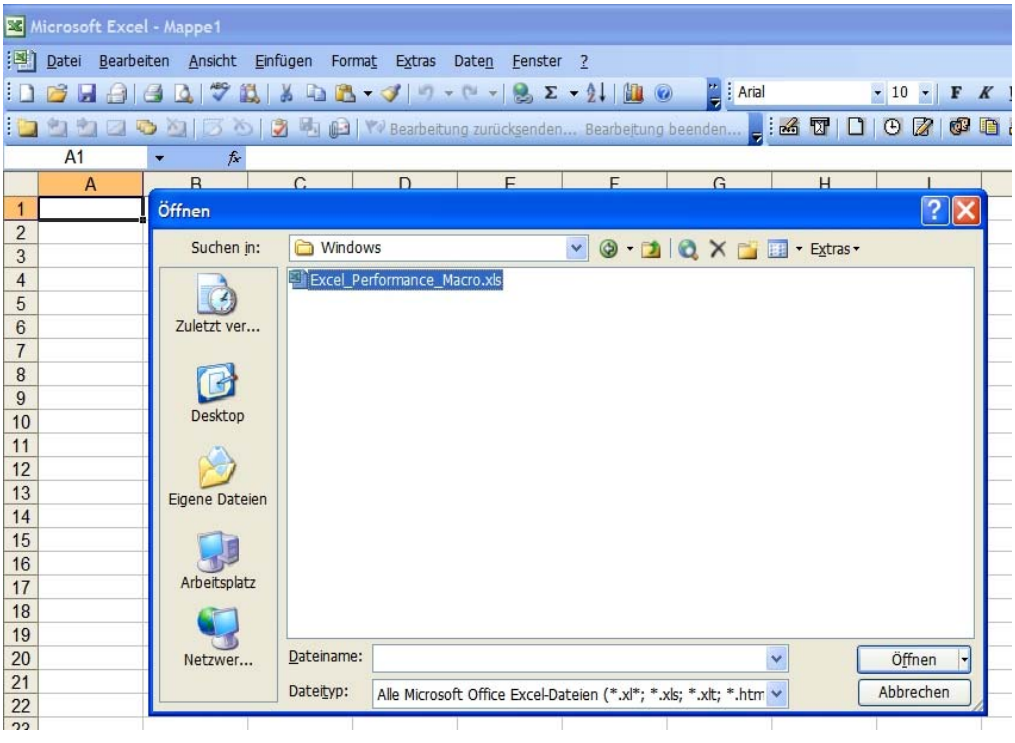
When you terminate the macro you will be asked whether you want to save the changes. If you want to keep the evaluation, you should store it in the form of another xls file (i.e. as an Excel file) in the dialog offered. Your original file will remain unaffected by this.

Example

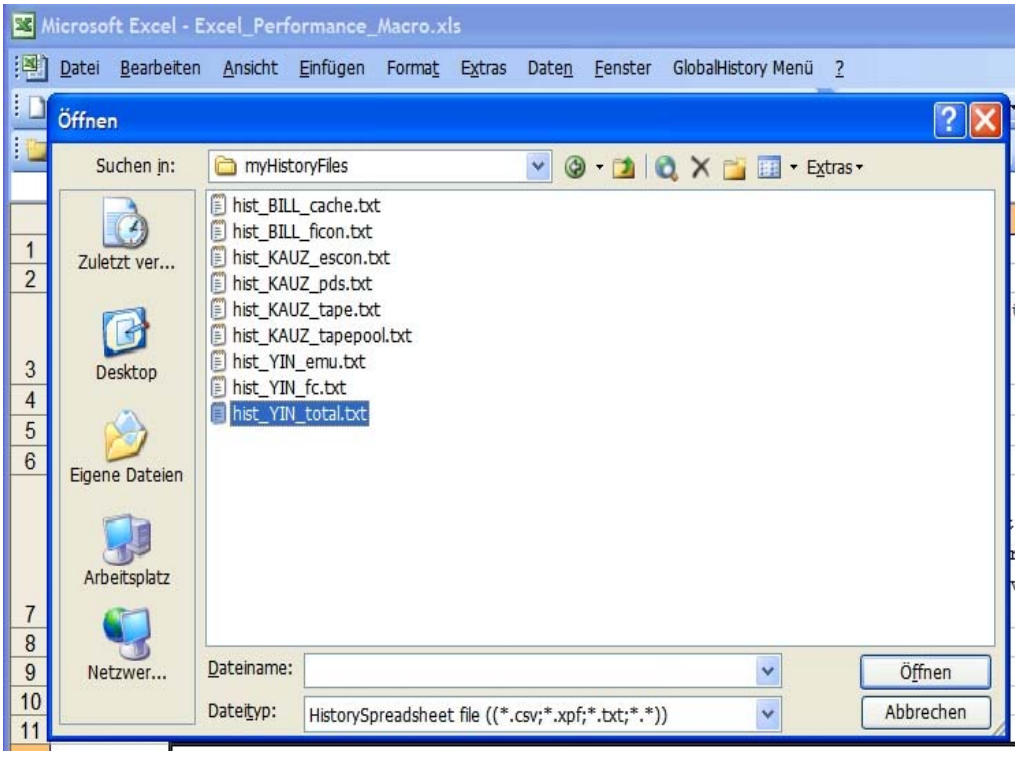
1. Create a file

```
get_hist.sh total -da 2006-03-29 -ho 0 -pt 6h >YIN.total2.txt
```

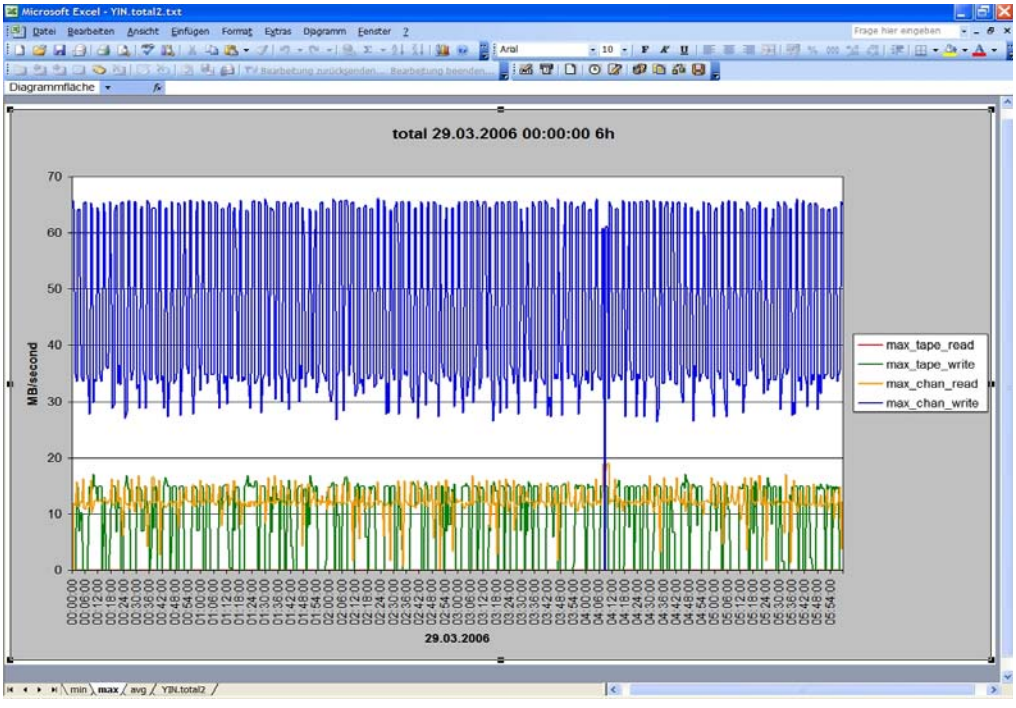
2. Transfer file
3. Open Excel macro:



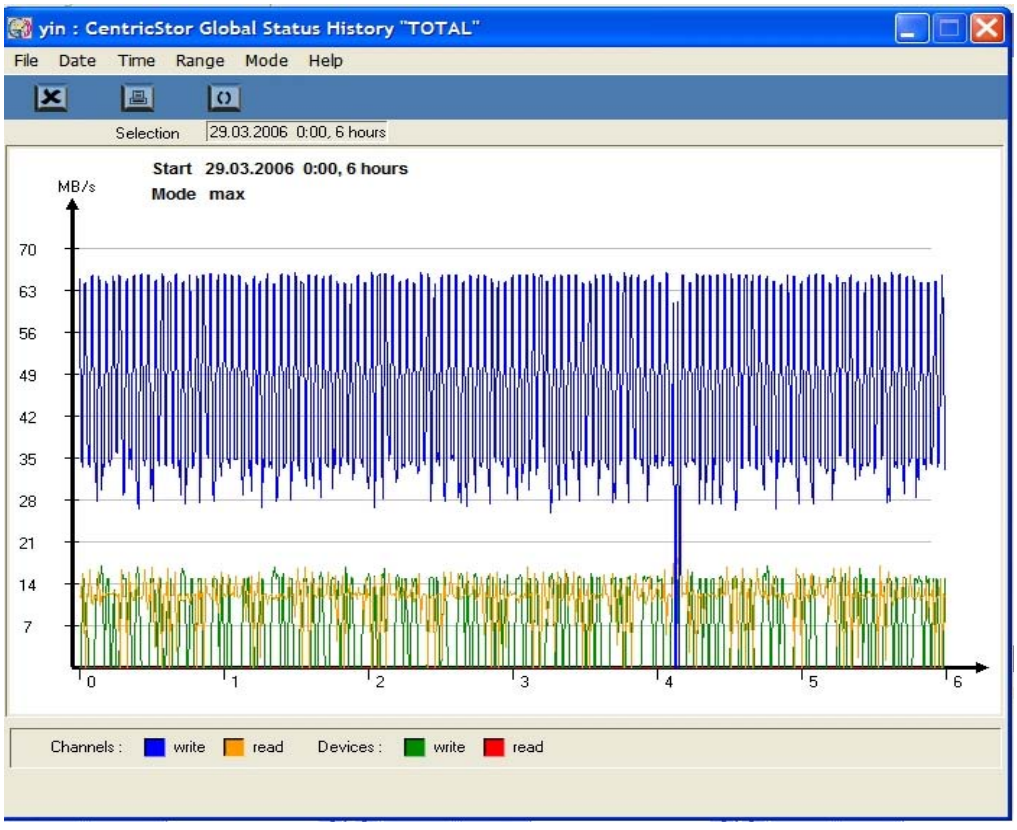
4. Open history file:



5. Confirm you wish to open it:



Here, by way of comparison, is the GXCC presentation:



Note the output mode (min,max,average) selected in GXCC and the spreadsheet of the same name selected in EXCEL.

8 XTCC

8.1 General

While GXCC regards a CentricStor system as a whole, XTCC is limited to one ISP together with the connected peripherals.

You start XTCC for an ISP by positioning the mouse pointer in GXCC over the symbol of the ISP and right-clicking to select the “Show Details (XTCC)” option from the function menu. For each ISP, XTCC can be started as often as you wish. When GXCC is terminated, all XTCC instances that were started from GXCC are also terminated.

XTCC assumes the operating mode (Service, User or Observe) of the initiating GXCC application. All other display parameters are taken from the profile files.

When operating in non-CentricStor systems, under virtual Window Managers or under installation conditions which deviate from the standard, some settings must be made to define the data path (`Path`) and to connect to a virtual window. The current status is described in the online help for XTCC under “Environment variables”.

CentricStor recognizes various ISP types.

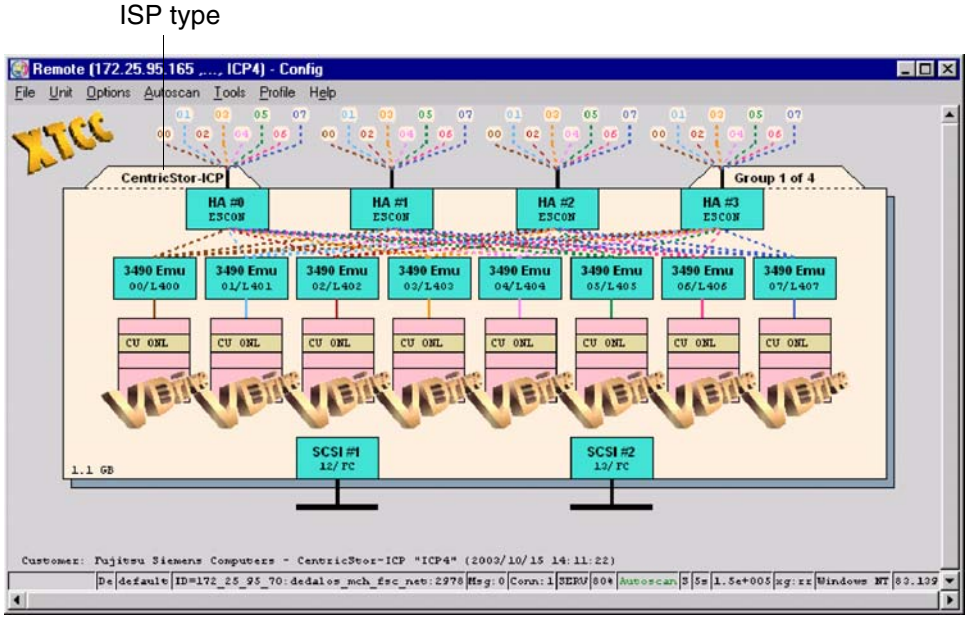
ICP Integrated Channel Processor
An ICP has a permanent connection to one or more BS2000/OSD, z/OS or OS/390 hosts via ESCON/FICON adapters or to an open systems host via an FC controller operating as a host connection. Host adapters and virtual devices are available only on ICPs.

IDP Integrated Device Processor
An IDP always has at least one tape drive connected via SCSI or FC and an associated PDS. Physical devices are available only on IDPs.

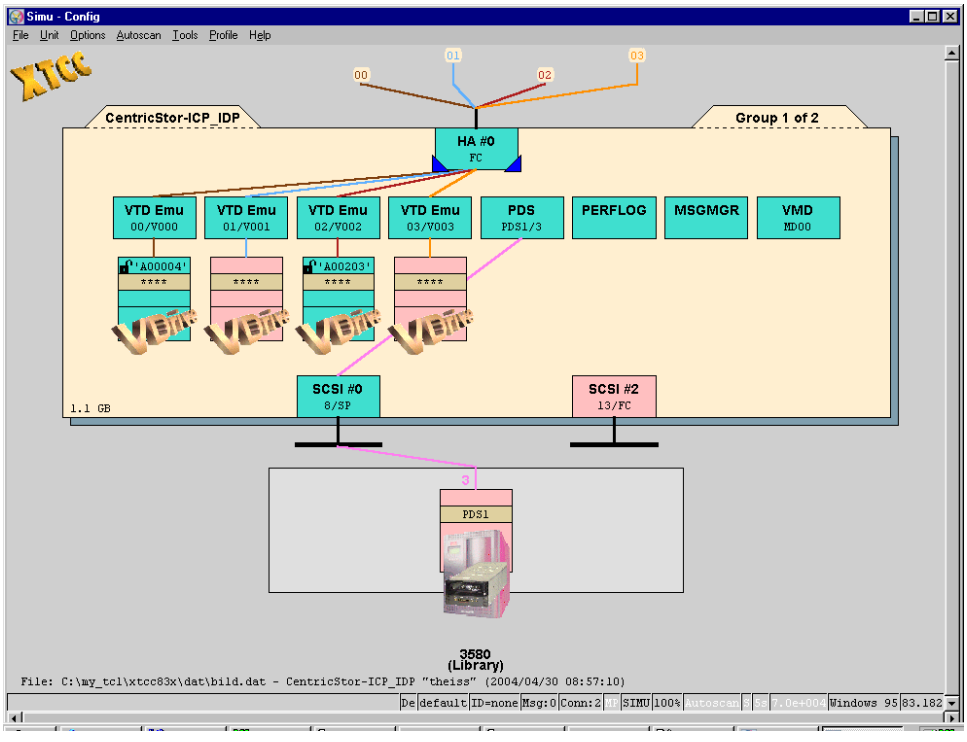
VLP Virtual Library Processor
Any ISP which is neither an ICP nor an IDP is regarded by the configuration routine as a VLP.

ICP_IDP In small CentricStor configurations, the ICP and IDP are on a shared processor. Several processors of the same type are, if necessary, configured next to each other. The VLP functionality resides with one of these ICP_IDP.

The diagram below shows the XTCC representation of an ICP:



In the case of an ICP_IDP combination, the display is somewhat different:



PDSs and emulations/virtual devices are located on the same level in the diagram. The PDSs are connected to the associated device controller, and the emulations are connected to the associated host adapter(s).

8.2 Margins of the main XTCC window

8.2.1 Title bar

`Local()-Config`
if XTCC is running on the ISP under consideration.

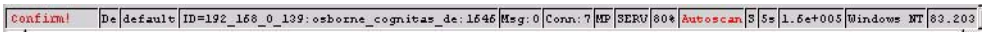
`Remote(<IP addr. of ISP><host name of ISP>)-config “<comment from unit list>”`
if XTCC is running on another ISP in the CentricStor system.

GXCC always starts XTCC on the system on which GXCC is also running.

`Remote(<IP address 1,....,ISP name>) - Config “<comment from unit list>”`
if there is an indirect connection between the VLP and the ISP under consideration. In some cases, such an indirect connection will be established automatically instead of a normal direct connection.

8.2.2 Status bar

The status bar is located at the bottom of the XTCC window:



The individual fields are explained below (from left to right) with the help of examples:

confirm ! If “confirm !” is flashing in red in the left-hand field you must answer a message window (generally with “OK” to confirm you have taken note). Until you confirm the higher-ranking window is blocked.

De/En Language of the Help system, in this case, En: English, De: German

default Current profile name specified in the command line or selected in the “Profile Select” menu. In the example, no profile is selected.

ID=<IP address/”local”>:<ISP name>:<port number>
For identification purposes, each XTCC instance has its own ID consisting of the IP address and name of the system on which XTCC is running, as well as the port number. Thus the ID of the computer with which you are monitoring CentricStor is displayed here.

Msg:0 Number of messages entered in the “XTCC Communications” window.

Conn:7 Number of existing XTCC connections to the monitored system.

MP Connection mode (MP: Multi-Port, SP: Single-Port)

SERV XTCC mode (OBSV=Observe, SERV=Service, USER=User, SIMU=Simulation).

80% Current window size setting (in the example, 80%).

Autoscan Green = started
Yellow = active
Red flashing = stopped / temporarily disabled
White =blocked (SIMU mode)

S 5s Autoscan operating mode and interval (S = self-adjusting, M = manually adjusted).

n.me+op Read rate for InfoBroker data [n.m*10^{op} bytes/second]. The rate is calculated using the transfer time of an InfoBroker record. When using a modem connection, this value will also allow you to calculate the performance of the connection.

Windows NT
Platform on which XTCC is running.

m.n XTCC version number.

The visual appearance of the main XTCC window is determined by the profile file. If you close XTCC by selecting “File“ ➟ “Exit”, the current settings will be saved to the ISP profile file currently active (processor- and user-specific) so that they are available again the next time the application is started. If this is not desired, XTCC must be terminated using the System function (icon at top left) or using the Windows Manager function (“X” box at top right) (for details on this see the section “Exit” on page 334).

The procedures for creating and managing profile files is described on page 344.

8.3 Function bar

Subfunctions:

- File
  - Select (page 331)
  - Save (page 331)
  - Show (page 331)
  - Print (page 332)
  - Exit (page 334)
- Unit
  - Select (page 335)
- Options
  - Settings (page 336)
  - Toggle Size (page 337)
  - Toggle Aspect (page 337)
  - Show Current Aspect (page 337)
  - Apply Current Aspect (page 337)
- Autoscan
  - Start / Stop (page 338)
  - Settings (page 339)
  - Scan Now (page 340)
- Tools
  - XTCC Communications (page 341)
  - Get Remote/Expand Local File (page 342)
  - Show Remote File (page 342)
  - Compare Local Files (page 343)
  - XTCC Update/Revert (page 343)
- Profile
  - Select (page 346)
- Help
  - README / LIESMICH (page 348)
  - Direct Help / Direkthilfe (page 348)
  - Mouse Functions / Maus-Funktionen (page 348)
  - About XTCC... (page 349)
  - CentricStor User Guide (page 350)
  - CentricStor Service Manual (page 351)

8.3.1 File

8.3.1.1 Select

Selects a configuration file saved previously with “Save” (see below):

The window contains the field for entering the file name plus the following function keys:

OK — Checks whether the specified file is a valid XTCC configuration file and, if so, its contents are output in graphical format and in Simulation mode. If not, an error message is output.

Browse — Opens a standard dialog box for searching for and selecting a file. The file type is preset to `*.dat`, and the file name is transferred to the entry field.

By default, configurations are saved as `.dat` files. Instead of accepting the proposed file, you can click on any other `.dat` file and open it. If a `.dat` file has been saved in a different directory then you can click the button next to the directory bar to change to any higher-level and, therefore, to any required directory.

Help — Opens the XTCC help file.

Cancel — Closes the window.

8.3.1.2 Save

Saves the configuration currently displayed (please refer to the information in the section “Save” on page 145). When you select this function, the current data is initially backed up. A standard dialog box is then opened for changing the directory and specifying a name for the file to be saved. The file name is automatically preset to `<system_name>.dat`. Both name components can be modified.

8.3.1.3 Show

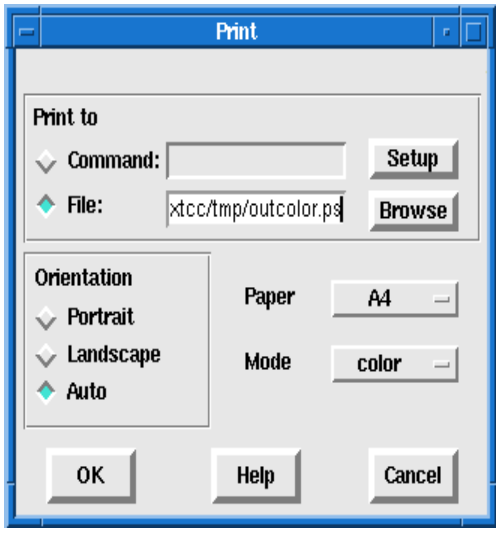
This function is only available in User and Service mode.

Opens an independent file viewer. This functionality is described on page 360.

8.3.1.4 Print

Unix Platform

Saves or prints the configuration currently displayed in PostScript format:



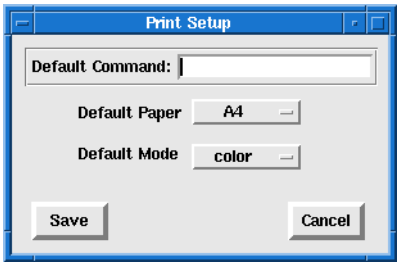
This opens a window containing the following fields and buttons:

Print to Specifies the target for the printout.

Command List box used to specify the printer. In the case of UNIX systems, this field must be set to the name of the print program or script.

File Target for the PostScript file to be created. The presetting is determined by the color mode set.

Setup Opens a submenu for defining the basic “Command”, “Paper” and “Mode” settings. These settings can be saved by clicking the “Save” button and can be used again the next time you open the print menu.



File — Selection with input field.
List box used to specify the name under which the PostScript file is to be saved. Depending on the color selection made under “Mode”, this field is preset with the file name `<path>/outcolor.ps` or `<path>/outgray.ps`, where `<path>` is set to the XTCC `tmp` directory. To print out the configuration, these files can then be sent to the PostScript printer that supports the corresponding mode.

Browse — Button provided under “Print to File” for opening a dialog box used to change the directory and specify a name for the file to be saved.

Orientation
Allows you to select the display format within the PostScript file:

Portrait	Portrait format
Landscape	Landscape format
Auto	Automatic selection depending on the page dimensions

Paper — Allows you to select the paper format to be used:

A4	210 x 297 mm
Letter	216 x 279 mm

Mode — Allows you to select the color mode:

color	The PostScript file/printout is created in color mode.
grayscale	The PostScript file/printout is created in grayscale mode.

OK — Starts the creation of the PostScript file/printout.

Help — Opens a text window containing the XTCC help file.

Cancel — Closes the print menu without accepting the changes.

Windows Platforms

The platform-specific “Print” menu is used which enables you to control all the required functions. In the case of “Print to file” the format corresponding to the selected printer is used.

The display is always adjusted to the paper format selected, taking into account the page ratio. Any scaling predefined in the printer menu is ignored.

8.3.1.5 Exit

Shuts down XTCC, saving the current settings to the profile file in the process.

The settings are not saved if XTCC is exited using the following functions:

– System function

Click on the CentricStor icon at the top left and in the pull-down menu select the “Close” function or the function at the bottom (the menu language depends on the system language selected).

– Window Manager function

At the top right click on the box containing the X.

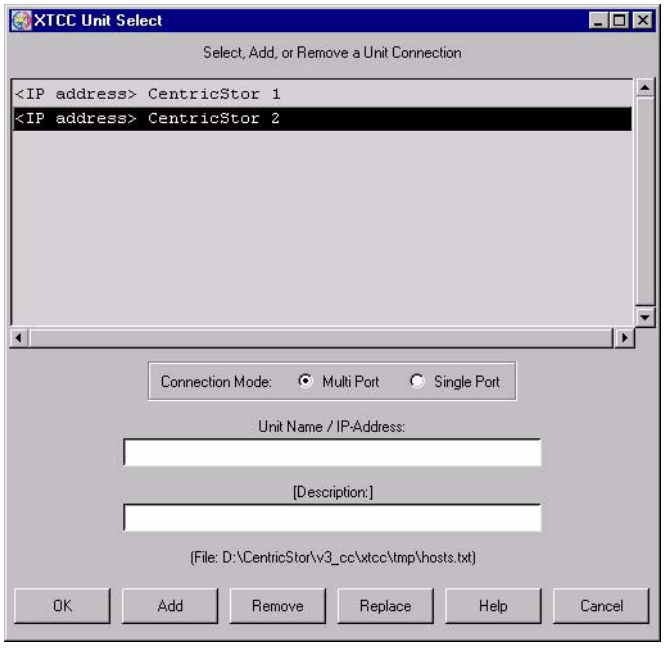
8.3.2 Unit

8.3.2.1 Select

This function is disabled if XTCC is started from GXCC.

Otherwise, if XTCC was started directly, the “XTCC Unit Select” window is opened.

Example

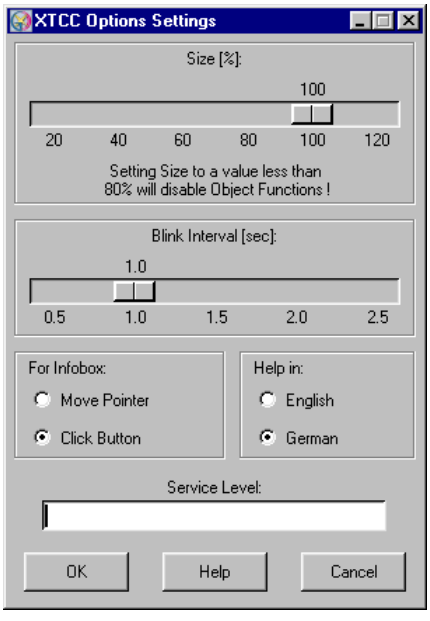


The operation and functions of Unit Select are described in the section “Select” on page 147. Errors during connection setup with “OK” are handled differently, however, because in this case no connection exists as yet to a CentricStor.

8.3.3 Options

8.3.3.1 Settings

Opens a submenu containing the following functions:



Allows you to set the following options:

Size [%]

You can vary the scale of the graphic display from 20% to 120% in 5% steps. If you set a value less than 80%, all the object functions will be deactivated and the images for the drive types will no longer be displayed.
By left- or right-clicking anywhere in the XTCC window, you can reset the configuration display to 100% with the optimum aspect. Smaller scales are particularly useful when monitoring several ISPs, especially when these can be displayed in separate tab pages. The group display described on page 356 is even more compact, and is more suitable for monitoring ISPs that can only be displayed using several tab sheets.

Blink Interval [sec]

The interval for flashing objects can be set to between 0.5 and 2.5 seconds in steps of 0.1 second.

For Infobox:

Move Pointer	The infos are displayed by positioning the mouse cursor.
Click Button	The infos are displayed by clicking on the left mouse button. The descriptions in the manual generally relate to this mode.

Help in:

English	Help texts in English.
German	Help texts in German.

The language of the help texts also controls which version of the online manual is offered in the Help menu. If there is no manual available in that language, no manual is offered in the Help menu.

Service Level
Reserved field for special functions not described here.

8.3.3.2 Toggle Size

Switches between the scale 100% and the last scale < 100% selected by the user.

8.3.3.3 Toggle Aspect

Switches between the optimum aspect determined by the program for the associated scale and the last aspect selected by the user. The aspect parameters are based on the size and position of the window on-screen. If the optimum aspect is changed by reducing the window size, you can scroll through the window contents by left-clicking the scroll bars underneath and to the right. If you are using a three-button mouse, you can also scroll through the window contents by holding down the middle button while moving the mouse pointer.

8.3.3.4 Show Current Aspect

Opens a window containing the current aspect values. This function is useful if, after setting the desired window size and position, you wish to determine the associated aspect values by means of an entry in a command line call.

8.3.3.5 Apply Current Aspect

Applies the current window position and size instead of the original command line argument specified by the user. The “Toggle Aspect” function then takes these new values into account.

8.3.4 Autoscan

Each Autoscan cycle consists of a data transfer phase, a display phase, and the Autoscan delay. The Autoscan delay is the interval between the end of the display phase and the beginning of the subsequent data transfer phase.

The color of the “Autoscan” text in the status bar in the bottom right-hand corner of the XTCC window shows the current status of this periodic transfer of information. The colors have the following meaning:

green	released
yellow	active
red	stopped temporarily or by the user
white	blocked (simu mode)

Each time a main menu is opened, an information window is output, or a function menu is called for an object, the Autoscan cycle is temporarily interrupted, indicated by the red flashing “Autoscan” text. It is continued automatically after the menu or window is closed. The Autoscan cycle is not interrupted on opening an information window if “Move Pointer for Info” mode was selected in the “Options” menu. Text in yellow indicates that a new data record is currently being received and edited by InfoBroker.

Autoscan delay is normally defined automatically but can also be set manually.

The “Autoscan” menu contains the following functions:

8.3.4.1 Start

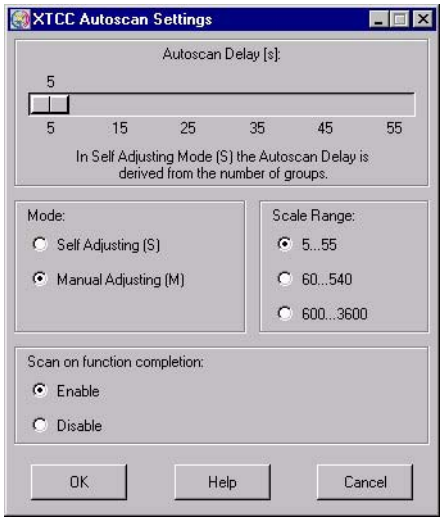
Starts the Autoscan process manually. This function is available only if Autoscan is currently stopped.

8.3.4.2 Stop

Stops the Autoscan process manually so that the status of the displayed objects is no longer updated. This function is available only if Autoscan has been started.

Before the window size or position of the configuration display on the screen is changed it is recommended that the Autoscan process first be stopped manually. Otherwise, the ongoing process of updating of the window contents will cause the window to jump back to its original position. The reason for this is that the application (XTCC) does not know about these modifications (made by the Window Manager), and always uses the most recently stored parameters to generate the display.

8.3.4.3 Settings



Opens a submenu containing the following setting options and buttons:

Autoscan Delay [s]

This scale allows you to determine the interval currently set. If “Manual Adjusting” is selected, this value can be changed.

Mode

Self Adjusting (S) The Autoscan delay is determined automatically and displayed in the status bar in the format `S<value>s`.

Manual Adjusting (M)
The Autoscan delay is set manually and displayed in the status bar in the format `M<value>s`

Scale Range

If “Manual Adjusting” is selected, the scale range for the slider control can be modified. The settings 5...55, 60...540 and 600...3600 seconds are possible. Within these ranges the resolution is 5, 30 or 300 seconds.

Scan on function completion

Enable Permits an additional scan cycle immediately after functions which result in a change to the object status (e.g. Start/Stop) have been terminated. This scan cycle is also executed in the event of an Autoscan process being stopped manually.

Disable Prevents the additional scan cycle.

OK
Confirms the settings and closes the menu.

Help
Opens a window containing the XTCC help file.

Cancel
Cancels the settings and closes the menu.

8.3.4.4 Scan Now

Triggers an additional, immediate scan cycle in the event of an Autoscan process being stopped manually or a lengthy Autoscan delay. This function can also be initiated by pressing CTRL + spacebar simultaneously.

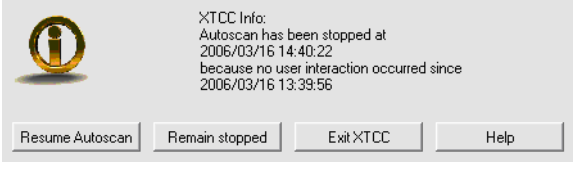
8.3.4.5 Interaction Timeout

XTCC stops the periodic Autoscan process if no user interactions are registered for an hour.

The following are counted as user interactions:

– Moving the mouse cursor over the configuration display or the Groups window
– Iconizing, maximizing, shifting or altering the size of one of these windows

After the timeout has occurred the following dialog box is displayed:



Meaning of the buttons

Resume Autoscan
The periodic Autoscan process is started again and the time window for one hour is re-started.

Remain stopped
The Autoscan stop status is retained.

Exit XTCC
XTCC is terminated.

Help
Opens a window with a help text.

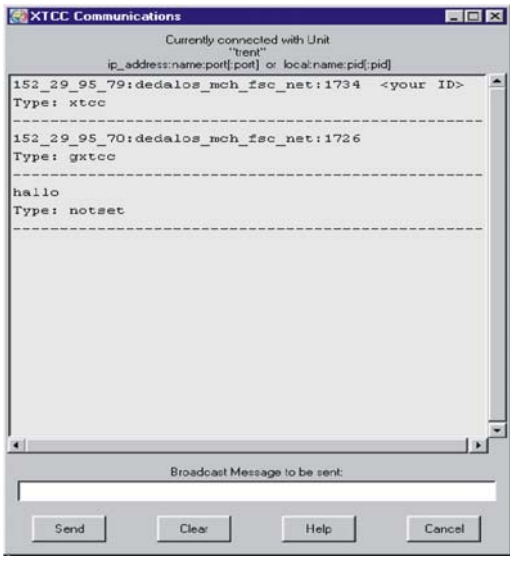
8.3.5 Tools

The following functions are available:

- XTCC Communications
- Get Remote/Expand Local File
- Show Remote File
- Compare Local Files
- XTCC Update/Revert

8.3.5.1 XTCC Communications

Opens a window containing a list box and an input field:



The list box contains the IDs of the XTCC connections to the selected ISPs together with short messages (Message) which are used for communication between the XTCC users. In Remote mode, the IDs have the format `<ip_address>:<name>:<port>` and in Local mode `local:<name>:pid`. The dots in the IP address are replaced by underscores. Your local connection ID is indicated by `<your ID>`.

A message consists of two lines with the formats

Message date: `YYYY/MM/DDHH:MM:SS (date and time of the sending system)`
Message text: `<text>`.

In the messages the special characters " \ $ [ ]" are replaced by underscores "_".

If messages are present, then the number of messages is displayed by means of the yellow indicator `Msg:<n>` in the XTCC status bar. Yellow letter symbols are also visible in the configuration display.

Meaning of the buttons

Send
: Sends a message entered in the “Broadcast Message” window to the InfoBroker. You can also use the Return key instead of this button.

Clear
: Deletes the input field and message in the InfoBroker.

Help
: Displays the XTCC help file.

Cancel
: Discards any entered message text and closes the window.

A sent message cannot be registered until the next Autoscan cycle.

8.3.5.2 Get Remote/Expand Local File

This function is identical to the GXCC function of the same name. This is described on page 154ff.

8.3.5.3 Show Remote File

This function is identical to the GXCC function of the same name. This is described on page 156ff.

8.3.5.4 Compare Local Files

Starts a graphical tool which enables two local text files to be compared. The two files are displayed in synchronized text windows. Differences are marked in color, and the number of differences is entered in the status line at the bottom right. By selecting “View / Show Line Comparison Window” in the diff tool menu, differences within individual lines can be made visible.

Notes

– The menu item “Compare Local Files” is available in Service and User mode only.
– In User mode, “View Only” mode is preset. As a result the Edit, Write, Merge and Save functions are disabled.
– The diff tool has its own help function.

8.3.5.5 XTCC Update/Revert

The use of this tool is described in the section “GXCC Update/Revert Tool” on page 159. Please note the following points:

– The update of GXCC is started from within GXCC independently of the XTCC update.

– When XTCC is updated, all XTCC and GXCC applications of the computer on which GXCC/XTCC is running must be closed.

– There are no restrictions regarding the compatibility of different GXCC and XTCC versions within a product line (CentricStor V2.x or CentricStor V3.x). Even if a workstation is to interwork with older CentricStor versions the GXCC/XTCC software can be updated to the latest level. GXTCC (CentricStor V2.x) cannot be upgraded to GXCC (CentricStor V3.x) using the update tool.

8.3.6 Profile

The term “profile” encompasses all user-specific settings chosen under “Options” and “Autoscan”. These settings are stored in a user-specific subdirectory.

When the main menu functions

- *Unit ➟ Select*
- *File ➟ Select*
- *File ➟ Exit*
- *Options ➟ Settings ➟ OK*
- *Options ➟ Apply Current Aspect*
- *Autoscan ➟ Settings ➟ OK*
- *Profile ➟ Select ➟ OK*

are called, the following settings which are used are backed up implicitly on a unit-specific basis:

- Options Settings — Size, For Infobox: Move Pointer for Info / Click Button for Info, Help in: English/German
- Autoscan Settings — Autoscan Delay, Mode: Manual/Self Adjusting, Scan on function completion: Enable/Disable
- and the current size and position of the window on-screen (aspect)

A backup operation does not take place if XTCC is terminated by some means other than selecting *File ➟ Exit*.

Note that if you change the position or size of the window on the screen using the *Options ➟ Apply Current Aspect* function you must confirm this.

The next time a unit is selected, the values that have already been stored are used again. If the command line arguments -aspect, -autoscan, -lang, -size were specified at the start, these will have priority over values which have already been saved and, as described above, will also be saved implicitly.

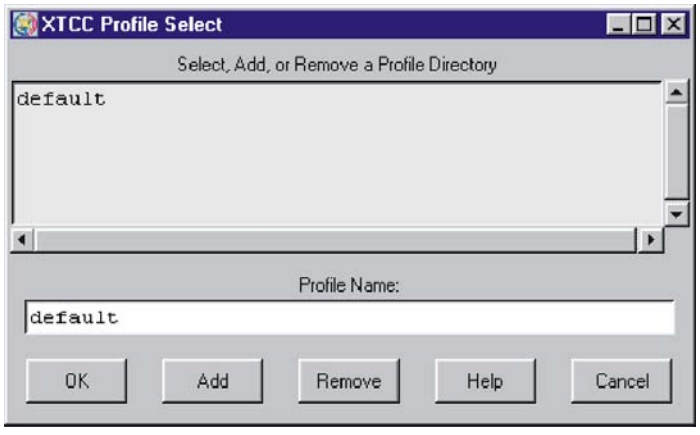
If you require individual profile settings, you should define separate profile settings. The profile data is saved in a matrix format: A directory is set up for each profile name, including “default”.

Directory:	**default.prf**	**Name1.prf**	**Name2.prf**	**Name3.prf**
CentricStor A	CentricStor_A.opt	CentricStor_A.opt	CentricStor_A.opt	CentricStor_A.opt
CentricStor B	CentricStor_B.opt	CentricStor_B.opt	CentricStor_B.opt	CentricStor_B.opt
CentricStor C	CentricStor_C.opt	CentricStor_C.opt	CentricStor_C.opt	CentricStor_C.opt
CentricStor D	CentricStor_D.opt	CentricStor_D.opt	CentricStor_D.opt	CentricStor_D.opt

Profile data is stored in this directory for each unit under the name `<system_name>.opt`. When changing unit, the current settings are saved under the old unit name. The directory is then searched to determine whether there is already data for the new unit. If this is the case, this data is used for control purposes, with the exception of any predefined command line arguments mentioned above. Otherwise the existing settings are adopted, and these will be saved when the system is terminated or when the unit is changed again.

8.3.6.1 Select

Allows you to create and select user-specific subdirectories in the temporary XTCC directory. All option settings are then stored in unit-specific files in these subdirectories.



The name of the subdirectory is formed from the profile name and the extension `.prf`. The “Profile Select” function opens a window consisting of a list box, an input field, and various buttons.

The list box contains the profile names already defined. To select an entry and transfer it to the input line, you simply left-click on the appropriate list item.
If special characters (/ \ [ ] “ ' $ * : ? < > |) are used when entering a profile name, these are replaced by underscores.

Meaning of the buttons

OK	Creates a new directory with the name specified in the input field (provided this directory does not already exist) and closes the window.
Add	Creates a new directory.
Remove	Deletes the selected directory and all its contents.
Help	Displays the XTCC help file.
Cancel	Closes the window without saving your selection.

Notes on operating

– You use the two scroll bars for positioning in the list box.
– Double-clicking on an entry with the left mouse button transfers this to the entry field.
– Simultaneously pressing the Ctrl+o keys enables the content of the list box to be sorted in ascending or descending order.
– Search function:
  After you have entered a search string in the entry field, pressing the return key displays the next hit.

  The following characters have a special meaning here:

?	Detection of an individual arbitrary character
*	Detection of no or multiple arbitrary characters
[abc]	Detection of a character from the group “abc”
[a-z]	Detection of a character from the range “a-z”
\c	Detection of the special character “c”

  If the entry field is empty you can press the return key to go to the next entry.

If you close XTCC by selecting “File“ ➟ “Exit”, the current profile file will be saved with the current settings. If this is not desired, you should use the button in the top left-hand corner of your screen instead.

If XTCC cannot find any profile file for the user and ISP on startup, the settings of the initiating GXCC application will be adopted.

8.3.7 Help

The appearance of the submenu depends on the language selected in “Settings” (see page 336):

German:

Help
LIESMICH
Direkthilfe
Maus-Funktionen
About XTCC...
Benutzerhandbuch

English:

Help
Readme
Direct Help
Mouse Functions
About XTCC...
User Guide

8.3.7.1 README / LIESMICH

This function is used to open the file viewer with the help file in accordance with the language setting, thus here to “Help”:

Information on using the file viewer can be found starting on page 360.

8.3.7.2 Direct Help / Direkthilfe

This describes how to call up the object-related Help functions.

8.3.7.3 Mouse Functions / Maus-Funktionen

This describes the object-related mouse functions. See also the section “Object-related functions” on page 355.

8.3.7.4 About XTCC...

The version of XTCC can also be seen at the bottom right of the configuration overview window.

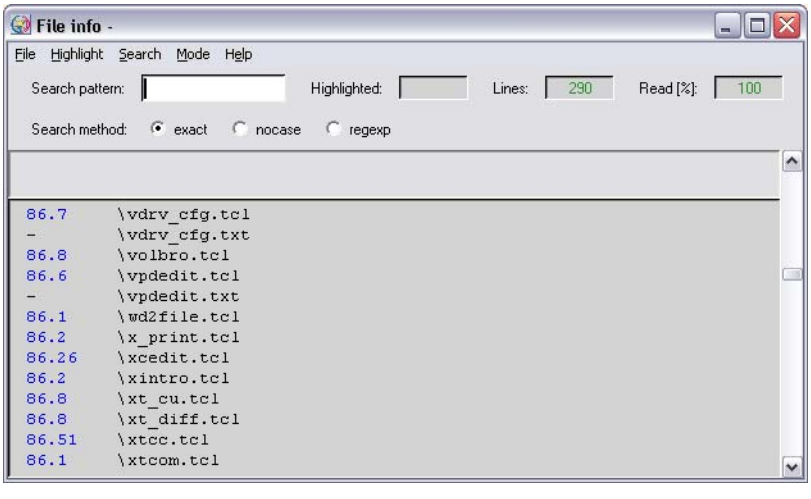
Meaning of the buttons

OK

The window is closed.

File info

Opens a text window in which information on the XTCC files that exist is output:



The version numbers are displayed in the left-hand column provided these are contained in the file concerned.

8.3.7.5 CentricStor User Guide

One of the menu functions

- CentricStor User Guide (complete)
- CentricStor User Guide (GUI Part)

is offered if

- XTCC is operated in User or Observe mode,
- the monitored system is of the type “CentricStor” and
- a PDF documentation file suitable for the CentricStor Version m.n and the current language setting is available.

In User mode XTCC updates the local documentation if more recent documentation is found on the remote CentricStor system in the event of connection setup (“Unit/Select”) or when changing the language setting (“Options Settings”).

Here a more recent “User Guide (GUI Part)” has priority over an older “User Guide (complete)”. The user is notified of this via a message window.

Notes

- The “User Guide” is also offered if no “Service Manual” is available (see the section “CentricStor Service Manual” below).
- To enable the PDF documentation files to be displayed a suitable viewer program must be installed on the local system (*xpdf* in SINIX, *xpdf* or *Acrobat Reader* in LINUX, *Acrobat Reader* in WINDOWS).
- To save space XTCC automatically removes obsolete local files.

A PDF viewer is started and the most up-to-date manual is displayed in the help language selected.

8.3.7.6 CentricStor Service Manual

One of the menu functions

– CentricStor Service Manual (complete)
– CentricStor Service Manual (GUI Part)

is offered if

– XTCC is operated in Service or Simu mode,
– the monitored system is of the type “CentricStor” and
– a PDF documentation file suitable for the CentricStor Version m.n and the current language setting is available.

In Service mode XTCC updates the local documentation if more recent documentation is found on the remote CentricStor system in the event of connection setup (“Unit/Select”) or when changing the language setting (“Options Settings”). Here a more recent “Service Manual (GUI Part)” has priority over an older “Service Manual (complete)”. The user is notified of this via a message window.

In Simu mode this function is not available; only the documentation available locally can be taken into consideration.

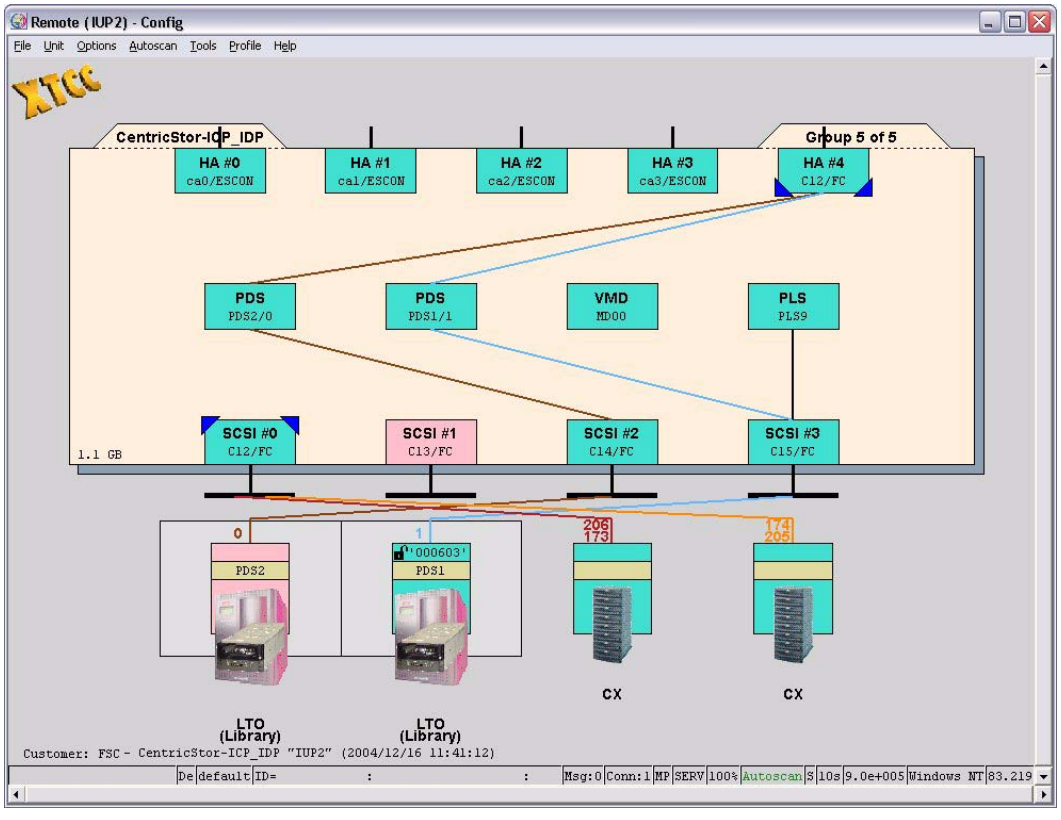
Notes

– If no suitable “Service Manual” is available, the “User Guide” may be offered (see the section “CentricStor User Guide” on page 350).
– To enable the PDF documentation files to be displayed a suitable viewer program must be installed on the local system (*xpdf* in SINIX, *xpdf* or *Acrobat Reader* in LINUX, *Acrobat Reader* in WINDOWS).
– To save space XTCC automatically removes obsolete local files.

8.4 Elements of the XTCC window

8.4.1 Display

Each XTCC window displays an ISP of the CentricStor system, together with the connected peripherals. The ISP is represented by a beige field at the center of the window:



The small colored boxes around the edge represent the peripheral controllers (ESCON, FICON, FC, SCSI, FC-SCSI). The small boxes in the middle represent software processes.

The operating status of an element is indicated by the color of the associated box, where the following color key applies:

Green:	Normal
Pink:	Malfunctioning, offline or not ready
Yellow:	Status unclear, some subcomponents are malfunctioning
Red:	Configuration error; the component is contained in the configuration description, but the InfoBroker has not yet established contact with it

If the ISP contains numerous XTCC objects, its contents are displayed over several tab sheets. The title of the tab sheet currently displayed is shown in the top right-hand corner. Tab sheets are selected in the group display (see the section “Group display” on page 356).

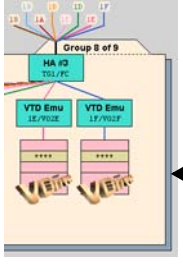
The ISP peripherals are displayed outside the central field.

Connections between elements are represented by colored lines, purely for the purposes of clarity.

If a connection is faulty in any way, this will be indicated by a broken line.

On the left side of the inner yellow field the particularly critical statuses of the ISP are shown using icons. A yellow circle indicates an SNMP message, a circle with a wrench indicates that the `/usr` file system is almost full (>95%) or is full (100%, symbol will flash with a red background). The function menu of the ISP offers actions that can be used to handle the situation.

The internal SCSI peripherals of the ISP can be addressed via the border of the symbol for the ISP.

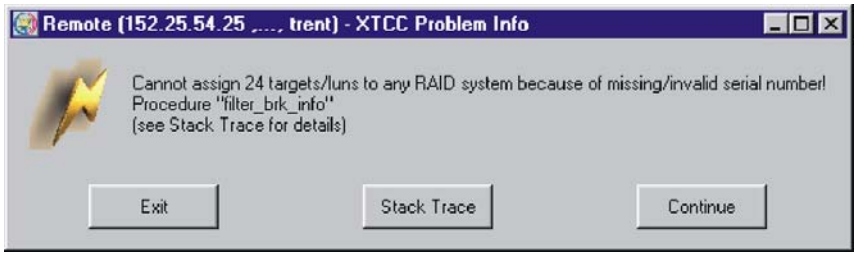


When you left-click on this margin, you select the internal SCSI peripherals of the ISP. One important example of these are internal RAID systems (see page 411).

8.4.2 Unexpected errors

In the event of internal errors such as those that occur owing to missing (mandatory) variables of the InfoBroker, XTCC opens (if possible) a window with the title:

“XTCC Problem Info”.



This window contains the error message and buttons for further activities:

Exit
: Terminates XTCC.

Stack Trace
: Opens a window with further information on the error. If you click on the “Cancel” button in this window, the window is closed and “Continue” is attempted.

Continue
: Continues the procedure in which the error occurred. This can lead to further errors, in other words background errors. In this case XTCC must be closed.

Try to skip
: This button is optional. XTCC attempts to skip the errored procedure, which can naturally result in further errors. In this case XTCC must be terminated.

8.4.3 Message window

All XTCC messages should be noted and also acknowledged by the user. The reason for this lies in the need to serialize device functions: You must ensure that it is not possible to start the same function several times or to start contradictor7y functions on a device.

Message windows containing an “OK” button are closed when you click on this button. Message windows without this button which contain texts such as “... Timeout is nn sec. Please wait ...” are displayed if InfoBroker data is waited for synchronously to the execution of device functions.

The Autoscan process is stopped for the duration of this wait time. Such a window can - if absolutely necessary - be closed by clicking on the relevant Window-Manager-specific button at the top right or left of the window title bar. The wait time for restarting the Autoscan is not reduced by this, however: The Autoscan process remains stopped until it is possible to terminate the associated function or the maximum wait time has elapsed (timeout nn sec.).

8.4.4 Object-related functions

When the mouse pointer is positioned above an object, you can call the following functions:

Left mouse button:
Object information is displayed

Shift + left mouse button
Object-related help.

CTRL + left mouse button
Direct Help for the object properties is displayed.

Right mouse button
Function menu is displayed.
The function menus only offer functions that can be used with the current object type (e.g. drive). If a function can theoretically be used but is not meaningful at present (e.g. “Stop Trace” when the trace is not running,) then this function is displayed, but cannot be used and as such is grayed out.

Shift + right mouse button (for drives and emulations)
Function menu relating to all objects of this class in the ISP currently addressed
The function menus only offer functions that can be used with the current object type (e.g. drive). If a function can theoretically be used but is not meaningful at present (e.g. “Stop Trace” when the trace is not running), then this function is displayed, but cannot be used and as such is grayed out.

Center mouse button (if available and configured appropriately)
Scrolls the configuration display in a reduced window. Depending on the type of system being used, the center mouse button can be emulated by clicking the right and left buttons of the mouse simultaneously.

The ISP itself is also an object. It is addressed by positioning the mouse pointer on the text `CentricStor-<Name>` in the top left-hand corner of the central field.

8.4.5 Group display

When CentricStor components are displayed, there may be more configuration elements (e.g. virtual drives) than can be displayed in a single window. At the same time, you may often want to monitor operations at multiple CentricStor ISPs simultaneously. Without the appropriate tools, this can make your screen difficult to interpret.

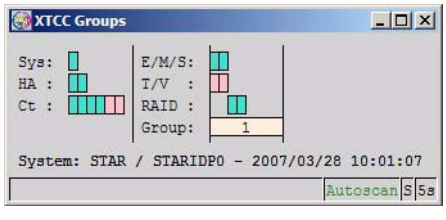
In XTCC, both problems are solved by the use of an overview window display.

If required, the display of the CentricStor components (e.g. ICP) can be subdivided into groups and presented on a number of different tab sheets. Therefore only one out of a number of different groups - represented by a tab sheet - is displayed. The tab sheet indicates which group is currently being displayed and the number of groups into which the display of the CentricStor components is divided.

Once XTCC is started and you have selected a unit or file, the group display is generated automatically. It shows all components and their status in the form of color boxes. In the case of large systems, it allows you to choose a group of logically related objects, and view detailed information on them on a tab sheets in the configuration display without having to scroll up and down.

Object names are shown in abbreviated form.

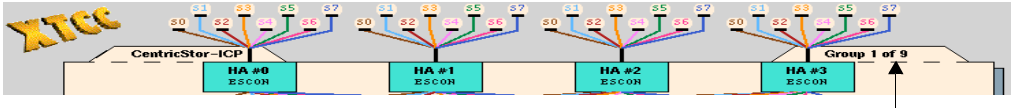
Sys	System	Entire ISP
HA	Host adapter	ESCON or FC-SCSI
Ct	Controller	SCSI controller
E/M/S	Emulation/manager/server	
T/V	Target (tape)/virtual drive	
RAID	RAID system	
Group	Group number as specified on the tab sheet	
System	System name/unit name (if available) or unit name	



The status line is contained at the bottom edge of the Groups window:

Autoscan	green = released yellow = active flashing red= stopped / temporarily discontinued white = locked (Simu mode)
S	Autoscan operating mode(S = Automatic setting, M = Manual setting)
5s	Autoscan interval

If the group display is minimized, you can reopen it simply by clicking the appropriate tab.



Click the tab to open the group display for the entire ISP.

When you select a group, its color changes to blue. If you then click your left mouse button, the group is transferred to the configuration display and its number appears in the “Group m of n” field in the tab in the top right-hand corner.

The group currently displayed is colored beige.

The host adapters and SCSI controllers are always displayed together with each group.

If you rest the mouse pointer on one of the small color boxes, a small window appears containing the name of that object. In the case of /390 emulations, the emulation name is displayed together with its mnemonic name.

Color codes in the group display

The object colors used in the group display are very similar to those in the configuration display:

	SYS	**HA**	**Ct**	**Emu/ Manager/ Server**	**Target/ V-Drive**	**RAID**
Turquoise	OK	ACTIVE	OK	Running and attached	Read/write, read only, busy	OK
Green				Running and not attached		
Pink		ACTIVATING CHAN_DISAB CONFIGURED FAILED INACTIVE INITIAL STOPPED	Hanging [11]	Stopped	Online, offline	Error
Yellow[12]		Unknown	Unknown	Unknown	Unknown	Warning
White			Removed [10]		T: Removed [13]	
Red	File system[1]			VLM halt PLM error VJUK: Offline Emu ERR_CFG[8]	MIM/SIM[9]	
Black	File system[2] SNMP [3]				CLEAN[4] BUSY[5] INFO[6] MIM/SIM[7]	
Brown				Trace on		

Explanation

1 File system full: red flashing tool symbol in the configuration overview. Flashing symbol for system messages in the GXCC window.

2 File system 95% full: black flashing tool symbol in the configuration overview.

3 SNMP: SNMP manager has received an SNMP trap. Flashing SNMP symbol in the configuration overview.

4 Drive needs cleaning. Yellow flashing symbol in the configuration overview.

5 Busy for some time. Clock symbol in the configuration overview.

6 Information present. “!” in the configuration overview.

7 MIM/SIM of the two lowest priorities. Flashing symbol in the overview.

8 Serious inconsistency in the configuration data. Emulation not operable.

9 MIM/SIM of the two highest priorities. Flashing symbol in the configuration overview.

10 A controller defined in the configuration could not be addressed. Its symbol is colored white in the configuration overview

11 Controller or SCSI bus is in a jammed state.

12 If a function is implemented through several processes (e.g. virtual drives), “yellow” means that the individual processes are in different statuses.

13 A target contained in the configuration description could not be found.

8.5 File viewer

XTCC provides a file viewer, complete with scroll bars and search functions, for displaying help texts and the data returned by various “Show” functions. This file viewer supports both text and binary files. Text files or hexadecimal dumps up to 100 Mbytes in size can be read.

8.5.1 Opening the file viewer

- The file viewer can be opened manually by selecting “File” ➟ “Show” in GXCC or XTCC. An intermediate form will be output allowing you to select a file for display. The direct call is only possible in User and Service mode.
- If a function like “Show System Messages” or “Show Logical Volumes” is called, the results will be displayed in the file viewer opened automatically. In this case, certain application-specific functions (e.g. “Re-read”) may be disabled. With some applications, special text may be displayed above the scroll area (see the section “Re-read” on page 361 and the section “1st Line -> Ruler/Selection -> Ruler” on page 365).

8.5.2 Function bar

File **AutoUpdate** **AutoPopup** **Highlight** Search **Mode** **Help**

If you have called the GXCC/XTCC file viewer (e.g. for “Show” functions), some functions are not offered depending on the context.

The individual functions can be selected either by clicking on them with your mouse, or by pressing the ALT key together with the accelerator key (underlined letter).

In addition, keyboard shortcuts have also been defined for the search functions.

By left-clicking while dragging your mouse, you can select text in the text window. Pressing CTRL+c (Copy) copies the selected text into the clipboard, from where it can then be inserted elsewhere by pressing CTRL+v (Paste).

8.5.3 File

8.5.3.1 Open (Text)/Open (Hex)

This function is only available in User and Service mode.

Opens a file selection box. Once you have made your selection, the file viewer is then opened in pure text mode (Open (Text)) or in combined hexadecimal/text mode (Open (Hex)). The display mode can be changed later on if desired.

When loading large files, the display window is opened as soon as the first few lines have been read in. The percentage of file contents that have been loaded is displayed in the “Read” field.

8.5.3.2 Save As

This function is only available in User and Service mode.

Saves the file views in a directory under a name of your choice.

8.5.3.3 Re-read

This is an optional function which reloads the file containing the text to be displayed.

Its availability is determined by the XTCC application from which a particular file is opened. This is the case for files that are automatically updated by the system.

8.5.3.4 Print

This function is only available if XTCC is running on a Windows system.

The text file is opened with WORDPAD. The print menu can be used for printing.

8.5.3.5 Exit

Left-clicking this button closes the window.

8.5.4 AutoUpdate

This function is offered only when called by specific GXCC/XTCC functions. The file displayed is reread cyclically. If entries have been added, these are shown at the end of the text window and highlighted by a lighter background.

8.5.4.1 Start

Only when AutoUpdate is stopped: AutoUpdate is activated.

8.5.4.2 Stop

Only when AutoUpdate is active: AutoUpdate is stopped.

8.5.5 AutoPopup

This menu item is only offered if the AutoUpdate is active.

With AutoPopup the text window is either maximized or placed in focus if AutoUpdate has detected a change to the text file.

8.5.5.1 Enable

Only when AutoPopup is disabled; AutoPopup is activated.

8.5.5.2 Disable

Only when AutoPopup is enabled; AutoPopup is inactive.

8.5.6 Highlight

Selecting “Down” or “Up” with the left mouse button or pressing the associated keyboard shortcut enables you to highlight all occurrences of the string specified in “Search String” in color. The number of occurrences is output in “Highlighted”, and the cursor is positioned on the first occurrence starting from the beginning or end of the text. If the string cannot be found in the text, the message “No match found” is output.

Under the entry field for the search pattern there are three buttons for specifying the search method:

Under this entry field the “Search method:” option field shows the current setting for the search method:

exact	The search is case-sensitive. This is the default setting.
nocase	The search is not case-sensitive.
regexp	The search is carried out in accordance with the conventions for regular expressions.

Regular expressions:

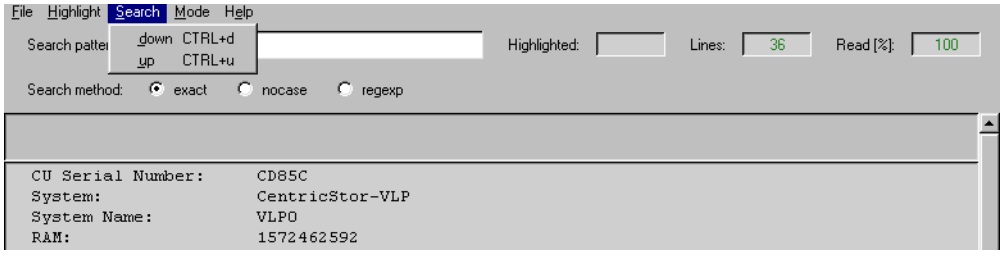
r*	Finds string r if there are zero or more occurrences of r
r+	Finds string r if there are one or more occurrences of r
r?	Finds string r if there are zero or one occurrences of r
^r	Finds string r if r occurs at the start of a line
r$	Finds string r if r occurs at the end of a line
r{m}	Finds string r if there are exactly m occurrences of r
r{m,}	Finds string r if there are at least m occurrences of r
r{m,n}	Finds string r if there are at least m but no more than n occurrences of r Conditions: m less than/equal to n; m=1...255; n=1...255
r1|r2	Finds sting r1 or r2
	Finds any character (apart from newline)
\	Precedes control characters (e.g. [,],...) in “Search String” when searching directly for them
[abc]	Finds an individual character in the set abc
[^abc]	Finds an individual character outside the set abc
[a-z]	Finds an individual character in the range a...z
[^a-z]	Finds an individual character outside the range a...z
()	Groups strings. “(” and “)” are thus control characters. When searching for “(” and “)”, therefore, you must insert a preceding “\”.

Highlighted
: Depending on the search procedure, this field outputs the number of color-highlighted hits for the string being searched for. This counter also takes multiple hits into account (depending on the search method and string). The search is ended when the color of the text for this field changes from red to green.

Read [%]
: Shows the percentage of the file already read in.

> **i** The functions “Highlight Down / Up” and “Search down / up” should only be called once the text file has been read in completely. Otherwise the number of hits for a text string to be searched for may be incorrect.

8.5.7 Search down/up

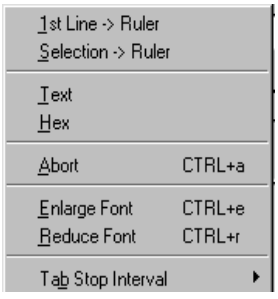


Selecting “Down” or “Up” with the left mouse button or pressing the associated keyboard shortcut enables you to search for the string specified in “Search String” starting from the beginning or end of the text.

Further information on the search criteria can be found in the section “Highlight” on page 363.

If the string is found, the cursor is positioned on the occurrence highlighted in color. Each time this function is activated, the cursor moves to the next occurrence. If the string cannot be found in the text, the message “No match found” is output. With “Search down”, the Return key can be used instead of the left mouse button or the shortcut.

8.5.8 Mode



8.5.8.1 1st Line -> Ruler/Selection -> Ruler

Displays the first line or the selected line in the non-scrolling area of the window.

This function can be used when viewing long tables in order to keep the title bar visible at all times.

Some applications predefine the title bars.

8.5.8.2 Text/Hex

These functions are not offered by all applications.

The selected file is displayed either in text mode or as a hexadecimal ASCII dump. In the hexadecimal dump all characters with the coding 0x00…0x1F and 0x7F…0xFF are replaced in the text section by dots (standard ASCII).

8.5.8.3 Abort

Selecting “Abort” terminates preparation of the current file.

8.5.8.4 Enlarge Font / Reduce Font

The font size can be changed over five levels.

This function enables you to considerably enhance the text display if the font used by the text viewer is not recognized as a true-type font in the GXCC system and is not available in the size originally requested.

8.5.8.5 Tab Stop Interval

In text files with tabulators the tab stop interval can change. The “default” generates an interval of 8 characters with behavior typical for a text editor. For the other values intervals from 1 .... 20 can be selected with behavior typical for a text editor.

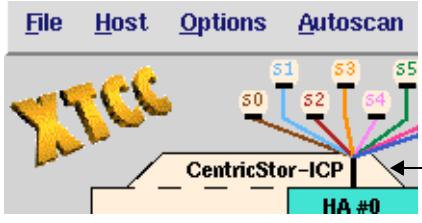
8.5.9 Help

Opens a text window containing operating instructions.

8.6 ISP

8.6.1 Object information on the ISP

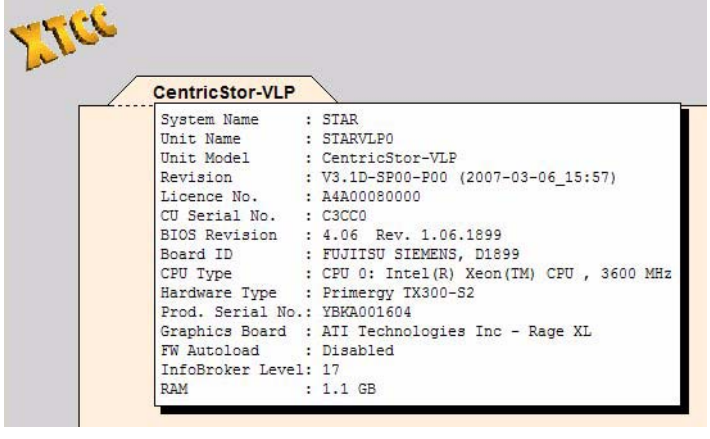
The object representing the entire ISP is hidden behind the text “CentricStor” in the center of the XTCC window.



Object representing the entire ISP

If required two additional symbols are displayed:

– A yellow flashing SNMP symbol indicates that SNMP data is present.
– A yellow or red flashing tool symbol indicates that the file system is overfull (yellow >95%, red = 100%).



The object information contains the following data:

System Name	Name of the CS system (if available)
Unit Name	Name of the ISP
Unit Model	Typ of ISP
Revision	Release version of the CentricStor software.
Licence Number	Number of the license
CU Serial Number	Serial number of the ISP.
BIOS Revision	Revision level of the BIOS
Board ID	ID of the motherboard.
CPU Type	Type of processor

Hardware Type	Primergy PC model.
Prod. Serial No.	Serial number of the Primergy
Graphics Board	Type of graphics board
Firmware Autoload	Indication of whether or not the firmware autoload function is activated.
InfoBroker Level	Revision level of the InfoBroker.
RAM	Memory configuration. The usual prefixes apply; 1 MB = 2^{20}, 1 GB = 2^{30}, 1 TB = 2^{40} bytes.
File system occupancy level (if more than 95%)	Over time, the ongoing logging process can cause the file system to fill up. If this occurs, it is reported.

8.6.2 ISP functions

Function	Note
Show Revision History	
Version Consistency Check	Offered only if the consistency check mechanism is available on the system and inconsistencies have been detected in the currently installed software version
Show Diff. Curr./Prev. Version	Offered only if the consistency check mechanism is available on the system
Show Node Element Descriptors	Offered only in the case of ICPs with ESCON channel adapter
Show Configuration Data	
Show System Log	
Clean File System	Offered only in the case of flashing yellow or red tool icon

8.6.2.1 Show Revision History

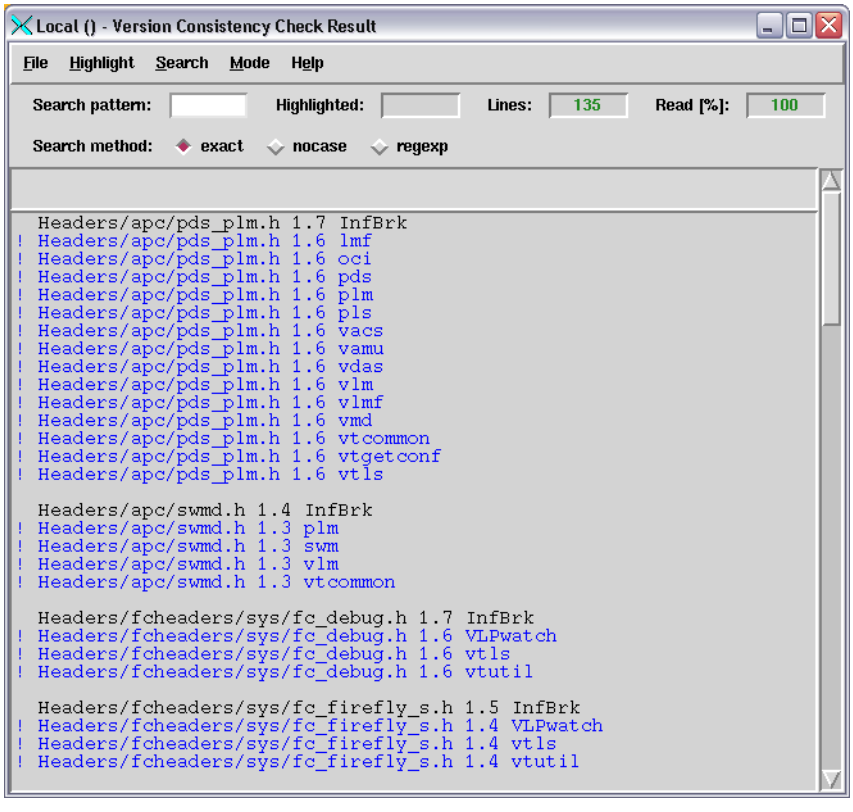
This function is used to display a log showing all the software updates of the ISP:

```
[RUL1] Change      Revision (Name)              Production Date       (De)Install Date

.
[RUL1] Change      Revision (Name)              Production Date       (De)Install Date

       NEW         V3.1D1000 (V3.1D1)           2006-07-03_11:00      2006-07-04_08:29
       UPD         V3.1D1000 (V3.1D1)           2006-07-05_12:08      2006-07-05_15:13
       SP          V3.1D1000-SP00 (V3.1D1)      2006-07-05_12:08      2006-07-05_15:13



Change Key:
        NEW  = New Kernel
        UPD  = Update
        SP   = Service Pack
        P    = Patch
        DEIN = DEINstallation
```

8.6.2.2 Version Consistency Check

This function is offered only if the consistency check mechanism is available on the monitored system and inconsistencies have been detected in the currently installed software version. This case can, for example, occur in the event of subsequent integration of developer corrections.

A window opens in which the result of the check is displayed:



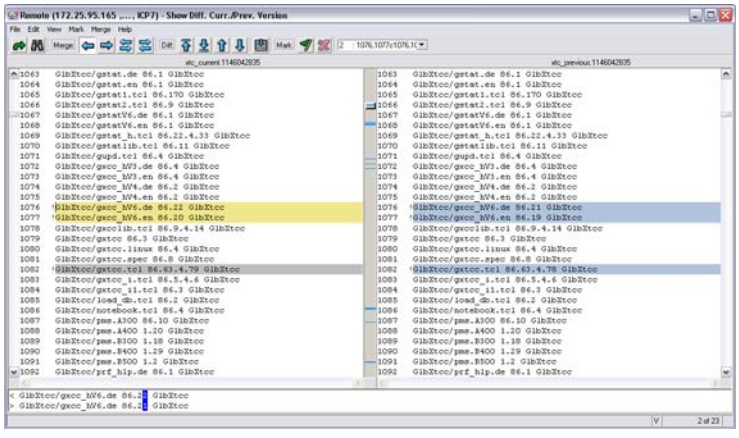
This example shows that Version 1.7 of header file `headers/apc/pds_plm.h` was used when the “InfBrk” package was created. The blue script below this which is preceded by an exclamation point lists all the packages in which another version of this header file was used.

For diagnostic purposes it is advisable to save the content of the file viewer window using the file viewer’s “File - Save As” function.

8.6.2.3 Show Diff. Curr./Prev. Version

This function is offered only if the consistency check mechanism is available on the system being observed.

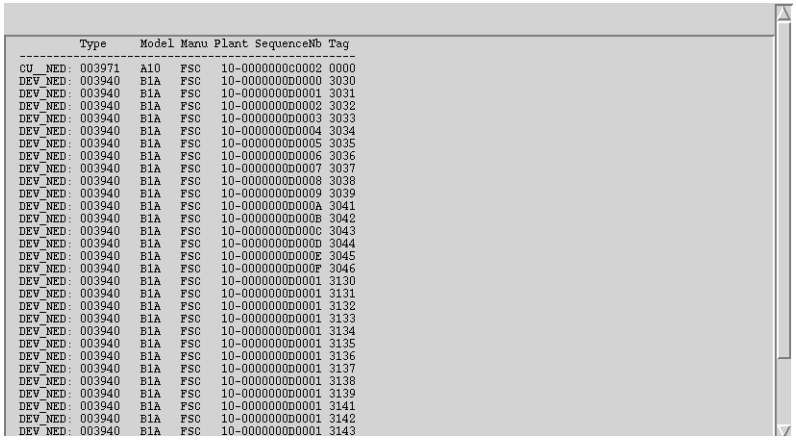
It is used to show the difference between the current and the previous versions using the graphical Diff tool. The two versions are displayed in synchronized text windows. The differences are marked with colors and the number is shown at the bottom right in the status line. Selecting “View / Show Line Comparison Window” in the View menu also enables differences within individual lines to be shown. The Diff tool has its own help system in English.



8.6.2.4 Show Node Element Descriptors

This function is available only for ICPs with an ESCON channel adapter.

It displays the node element descriptors of the ESCON channel adapters and the underlying virtual devices:



	Type	Model	Manu	Plant	SequenceNb	Tag
CU_NED:	003971	A10	FSC	10	0000000D0002	0000
DEV_NED:	003940	B1A	FSC	10	0000000D0000	3030
DEV_NED:	003940	B1A	FSC	10	0000000D0001	3031
DEV_NED:	003940	B1A	FSC	10	0000000D0002	3032
DEV_NED:	003940	B1A	FSC	10	0000000D0003	3033
DEV_NED:	003940	B1A	FSC	10	0000000D0004	3034
DEV_NED:	003940	B1A	FSC	10	0000000D0005	3035
DEV_NED:	003940	B1A	FSC	10	0000000D0006	3036
DEV_NED:	003940	B1A	FSC	10	0000000D0007	3037
DEV_NED:	003940	B1A	FSC	10	0000000D0008	3038
DEV_NED:	003940	B1A	FSC	10	0000000D0009	3039
DEV_NED:	003940	B1A	FSC	10	0000000D000A	3041
DEV_NED:	003940	B1A	FSC	10	0000000D000B	3042
DEV_NED:	003940	B1A	FSC	10	0000000D000C	3043
DEV_NED:	003940	B1A	FSC	10	0000000D000D	3044
DEV_NED:	003940	B1A	FSC	10	0000000D000E	3045
DEV_NED:	003940	B1A	FSC	10	0000000D000F	3046
DEV_NED:	003940	B1A	FSC	10	0000000D0001	3130
DEV_NED:	003940	B1A	FSC	10	0000000D0001	3131
DEV_NED:	003940	B1A	FSC	10	0000000D0001	3132
DEV_NED:	003940	B1A	FSC	10	0000000D0001	3133
DEV_NED:	003940	B1A	FSC	10	0000000D0001	3134
DEV_NED:	003940	B1A	FSC	10	0000000D0001	3135
DEV_NED:	003940	B1A	FSC	10	0000000D0001	3136
DEV_NED:	003940	B1A	FSC	10	0000000D0001	3137
DEV_NED:	003940	B1A	FSC	10	0000000D0001	3138
DEV_NED:	003940	B1A	FSC	10	0000000D0001	3139
DEV_NED:	003940	B1A	FSC	10	0000000D0001	3141
DEV_NED:	003940	B1A	FSC	10	0000000D0001	3142
DEV_NED:	003940	B1A	FSC	10	0000000D0001	3143

Show/View functions open windows that are equipped with scroll bars and search functions. For information on the tools that can be used to navigate through these windows when large data volumes are involved, see the section “File viewer” on page 360.

8.6.2.5 Show Configuration Data

Outputs a configuration display in table form:

```
.
CU Serial Number:      CFA7E
System:                CentricStor-ICP
System Name:           ICP7
RAM:                   1073344512

Number of Emulations: 16

   Emu.Name       HSI         Device
   ---------------------------------------
   0F             3490        vd_L20F
   0E             3490        vd_L20E
   0D             3490        vd_L20D
   0C             3490        vd_L20C
   0B             3490        vd_L20B
   0A             3490        vd_L20A
   09             3490        vd_L209
   08             3490        vd_L208
   07             3490        vd_L207
   06             3490        vd_L206
   05             3490        vd_L205
   04             3490        vd_L204
   03             3490        vd_L203
   02             3490        vd_L202
   01             3490        vd_L201
   00             3490        vd_L200

Number SCSI Devices:  55

   SCSI Dev.      Type            State   Inquiry
   ---------------------------------------------------------------------
   c13t174l0      processor               <STGT-FC IDP5 81.0>
   c13t172l0      processor               <STGT-FC IDP6 81.0>
   c13t171l0      processor               <STGT-FC IDP7 81.0>
   c13t170l0      processor               <STGT-FC ICP8 81.0>
   c13t168l0      processor               <STGT-FC ICP1 81.0>
   c13t166l0      processor               <STGT-FC IDP0 81.0>
   c13t162l0      processor               <STGT-FC ICP2 81.0>
   c13t158l0      processor               <STGT-FC IDP5 81.0>
   c12t154l0      processor               <STGT-FC ICP8 81.0>
   c12t152l0      processor               <STGT-FC ICP1 81.0>
   c12t150l0      processor               <STGT-FC IDP0 81.0>
   c12t146l0      processor               <STGT-FC ICP2 81.0>
   c12t1013       direct                  <SNI PXRE-F V82G>
   c12t1011       direct                  <SNI PXRE-F V82G>
   c12t812        direct                  <SNI PXRE-F V82G>
   c12t810        direct                  <SNI PXRE-F V82G>
   c12t613        direct                  <SNI PXRE-F V82G>
   c12t611        direct                  <SNI PXRE-F V82G>
   c12t412        direct                  <SNI PXRE-F V82G>
   c12t410        direct                  <SNI PXRE-F V82G>
   c12t213        direct                  <SNI PXRE-F V82G>
   c12t211        direct                  <SNI PXRE-F V82G>
   c12t012        direct                  <SNI PXRE-F V82G>
   c12t010        direct                  <SNI PXRE-F V82G>
   c8t010         direct                  <SEAGATE ST318404LC 3251>

Number of Channel Adapters: 2

   Channel Ad.    Bus Type    Channel Type    State
   ---------------------------------------------------
   ca1            PCI         FC              ACTIVE
   ca0            PCI         ESCON           ACTIVE
```

For space reasons the example has been shortened.

The configuration data shows:

- information about the ISP
- a list of emulations with emulation name, HSI and device name (for ICPs) or a list of PDSs for an IDP.
- a description of the CentricStor-internal Fibre Channel topology from the point of view of the ISP
- information about the host adapters

The description of the Fibre Channel topology is contained in the section “Number SCSI Devices”, but in coded form. The networking information can be found in the “SCSI Dev” column if processor or RAID controller is specified under “Inquiry”.

The SCSI devices are represented in the normal way as
`c` (=controller) `<cc>t`(=target)`<tt>l`(=Lun)`<ll>`, where `cc`, `tt`, `ll` are shown as decimal numbers.

cc	specifies the controller number in the ISP.
tt	target number in the form of a decimal number. With components connected via Fibre Channel, the path is coded in this number. This is described in more detail in the next section.
ll	Logical Unit Number of the component.

Coding the Fibre Channel path

If a binary representation is being used and the highest-order bit is set, the connection is via the fabric protocol. If this bit is not set, an arbitrated loop connection is being used.

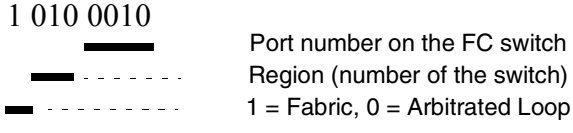
The following bits, as shown below, display the number of the switch and the number of the connection.

Example

second line of the list: `t162 ICP2`

In binary representation, the target number is:
b'1010 0010'

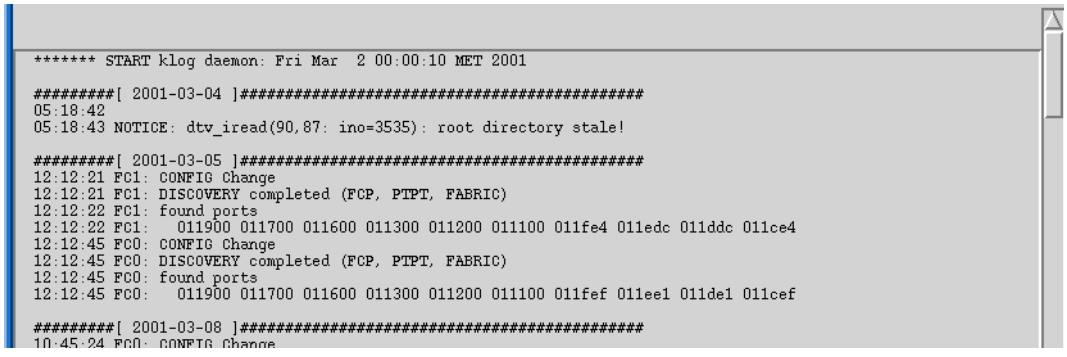
```
c12t10l3      direct              <SNI PXRE-F V82G>
c13t162l0     processor           <STGT-FC ICP2 81.0>
c12t146l0     processor           <STGT-FC ICP2 81.0>
```



In the example, the redundant connection runs over ICP2 (tt = X'92') to switch number 1 using the same port number.

8.6.2.6 Show System Log

Displays system messages from the file `klog.msg`:



8.6.2.7 Show SNMP Data

This function is only available if a flashing yellow “SNMP” symbol indicates that one or more SNMP data blocks are available. It opens a submenu in which you can select a block for display. This is then removed from the submenu.

8.6.2.8 Clean File System

This function is not available in Observe mode.

This function is only available if a yellow or flashing red tool symbol indicates that the file system occupancy level is greater than 95% or is at 100% (“File System full”).

The function starts a program which cleans the file systems of superfluous files. The program deletes files that are contained in a list which can be modified by the service staff. It also searches for temporary files that are less than 24 hours old and that occupy more than 5 Mbytes of storage space. A message box will then appear telling you which files have been located and how much space this now makes available. You must acknowledge this message.

If this call does not solve the problem, you must notify your service staff. The majority of software problems result in large volumes of diagnosis data being saved which, in turn, fills the file system.

8.7 Internal objects of the ISP

8.7.1 Representation of internal objects

Internal objects are those that do not communicate directly with the external data path and are arranged physically within the system.

If the block for the internal objects is not in the foreground, the visible border of the dark gray block changes its color to blue when the mouse pointer is positioned on it, indicating that it is selected. If you press the left mouse button, it is brought into the foreground. An alternative display mode is described in section “Settings” on page 336.

Host connections and external drives always remain visible.

8.7.1.1 Hard disk drives

The status of a hard disk is indicated by the following colors:

Green: Read/write, read, busy
Pink: Online, offline
Yellow: Status unknown

If the mouse pointer is positioned over such an object, its color changes to blue, indicating that it is selected.

If you press the left mouse button, a window containing the following information appears:

– vendor ID
– product ID
– product revision
– drive status
– controller number
– target number

If the drive is a logical drive of an internal RAID system, the following are also displayed:

– disk number
– RAID level
– status
– capacity
– mode

In the upper part, the write/read status is indicated by a lock symbol. If the lock is closed, the status is read only.

8.7.1.2 CD-ROM

The status of a CD-ROM drive is indicated by the following colors:

Turquoise: Read/write, read, busy
Pink: Online, offline
Yellow: Status unknown

If the mouse pointer is positioned over such an object, its color changes to blue, indicating that it is selected.

If you press the left mouse button, a window containing the following information appears:

– vendor ID
– product ID
– product revision
– drive status
– controller number
– target number

In the upper part, the write/read status is indicated by a lock symbol. If the lock is closed, the status is read only.

8.7.1.3 Streamer

The status of a streamer drive is indicated by the following colors:

Green: Read/write, read, busy
Pink: Online, offline
Yellow: Status unknown

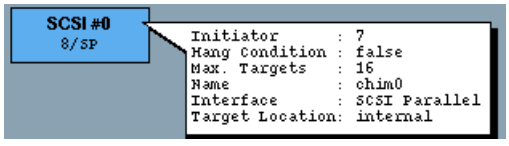
If the mouse pointer is positioned over such an object, its color changes to blue, indicating that it is selected. If you press the left mouse button, a window containing the following information appears:

– vendor ID
– product ID
– product revision
– drive status
– controller number
– target number

In the upper part, the write/read status is indicated by a lock symbol. If the lock is closed, the status is read only.

8.7.1.4 SCSI controller

This is represented exactly as described in the section “Object information on SCSI controllers” on page 421.



8.7.1.5 RAID controller

A RAID controller is represented by a block in which the device number (RAID #0, RAID #1 etc.), controller number and interface type SP (SCSI parallel) are displayed. The status of the controller is indicated by the following colors:

Pink: Hang condition “true”
Green: Ready for operation
Yellow: Unknown
White: Not available

You will find more information in the section “Object information on RAID systems” on page 411.

8.7.2 Functions of the ISP-internal objects

8.7.2.1 Hard disk, CD-ROM, streamer, all internal objects

There are no functions available.

8.7.2.2 SCSI controller

The functions are identical to those described for external SCSI controllers as of the section “SCSI controller functions” on page 422.

8.7.2.3 RAID controller

Show complete internal RAID status

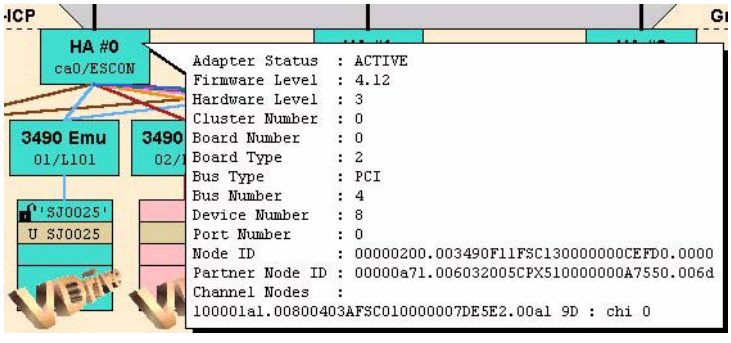
The status of all the components of the internal RAID system is displayed. You will find detailed information in the section “Functions of RAID systems” on page 414.

8.8 ESCON/FICON host adapter

8.8.1 Object information for the ESCON/FICON host adapter

Each host adapter is represented by a block at the top of the ICP. Within the block, the host adapter number (HA #0, HA #1, etc.) and type (ESCON, FICON, FC) are displayed. The status of the host adapter is indicated by the colors pink (not active), green (active) and yellow (unknown).

- *Example for an ESCON host adapter*



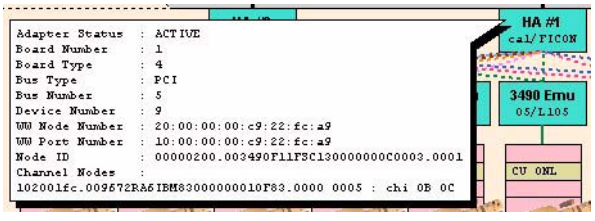
In the host adapter symbol, the serial number of the host adapter in the ICP appears in the top line (here: HA #0) and the interface type appears in the second line (here: ESCON).

The following information is also displayed in the information box:

Adapter Status	Active or stopped.
Firmware Level	Firmware version.
Hardware Level	Hardware version.
Cluster Number	Always 0 in CentricStor.
Board Number	Number of the adapter board.
Board Type	Board type.
Bus Type	Bus type.
Bus Number	Bus number.
Device Number	Position of the ESCON host adapter in the ICP bus system.
Port Number	Port number.
Node ID	Node ID of the ESCON host adapter.
Partner Node ID	Node ID at the other end of the ESCON connection (usually the ESCON Director).

Channel Nodes	List of host channels used to establish a logical path. Each line corresponds to one ESCON channel. The list shows the node ID of the ESCON port in the host. The hexadecimal number separated by a blank represents the port number of the host channel on the ESCON Director (= link address). The colon is followed by “chi” (= Channel Image) with a list of the virtual channels of the host connected via this physical path. To display formatted output of ESCON parameters, use the “Show Node ID Details” command (see page 381).

- *Example for a FICON host adapter*



The following information is also displayed in the information box:

Adapter Status	Active or stopped.
Board Number	Number of the adapter board.
Board Type	Board type.
Bus Type	Bus type.
Bus Number	Bus number.
Device Number	Position of the FICON host adapter in the ICP bus system.
WW Node Number	World Wide Node ID (WWNN)
WW Port Number	World Wide Port ID (WWPN)
Node ID	Node ID of the host adapters
Channel Nodes	List of host channels used to establish a logical path. For further information see the example for an ESCON host adapter.

Connecting lines to the hosts

The connecting lines from the host adapter that go over the top of the screen show the host devices connected.

The circle at the top of the line contains the device mnemonic. If the name is underscored and the line continuous, the connection is active; the device is reserved and a logical path has been established.

A dashed line indicates that a path has been established but no reservation exists.

If no line is displayed, no path has been established.

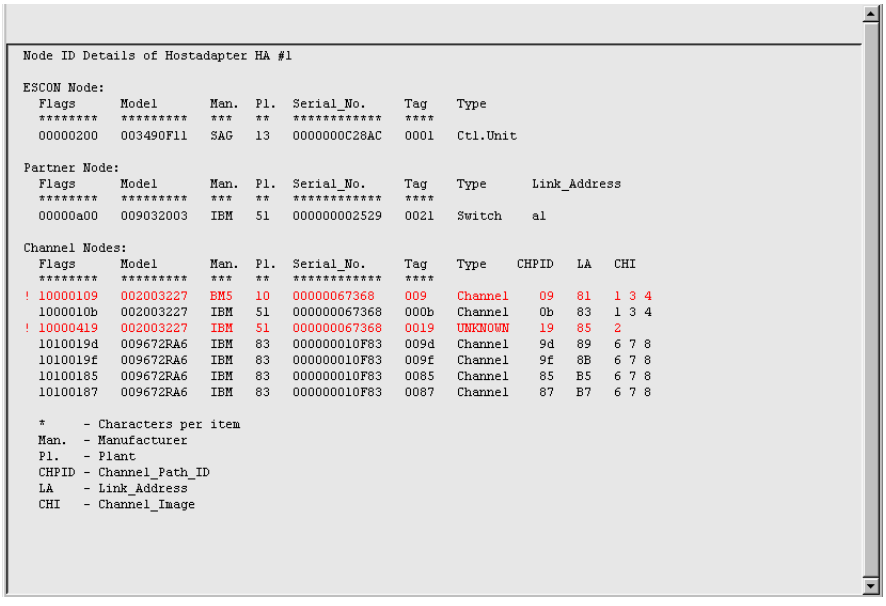
8.8.2 ESCON/FICON host adapter functions

The following functions are available:

- Show Node ID Details
- Show Node Element Descriptors
- Show Dump (prkdump)

8.8.2.1 Show Node ID Details

Display of the node element descriptors of an ESCON/FICON host adapter, of the ESCON/FICON Director, and of the host channels connected to the host adapter:



```
Node ID Details of Hostadapter HA #1

ESCON Node:
  Flags      Model       Man.  Pl.  Serial_No.     Tag    Type
  ********   *********   ***   **   ************   ****
  00000200   003490F11   SAG   13   0000000C28AC   0001   Ctl.Unit

Partner Node:
  Flags      Model       Man.  Pl.  Serial_No.     Tag    Type      Link_Address
  ********   *********   ***   **   ************   ****
  00000a00   009032003   IBM   51   000000002529   0021   Switch    al

Channel Nodes:
  Flags      Model       Man.  Pl.  Serial_No.     Tag    Type    CHPID   LA   CHI
  ********   *********   ***   **   ************   ****
! 10000109   002003227   BM5   10   00000067368    009    Channel   09   81   1 3 4
  1000010b   002003227   IBM   51   000000067368   000b   Channel   0b   83   1 3 4
! 10000419   002003227   IBM   51   000000067368   0019   UNKNOWN   19   85   2
  10100190   009672RA6   IBM   83   000000010F83   009d   Channel   9d   89   6 7 8
  10100191   009672RA6   IBM   83   000000010F83   009f   Channel   9f   8B   6 7 8
  10100185   009672RA6   IBM   83   000000010F83   0085   Channel   85   B5   6 7 8
  10100187   009672RA6   IBM   83   000000010F83   0087   Channel   87   B7   6 7 8

  *     - Characters per item
  Man.  - Manufacturer
  Pl.   - Plant
  CHPID - Channel_Path_ID
  LA    - Link_Address
  CHI   - Channel_Image
```

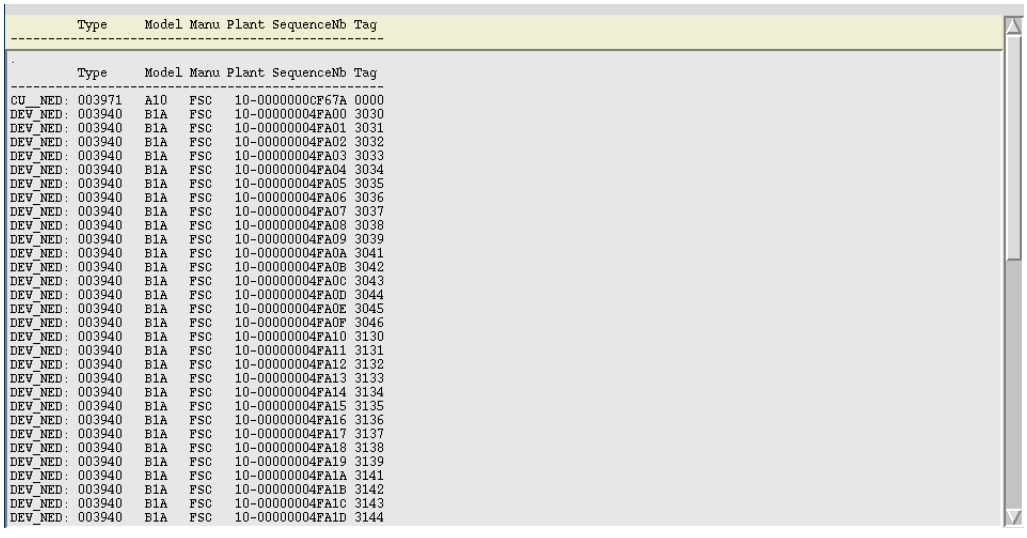
The node ID is formatted. An explanation of the abbreviations can be found under the list. If the node ID cannot be decoded, the relevant line is highlighted by an exclamation mark in the left margin and is colored red.

In the example shown, two errors were detected in the channel node IDs:
Both lines are marked by “!” at the start of the line and are colored red.

The first error involves a shift due to a missing character, while the second errored line shows “UNKNOWN” as the type.

8.8.2.2 Show Node Element Descriptors

Display of the node element descriptors of an ESCON/FICON host adapter and the underlying virtual devices.

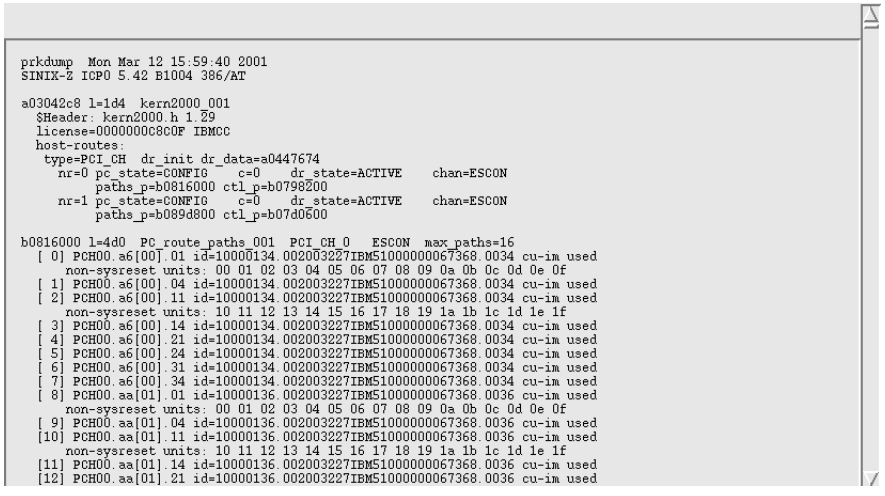


```
         Type     Model Manu Plant SequenceNb Tag
-------------------------------------------------

.
         Type     Model Manu Plant SequenceNb Tag
-------------------------------------------------
CU__NED: 003971   A10   FSC   10-0000000CF67A 0000
DEV_NED: 003940   B1A   FSC   10-00000004FA00 3030
DEV_NED: 003940   B1A   FSC   10-00000004FA01 3031
DEV_NED: 003940   B1A   FSC   10-00000004FA02 3032
DEV_NED: 003940   B1A   FSC   10-00000004FA03 3033
DEV_NED: 003940   B1A   FSC   10-00000004FA04 3034
DEV_NED: 003940   B1A   FSC   10-00000004FA05 3035
DEV_NED: 003940   B1A   FSC   10-00000004FA06 3036
DEV_NED: 003940   B1A   FSC   10-00000004FA07 3037
DEV_NED: 003940   B1A   FSC   10-00000004FA08 3038
DEV_NED: 003940   B1A   FSC   10-00000004FA09 3039
DEV_NED: 003940   B1A   FSC   10-00000004FA0A 3041
DEV_NED: 003940   B1A   FSC   10-00000004FA0B 3042
DEV_NED: 003940   B1A   FSC   10-00000004FA0C 3043
DEV_NED: 003940   B1A   FSC   10-00000004FA0D 3044
DEV_NED: 003940   B1A   FSC   10-00000004FA0E 3045
DEV_NED: 003940   B1A   FSC   10-00000004FA0F 3046
DEV_NED: 003940   B1A   FSC   10-00000004FA10 3130
DEV_NED: 003940   B1A   FSC   10-00000004FA11 3131
DEV_NED: 003940   B1A   FSC   10-00000004FA12 3132
DEV_NED: 003940   B1A   FSC   10-00000004FA13 3133
DEV_NED: 003940   B1A   FSC   10-00000004FA14 3134
DEV_NED: 003940   B1A   FSC   10-00000004FA15 3135
DEV_NED: 003940   B1A   FSC   10-00000004FA16 3136
DEV_NED: 003940   B1A   FSC   10-00000004FA17 3137
DEV_NED: 003940   B1A   FSC   10-00000004FA18 3138
DEV_NED: 003940   B1A   FSC   10-00000004FA19 3139
DEV_NED: 003940   B1A   FSC   10-00000004FA1A 3141
DEV_NED: 003940   B1A   FSC   10-00000004FA1B 3142
DEV_NED: 003940   B1A   FSC   10-00000004FA1C 3143
DEV_NED: 003940   B1A   FSC   10-00000004FA1D 3144
```

Show/View functions open windows that are equipped with scroll bars and search functions. For information on the tools that can be used to navigate through these windows when large data volumes are involved, see the section “File viewer” on page 360.

8.8.2.3 Show Dump (prkdump)

Display of the host adapter driver dump:



```
prkdump  Mon Mar 12 15:59:40 2001
SINIX-Z ICP0 5.42 B1004 386/AT

a03042c8 l=1d4  kern2000_001
  $Header: kern2000.h 1.29
  license=0000000C8C0F IBMCC
  host-routes:
   type=PCI_CH  dr_init dr_data=a0447674
     nr=0 pc_state=CONFIG    c=0    dr_state=ACTIVE    chan=ESCON
          paths_p=b0816000 ctl_p=b0798200
     nr=1 pc_state=CONFIG    c=0    dr_state=ACTIVE    chan=ESCON
          paths_p=b089d800 ctl_p=b07d0600

b0816000 l=4d0  PC_route_paths_001  PCI_CH_0   ESCON  max_paths=16
  [ 0] PCH00.a6[00].01 id=10000134.002003227IBM51000000067368.0034 cu-im used
     non-sysreset units: 00 01 02 03 04 05 06 07 08 09 0a 0b 0c 0d 0e 0f
  [ 1] PCH00.a6[00].04 id=10000134.002003227IBM51000000067368.0034 cu-im used
  [ 2] PCH00.a6[00].11 id=10000134.002003227IBM51000000067368.0034 cu-im used
     non-sysreset units: 10 11 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f
  [ 3] PCH00.a6[00].14 id=10000134.002003227IBM51000000067368.0034 cu-im used
  [ 4] PCH00.a6[00].21 id=10000134.002003227IBM51000000067368.0034 cu-im used
  [ 5] PCH00.a6[00].24 id=10000134.002003227IBM51000000067368.0034 cu-im used
  [ 6] PCH00.a6[00].31 id=10000134.002003227IBM51000000067368.0034 cu-im used
  [ 7] PCH00.a6[00].34 id=10000134.002003227IBM51000000067368.0034 cu-im used
  [ 8] PCH00.aa[01].01 id=10000136.002003227IBM51000000067368.0036 cu-im used
     non-sysreset units: 00 01 02 03 04 05 06 07 08 09 0a 0b 0c 0d 0e 0f
  [ 9] PCH00.aa[01].04 id=10000136.002003227IBM51000000067368.0036 cu-im used
  [10] PCH00.aa[01].11 id=10000136.002003227IBM51000000067368.0036 cu-im used
     non-sysreset units: 10 11 12 13 14 15 16 17 18 19 1a 1b 1c 1d 1e 1f
  [11] PCH00.aa[01].14 id=10000136.002003227IBM51000000067368.0036 cu-im used
  [12] PCH00.aa[01].21 id=10000136.002003227IBM51000000067368.0036 cu-im used
```

To analyze this dump, you will need detailed knowledge of the system.

8.9 Emulations of drives connected to OS/390 host adapters

8.9.1 Information on emulations

The ESCON channel adapter only has emulations of drives of the types IBM-3490E and Fujitsu F6473K. In the Fujitsu-Siemens Computers product lists, 3490-E devices are listed under the number 3590 and must not be confused with 3590 tape drives from IBM.

Each emulation is assigned to a virtual tape drive. It is represented by a block connected to one or two channel adapters. Within the block, the emulation type (IBM-3490), emulation name (O3, etc.) and, in the case of virtual drives, the number of the logical device (L000, L001, etc.) are displayed.

This type of emulation consists of two processes, one for communicating with the host adapter and the other for communicating with the logical device or RAID system. These processes are referred to as the channel process and the device process.

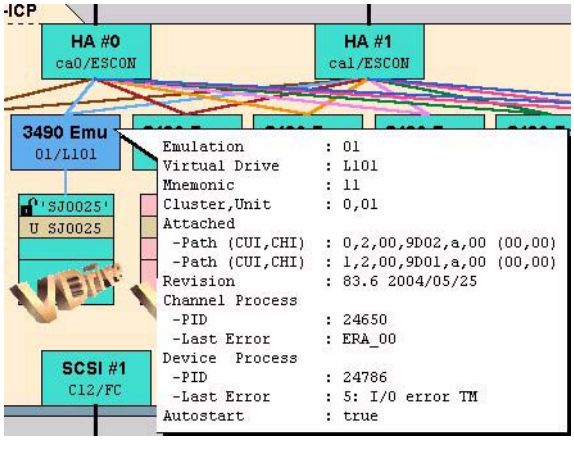
Normally, both processes have the same status. However, there are situations in which this will not be the case. If this occurs, the top half of the block shows the status of the channel process, while the bottom half shows the status of the device process. The process status is indicated by the colors pink (stopped), green (running), green/brown (running with the trace switched on), and red (configuration error).

XTCC represents the integration of the virtual drive in the CentricStor system:

– the connection to one or both ESCON host adapters
– the device names in the ESA/390 or BS2000 host

The connection lines are colored purely for the purposes of clarity.

In the event of an error (e.g. because of the failure of an ESCON channel) the connections concerned are indicated by dashed lines.



The information box contains the following information:

Emulation Name of the emulation.
Virtual Drive Internal CentricStor name for the logical drive.
Mnemonic Name of the logical drive in the host (if defined).
CIuster, Unit ESCON address of the logical drive (chennel and unit number).
Revision Software revision level.
Attached Path (CUI, CHI): n,t,cc,llll,a,uu (uu, cc)
Describes the paths to the hosts:
n: Host adapter number
t: Host adapter type
cc: Channel image if defined
llll: Link address (connection number of the host on the ESCON director)
a: Connection status (a=attached)
uu: Control Unit Image (CUI)
Channel Process/Device Process/Last Error
Process ID and last error message from the channel and device processes in the SINIX system.
Autostart
Specifies whether autostart is active for this emulation.

8.9.2 Functions for individual 3490 emulations

If the yellow “Busy” symbol is displayed for the selected drive, this means that the function menu is currently not available.

The following functions are available:

– Show Error/Transfer Statistics
– Show Short Trace
– Show Path Trace
– Show Error Log
– Show Memory Log

8.9.2.1 Show Error/Transfer Statistics

Display of the error and statistical data transferred to the host:

```
      Tape Error and Transfer Statistics
      ==================================


Device Type: 3490

Date:   08.03.2001
Time:   155700.77

Format: 30 - ( 3490 Format )

Statistic Bytes 0-31:
   4040402B0000003000000000000000000000000000000000000809C8C0F1098

Statistic Bytes 32-63:
   0000000000000000000000000000000000000000000000001904400440000000

---------------------------------------------------------------
Date:   08.03.2001
Time:   091605.48

Format: 30 - ( 3490 Format )

Statistic Bytes 0-31:
   0048402B0000003000000000000000000000000000000000000849C8C0F1098

Statistic Bytes 32-63:
   0000000000000000000000000000000000000000000000001904400440000000

---------------------------------------------------------------
Date:   08.03.2001
Time:   091604.86
```

8.9.2.2 Show Short Trace

Displays general information at the beginning of the start trace file:

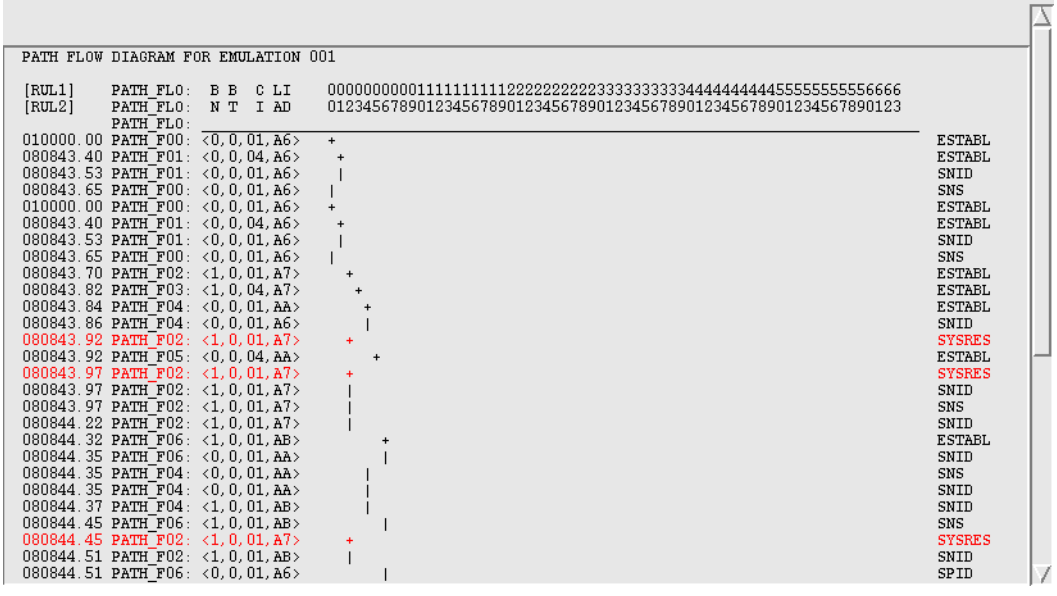
```
081502.67 TR_HEAD:  ######## TRACE HEAD ##########################
081502.67 TR_HEAD:  #
081502.79 TR_HEAD:  #
081502.79 TR_HEAD:  # Emulation:
081502.90 TR_HEAD:  #     Revision:     8.33 2001/02/01
081502.90 TR_HEAD:  #     HSI:          3490
081502.98 TR_HEAD:  #     Process:      Parent
081502.98 TR_HEAD:  #     PID:          17917
081503.08 TR_HEAD:  #
081503.08 TR_HEAD:  # Device:
081503.25 TR_HEAD:  #     Synonym:      VDRIVE
081503.25 TR_HEAD:  #     Inquiry:      <FSC     0VDRVX01>
081503.42 TR_HEAD:  #     Device Type:  01
081503.42 TR_HEAD:  #     Firmware Rev: 8331
081503.59 TR_HEAD:  #     Cart. Loader: no
081503.59 TR_HEAD:  #     ACF Mode:     NoLoader
081503.71 TR_HEAD:  #     Manufacturer: 10
081503.71 TR_HEAD:  #     Serial Nb.:   0000000D8C01
081503.82 TR_HEAD:  #     Mnemonic:     01
081503.82 TR_HEAD:  #     Display Type: 00
081504.00 TR_HEAD:  #     Attach:       yes
081504.00 TR_HEAD:  #     Barcode Read: no
081504.06 TR_HEAD:  #     Compression:  yes
081507.28 TR_HEAD:  ######## END TRACE HEAD ######################
```

This is followed by the trace on all commands sent by the host together with their termination.

```
081502.27 CMD_IOCL: <S_MSG>
081517.64 CMD_SCSI: <TestUnitReady_vtls>
081518.41 CMD_IOCL: <REQ_EV>
081557.49 CMD_CSTA:  2: 2/04/03 - LUN Not Ready, Manual Intervention...
081619.17 CMD_SCSI: <TestUnitReady_vtls>
081642.10 CMD_CSTA:  2: 2/04/03 - LUN Not Ready, Manual Intervention...
081717.90 CMD_SCSI: <TestUnitReady_vtls>
081756.38 CMD_CSTA:  2: 2/04/03 - LUN Not Ready, Manual Intervention...
081901.86 CMD_SCSI: <TestUnitReady_vtls>
081932.61 CMD_CSTA:  2: 2/04/03 - LUN Not Ready, Manual Intervention...
082010.83 CMD_IOCL: <G_MSG>
082033.69 CMD_SCSI: <TestUnitReady_vtls>
082102.60 CMD_CSTA:  2: 2/04/03 - LUN Not Ready, Manual Intervention...
082120.57 CMD_SCSI: <TestUnitReady_vtls>
082140.59 CMD_CSTA:  2: 2/04/03 - LUN Not Ready, Manual Intervention...
082214.12 CMD_SCSI: <TestUnitReady_vtls>
082238.65 CMD_CSTA:  2: 2/04/03 - LUN Not Ready, Manual Intervention...
.
```

8.9.2.3 Show Path Trace

Displays the path sequence of I/Os:



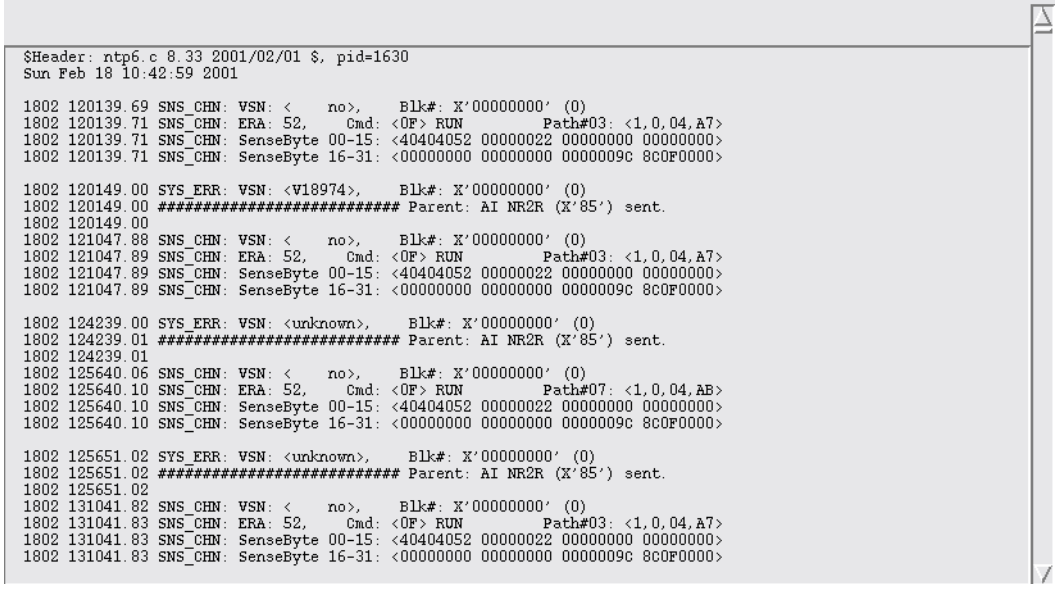
```
PATH FLOW DIAGRAM FOR EMULATION 001

[RUL1]    PATH_FLO:  B B  C LI    0000000000111111111122222222223333333333444444444455555555556666
[RUL2]    PATH_FLO:  N T  I AD    0123456789012345678901234567890123456789012345678901234567890123
          PATH_FLO: ____________________________________________________________________________________
010000.00 PATH_F00: <0,0,01,A6>   +                                                                ESTABL
080843.40 PATH_F01: <0,0,04,A6>    +                                                               ESTABL
080843.53 PATH_F01: <0,0,01,A6>    |                                                               SNID
080843.65 PATH_F00: <0,0,01,A6>   |                                                                SNS
010000.00 PATH_F00: <0,0,01,A6>   +                                                                ESTABL
080843.40 PATH_F01: <0,0,04,A6>    +                                                               ESTABL
080843.53 PATH_F01: <0,0,01,A6>    |                                                               SNID
080843.65 PATH_F00: <0,0,01,A6>   |                                                                SNS
080843.70 PATH_F02: <1,0,01,A7>     +                                                              ESTABL
080843.82 PATH_F03: <1,0,04,A7>      +                                                             ESTABL
080843.84 PATH_F04: <0,0,01,AA>       +                                                            ESTABL
080843.86 PATH_F04: <0,0,01,A6>       |                                                            SNID
080843.92 PATH_F02: <1,0,01,A7>     +                                                              SYSRES
080843.92 PATH_F05: <0,0,04,AA>        +                                                           ESTABL
080843.97 PATH_F02: <1,0,01,A7>     +                                                              SYSRES
080843.97 PATH_F02: <1,0,01,A7>     |                                                              SNID
080843.97 PATH_F02: <1,0,01,A7>     |                                                              SNS
080844.22 PATH_F02: <1,0,01,A7>     |                                                              SNID
080844.32 PATH_F06: <1,0,01,AB>          +                                                         ESTABL
080844.35 PATH_F06: <0,0,01,AA>          |                                                         SNID
080844.35 PATH_F04: <0,0,01,AA>       |                                                            SNS
080844.35 PATH_F04: <0,0,01,AA>       |                                                            SNID
080844.37 PATH_F04: <1,0,01,AB>       |                                                            SNID
080844.45 PATH_F06: <1,0,01,AB>          |                                                         SNS
080844.45 PATH_F02: <1,0,01,A7>     +                                                              SYSRES
080844.51 PATH_F02: <1,0,01,AB>     |                                                              SNID
080844.51 PATH_F06: <0,0,01,A6>          |                                                         SPID
```

8.9.2.4 Show Error Log

Displays a text window containing the error log of the virtual device or emulation. Logical device error messages may be issued as a result of:

– operating errors (read command for empty drive, write command for write-protected volume)
– the mapping of internal CentricStor errors to device errors

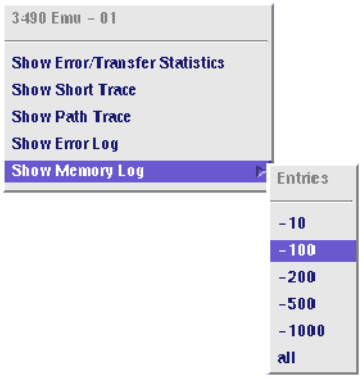
Display of the emulations's error logging:



```
$Header: ntp6.c 8.33 2001/02/01 $, pid=1630
Sun Feb 18 10:42:59 2001

1802 120139.69 SNS_CHN: VSN: <    no>,    Blk#: X'00000000' (0)
1802 120139.71 SNS_CHN: ERA: 52,    Cmd: <0F> RUN         Path#03: <1,0,04,A7>
1802 120139.71 SNS_CHN: SenseByte 00-15: <40404052 00000022 00000000 00000000>
1802 120139.71 SNS_CHN: SenseByte 16-31: <00000000 00000000 0000009C 8C0F0000>

1802 120149.00 SYS_ERR: VSN: <V18974>,    Blk#: X'00000000' (0)
1802 120149.00 ########################## Parent: AI NR2R (X'85') sent.
1802 120149.00
1802 121047.88 SNS_CHN: VSN: <    no>,    Blk#: X'00000000' (0)
1802 121047.89 SNS_CHN: ERA: 52,    Cmd: <0F> RUN         Path#03: <1,0,04,A7>
1802 121047.89 SNS_CHN: SenseByte 00-15: <40404052 00000022 00000000 00000000>
1802 121047.89 SNS_CHN: SenseByte 16-31: <00000000 00000000 0000009C 8C0F0000>

1802 124239.00 SYS_ERR: VSN: <unknown>,    Blk#: X'00000000' (0)
1802 124239.01 ########################## Parent: AI NR2R (X'85') sent.
1802 124239.01
1802 125640.06 SNS_CHN: VSN: <    no>,    Blk#: X'00000000' (0)
1802 125640.10 SNS_CHN: ERA: 52,    Cmd: <0F> RUN         Path#07: <1,0,04,AB>
1802 125640.10 SNS_CHN: SenseByte 00-15: <40404052 00000022 00000000 00000000>
1802 125640.10 SNS_CHN: SenseByte 16-31: <00000000 00000000 0000009C 8C0F0000>

1802 125651.02 SYS_ERR: VSN: <unknown>,    Blk#: X'00000000' (0)
1802 125651.02 ########################## Parent: AI NR2R (X'85') sent.
1802 125651.02
1802 131041.82 SNS_CHN: VSN: <    no>,    Blk#: X'00000000' (0)
1802 131041.83 SNS_CHN: ERA: 52,    Cmd: <0F> RUN         Path#03: <1,0,04,A7>
1802 131041.83 SNS_CHN: SenseByte 00-15: <40404052 00000022 00000000 00000000>
1802 131041.83 SNS_CHN: SenseByte 16-31: <00000000 00000000 0000009C 8C0F0000>
```

8.9.2.5 Show Memory Log

Displays the process log for the emulation which is present in memory:



This function makes it possible to display a continuous memory trace for the emulation (logging). This logging is independent of the trace set manually.

Example

Memory log, range 100

```
080844.52 CMD_SNS:  <4240404D0000000200000B31204030000>
080844.52 CMD_SNS:  <00000088000000000CE0E219C8C0F1000>
080844.52 CMD_IOCL: <COPY_KBUF>
080844.52 KADR_PUT: <B11A9778>   SERIAL_NB: <14>
080844.52 CMD_STA:  <0C>   CE/DE
080844.52 CMD_IOCL: <REQ_EV>
080844.53 CMD: ================================= <AF>     SPID
080844.53 PATH_#02: <1,0,01,A7>
080844.53 PATH_F02: <1,0,01,A7>     |                                                SPID
080844.53 CMD_LEN:  <12>
080844.53 TAP_BLK#: <00000000> 0
080844.53 KADR_GET: <B11A9778>   SERIAL_NB: <15>
080844.53 CMD_IOCL: <COPY_KBUF>
080844.53 CMD_FUNC: <ESTABLISH GROUP>
080844.53 KADR_PUT: <B11A9778>   SERIAL_NB: <15>
080844.53 CMD_STA:  <0C>   CE/DE
080844.53 CMD_IOCL: <REQ_EV>
080844.53 CMD: ================================= <AF>     SPID
080844.53 PATH_#02: <0,0,01,AA>
080844.53 PATH_F02: <0,0,01,AA>     |                                                SPID
080844.53 CMD_LEN:  <12>
080844.53 TAP_BLK#: <00000000> 0
080844.53 KADR_GET: <B11A9778>   SERIAL_NB: <16>
080844.53 CMD_IOCL: <COPY_KBUF>
080844.53 CMD_FUNC: <ESTABLISH GROUP>
080844.53 KADR_PUT: <B11A9778>   SERIAL_NB: <16>
080844.53 CMD_STA:  <0C>   CE/DE
080844.53 CMD_IOCL: <REQ_EV>
080844.65 CMD: ================================= <AF>     SPID
080844.65 PATH_#04: <1,0,01,AB>
080844.65 PATH_F04: <1,0,01,AB>       |                                              SPID
080844.65 CMD_LEN:  <12>
```

8.9.3 Functions for all 3490 emulations

In Observe and User mode no functions are available which affect all emulations.

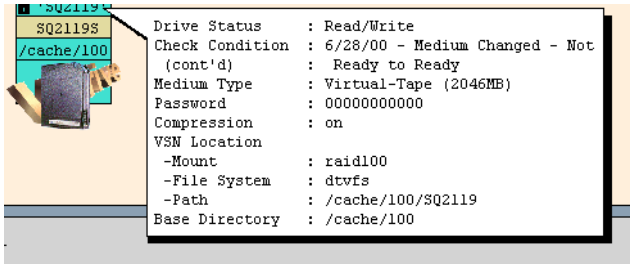
8.10 Virtual 3490 drives

8.10.1 Object information and error messages for virtual 3490 drives

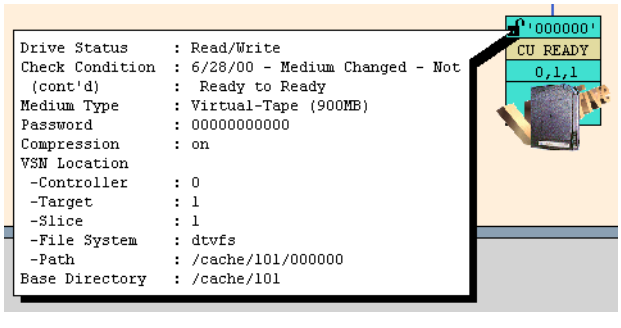
Each emulation is assigned its own virtual drive. In this object, the error messages and behavior of a real drive are simulated as required. Even the display units on real 3490 drives are reproduced faithfully and have the same displays as the real object of the emulation.

In contrast to real drives, an associated SCSI controller exists only when the logical volume is located on the local disk. This is the case with a VTC, for example. In the case of CentricStor systems with an external RAID, a logical volume is addressed via a mount point (e.g. 'raid100'). Access takes p lace via the mount point by means of a fully-automatic path switchover depending on which FC controller is used to access the external RAID (in the event of FC redundancy).

The overall integration of a virtual drive in CentricStor is displayed in the ICP main window. The screens below display the information for the virtual drives:



VSN location in case of external RAID



VSN location in case of internal RAID

The virtual drive is symbolized by a rectangle subdivided into lines. If a logical volume is mounted, write protection (in the form of a padlock) and the name of the volume are displayed in the top line. With an internal RAID the bottom line contains the information <c>, <t>, <s> (Controller, Target, Slice) or <c>, <t>, <s>, <l> (Controller, Target, Slice, LUN) depending on the filesystem. With an external RAID the Base Directory is displayed.

The middle line, displayed against a yellow background, indicates the display unit for the drive. Here you can see the text that the host loads into the drive display.

The display can contain one of the following messages:

Display 0	Display 1	Description
CU READY	--	CU ready but path not yet connected.
CU ONL	--	CU ready, path connected.
EMU STOP	NORMAL	Emulation stopped: normal end.

When a logical volume is loaded, the third line specifies which cache contains the associated data.

8.10.1.1 Error conditions indicated on the display

Display 1	Display 2	Meaning
EMU STOP	ERR #001	BAD_IAT (address conflict between the emulation and the EXA driver)
EMU STOP	ERR #002	pcib open failed (no connection to the channel)
EMU STOP	ERR #003	Index already exists (overlap in the kernel buffer address)
EMU STOP	ERR #004	SIGSET for pcib
EMU STOP	ERR #005	Device type not supported
EMU STOP	ERR #006	Endless loop child (hard software error)
EMU STOP	ERR #011	SIGBUS,-FPE,-SEGV (code overwritten)
EMU STOP	ERR #013	Library init wrong
EMU STOP	ERR #022	REG_EV (channel driver closed the connection to the emulation)
EMU STOP	ERR #030	VT_LS open error (initialization error)
EMU STOP	ERR #031	VT_LS mount error
EMU STOP	ERR #032	VT_LS Library Manager error
EMU STOP	ERR #045	KBUF inconsistency (buffer inconsistency between the channel and the emulation)
EMU STOP	ERR #09	Test stop (trap)
EMU STOP	ERR #100	PROCLOCK == ERR

8.10.1.2 Object information

The extended information contains the following data:

Drive Status	(Empty, write-protected); Specifies whether a cartridge is inserted and whether data can be written to this cartridge.
Check Condition	Date and description of the last Check Condition that occurred.
Medium Type	(Only for mounted volume); Currently always “Virtual-Tape”.
Password	Password assigned to the drive by the host software.
Compression	Specifies whether data compression is activated.
VSN-Location	(Only for mounted volume); Mount point, file system and path for mapping the mounted volume in the cache (external RAID) or Controller, Target, Slice, LUN, Filesystem and Path for mapping the volume in the cache (internal RAID).
Cache-Directory	(Only for mounted volume); Details of the cache area occupied by the volume.

The graphical display also indicates error messages that have not yet been acknowledged. A flashing icon indicates whether Service Information Messages (SIM) or Media Information Messages (MIM) exist.

8.10.1.3 SIM/MIM error messages on virtual devices

The number after the SIM/MIM display specifies the severity code:

Code	Designation	Urgency
0	Service	Informative
1	Moderate	Medium
2	Serious	High
3	Acute	Urgent

If there are several error messages, the associated codes are displayed alternately. Details of the error message are shown if you click the error symbol. The flashing stops when you open the error message.

As far as the host is concerned, CentricStor simulates 3490 cartridge drives. CentricStor problems are mapped to error messages for these virtual drives. To do this, MIMs and SIMs (Media Information Messages, Service Information Messages) that do not occur in physical devices are used.

The following table lists the SIMs/MIMs used by the emulation and gives the probable cause.

MIM fault symptom code FSC(0-3) X'hhhh'	MIM text	Possible cause
0C01	Unsupported format	
0C02	Hard write error	TFS hard write error. Hard errors which recur repeatedly cause CentricStor to crash.
0C03	Hard read error	TFS hard read error. Hard errors which recur repeatedly cause CentricStor to crash.
0C04	Read, write or positioning error	
0C05	Write to write protected tape	
0C06	Load failure, unload media and retry	
B111	No device Response	
0815	No device Response	
0816	File System Full	
0817	Unknown Filesystem Sense Code	The TFS sent an unknown error code to the device emulation.

8.10.2 Virtual drive functions

The following functions are available:

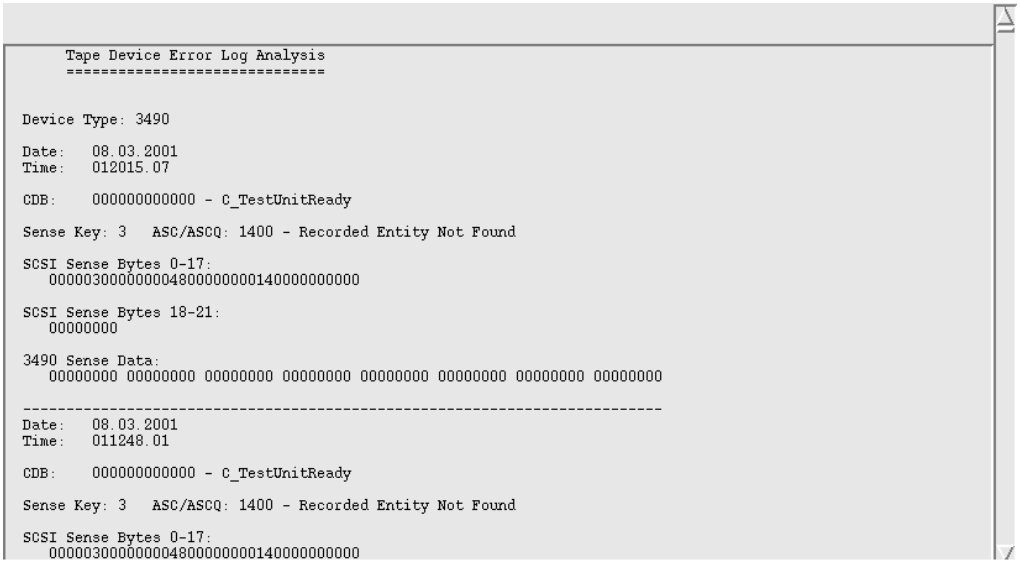
- Show SCSI Sense
- Show Medium Info (MIM)
- Show Service Info (SIM)
- Unload and Unmount

When interpreting the information, it should be remembered that this is emulated data.

8.10.2.1 Show SCSI Sense

The device emulation of CentricStor works internally as a protocol converter from the channel to the SCSI protocol and vice versa. In a CentricStor ICP the SCSI interface is only emulated. In the real system the device emulation works with the interfaces of the file system to the RAID cache. However, because internal processing takes place as SCSI, the error display is accordingly in SCSI notation because this is standardized.

The menu item produces a text page containing the most recent SCSI sense information:

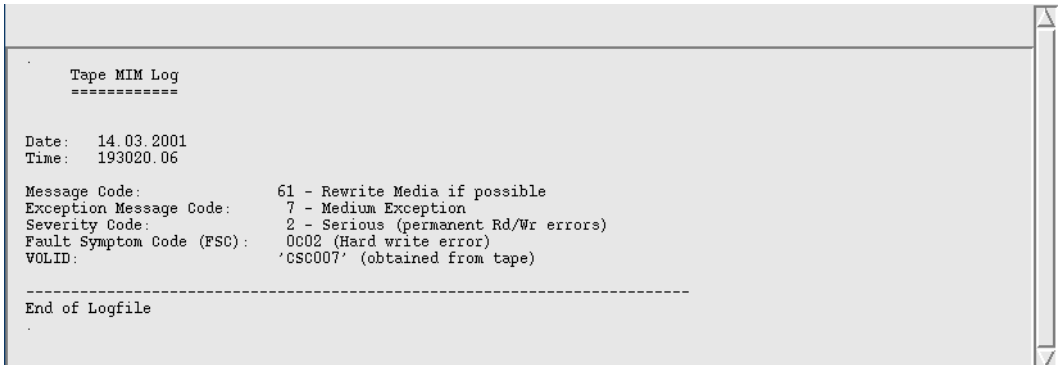


```
      Tape Device Error Log Analysis
      ==============================


Device Type: 3490

Date:    08.03.2001
Time:    012015.07

CDB:     000000000000 - C_TestUnitReady

Sense Key: 3   ASC/ASCQ: 1400 - Recorded Entity Not Found

SCSI Sense Bytes 0-17:
   00000300000000480000000140000000000

SCSI Sense Bytes 18-21:
   00000000

3490 Sense Data:
   00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000

--------------------------------------------------------------------------------
Date:    08.03.2001
Time:    011248.01

CDB:     000000000000 - C_TestUnitReady

Sense Key: 3   ASC/ASCQ: 1400 - Recorded Entity Not Found

SCSI Sense Bytes 0-17:
   00000300000000480000000140000000000
```

8.10.2.2 Show Medium Info (MIM)

An info box appears if no MIM log exists:

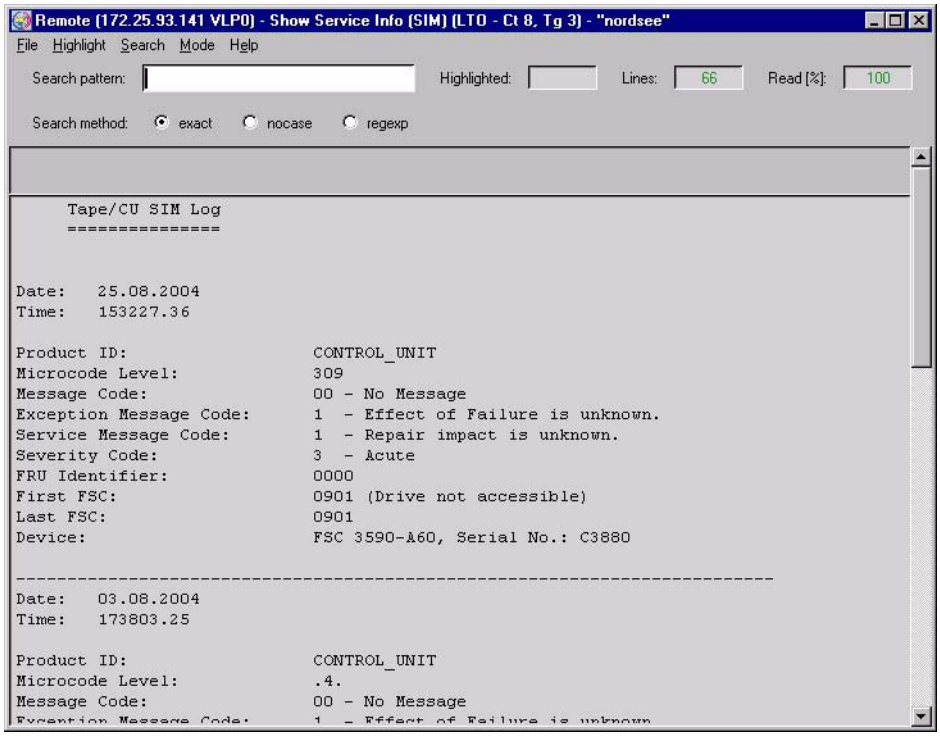
Displays the latest Media Information Messages in a text window.



```
     Tape MIM Log
     ============


Date:    14.03.2001
Time:    193020.06

Message Code:               61 - Rewrite Media if possible
Exception Message Code:      7 - Medium Exception
Severity Code:               2 - Serious (permanent Rd/Wr errors)
Fault Symptom Code (FSC):    0C02 (Hard write error)
VOLID:                      'CSC007' (obtained from tape)

------------------------------------------------------------------------------
End of Logfile
```

8.10.2.3 Show Service Info (SIM)

Displays the latest Service Information Messages in a text window.



The MIM and SIM codes of the virtual devices are described in the section “Object information” on page 393.

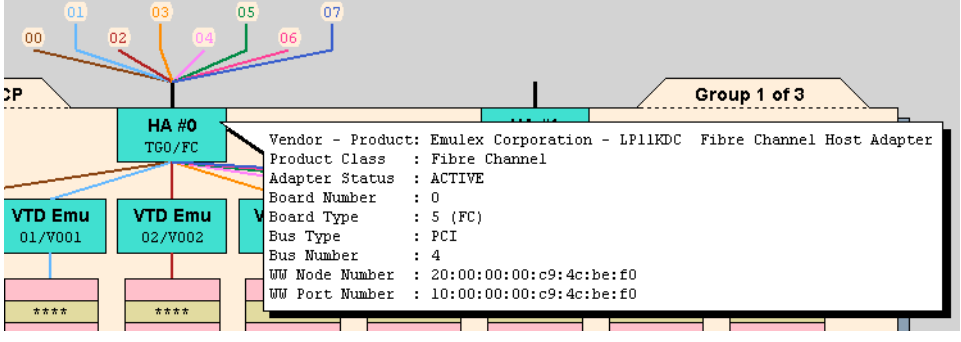
8.10.2.4 Unload and Unmount

This function is used to unload and unmount the virtual volume.

8.11 FC-SCSI host adapter

8.11.1 Object information on FC-SCSI host adapters

Each host adapter is represented by a block at the top of the ICP. Within the block, the host adapter number (HA #0, HA #1, etc.) and type (ESCON, FICON, FC) are displayed. The status of the host adapter is indicated by the colors pink (not active), green (active) and yellow (unknown).



In the host adapter symbol, the serial number of the host adapter in the ICP appears in the top line (here: HA #0) and the name and the interface type appear in the second line (here: TG0/FC).

The following information is also displayed in the information box:

Vendor - Product	Vendor and product name
Product Class	Product class
Adapter Status	Operational status.
Board No., Type	Number and type of the host adapter.
Bus Type, Number	Type and number of the internal bus to which the FC host adapter is connected.
Device Number	Internal ICP device number.
WW Node Number	World Wide Node ID (WWNN).
WW Port Number	World Wide Port ID (WWPN)
	You need WWNN and WWPN to reconcile the configuration in the host system.

Connecting lines to the hosts:

The connecting lines from the host adapter that go over the top of the screen show the host devices connected.

The circle at the top of the line contains the LUN (Logical Unit) of the device. If the line is continuous, the connection is active; host adapter and emulation are ready.

A dashed line indicates that the host adapter and/or emulation are not ready.

If no line is displayed, no LUN was found.

8.11.2 FC-SCSI host adapter functions

8.11.2.1 Perform Link Down/Up Sequence

For approx. 30 seconds the status “Link Down” is generated, thus activating a flashing display on the module. This enables the module to be located in the hardware.

The function can be called only if the host adapter is in “ACTIVE” mode.

8.12 Emulations of SCSI drives (VTD)

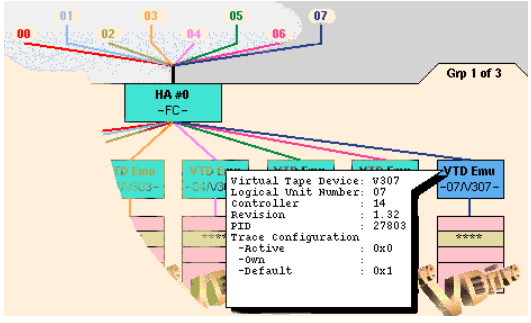
8.12.1 Object information on emulations of SCSI devices

The emulation type VTD (Virtual Tape Device) is provided for open systems (OS).

Each emulation is assigned to a virtual tape drive. It is represented by a block connected to the host adapter. Within the block, the emulation type (VTD), logical unit number (0x00, 0x01, etc.), and the number of the virtual drive (V000, V001, etc.) are displayed.

This type of emulation consists of a single process, the status of which is indicated by the colors pink (stopped), green (running), and green/brown (running with the trace switched on).

The figure below shows the characteristics of an emulation as displayed in XTCC.



The information box displays:

Virtual Tape Device	Internal SINIX name for the device.
Logical Unit Number	LUN on the FC-SCSI interface.
Controller	Serial number on the FC-SCSI controller.
Revision	Revision level of the emulation.
Process ID	Process ID of the emulation.
Active, Own and Default Trace Configuration	Trace settings (dependent on the VTD version).

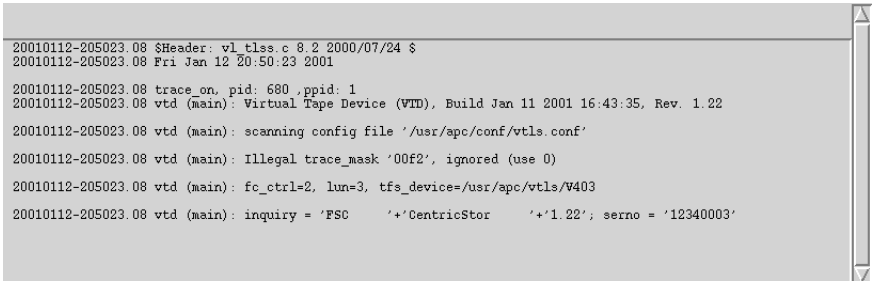
8.12.2 Functions for individual VTD emulations

The following function is available:

– Show Trace

8.12.2.1 Show Trace

Displays the emulation trace in a text window.



The example above shows the trace entries created when the VTD is started. During operation, the trace primarily records the SCSI commands processed.

8.12.3 Functions for all VTD emulations

“All” means all emulations on this ISP.

In Observe and User mode no functions are available.

8.13 Virtual SCSI drives

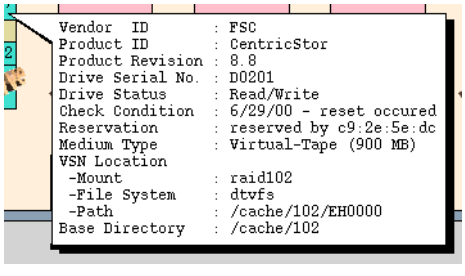
8.13.1 Object information on virtual tape drives

Drives of this type are designated as VDrives.

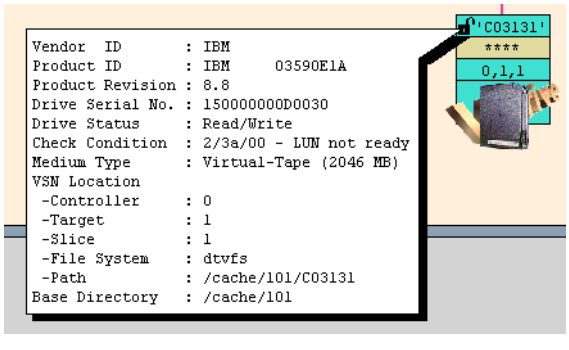
In contrast to real drives, an associated SCSI controller exists only when the logical volume is located on the local disk. This is the case with a VTC, for example. In the case of CentricStor systems with an external RAID, a logical volume is addressed via a mount point (e.g. 'raid102'). Access takes p lace via the mount point by means of a fully-automatic path switchover depending on which FC controller is used to access the external RAID (in the event of FC redundancy).

A virtual drive is symbolized by a rectangle subdivided into lines. If a logical volume is mounted, the write protection (in the form of a padlock) and the name of the volume are displayed in the top line. With an internal RAID the bottom line contains the information <c>, <t>, <s> (Controller, Target, Slice) or <c>, <t>, <s>, <l> (Controller, Target, Slice, LUN) depending on the filesystem. With an external RAID the Base Directory is displayed.

The drive's display unit is emulated in the middle line, which is highlighted in yellow.



VSN location in case of external RAID



VSN location in case of internal RAID

The following is displayed:

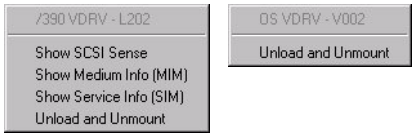
Inquiry data	Vendor ID, product ID, product revision level, drive serial number. Vendor ID and product ID can be selected during configuration.
Drive Status	Online, Offline, Read/Write
Check Condition:	Date and designation of the error condition that occurred last.
Reservation	The last 4 bytes of the WWPN of the host which reserves the drive are displayed.
Medium Type:	(Only with a mounted volume); always corresponds to the emulated volume type .
VSN Location	Mount point, file system and path to the map of the mounted volume in the cache (external RAID) or Controller, Target, Slice, LUN, Filesystem and Path for mapping the volume in the cache (internal RAID).
Base Directory	(Only with a mounted volume); details on the cache area which the volume occupies.

Depending on the operating status, some of the information listed above may not be displayed.

8.13.2 Virtual generic drive functions

Depending on the emulation, the following functions are available:

/390 VDRV OS VDRV



8.13.2.1 Show SCSI Sense

Shows the accumulated SCSI sense bytes of the virtual drive.

8.13.2.2 Show Medium Info (MIM)

Shows the “Media Information Messages”.

8.13.2.3 Show Service Info (SIM)

Shows the “Service Information Messages”.

8.13.2.4 Unload and Unmount

Unloads and unmounts the virtual volume.

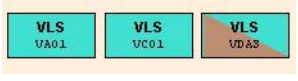
8.14 VLS (Virtual Library Service)

8.14.1 Object information on VLSs

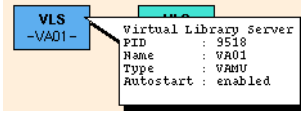
A VLS (Virtual Library Server) is the emulation of an archive system for magnetic tapes. CentricStor can emulate various types of archive systems.

VLSs of the type VACS, VLMF or VDAS serve a number of clients. These VLSs can only run once in CentricStor. A VLS of the type VAMU or VJUK is only able to serve a single client. However, CentricStor is able to run up to 10 instances of a library of type VAMU or 20 instances of a library of type VJUK.

The status of a VLS is indicated by the colors pink (stopped), green (running) and green/ brown (running with the trace switched on):



- The following information is displayed for all VLS types:



Example: VAMU

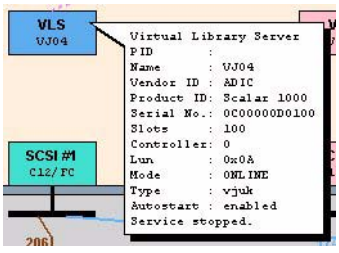
PID	Process ID.
Name	Name as it appears on the VLS symbol, which is defined during configuration.
Type	Type of VLS: vamu, vacs, vlmf, vdas or vjuk.
Autostart	Enabled / disabled.

- The following information is also displayed for VLSs of type VDAS:

Example: VDAS

Revision	Software revision level.
Trace Mask	Active trace mask.
Clients	Client names and hosts.

- The following information is also output for VLSs of the type VJUK:



Example: VJUK

Vendor ID	Vendor identifier
Product ID	Product identifier
Serial No	Serial number
Slots	Number of slots
Controller	Number of the controller used
Lun	SCSI Lun of the jukebox
Mode	Operating status

8.14.2 Functions for individual VLSs

The functions available for a VLS depend on its type.

VDAS has the “Show Trace” function which opens a text window containing trace information.

8.14.2.1 Show Trace

Displays the trace data. This function is available only for VLSs of type VDAS.

8.14.3 Global functions for all VLSs of an ISP

When operating in Observe or User mode, there are no such functions available.

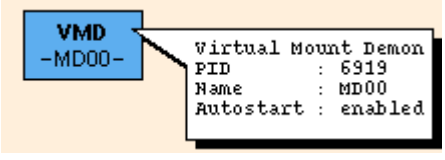
8.15 VMD (Virtual Mount Daemon)

8.15.1 Object information on the Virtual Mount Daemon (VMD)

The VMD, also known as the mount server, controls the mounting and unmounting of virtual volumes in the virtual drive(s) on behalf of the VLM.

Each ICP has its own VMD. The VMD and the drives it serves must be located on the same ISP.

The status of the VMD is indicated by the colors pink (stopped), green (running), and green/brown (running with the trace switched on).



PID	Process ID.
Name	Name of the VMD.
Autostart	Enabled / disabled

8.15.2 VMD functions

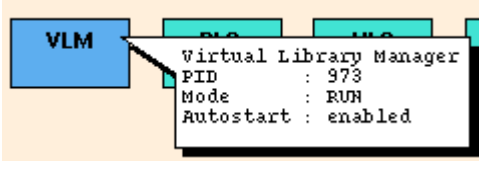
The VMD has no functions which can be addressed via XTCC.

8.16 VLM (Virtual Library Manager)

8.16.1 Object information for the VLM

Virtual libraries are emulated and mapped to physical libraries in a process pair consisting of a VLM (Virtual Library Manager) and a PLM (Physical Library Manager).

In XTCC, the VLM and PLM are represented by small boxes in the VLP. The status of the VLM is indicated by the colors pink (stopped), green (running), green/brown (running with the trace switched on), and green/red (in HALT mode).



The following information is displayed:

PID:	Process ID
Mode:	Operational status (RUN, HALT)
Autostart:	Autostart enabled/disabled

The trace masks are not specified for customer operation. If the mask contains only binary zeros or is not present then the corresponding trace is inactive.

8.16.2 VLM functions

The following functions are available:

- Show Cache Status
- Set HALT Mode/Set RUN Mode

Functions for monitoring and managing virtual components (logical volumes, drives, libraries) can be called under Global Status » Statistics (for display functions see page 245) and GXCC » Administration (for management functions see page 202).

8.16.2.1 Show Cache Status

A cache window containing information on cache occupancy is output. The numerical values correspond to the information that is displayed in graphical form in the Global Status Monitor (see the chapter “Global Status” on page 237, the corresponding description also explains the terms such as “used”, “dirty”, etc.).

In addition, the following is displayed for each cache file system:

- Whether the cache file system is used for “floating” volumes or whether volume groups are permanently assigned to it (“exclusive”).
- The number of “misplaced” volumes which may be present. These are logical volumes which are currently not located in the cache file system for which they were configured.

The cache status provides an overview of the CentricStor load status. In the case of logical volumes, the following numerical values are displayed:

– Total number of logical volumes
– Logical volumes in home status
– Mounted (loaded) logical volumes
– Logical volumes that are currently being loaded from tape to cache (restoring)
– Logical volumes that are being read in as part of a reorganization (move restore)
– Logical volumes that are being rewritten as part of a reorganization (move save)
– Logical volumes for which a prefetch operation is running
– Logical volumes that are no longer present in the cache (migrated)
– Logical volumes whose physical tape map is obsolete (dirty)
– last mount completed: indicates when a logical volume was last mounted (if cc=0) or the VLM error code with which the last mount job was aborted.

Only statuses which are assigned are also listed.

“Mode” indicates whether logical tape processing (i.e. the acceptance of mount requests) was halted by the host (mode: Halt) or not (mode: Run).

“State” indicates whether the VLM is currently still executing jobs (state: busy) or not (state: idle).

Example

```
/cache/125: (exclusive)
used:   0.00%  dirty:   0.00%  clean:  60.03%  free:  39.97%

/cache/126: (exclusive)
used:   0.00%  dirty:   0.00%  clean:  60.02%  free:  39.98%

/cache/127: (exclusive)
used:   0.00%  dirty:   0.00%  clean:  60.02%  free:  39.98%

Virtual Volumes:           2000

Home:                      1999 Volume(s)
Faulty:                       1 Volume(s)

Mode:   run
State:  idle
```

8.16.2.2 Set HALT Mode/Set RUN Mode

This function is not available in Observe mode.

In HALT mode, the VLM accepts no mount jobs for logical volumes. All other CentricStor activities continue to run. The hosts can continue to access logical volumes that are already mounted. Mount jobs are rejected with the error message “N005 - Robot not ready”.

WARNING!
In some host systems, even a brief HALT period can result in considerable disturbance to magnetic tape processing.

If you choose the “Set HALT Mode” menu item, a dialog box asks you if you really want to execute this function. If you confirm with “Yes” then a corresponding message box is displayed that you must confirm by clicking “OK”.

The symbol for the VLM in the corresponding XTCC window changes to red/green:

CentricStor has not yet reached its idle state. Before this can happen, all the logical volumes must be unloaded and all the “dirty” cache data must be written back.

The idle state is most clearly identified on the basis of the cache status. In Global Status no “dirty” data may now be displayed in the cache statistics. In this case, the status IDLE must be displayed in the last line of the text field.

“Set RUN Mode” exits the HALT status. This command is available in the VLM function menu if the VLM is in HALT mode. This command is also effective even if the VLM has not yet entered idle status.

8.17 RAID systems

8.17.1 Object information on RAID systems

CentricStor can be supplied with the RAID systems S80, CX500, CX3-20 and Eternus 3000/4000. In XTCC, the RAID systems are represented as peripherals connected to the ISP via a Fibre Channel controller.

In some CentricStor configurations, internal RAID controllers are used. These have a direct connection to the host and do not require a Fibre Channel connection. They are thus not visible in the overview of the ISP. They become visible when you position the mouse pointer on the right-hand (gray) border of the ISP symbol and press the right mouse button.

The status of a RAID system is indicated by the colors green (OK), pink (fail), and yellow (attention) (does not apply for CX500/CX3-20 and Eternus 3000/4000).

The Fibre Channel addresses of the RAID system (controller, target) can be obtained from the overview: the controller number (number in front of “/FC”) from the controller block, and the target number from the number that appears after the slash.

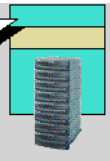
Compared to GXCC, XTCC displays additional information on the RAID systems.

The controller types differ slightly in their presentation of the functions available:

```
Vendor  ID    : FUJITSU
Product ID    : E3000
RAID System   : E3000 - #159171
Firmware Rev.:
Status        : okay
Logical Units
c12t159       : 0,1,2,3,4,5,6 (Local Domain 1, Port 15)
c12t171       : 0,1,2,3,4,5,6 (Local Domain 2, Port 11)
c13t159       : 0,1,2,3,4,5,6 (Local Domain 1, Port 15)
c13t171       : 0,1,2,3,4,5,6 (Local Domain 2, Port 11)
```

Eternus 3000/4000

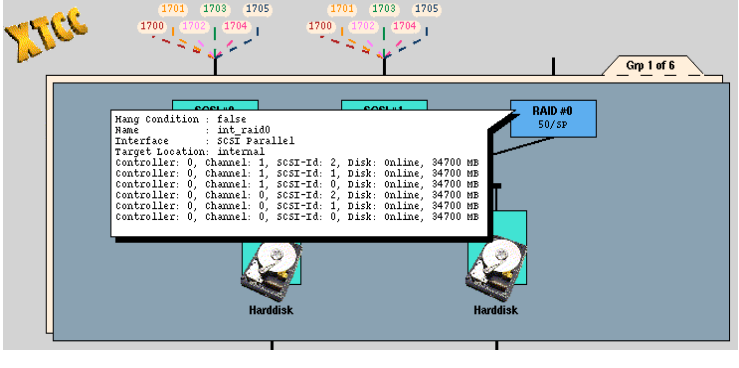
```
Vendor  ID    : DGC
Product ID    : CX
RAID System   : CX - #01580173
Firmware Rev.: 0322
Status        : okay
Info          :
Logical Units
c12t158       : 0,2,4 (Local Domain 1, Port 14)
c12t173       : 1,3,5 (Local Domain 2, Port 13)
c13t158       : 0,2,4 (Local Domain 1, Port 14)
c13t173       : 1,3,5 (Local Domain 2, Port 13)
```



CX500/CX3-20

```
Vendor  ID    : EUROLOGC
Product ID    : FC2502
RAID System   : FC2502 - #01530169
Firmware Rev.: 7860
Status        : okay
Info          :
Logical Units
c12t153       : 0,1,2,3 (Local Domain 1, Port 9)
c12t169       : 0,1,2,3 (Local Domain 2, Port 9)
c13t153       : 0,1,2,3 (Local Domain 1, Port 9)
c13t169       : 0,1,2,3 (Local Domain 2, Port 9)
```

S80 (=FC2502)



Internal RAID system

In the case of external RAID systems, the information window contains the following information:

– vendor ID, product ID
– type and serial number of the RAID system
– firmware release (insofar as this can be queried)
– operating status and any error messages (info)
– internal SINIX name, SCSI topology (CTL) and the connection to the FC fabric

In Fabric Mode, the information “Local Domain x, Port y“ is displayed for the target numbers 128…2047. The local domain is in the value range 1...8. In the case of FC switches with more than 16 ports, it can differ from the “Domain” displayed in GXCC as follows:

```
GXCC Domain       = 1 2 3 4 5 6 7 8 9 10 11 ... etc.
XTCC Local Domain = 1 2 3 4 5 6 7 8 1  2  3 ... etc.
```

If multiple RAID systems are contained in CentricStor and it was possible to determine the firmware version for at least one RAID, the versions of all RAIDs of the same type are compared. If the versions are different the message “Different Firmware!” is displayed on the symbols for all RAIDs of this type. This is also done if the version information for a RAID is missing.

The number contained in the internal SINIX name (e.g. c12t**158**) is also displayed at the end point of the connection lines.

In the case of internal RAID systems, the following information is displayed:

– hang condition
– name
– interface type
– target location

In addition, there may be information relating to the physical disks of the RAID system:

– controller
– channel
– SCSI ID
– status
– capacity

The representation of the RAID system is a symbol rather than a photograph of the product. Its actual appearance may well differ from this.

8.17.2 Functions of RAID systems

The following functions are available:

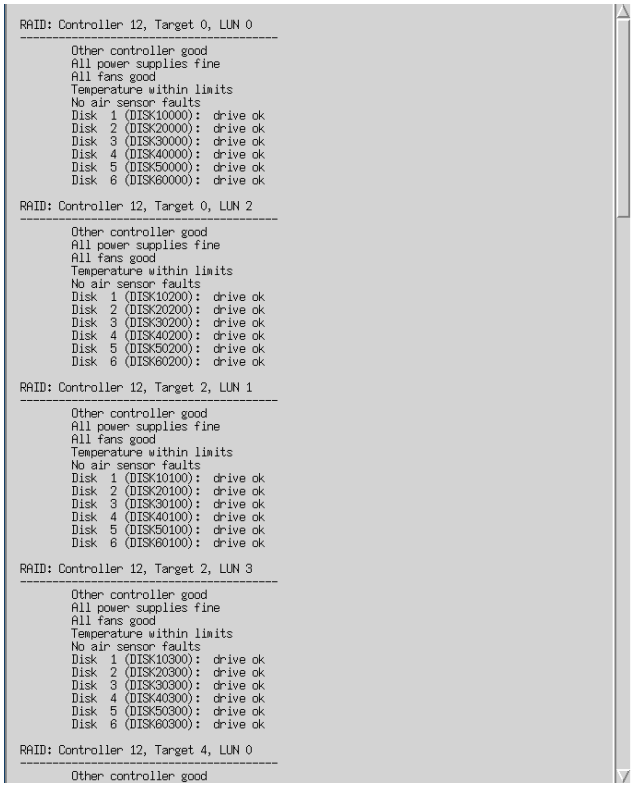
- Show Complete RAID Status (all types)
- Show Mode Pages (CX500/CX3-20 and FCS80)
- Show Mode Page Details
- Show Log Pages
- Show Log Page Details

The availability of the functions de-pends on the particular RAID system.

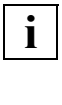
The menus are available in all operating modes.

8.17.2.1 Show Complete RAID Status (all types)

Opens a text window containing the detailed RAID status:



```
RAID: Controller 12, Target 0, LUN 0
----------------------------------------
       Other controller good
       All power supplies fine
       All fans good
       Temperature within limits
       No air sensor faults
       Disk  1 (DISK10000):  drive ok
       Disk  2 (DISK20000):  drive ok
       Disk  3 (DISK30000):  drive ok
       Disk  4 (DISK40000):  drive ok
       Disk  5 (DISK50000):  drive ok
       Disk  6 (DISK60000):  drive ok

RAID: Controller 12, Target 0, LUN 2
----------------------------------------
       Other controller good
       All power supplies fine
       All fans good
       Temperature within limits
       No air sensor faults
       Disk  1 (DISK10200):  drive ok
       Disk  2 (DISK20200):  drive ok
       Disk  3 (DISK30200):  drive ok
       Disk  4 (DISK40200):  drive ok
       Disk  5 (DISK50200):  drive ok
       Disk  6 (DISK60200):  drive ok

RAID: Controller 12, Target 2, LUN 1
----------------------------------------
       Other controller good
       All power supplies fine
       All fans good
       Temperature within limits
       No air sensor faults
       Disk  1 (DISK10100):  drive ok
       Disk  2 (DISK20100):  drive ok
       Disk  3 (DISK30100):  drive ok
       Disk  4 (DISK40100):  drive ok
       Disk  5 (DISK50100):  drive ok
       Disk  6 (DISK60100):  drive ok

RAID: Controller 12, Target 2, LUN 3
----------------------------------------
       Other controller good
       All power supplies fine
       All fans good
       Temperature within limits
       No air sensor faults
       Disk  1 (DISK10300):  drive ok
       Disk  2 (DISK20300):  drive ok
       Disk  3 (DISK30300):  drive ok
       Disk  4 (DISK40300):  drive ok
       Disk  5 (DISK50300):  drive ok
       Disk  6 (DISK60300):  drive ok

RAID: Controller 12, Target 4, LUN 0
----------------------------------------
       Other controller good
```



As it is not possible to read the status via an FC port in the FibreCAT CX500/CX3-20 or Eternus 3000/4000, “no information available” is always output for these RAID systems.

This very extensive information indicates the status of the controllers and the disks. The displays are self-explanatory. For a more precise interpretation, in particular in the case of partial failures, please refer to the RAID system manual. The content and presentation depend on the type of RAID controller.

8.17.2.2 Show Mode Pages (CX500/CX3-20 and FCS80)

Displays the SCSI mode pages in a text window. To interpret the page data, you will need to refer to the SCSI reference manual and the manual for the RAID system.

8.17.2.3 Show Mode Page Details

The mode pages described in the SCSI standard are displayed in detail in text windows. For further information refer to the section “Show Mode Page Details” on page 428.

8.17.2.4 Show Log Pages

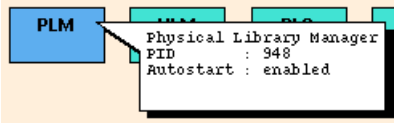
The SCSI log pages are displayed. This function is not available on all systems.

8.17.2.5 Show Log Page Details

You obtain an itemized display of the log page you selected in the submenu. This function is not available on all systems.

8.18 PLM (Physical Library Manager)

8.18.1 Object information on the PLM



The status of the Physical Library Manager (PLM) is represented by the colors pink (stopped), green (running), green / brown (running with trace switched on) and green / red (in recovery mode).

In the extended status the PID and the autostart setting are also displayed.

8.18.2 PLM functions

In User and Observe modes no PLM functions are available.

8.19 PLS (Physical Library Service)

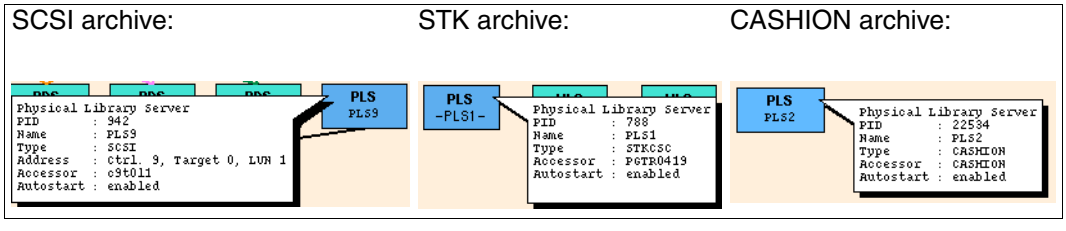
8.19.1 Object information on the PLS

Each physical library is assigned at least one PLS (Physical Library Server).

The PLS of a SCSI-controlled archive must run on the ISP that contains the associated SCSI controller. The easiest way of identifying the location of a PLS is to use the Global Status Monitor. By resting the mouse pointer on a PLS symbol, you can open an information box which among other things specifies the associated ISP.

As in XTCC, the status of the PLS is indicated by the colors pink (stopped), green (running), and green/brown (running with the trace switched on). In the event of an error, this is indicated by means of a red triangle.

The example below shows the object information of an archive controlled via SCSI (left), via LAN (center), and a CASHION archive controlled via serial interface (right):



The following information is displayed:

Name	Name assigned during configuration and displayed in the PLS symbol.
Type	Type of access system (SCSI, STKCSC, STLACI, CASHION or LMF).
Address	SCSI address (controller, target, LUN) or SINIX name of the access system.
Accessor	Internal device name of the library (device node with SCSI, otherwise IP address or server name).
Error	Only in the event of an error. Message indicating the cause of the error.
Autostart	Enabled / disabled.

8.19.2 Functions for individual PLSs

There are no PLS functions available in Observe and User mode.

8.19.3 Functions for all PLSs

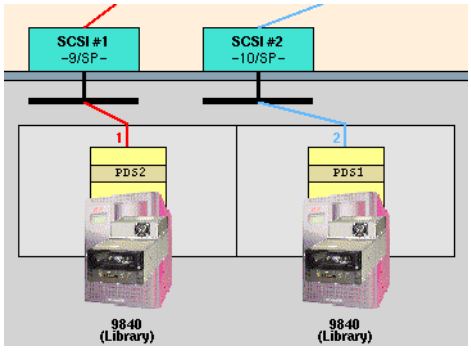
No functions for all PLSs are available.

8.20 SCSI archive systems

8.20.1 Object information on archive systems

Archives with a SCSI-controlled access system can be operated in the ISP via the XTCC instance containing the associated PLS.

A lighter-colored image of the archive system is shown behind the drive(s) belonging to the archive. All associated drives are also enclosed in a light gray shadow frame, which is intended to represent the archive system.



The following detailed information is displayed:

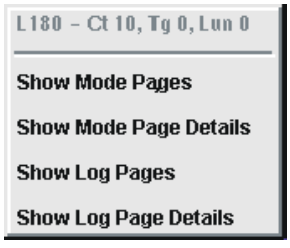
Vendor ID	Vendor identifier
Product ID	Product identifier
Product Rev.	Product revision level
Accessor Type	Type of access system
Accessor Model	Model
Accessor Status	Status
Controller	SCSI controller
Target	SCSI target
Logical Unit	SCSI LUN

Switch: Local Domain x, Port y	This information is displayed for archives with the target numbers 128…2047. The local domain is in the value range 1...8. In the case of FC switches with more than 16 ports, it can differ from the “Domain” displayed in GXCC as follows:
	`GXCC Domain = 1 2 ... 7 8 9 10 11 etc.`
	`XTCC Local Domain = 1 2 ... 7 8 1 2 3 etc.`

The statuses of all libraries, including the LAN-controlled ones, are shown on the right-hand side of the window (Physical Components) of the “Global Status”.

8.20.2 SCSI Archive system functions

This function is offered after you right-click on the archive system icon (behind the drive icon).



The *Show Mode Pages*, *Show Mode Page Details*, *Show Log Pages* and *Show Log Page Details functions* are not offered for all libraries.

8.20.2.1 Show Mode Pages

The SCSI mode pages are displayed.

This function is not offered for all systems and all libraries.

8.20.2.2 Show Mode Page Details

Via a submenu you must specify the mode page for which you want an itemized display.

This function is not offered for all systems and all libraries.

8.20.2.3 Show Log Pages

The SCSI log pages are displayed.

This function is not offered for all systems and all libraries.

8.20.2.4 Show Log Page Details

Via a submenu you must specify the log page for which you want an itemized display.

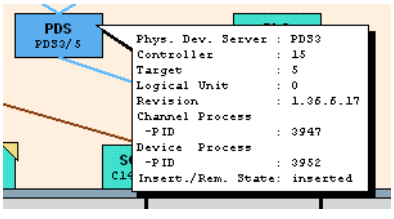
This function is not offered for all systems and all libraries.

8.21 PDS (Physical Device Service)

8.21.1 Object information on PDS

A PDS (Physical Device Server) controls precisely one physical device. The object information displays the controller and target of the associated SCSI device. This information is also indicated by the color of the connecting lines to the SCSI controllers and drives.

A PDS consists of two processes, one for communicating with the RAID system and the other for communicating with the device. These processes are referred to as the channel process and the device process. Normally, both processes have the same status. However, there are situations in which this will not be the case. If this occurs, the top half of the block shows the status of the channel process, while the bottom half shows the status of the device process. The process status is indicated by the colors pink (stopped), green (running), and green/brown (running with the trace switched on).



Phys. Dev. Server	Number of the PDS.
Controller	Controller number of the drive controlled by the PDS
Target	Target number of the drive controlled by the PDS
Logical Unit	LUN number of the drive controlled by the PDS
Revision	Revision level.
Channel Process PID	Process ID of the channel process.
Device Process PID	Process ID of the device process.
Attached Path	FC paths through which connections are established.
Insert./Rem. State	Configuration status (inserted/removed).

8.21.2 PDS functions

No PDS functions are available.

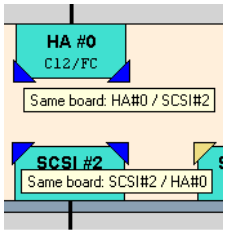
8.22 SCSI controllers

8.22.1 Object information on SCSI controllers

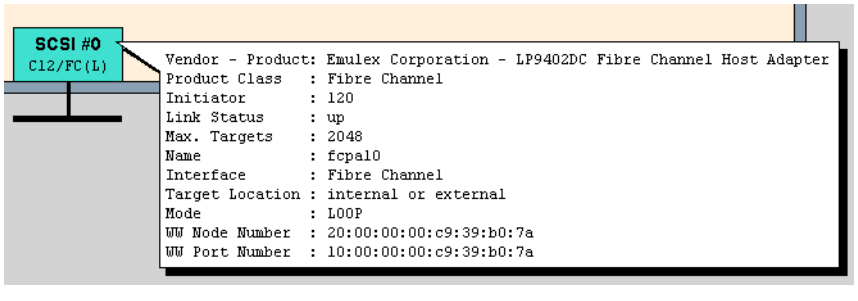
Each SCSI controller is represented by a block at the bottom of the inner window. Within the block, the device number (SCSI #1, SCSI#2, etc.), controller number, and interface type (SP = SCSI parallel / FC = Fibre Channel) are displayed. The status of the controller is indicated by the colors pink (hanging status “true” in the case of SP, link status “down” in the case of FC), green (ready for operation), yellow (unknown), or white (not available).

FC controllers (RAID system connection) are handled in the same way as SCSI controllers. The label “FC” allows you to differentiate them from the drive controllers, which are labelled “SP” (standing for SCSI parallel).

For technical reasons FC controllers are displayed at both the top border (as HA) and the lower border of the screen. You can recognize the assignment from the small colored triangles at the top/bottom of the symbol. Furthermore, when you touch these triangles with the mouse cursor this assignment is displayed in a small text window (“Balloon”).



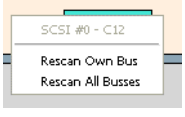
The following information is displayed:



Vendor - Product	vendor and product name
Product Class	product class
Initiator	the SCSI address of the controller
Link Status	an indication of the presence/absence of a hang condition (parallel SCSI) or whether the link is up/down (FC)

Max. Targets	the maximum number of targets supported by the controller
Name	the system name of the controller
Interface	the interface variant (e.g. SCSI Parallel or Fibre Channel)
Target Location	an indication of whether or not the targets are inside or outside the cabinet.
Mode	mode, if available (FC): LOOP (L) or POINT TO POINT (P)
WW Node Number	World Wide Node Number (FC)
WW Port Number	World Wide Port Number (FC)

8.22.2 SCSI controller functions



No menu is provided in Observe mode.

The title bar displays the serial number of the SCSI interface and the controller number.

The functions are used to diagnose problems and eliminate hang conditions.

8.22.2.1 Rescan own Bus

Searches for the targets connected to the SCSI bus of this controller.

This function should be used if components have been added to or removed from the corresponding SCSI bus. It is not suitable for incorporating newly installed devices or controllers in CentricStor.

This command enables you to rectify problems which arise from establishing FC connections after the system startup.

These problems are indicated by messages such as "`cannot assign ... targets-luns to any RAID system`" and indicate that the RAID LUNs' serial numbers are not uniquely assigned. The cause may be, for example, that the FC cables were only connected after the system started.

8.22.2.2 Rescan all Busses

Searches for the targets connected to the SCSI buses of all controllers.

This function can also be used to search for SCSI controllers or devices that are not displayed. It is not suitable for incorporating newly installed devices or controllers in CentricStor.

8.23 Cartridge drives (real)

8.23.1 Object information on tape drives

The XTCC user interface is designed for a wide range of tape drives. Please refer to the data sheet for your product variant to determine which drives are or can be connected.

Depending on the drive type, some of the functions described here may not be available and some of the information given here may not apply.

The graphical display in XTCC shows the data path in the IDP from the FC controllers that establish the connection to the RAID system, through the PDS and the SCSI controller, and on to the drive. The SCSI and FC-SCSI addresses (CTL) are displayed in the small boxes that represent the components and on the connection line to the drive.

The FC controllers between RAID and IDP are shown twice in the IDP symbol: once as host adapter at the top edge and once as controller with the acctached RAID system.

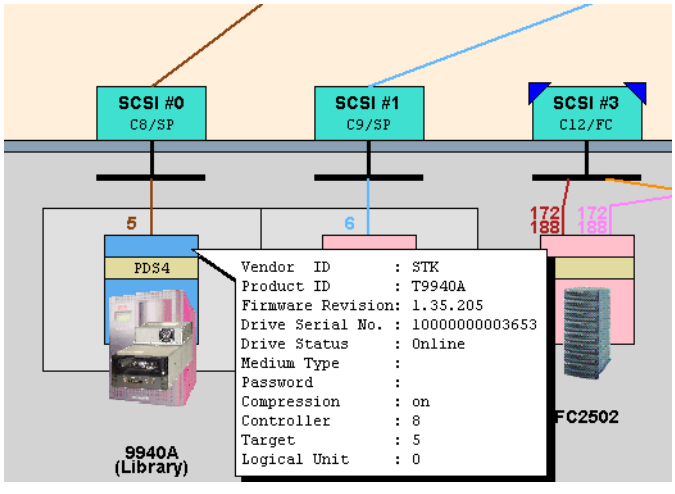
Each tape drive is represented by a block with three sections. The top section indicates the read/write status of the drive by means of a lock symbol. If the lock is closed, the drive will only permit read access. To the right of the lock symbol is the serial number of the volume currently loaded (VSN). The middle section represents the device's display, and is used to indicate statuses such as CU READY, LOADED, etc. The bottom section contains a graphical representation of the device type, and the archive system icon is behind this. The top and bottom sections are colored pink to indicate "Unloaded" or "Offline", or green to indicate "Ready". The device type is specified immediately under the block. A colored line connects the device to its associated SCSI controller, the assigned emulation, and possibly to one or more hosts.

At the top of the device block, the SCSI target number "tgt" appears next to the connection line. If the Logical Unit Number "lun" of the device is not 0 or if a device for which this is the case exists for the same controller target address, "tgt,lun" is displayed instead.

If the drive requires cleaning, this is represented by a flashing "Clean" symbol. If the device is busy (e.g. due to data security erasures (DSEs) or the loading of microcode), this is indicated by a yellow BUSY symbol. The device function menu will not be available during this time.

If the yellow "!" symbol is flashing, this indicates that some form of manual intervention is required on the device.

If Service Information Messages (SIM) or Medium Information Messages (MIM) are present in the drive, these are indicated by means of a yellow or red flashing SIM/MIM symbol, depending on their severity (severity 0/1/2/3 = Service/Moderate/Serious/Acute). If the device hangs, the entire block is marked with a large red “X”. Devices which are recognized by XTCC as SCSI targets on the SCSI bus but which cannot be identified further are assigned the type designation “xxxx”. In this case, the device type is depicted by means of a question mark.



The following information is displayed:

Vendor ID, Product ID

Firmware Revision
Drive Serial Number
Drive Status
SIM/MIM Severity — Appears only if SIMs or MIMs are present, and indicates the severity of the message.

Check Condition — Appears only in the event of errors.
Medium Type — Appears only if the device is loaded.
Password — Password of device, not used in CentricStor.
Compression Mode — Data compression activated/deactivated.
Controller, Target, Logical Unit — SCSI topology
Switch: Local Domain x, Port y — This information is displayed for archives with the target numbers 128…2047. The local domain is in the value range 1...8. In the case of FC switches with more than 16 ports, it can differ from the “Domain” displayed in GXCC as follows:

```
GXCC Domain       = 1 2 ... 7 8 9 10 11 etc.
XTCC Local Domain = 1 2 ... 7 8 1  2  3 etc.
```

8.23.2 Tape drive functions

Which functions are actually offered depends on the drive type. The menus are only examples.

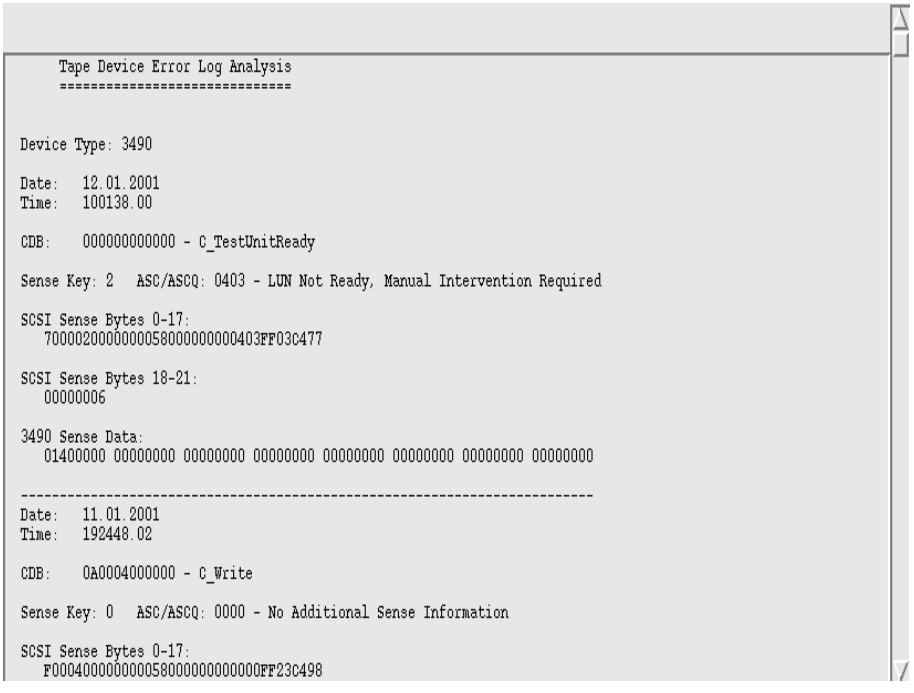
The following functions are available:

- Show SCSI Sense
- Show Log Pages
- Show Log Page Details
- Show Mode Pages
- Show Mode Page Details
- Show Vital Product Data
- Show Medium Info (MIM)
- Show Service Info (SIM)

The device type and the SCSI address (controller, target) are displayed in the title bar. Depending on the drive type a subset of the functions is offered.

8.23.2.1 Show SCSI Sense

Displays the SCSI sense data:



```
      Tape Device Error Log Analysis
      ==============================


Device Type: 3490

Date:   12.01.2001
Time:   100138.00

CDB:    000000000000 - C_TestUnitReady

Sense Key: 2   ASC/ASCQ: 0403 - LUN Not Ready, Manual Intervention Required

SCSI Sense Bytes 0-17:
   70000200000000580000000000403FF03C477

SCSI Sense Bytes 18-21:
   00000006

3490 Sense Data:
   01400000 00000000 00000000 00000000 00000000 00000000 00000000 00000000

--------------------------------------------------------------------------------
Date:   11.01.2001
Time:   192448.02

CDB:    0A0004000000 - C_Write

Sense Key: 0   ASC/ASCQ: 0000 - No Additional Sense Information

SCSI Sense Bytes 0-17:
   F0004000000000580000000000000FF23C498
```

SCSI logging starts with the earliest entries, (see timestamp). It consists of four reference sections which are described in the hardware reference manual of the corresponding device.

For MBK6 (3490-HSI):

- CDB, i.e. the SCSI command with associated parameters.
- Sense Key with the corresponding analyzed message
- SCSI Sense Bytes 0-17
- SCSI Sense Bytes 18-21
- Sense data, if the device itself reports sense data, and information on how it is routed to BS2000/OSD.

8.23.2.2 Show Log Pages

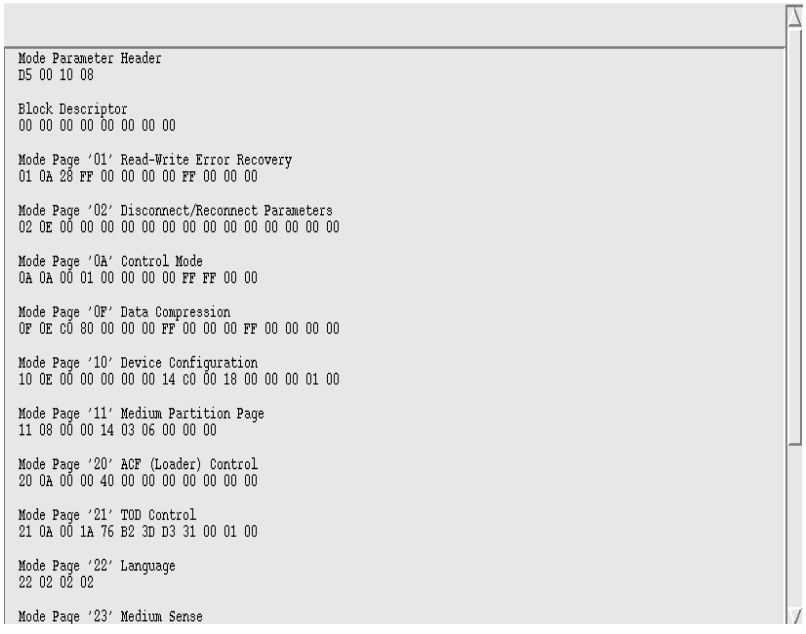
The SCSI log pages are displayed.

8.23.2.3 Show Log Page Details

A submenu is opened in which you specify which log pages are to be itemized and displayed.

8.23.2.4 Show Mode Pages

Displays the SCSI mode pages:

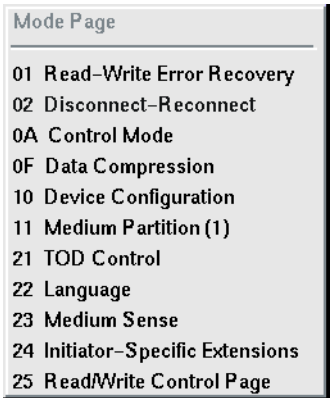


```
Mode Parameter Header
D5 00 10 08

Block Descriptor
00 00 00 00 00 00 00 00

Mode Page '01' Read-Write Error Recovery
01 0A 28 FF 00 00 00 00 FF 00 00 00

Mode Page '02' Disconnect/Reconnect Parameters
02 0E 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Mode Page '0A' Control Mode
0A 0A 00 01 00 00 00 00 FF FF 00 00

Mode Page '0F' Data Compression
0F 0E C0 80 00 00 00 FF 00 00 00 FF 00 00 00 00

Mode Page '10' Device Configuration
10 0E 00 00 00 00 00 14 C0 00 18 00 00 00 01 00

Mode Page '11' Medium Partition Page
11 08 00 00 14 03 06 00 00 00

Mode Page '20' ACF (Loader) Control
20 0A 00 00 40 00 00 00 00 00 00 00

Mode Page '21' TOD Control
21 0A 00 1A 76 B2 3D D3 31 00 01 00

Mode Page '22' Language
22 02 02 02

Mode Page '23' Medium Sense
```

This displays the current device setting (to perform a detailed analysis it is essential to refer to the device-specific SCSI reference manual, *Mode Pages* chapter).

8.23.2.5 Show Mode Page Details

A submenu shows which mode pages the device supplies.



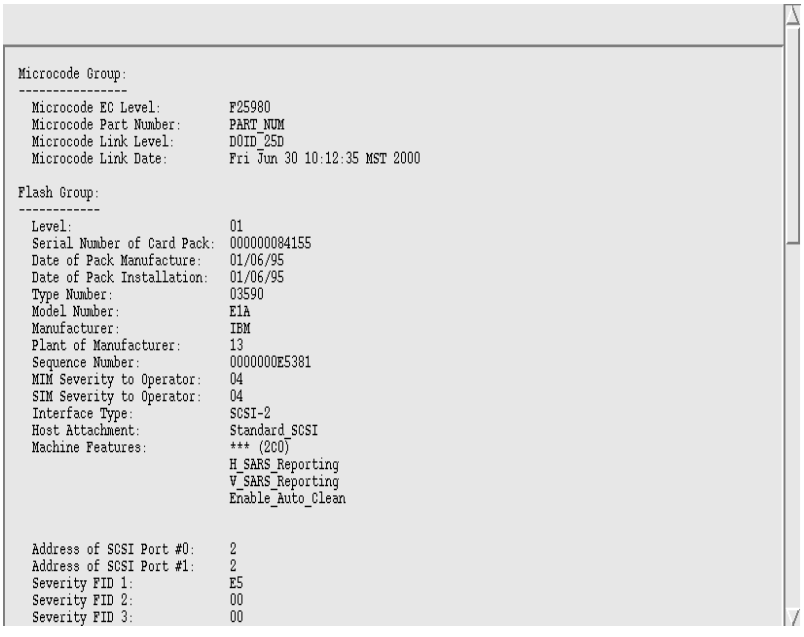
If you select a page here that is also described in the SCSI standard, this will be displayed and interpreted in detail as in the example below.

```
[RUL1] Device Individual : c 9  t 1  l 0
[RUL2] Device Type       : IBM 03570C1A 542  sequential-access


Mode Page X'02' Disconnect-Reconnect
Page is defined as ANSI SCSI Standard for all devices
Decode-Verbose Format Representation on the Base of :
IBM Tape Subsystem 3590 HardWare Reference GA32-0331-A1
Byte         :
Position     :                    Actual Value :
PosDec  Description               ValueHex Description
0                                 02
        Bit          :
        Position     :                 Actual Value :
        PosDec  Description            ValueBin Description
        7                              0       PS(Parameter Saveable):
                                               B'0'
        6       Reserved               0
        5-0     Page Code              000010   Page Code:X'02'
BytePos Description               ValueHex Description
1       Page Length               0E       Page Length:X'0E'
2       Buffer Full Ratio         00       Full Ratio:X'00'
3       Buffer Empty Ratio        00       Empty Ratio:X'00'
4-5     Bus Inactivity Limit      0000     no limit:X'0000'
6-7     Disconnect Time Limit     0000     no limit:X'0000'
8-9     Connect Time Limit        0000     no limit:X'0000'
10-11   Maximum Burst Size        0000     no limit:X'0000'
        This field is changeable. The default value is X'0000'
12                                00
        BitPos  Description            ValueBin Description
        7-2     Reserved               000000
        1-0     DTDC                   00       DTDC:B'00'
                (Data Transfer Disconnect Word)
BytePos Description               ValueHex Description
13-15   Reserved                  000000
```

The SCSI topology (CTL) as well as the Inquiry String of the drive are shown in the “control lines” of the text window.

8.23.2.6 Show Vital Product Data

Displays certain elements of the vital product data:



```
Microcode Group:
----------------
  Microcode EC Level:          F25980
  Microcode Part Number:       PART_NUM
  Microcode Link Level:        D0ID_25D
  Microcode Link Date:         Fri Jun 30 10:12:35 MST 2000

Flash Group:
------------
  Level:                       01
  Serial Number of Card Pack:  000000084155
  Date of Pack Manufacture:    01/06/95
  Date of Pack Installation:   01/06/95
  Type Number:                 03590
  Model Number:                E1A
  Manufacturer:                IBM
  Plant of Manufacturer:       13
  Sequence Number:             0000000E5381
  MIM Severity to Operator:    04
  SIM Severity to Operator:    04
  Interface Type:              SCSI-2
  Host Attachment:             Standard_SCSI
  Machine Features:            *** (2C0)
                               H_SARS_Reporting
                               V_SARS_Reporting
                               Enable_Auto_Clean


  Address of SCSI Port #0:     2
  Address of SCSI Port #1:     2
  Severity FID 1:              E5
  Severity FID 2:              00
  Severity FID 3:              00
```

You can use this function to display a subsection of the configuration data stored in the tape device.

The device settings made in the Service and Operator menus can be found again here. These include, for example, the display language. Here you will also find the device's FID log which provides important assistance to service engineers (FID: FRU identifier, FRU: field replaceable unit). Up to 30 entries can be logged.

Extract from the FID log:

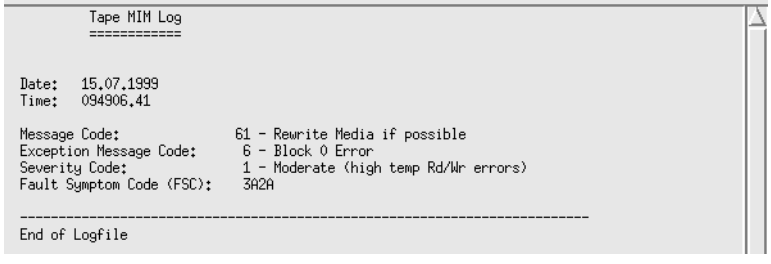
```
FID Log:                                                    Power On
 # Severity (Reason)          FID   FSC1   FSC2   FW       hrs   min sec
 ------------------------------------------------------------------------
 1 ATTN DRV (LOAD ERROR)                          747      1697  21  47
 2 ATTN DRV (INVALID CARTRIDGE)                   747      1697  28  47
 3 ATTN DRV (LOAD ERROR)                          747      1821  37   9
 4 FID1                       E5    F008   6958   22E      7734   0   0

Error Match 1:              0000
Error Match 2:              0000
Error Match 3:              0000

Mounts to Drive 1:          0
Mounts to Drive 2:          0
Clean Mounts to Drive 1:    317
Clean Mounts to Drive 2:    0
ACF Priority Cell Mounts:   0
ACF Errors:                 0
ACF Magazine Mounts:        0
ACF Power on Hours:         10091
ACF Put Drive Failures:     0
ACF Get Drive Failures:     0
ACF Pinch Motor Errors:     0
ACF Feed Motor Errors:      0
ACF Elevator Motor Errors:  0
ACF Cell to Cell Moves:     2
ACF Recalibrations:         2
ACF Put Magazine Failures:  0
ACF Get Magazine Failures:  0
ACF Put Priority Failures:  0
ACF Get Priority Failures:  0
ACF Put Magazine Retries:   0
ACF Get Magazine Retries:   0
```

In this way you can extract an event or error history. FID code and FSC1 and FSC2 (Fault Symptom Code) must be reported to the manufacturer if errors which cannot be resolved occur on the device.

8.23.2.7 Show Medium Info (MIM)

If there is no MIM entry, you will be notified in an info box:

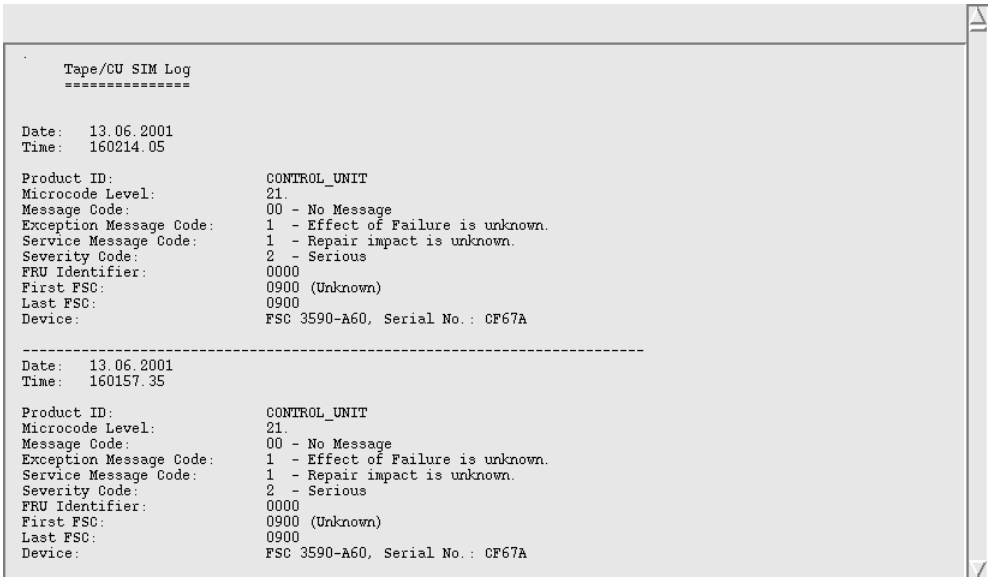
If Medium Information Messages have been recorded, a text window appears with the messages:



The MIMs of the drives are recorded. The MIMs and the various responses are described in the maintenance documentation of the devices.

8.23.2.8 Show Service Info (SIM)

Displays the Service Information Messages:



```
     Tape/CU SIM Log
     ===============


Date:   13.06.2001
Time:   160214.05

Product ID:                   CONTROL_UNIT
Microcode Level:              21.
Message Code:                 00 - No Message
Exception Message Code:       1  - Effect of Failure is unknown.
Service Message Code:         1  - Repair impact is unknown.
Severity Code:                2  - Serious
FRU Identifier:               0000
First FSC:                    0900 (Unknown)
Last FSC:                     0900
Device:                       FSC 3590-A60, Serial No.: CF67A

--------------------------------------------------------------------------------
Date:   13.06.2001
Time:   160157.35

Product ID:                   CONTROL_UNIT
Microcode Level:              21.
Message Code:                 00 - No Message
Exception Message Code:       1  - Effect of Failure is unknown.
Service Message Code:         1  - Repair impact is unknown.
Severity Code:                2  - Serious
FRU Identifier:               0000
First FSC:                    0900 (Unknown)
Last FSC:                     0900
Device:                       FSC 3590-A60, Serial No.: CF67A
```

If problems relating to the channel adapter (CONTROL UNIT) or tape devices (TAPE) occur, this information permits a better assessment of the severity of the recorded error.
The problem is described in more detail in this window. In some cases, there is already a suggested solution for the service engineer.

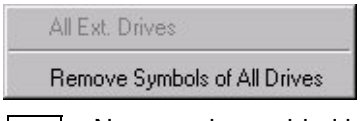
If required, the PDS creates two separate SIMs.

0900	Drive did not eject a volume
0901	Drive not accessible

The other SIM codes come directly from the drive. They are explained in the drive documentation.

8.23.3 Global functions for tape drives

“All” means all drives that are connected to this ISP.



No menu is provided in Observe mode.

8.23.3.1 Remove Symbols of all Drives

Removes all warning signals on drives (MIM and SIM symbols) without having to retrieve the underlying error message. Warning signals can also be removed in Observe mode, but only by retrieving the underlying error message.

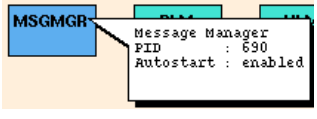
8.24 MSGMGR (Message Manager)

8.24.1 Object information on the Message Manager (MSGMGR)

The Message Manager monitors and saves the system outputs of the various processors of the CentricStor system. It can respond to certain error events by instigating the appropriate measures, such as sending traps to the CentricStor SNMP manager.

The message list output is described on page 158.

The status of the Message Manager is indicated by the colors pink (stopped), green (running), and green/brown (running with the trace switched on):



Name
PID Process ID.
Autostart Enabled / disabled.

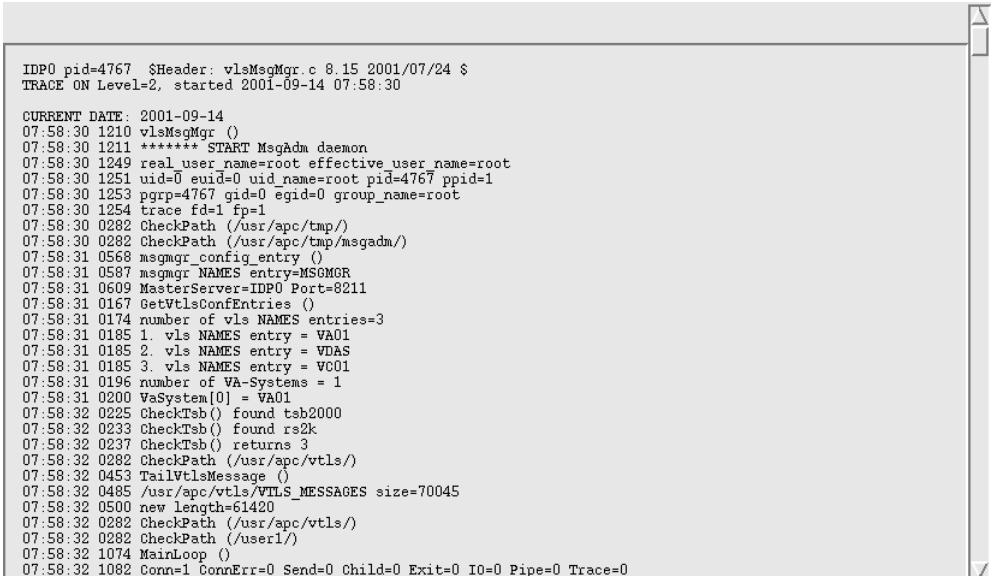
8.24.2 MSGMGR functions

The following functions are available:

– Show Trace
– Show Trap Trace

8.24.2.1 Show Trace

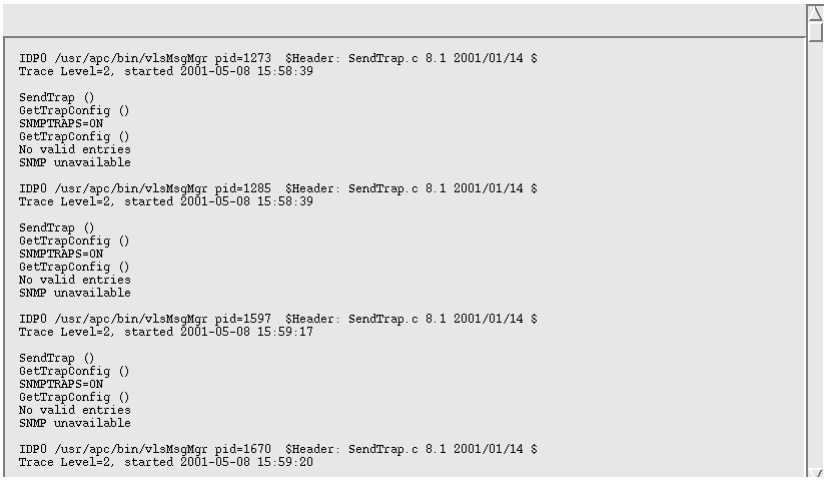
Displays the trace data:



```
IDP0 pid=4767  $Header: vlsMsgMgr.c 8.15 2001/07/24 $
TRACE ON Level=2, started 2001-09-14 07:58:30

CURRENT DATE: 2001-09-14
07:58:30 1210 vlsMsgMgr ()
07:58:30 1211 ******* START MsgAdm daemon
07:58:30 1249 real_user_name=root effective_user_name=root
07:58:30 1251 uid=0 euid=0 uid_name=root pid=4767 ppid=1
07:58:30 1253 pgrp=4767 gid=0 egid=0 group_name=root
07:58:30 1254 trace fd=1 fp=1
07:58:30 0282 CheckPath (/usr/apc/tmp/)
07:58:30 0282 CheckPath (/usr/apc/tmp/msgadm/)
07:58:31 0568 msgmgr_config_entry ()
07:58:31 0587 msgmgr NAMES entry=MSGMGR
07:58:31 0609 MasterServer=IDP0 Port=8211
07:58:31 0167 GetVtlsConfEntries ()
07:58:31 0174 number of vls NAMES entries=3
07:58:31 0185 1. vls NAMES entry = VA01
07:58:31 0185 2. vls NAMES entry = VDAS
07:58:31 0185 3. vls NAMES entry = VC01
07:58:31 0196 number of VA-Systems = 1
07:58:31 0200 VaSystem[0] = VA01
07:58:32 0225 CheckTsb() found tsb2000
07:58:32 0233 CheckTsb() found rs2k
07:58:32 0237 CheckTsb() returns 3
07:58:32 0282 CheckPath (/usr/apc/vtls/)
07:58:32 0453 TailVtlsMessage ()
07:58:32 0485 /usr/apc/vtls/VTLS_MESSAGES size=70045
07:58:32 0500 new length=61420
07:58:32 0282 CheckPath (/usr/apc/vtls/)
07:58:32 0282 CheckPath (/user1/)
07:58:32 1074 MainLoop ()
07:58:32 1082 Conn=1 ConnErr=0 Send=0 Child=0 Exit=0 IO=0 Pipe=0 Trace=0
```

8.24.2.2 Show Trap Trace

Displays the trap trace data:



```
IDP0 /usr/apc/bin/vlsMsgMgr pid=1273  $Header: SendTrap.c 8.1 2001/01/14 $
Trace Level=2, started 2001-05-08 15:58:39

SendTrap ()
GetTrapConfig ()
SNMPTRAPS=ON
GetTrapConfig ()
No valid entries
SNMP unavailable

IDP0 /usr/apc/bin/vlsMsgMgr pid=1285  $Header: SendTrap.c 8.1 2001/01/14 $
Trace Level=2, started 2001-05-08 15:58:39

SendTrap ()
GetTrapConfig ()
SNMPTRAPS=ON
GetTrapConfig ()
No valid entries
SNMP unavailable

IDP0 /usr/apc/bin/vlsMsgMgr pid=1597  $Header: SendTrap.c 8.1 2001/01/14 $
Trace Level=2, started 2001-05-08 15:59:17

SendTrap ()
GetTrapConfig ()
SNMPTRAPS=ON
GetTrapConfig ()
No valid entries
SNMP unavailable

IDP0 /usr/apc/bin/vlsMsgMgr pid=1670  $Header: SendTrap.c 8.1 2001/01/14 $
Trace Level=2, started 2001-05-08 15:59:20
```

The trap trace records all SNMP traps sent by the Message Manager to the SNMP management station(s).

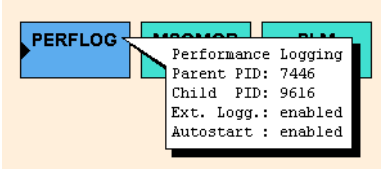
8.25 PERFLOG

8.25.1 Object information of PERFLOG

PERFLOG regularly collects performance-related system data and stores it in log files. The logging period and the directory in which log files are stored can be defined by service personnel during configuration.

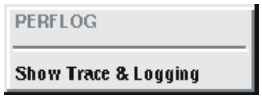
The log files can be displayed in graphical format using the tools described starting in section “History data” on page 257.

The status of the Performance Logger is indicated by the colors pink (stopped), green (running), and green/brown (running with the trace switched on). A black triangle on the left edge indicates that extended logging has been enabled.



Name	Name as shown in the symbol
Parent und Child PID	Process ID of the parent and child processes
Extended Logging	Enabled / Disabled
Autostart	Enabled / Disabled

8.25.2 PERFLOG functions



8.25.2.1 Show Trace & Logging

Displays the trace and log data:

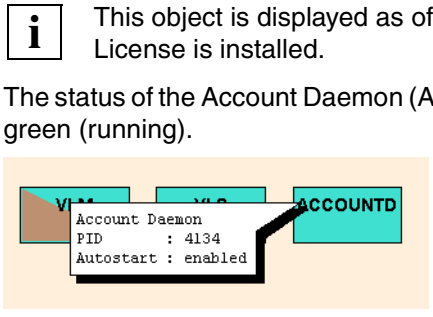
```
  start perf_log 10:05:51 23/05/01
  $Header: perf_log.c 1.50 2001/05/21 $
  argc = 1
  argument 1 = /usr/apc/bin/perf_log
Child 0
current month=<05>
read_log ps response-<>
start read_log.
parent pid=1346
SINIX Release K804

Diag-No vlp or hosts were specified. The local host will
     be considered to be the vlp.
sys.name=<IDP0>
Infobroker level=3
Attempt connection to host-ReqBroker at 10:05:54 23/05/01
vlts.conf record=<PERFLOG>
vlts.conf item=<PERFLOG>
vlts.conf item=<IDP0>
vlts.conf item=<8190>
vlts.conf item=<4>
vlts.conf item=</usr
>
log retention months=4
archive directory=</usr
>
9 icp hosts
idp host IDP7 type = 4
icp host ICP2 type = 2
icp host ICP1 type = 2
idp host IDP6 type = 4
icp host ICP7 type = 2
vlp host IDP0 type = 1
icp host ICP8 type = 2
```

This example shows an extract from a trace depicting the events recorded during startup.

8.26 ACCOUNTD (Account Daemon)

8.26.1 Object information of ACCOUNTD

The Account Daemon records the accounting data in a database.



Name	Name as displayed in the symbol
PID	Process ID
Autostart	enabled / disabled

8.26.2 Functions of the ACCOUNTD

In User and Observe modes ACCOUNTD has no functions that can be called via XTCC.

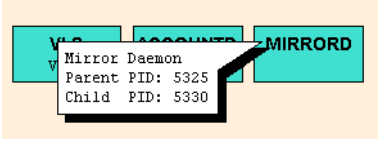
8.27 MIRRORD (mirror daemon)

8.27.1 Object information of MIRRORD

The mirror daemon monitors the status of the cache mirror.

The presentation of this object requires CentricStorV3.1C and the Cache Mirroring Feature License (CMF).

MIRRORD consists of two processes: the parent and child processes. The upper half of the block is used to present the parent process, the lower half the child process. The status of the processes is indicated by the colors pink (stopped) and green (running).



Name	Name as shown in the symbol
Parent PID	Process ID of the parent process
Child PID	Process ID of the child process

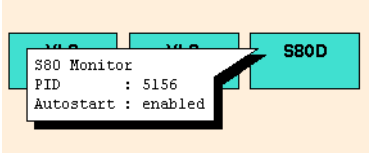
8.27.2 Functions of MIRRORD

MIRRORD has no functions that can be addressed via XTCC.

8.28 S80D (S80 daemon)

8.28.1 Object information of S80D

Daemon S80D is a monitoring process for RAID systems of the type FC2502.



Name	Name as shown in the symbol
PID	Process ID
Autostart	enabled / disabled

The status of the daemon is indicated by the following colors:

pink	Stopped
green	Running
yellow	Status unknown

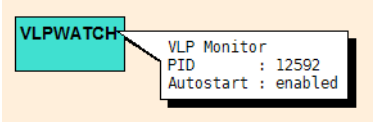
8.28.2 Functions of S80D

S80D has no functions which can be addressed via XTCC in User or Observe mode.

8.29 VLPWATCH (VLPwatch daemon)

8.29.1 Object information of VLPWATCH

When the AutoVLP failover function is enabled, one VLPwatch daemon runs on the VLP and one on the SVLP. These daemons monitor the operational integrity of the VLP and, in the event of a failure, trigger automatic VLP switchover.



PID	Process ID
Autostart	enabled / disabled

The status of the daemon is indicated by the following colors:

pink	Stopped
green	Running

8.29.2 Functions of VLPWATCH

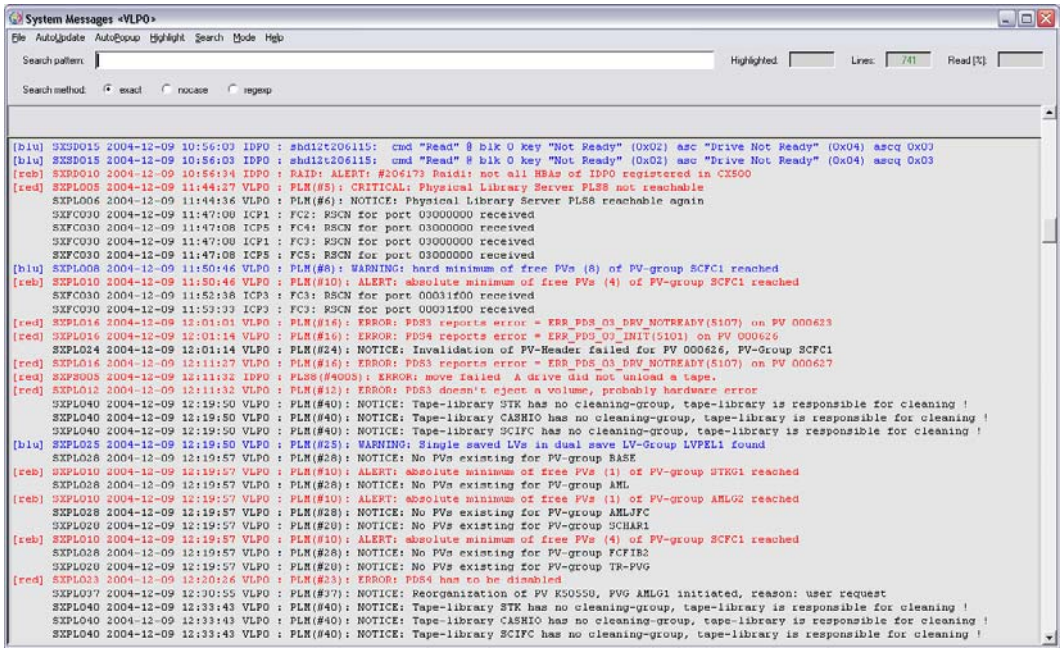
VLPWATCH has no functions which can be addressed via XTCC in User or Observe mode.

9 Explanation of console messages

9.1 General

When unusual events occur, the various CentricStor software components output messages at the console. The message texts are stored in the file `/var/adm/klog.msg` on the host in question and can be viewed centrally via the GXCC menu item “Show System Messages” (see section “Show System Messages” on page 158).

Example screen output



The color and text of the message provide you with important information concerning an event:

- Message color

  The color informs you of the “urgency” of a message:

Urgency	Description	Color
None	---	Black
INFO	General information	Black
DEBUG	Debug information	Black
NOTICE	Information about a normal state change	Black
WARNING	Warning message	Blue
ERROR	Error message	Red
CRITICAL	Information about a critical state	Red
ALERT	Alarm message: the error that has occurred must be eliminated immediately	Flashing red
EMERGENCY	Alarm message: the system is in an unstable state	Flashing red

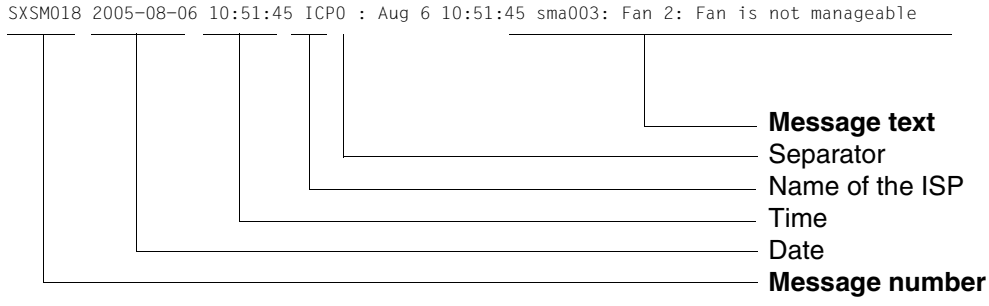
  The weight is normally a component part of the message text. When this is not the case, the weight is specified below the message line in the following messages.

- The separator - normally this is a colon - provides important information regarding a VLP switchover from the time the event was reported.

Separator	Meaning
:	Default
!	Message **during** a VLP switchover
#:	Backup message: The message relates to an event **before** the last VLP switchover.
#!	Backup message: After a VLP switchover has taken place **twice**, the message relates to an event during the **first** VLP switchover.

- Alongside the message number, the weight and the message text itself, the message provides the following additional information.

  Example



  In the sections below, only the message line components printed in bold here, i.e. the message number and message text, are presented.

When interpreting console messages, you must take into consideration that error messages are issued at different levels for one and the same error event.

If problems occur with physical MTC drives or cartridges, the error messages are collected in the PLM. This is also where a relation (unknown in lower levels) to physical and logical volume identifiers is established.

Corrective measures are suggested where possible. If there are no corrective measures specified, this may be due to the following reasons:

- Corrective measures are not required (e.g. in the case of an “all clear” message).
- The error is extremely complex and its source cannot be determined. In this case, error analysis and correction are carried out by service personnel.

The DAS and VDAS error messages are described in the “DAS Administration Guide” in chapter 6:

Version 3.1E: http://www.adic.com/us/collateral/omDas310Administration.pdf

Version 3.12: http://www.adic.com/us/collateral/omDas312Administration.pdf

The message numbers in the following section are arranged alphabetically

9.2 Message lines

9.2.1 SXCF... (CMF: Cache Mirroring Feature)

`SXCF012 CMF(#12): ALERT: failed to become PRIMARY, time exhausted: <sec> seconds`

Meaning
During the switchover to multi-user mode (RunLevel 2) in the VLP's boot phase the rc2 script `/etc/rc2.d/S70mirrorstart` determined that the data of the cache mirror when obsolete when it checked it. The switchover to multi-user mode is stopped until the data resources have been validated manually.

The cache mirror data (`/etc/mirrord/ms.db`) is replicated on the mirror backup server (SVLP) by the mirror server (VLP) at regular intervals. It is regarded as obsolete after 500 seconds.

The time period is specified in the message. Depending on this period, different measures must be taken.

Response
When a value greater than *500 seconds* is specified as a period, a check must be made to see whether CMF failures have been reported by the ICPs or IDPs since the time *Time stamp of the message minus period*. For this purpose messages which contain the `mirror changing` string and have a corresponding time stamp must be searched for in the Klogger files `/var/adm/klog.msg*` of these ISPs.

Case 1:

If no such message exists, the data resources are declared valid by the measure below.

Access to the VLP via LAN is possible despite incomplete multi-user mode as the LAN services (inetd) have already been started.

The existing data resources can be validated using the following statement:

```
echo "reset -f" > /etc/mirrord/mirror_server_ctl
```

As an rsh call:

```
rsh <VLP-Name> "echo \"reset -f\" > /etc/mirrord/mirror_server_ctl"
```

The switchover to multi-user mode is then continued.

Case 2:

If messages of the type described above exist for the specified period, `/etc/mirrord/ms.db` must be reconstructed manually. Notify 3rd-Level Support!

Case 3:

If the value *0 seconds* is specified as the period, no usable data is contained in `/etc/mirrord/ms.db`. Notify 3rd-Level Support!

`SXCF014 CMF(#14): ALERT: failed to become PRIMARY, stale data`

Meaning
When switching from SVLP to VLP a mirror backup server switches to become the mirror server (from the viewpoint of the CMF). During the change to multi-user mode in the VLP's boot phase, the `/etc/rc2.d/S70mirrorstart` script determines that the data resources are not up-to-date when it checks the cache mirror data (`/etc/mirrord/ms.db`).

This can occur when the failed VLP was not able to replicate the data (see message `SXCF012`).

The switchover to multi-user mode is stopped and the data resources are updated manually.

Response
Access to the VLP via LAN is possible because the LAN services (inetd) are already activated.

The most recent valid data resources of the "ex-VLP" must be restored manually on the new VLP. When activated the ex-VLP automatically becomes the SVLP. When you switch to multi-user mode this will probably be halted in the `/etc/rc2.d/S70mirrorstart` script because the database (`/etc/mirrord/ms.db`) which the VLP has not yet been able to replicate is obsolete. However, access via LAN is possible.

The following steps are required to update the data resources:

1. Terminate the mirror server on the VLP:

   ```
   myps -K mirror.s
   ```

2. Copy the last version of the data resources but one from the ex-VLP to the VLP using `rcp`:

   ```
   rcp <Name-des-Ex-VLPs>:/etc/mirrord/ms.dbak /etc/mirrord/ms.db
   ```

3. Start the mirror server on the VLP:

   ```
   /etc/mirrord/mirror.spray
   ```

4. Check whether the mirror server's processes are running:

   ```
   myps mirror.s
   ```

   Sample output

   ```
   ? 922    1      ? ? ? ? /etc/mirrord/mirror.client
   ? 5179   5177   ? ? ? ? /etc/mirrord/mirror.server
   ? 5177   1      ? ? ? ? /etc/mirrord/mirror.server
   ```

   In the mirror server's event log (`/etc/mirrord/ms.event` file) there is an entry with the message "ASSUMING role PRIMARY".

   Example: s.event:

   ```
   1110 152018.18 MS: ASSUMING role PRIMARY (1, 1) 1110 152018.22 MS:
   ```

5. Start the Message Manager for the display on the GUI:

   ```
   /usr/apc/broker/mycu -w "class   mir      public /usr/apc/broker/mir_mgr"
   ```

The switchover to multi-user mode is then continued.

9.2.2 SXCH... (Channel: pcib/pcea)

`SXCH001 ALERT` `channel (linkad <link>) has invalid node_id: mfr='<mfr>'`

Meaning
A host with the unknown ID <mfr> is connected to the channel at address <link>. The host is not supported.

`SXCH002 ERROR` `ESCON-ad pcea<port> (bus <pci-bus> dev <pci-device>) failed`

Meaning
Owing to a fault the ESCON port <port> is no longer available. This fault can be in the PCEAS controller or a cable fault (e.g. connector pulled out).

Response
Notify maintenance staff.

`SXCH003 NOTICE` `ESCON-ad pcea<port> (bus <pci-bus> dev <pci-device>) stopped`

Meaning
The ESCON port <port> has been deactivated. This deactivatation can be the result of a board or port being reset.

SXCH004 ESCON-ad pcea<port> (bus <pci-bus> dev <pci-device>) started
NOTICE

Meaning
The ESCON port <port> has been activated. This happens regularly at system startup. A port can also be reactivated after being reset or deactivated.

SXCH005 ESCON-ad pcea<port> (bus <pci-bus> dev <pci-device>) Memory error
ALERT

Meaning
A memory error has occurred on the ESCON board. The driver was requested to perform a board reset and to recalibrate the memory.

Response
The board is operational again following a successful reset. However, if this error occurs again, you are recommended to replace the board.

SXCH006 ESCON-ad<board> (bus <pci-bus> dev <pci-device> ser_nr <serial-nr>) defective
ALERT

Meaning
Error when starting the ESCON board (PCEAS/PCEAT). This error is reported when a memory BIST (Built-in Self Test) has not been executed correctly and in the event of the board firmware not being loaded completely.

Response
Replace the ESCON board.

SXCH007 ESCON-ad<board> (bus <pci-bus> dev <pci-device>) defective
ALERT

Meaning
Error when starting the ESCON board (PCEAF). This error is reported when a memory BIST (Built-in Self Test) has not been executed correctly.

Response
Replace the ESCON board.

SXCH008 ESCON-adaptor <board> (ser_no <serial-nr>) Board Reset Failed
ALERT

Meaning
A board reset triggered by a memory error (SXCH005) could not be performed successfully.

Response
Replace the ESCON board.

SXCH009 ESCON-adaptor <board> (ser_no <serial-nr) Compare Error in Channel <chn>
ALERT

Meaning
A test of the internal data paths on the ESCON board (PCEAS/PCEAT) which runs during the startup phase and idle times returned an error.

Response
Replace the ESCON board.

SXCH010 ESCON-adaptor <board> CRC READ Error in Channel <chn>
ALERT

Meaning
During a read access the data was corrupted when it was transferred from the SINIX memory to the ESCON channel.

Response
Replace the ESCON board.

SXCH011 ESCON-adaptor <board> CRC WRITE Error in Channel <chn>
ALERT

Meaning
During a write access the data was corrupted when it was transferred from the ESCON channel to the SINIX memory.

Response
Replace the ESCON board.

9.2.3 SXCM... (CHIM)

SXCM001 chim1 (sadm9): SCSI-Bus reset
None

This message is part of a message complex (see the section “Bus Reset for SCSI Controller” on page 542).

9.2.4 SXDN... (DNA: Distribute and Activate)

SXDN100 (DNA#100): ALERT: switch SVLP_to_VLP successfully completed! (needed time: <mm>:<ss> (mm:ss))

Meaning
The VLP switchover was successful. The time required for it is specified in parentheses.

SXDN101 (DNA#101): ALERT: switch SVLP_to_VLP completed with errors! (needed time: <mm>:<ss> (mm:ss))

Meaning
The VLP switchover has been completed. The previous SVLP is now the current VLP. However, errors occurred when the system was started. The details can be found in the Broker's logging files (`/usr/apc/broker/broker.log`). The time which was required for reconfiguration is specified in parentheses.

Response
The cause of the error must be removed. After this, the configuration function *Distribute and Activate* must be initiated in *Reactivate_failed_config* mode.

SXDN102 (DNA#102): ALERT: switch VLP_to_SVLP successfully completed!

The VLP has been successfully reconfigured as the SVLP. This message is output only if the reconfiguration was triggered by the VLP function *Swap Master*.

9.2.5 SXDT... (DTV File System)

SXDT001 DTV(# 1): ALERT: resource allocation failed, interface not activated!

Meaning
It was not possible to allocate the necessary resources for the DTV file systems. As a result, the TFS/DTV file systems cannot be mounted.

Response
Notify maintenance staff.

SXDT002 DTV(# 2): ERROR: unmount(<maj,min>): filesystem state not clean!

Meaning
The specified file system has been unmounted, even though it was not possible to perform all I/O operations on the metadata successfully. As a result, the file system on the corresponding hard disk is inconsistent.

Response
Notify maintenance staff.

SXDT003 DTV(# 3): ALERT: dev=<maj,min>: disk filesystem state is corrupted!

Meaning
Due to I/O errors when writing metadata, the DTV file system on the corresponding hard disk has become inconsistent. If this I/O problem is temporary, the metadata operation is rolled back and the file system is automatically restored to a consistent state (see message SXDT004 ...).

Response
Notify maintenance staff.

SXDT004 DTV(# 4): NOTICE: dev=<maj,min>: disk filesystem state is clean!

Meaning
The DTV file system on the corresponding hard disk has been restored to a consistent state.

SXDT005 DTV(# 5): ALERT: data compression disabled!

Meaning
It was not possible to allocate the necessary resources for DTV data compression. As a result, support is not provided for TFS/DTV data compression and compressed volumes cannot be read.

Response
Notify maintenance staff.

SXDT009 ALERT: DTV: *** filesystem may be corrupted! ***"

Meaning
This class of error messages indicates that write operations on the metadata could not be performed. If the problem is temporary, the write operation will be performed later. If the problem remains until the system is shut down, or the system crashes before the problem is rectified, the CentricStor data maintenance system will be inconsistent.

Response
Check whether the RAID controller and the Fibre Channel connection are okay. If the problem cannot be rectified, notify maintenance staff.

SXDT010 DTV(#10):ALERT: <func>(<maj,min>: ino=<ino>): cannot sync meta data to disk!

Meaning
Due to an I/O error, it is not possible to conclude the metadata transaction for the corresponding file. As a result, the transaction is rolled back.

9.2.6 SXFC... (FibreChannel Driver)

```
SXFC026     PVA1ICP0 : FC2: IOCB_E_LOCAL_REJECT
ALERT
SXFC005     PVA1ICP0 : FC2: loop_id 0, IOCB error sequence timeout
None
```

Meaning
These two messages only occur together. The 'sequence timeout' indicates a problem which was detected/caused by the Emulex firmware. A typical example is a data transfer while writing or reading which is not terminated within the permissible maximum time. The source of the error cannot be determined from this. The error describes a situation which occurs on FC-PH-2 protocol level. Use of an FC analyzer is generally required for a precise analysis.

```
SXFC026     FC3: IOCB_E_LOCAL_REJECT
ALERT
SXFC005     FC3: loop_id 0, IOCB error invalid RPI
None
```

Meaning
These two messages only occur together and can be output when individual ISPs or the entire CentricStor system is/are rebooted. They are issued only when certain switch firmware revisions are used and can be ignored.

```
SXFC026     ICP1 : FC2: IOCB_E_LOCAL_REJECT
ALERT
SXFC005     ICP1 : FC2: loop_id 0, IOCB error abort requested
None
```

The CentricStor ISP concerned has aborted an I/O operation.

Response
Notify the maintenance staff.

```
SXFC028     FC self initiated abort
ALERT
```

Meaning
This message is issued when the CentricStor FC driver aborts an IO after a timeout of 2 minutes. The timeout generally concerns a data transfer which has not been completed. In exceptional cases the abortion can also apply for commands which the CentricStor FC driver has issued for the Emulex board and which have not been answered after 2 minutes. The timeout can be triggered by faulty behavior of the firmware on the host or CentricStor side. The precise cause of the problem can only be determined by also using an FC analyzer.

Response
If the problem occurs frequently you must notify the maintenance staff.

SXFC030 FC5: RSCN for port 00637713 received
NOTICE

RSCN means “Registered State Change Notification”. This is a “service” of the FC switch which every FC port can request from the switch. As the “central unit” the switch at all times has a general overview of all active FC ports in the fabric. The FC port which utilizes the RSCN service is now notified of each change in the fabric (e.g. addition or removal of an FC port) in the form of an “RSCN”.

Meaning
The FC port in the fabric with the address00637713, which also includes FC5 of the ISP A02-ICPB, has either been added or removed.

SXFC031 FC<num>: invalid FW version for TARGET MODE, current: <4-digit hexnum> \
required: <4-digit hexnum>
ALERT

Meaning
This message can only appear after a new installation or an update: The current FW on the SAN controller does not permit operation.

Response
Notify maintenance staff.

SXFC044 stgt2.06: received NACK
ERROR

Meaning
The Emulex firmware returns a negative acknowledgment to the FC driver. This not-acknowledge (NACK) can have various causes. A more precise diagnosis of the cause may be possible if the error messages SXFC005/SXFC026 are also taken into account (see above).

SXFC045 stgt<number>.XX: received ABORT, HOST <host>
ERROR

Meaning
An I/O has been aborted in SCSI target mode on the FC controller with the controller number <number>.

There are two types of FC controller (configured in vtls.conf):

– internal controllers
– external controllers

The internal controllers permit communication between the ISPs themselves and between the ISPs and the RAID systems. The external controllers, on the other hand, are used for connecting to SAN hosts (open system hosts).

The message is only significant for external FC controllers. The abortion may have been initiated either by the SAN host or CentricStor. <host> contains the 4 most significant bytes of the host WWN. A data transfer (read/write) is generally aborted, and the user receives an error message.

Response
The message can be ignored for the internal FC controllers because the SCSI target interface is not used here for data transfers. If the message occurs for an external FC controller, the service must be notified.

SXFC050 stgt<num>.XX: protocol <num> registered twice
ALERT

Meaning
A configuration error has been located (e.g. an inconsistent 'vtls.conf').

Response
Notify maintenance staff.

9.2.7 SXFP... (FibreChannel Driver)

SXFP033 A02-ICPB : FC5: RESET controller initiated
None

Meaning
After a hardware or firmware defect, an attempt is made to reset the module. Once this has been completed, you can, in most cases, continue to work normally. IOs during the period of the reset may be aborted with an error, however.

SXFP040 fcpal<n> (sadm<m>): cannot abort job on target <t> lun <l>
NONE
SXFP040 fcpal<n> (sadm<m>): will not abort job on target <t> lun <l> anymore! Use manual BusReset!
NONE

Meaning
After a timeout (see previous message SXSB007 on page 495) an attempt is made to stop the command that was sent. The attempt fails (cannot abort). The second variant of the message (will not abort) only occurs with tape devices and indicates that only a bus reset will rectify the error.

Response
Check the device specified in the message (when <m> = 12 or 13 it is generally a RAID system, when <m> = 14 or 15 a tape device). The bus reset is executed on the GUI (XTCC) using the SCSI controller function *Reset Controller*.

Temporary unavailability of the FC

The following message complex, with LOOP-DOWN, rescheduling and LINK-UP messages, is output:

```
SXFP041    fcpal<n> (sadm<k>): rescheduling after temporarily unavailable resource
None
SXFP041    fcpal<n> (sadm<k>): rescheduling on intr : unavailable resource
None
SXFP041    fcpal<n> (sadm<k>): skipping timer processing
None
```

Meaning
The FC configuration is being changed. Devices like PCs or RAID disk arrays are currently being removed or added, or cables are being plugged in/removed.

Response
None if this state is temporary. However, after approximately 1 minute things should return to normal. If this is not the case, notify maintenance staff.

9.2.8 SXFW... (Firmware)

```
SXFW001    Firmware update for device mbk<xxx> timed out, device not responding.
ALERT
```

Meaning
Loading of the firmware could not be completed within a particular time.

Response
Notify maintenance staff.

```
SXFW002    Firmware update for device mbk<xxx> failed.
ALERT
```

Meaning
Loading of the firmware could not be completed successfully.

Response
Notify maintenance staff.

9.2.9 SXIB... (Info Broker)

System messages from the InfoBroker

SXIB001 `IB 001 EMERGENCY "*** %s File System full. ***"`

Meaning
`%s` = name of the affected file system.
The file system is 100% full.

SXIB002 `IB 002 ALERT "*** %s File System %d Percent filled . ***"`

Meaning
`%s` = name of the affected file system.
The file system is `%d` percent full (output once the occupancy level reaches 93%).

SXIB100 `IB 100 NOTICE "%s automatically restarted."`

Meaning
`%s` stands for: VMD name (e.g. `MD03`), '`perf_log`', '`vlsMsgMgr`'.
The process was automatically restarted.

SXIB101 `IB 101 NOTICE "%s automatically restarted %s after %d tries."`

Meaning
`%s` stands for: VMD name (e.g. `MD03`), '`perf_log`', '`vlsMsgMgr`'.
The process was automatically restarted after %d attempts.

SXIB102 `IB 102 NOTICE "Stop %s for Maintenance."`

Meaning
`%s` stands for: VMD name (e.g. `MD03`), '`perf_log`', '`vlsMsgMgr`'.
The process was stopped via a menu in the graphical user interface.

SXIB104 `IB 104 ALERT "Auto restart of %s %d times %s failed. Intervention required."`

Meaning
`%s` stands for: VMD name (e.g. `MD03`), '`perf_log`', '`vlsMsgMgr`'.
The process could not be restarted even after %d attempts. Manual intervention is required.

SXIB110 `IB 110 ALERT "*** Conversion of vtls.conf: %s %s . ***"`

Meaning
Contains the ERROR text:
`KEY-VIOLATION: Missing Key for multiple Host Interface.`
or
`KEY-VIOLATION: Missing Key for multiple Physical Library Services.`
or
`KEY-VIOLATION: Missing Key for 64 virtual Drives.`

SXIB200 IB 200 NOTICE "Please archive the performance history log files."

Response
If performance analyses are required for periods which precede the recording period, the history log files from the [fsys]/apc/diag/emtape/hist_log directory must be archived. Obsolete performance history log files are automatically deleted after the recording period has elapsed .

SXIB201 IB 201 WARNING "Performance history recording discontinued."

Meaning
It is not possible to continue writing the history data (permanent or temporary problem). Cause: may be a write error, hard disk is full, too many processes in the system, among other things.

SXIB202 IB 202 NOTICE "Performance history recording resumed."

Meaning
If the situation indicated by IB201 was temporary, recording of history data is continued. In the history data there will be a time gap between message IB201 and IB202.

SXIB300 IB(#300): ERROR: connection to <isp> lost

Meaning
The hosts of the CentricStor network are monitored using a “keep-alive” mechanism. Here the hosts must report regularly to the network by means of “sign-of-life” messages. If the above message appears this means that the host specified with <isp> has not sent any “sign-of-life” message for more than 10 seconds. It can be assumed that the host is no longer available. This message also occurs in poor or overloaded networks or if the monitoring software on the host has been stopped. However, if neither is the case, this means that the host has been shut down or has crashed.

Response
Notify maintenance staff.

SXIB400 IB(#400) ALERT: Distr. & Act.: vtls_spray: cmd "<command>" failed

Meaning
During a “Distribute and Activate” the vtls_spray.sh script encountered an error in the command <command> and has terminated.

Response
Check why the command <command> could not be executed.

SXIB500 VLP0 : IB(#500) ERROR <fcswitch> not reachable

Meaning
The FC switch does not respond to SNMP requests.

Response
Wait to see whether the error message appears repeatedly (multiple messages) because with “bge” and the “cisco catalyth switches” there is the problem that the LAN is only available with a delay. If the error recurs repeatedly, . Notify the maintenance staff.

9.2.10 SXLA... (LANWATCH)

`SXLA001 LANWATCH(#1): CRITICAL: <interface><no>: <ip-addr> LINK DOWN`

Meaning
The LAN interface `<interface><no>` (e.g. `iee0`, `bge1`) has been deactivated or no longer has a connection to the next hub or switch. The reason for this can be:

– cable fault (connector pulled out)
– fault in the hub or switch (e.g. deactivated)
– damage to the LAN interface

Response
Notify maintenance staff.

`SXLA002 LANWATCH(#2): NOTICE: <interface><no>: <ip-addr> LINK UP`

Meaning
The LAN interface `<interface><no>` (e.g. `iee0`, `bge1`) has set up a connection to the next hub or switch. This happens, for example, at system startup. After an interruption has been cleared (e.g. connector pulled out) the connection is reestablished automatically.

9.2.11 SXLV... (Log Volume)

`SXLV001 ERROR: TFS: LV CB3557: checksum error loading record table #1`

Meaning
Checksum error

Response
In the event of a checksum error the tape emulation maps the TFS sense code for the archiving software to medium error (~ “tape torn”). This should “automatically” lead to this medium no longer being used. The content of the medium (in the RAID cache) need not necessarily be “wrong” (“data corrupter” when reading), but it is undefined! It may thus well make sense to access the medium again - via another ISP.

9.2.12 SXMM... (Message Manager)

SXMM007 KLOG[<pid>]: INFO: Message Manager unavailable!

Meaning
Information that the Message Manager is not available.

Response
Notify maintenance staff.

SXMM005 KLOG[<pid>]: WARNING: vlsTrace(<trace signal>) error

Meaning
Error while creating a new trace file or error while activating/deactivating the trace.

Response
Notify maintenance staff.

SXMM005 KLOG[<pid>]: WARNING: getc() error errno=<error number>
<error description>

Meaning
Error while reading in the messages from `/dev/osm`.

Response
Notify maintenance staff.

SXMM005 KLOG[<pid>]: WARNING: fork() error errno=<error number>
<error description>

Meaning
Internal process error

Response
Notify maintenance staff.

SXMM005 KLOG[<pid>]: WARNING: vlsTrace(<trace filename>) error

Meaning
Error while creating a new trace file.

Response
Notify maintenance staff.

SXMM005 KLOG[<pid>]: WARNING: Check Path /usr/apc/tmp/msgadm error

Meaning
The directory `/usr/apc/tmp/msgadm` cannot be created.

Response
Notify maintenance staff.

SXMM005 KLOG[<pid>]: WARNING: fopen(/dev/osm) error errno=<error number> <error description>

Meaning
Error while opening /dev/osm.

Response
Notify maintenance staff.

SXMM005 KLOG[<pid>]: WARNING: fstat(/dev/osm) error errno=<error number> <error description>

Meaning
Error while accessing /dev/osm.

Response
Notify maintenance staff.

SXMM005 KLOG[<pid>]: WARNING: stdout error errno=<error number> <error description>

Meaning
Error while accessing stdout.

Response
Notify maintenance staff.

SXMM005 KLOG[<pid>]: WARNING: input/output files '<filename>' identical

Meaning
Error while comparing input and output.

Response
Notify maintenance staff.

SXMM005 KLOG[<pid>]: WARNING: Check Path /usr/apc/vtls error

Meaning
The directory /usr/apc/vtls cannot be created.

Response
Notify maintenance staff.

SXMM005 KLOG[<pid>]: WARNING: BuildSearchTable() error

Meaning
Error while reading in the klog parameter file.

Response
Notify maintenance staff.

SXMM007 KLOG[<pid>]: INFO: setsid() errno=<error number> <error description>

Meaning
Internal process error

SXMM012 VLSM[<pid>]: WARNING: too many client entries pid=<process id> sd=<socket descriptor>

Meaning
Owing to lack of space the Message Manager could not accept any new connection request.

SXMM012 VLSM[<pid>]: WARNING: Send SNMP Trap() error

Meaning
Error while calling the SendTrap process for sending a message to the SNMP master station.

Response
Notify maintenance staff.

SXMM012 VLSM[<pid>]: WARNING: vlsTrace(<trace signal>) error

Meaning
Error while creating a new trace file or error while activating/deactivating the trace.

Response
Notify maintenance staff.

SXMM012 VLSM[<pid>]: WARNING: CheckListeningPorts() error

Meaning
Error while waiting for inputs from Klogger or Message Manager clients.

Response
Notify maintenance staff.

SXMM012 VLSM[<pid>]: WARNING: fork() error errno=<error number> <error description>

Meaning
Internal process error

Response
Notify maintenance staff.

SXMM012 VLSM[<pid>]: WARNING: vlsTrace(<trace filename>) error

Meaning
Error while creating a new trace file.

Response
Notify maintenance staff.

SXMM012 VLSM[<pid>]: WARNING: Check Path /usr/apc/tmp/msgadm error

Meaning
The directory /usr/apc/tmp/msgadm cannot be created.

Response
Notify maintenance staff.

SXMM012 VLSM[<pid>]: WARNING: chdir(/usr/apc/tmp/msgadm) error errno=<error number> <error description>

Meaning
Error while changing the working directory to /usr/apc/tmp/msgadm.

Response
Notify maintenance staff.

SXMM012 VLSM[<pid>]: WARNING: VTLS configuration file read error

Meaning
Error while reading in the configuration file vtls.conf.

Response
Notify maintenance staff.

SXMM012 VLSM[<pid>]: WARNING: Message Manager configuration entry read error

Meaning
Error while reading in the Message Manager configuration entry from the file vtls.conf.

Response
Notify maintenance staff.

SXMM012 VLSM[<pid>]: WARNING: Open VTLS message file (/usr/apc/vtls/VTLS_MESSAGES) error

Meaning
Error while opening the file VTLS_MESSAGES (file for displaying the messages via GXCC).

Response
Notify maintenance staff.

SXMM012 VLSM[<pid>]: WARNING: TailVtlsMessage() error

Meaning
Error while reducing the file VTLS_MESSAGES.

Response
Notify maintenance staff.

SXMM012 VLSM[<pid>]: WARNING: Check Path /msg error

Meaning
Error while creating the directory /msg.

Response
Notify maintenance staff.

SXMM013 `VLSM[<pid>]: NOTICE: File <filename> removed`

Meaning
Information indicating that the oldest history file has been removed.

SXMM014 `VLSM[<pid>]: INFO: No space left in /msg (kbytes=<n> used=<n> avail=<n> capacity=<n>)`

Meaning
Directory `/msg` (history files) could no longer be written to owing to lack of space. The odest history file has been removed.

SXMM014 `VLSM[<pid>]: INFO: kbyte available /msg kbytes=<n> used=<n> avail=<n> capacity=<n>`

Meaning
Information on free memory space in `/msg` (after the oldest history file has been removed).

SXMM014 `VLSM[<pid>]: INFO: ******* START MsgAdm daemon`

Meaning
Information on the start of the process `vlsMsgMgr`.

SXMM014 `VLSM[<pid>]: INFO: reopen(stdin)->/dev/null error`

Meaning
Error while redirecting `stdin` to `/dev/null`.

SXMM014 `VLSM[<pid>]: INFO: reopen(stderr)->TraceFile error`

Meaning
Error while redirecting `stderr` to the Message Manager trace file.

SXMM014 `VLSM[<pid>]: INFO: error setsid() errno=<error number> <error description>`

Meaning
Internal process error

SXMM014 `VLSM[<pid>]: INFO: ******* STOP MsgAdm daemon`

Meaning
Information on termination of the process `vlsMsgMgr`.

SXMM019 `EMSG[<pid>]: WARNING: vlsTrace(<trace signal>) error`

Meaning
Error while creating a new trace file or error while activating/deactivating the trace.

Response
Notify maintenance staff.

SXMM019 EMSG[<pid>]: WARNING: ReadNextEvtMsgLine() error

Meaning
Error while reading the event message file.

Response
Notify maintenance staff.

SXMM019 EMSG[<pid>]: WARNING: fork() error errno=<error number>
<error description>

Meaning
Internal process error

Response
Notify maintenance staff.

SXMM019 EMSG[<pid>]: WARNING: vlsTrace(<trace filename>) error

Meaning
Error while creating a new trace file.

Response
Notify maintenance staff.

SXMM019 EMSG[<pid>]: WARNING: Check Path /usr/apc/vtls error

Meaning
The directory `/usr/apc/vtls` cannot be created.

Response
Notify maintenance staff.

SXMM019 EMSG[<pid>]: WARNING: BuildEvtSearchTable() error

Meaning
Error while reading in the event parameter file.

Response
Notify maintenance staff.

SXMM019 EMSG[<pid>]: WARNING: Check Path /usr/apc/tmp/msgadm error

Meaning
The directory `/usr/apc/tmp/msgadm` cannot be created.

Response
Notify maintenance staff.

SXMM019 EMSG[<pid>]: INFO: Message Manager unavailable!

Meaning
Information that the Message Manager is not available.

Response
Notify maintenance staff.

SXMM021 EMSG[<pid>]: INFO: ******* START EmsgTrap (EventMessageTrap) daemon

Meaning
Information on the start of the process EmsgTrap.

SXMM021 EMSG[<pid>]: INFO: reopen(stdin)->/dev/null error

Meaning
Error while redirecting `stdin` to `/dev/null`.

SXMM021 EMSG[<pid>]: INFO: reopen(stderr)->TraceFile error

Meaning
Error while redirecting `stderr` to the EmsgTrap trace file.

SXMM021 EMSG[<pid>]: INFO: error setsid() errno=<error number>
<error description>

Meaning
Internal process error

SXMM021 EMSG[<pid>]: INFO: ******* STOP EmsgTrap daemon

Meaning
Information on termination of the process `EmsgTrap`.

9.2.13 SXPL... (PLM: Physical Library Manager)

SXPL001 PLM(#1): CRITICAL: Physical Library <name> temporarily not functional:

Meaning
The PLS has reported a general error (4006).

Response
Notify maintenance staff.

SXPL002 PLM(#2): NOTICE: Physical Library <name> functional again

Meaning
A problem with the robot has been rectified.

SXPL003 PLM(#3): ALERT: <PDS-name> on <hostname> not reachable

Meaning
It was not possible to send a message to the PDS <PDS-name> on the host <hostname>.

Response
Check whether the PDS and/or host are running and whether the TCP/IP connection is okay. If the corresponding IDP is running but the connection is not working, check the cables and the hubs. Notify maintenance staff if necessary.

SXPL004 PLM(#4): NOTICE: <PDS-name> on <hostname> reachable again

Meaning
The PDS <PDS-name> can again be reached.

SXPL005 PLM(#5): CRITICAL: Physical Library Server <name> not reachable

Meaning
It was not possible to send a message to the PLS.

Response
Check whether the PLS is functioning.

SXPL006 PLM(#6): NOTICE: Physical Library Server <name> reachable again

Meaning
It was again possible to send a message to the PLS.

SXPL007 PLM(#7): ALERT: VLM not reachable

Meaning
It was not possible to send a message to the VLM.

Response
Check whether the VLM is functioning (normally the VLM and PLM are running on the same host).

SXPL008 PLM(#8): WARNING: hard minimum of free PVs (<num>) of PVG <name>, TL <name> reached

Meaning
There are almost no more free tapes. The reserve of free cartridges created during the last “soft configuration” was not large enough. Only <num> tapes are available. Reorganization is performed and is given high priority.

Response
If the reduced throughput is currently causing problems, mount new cartridges.
In the long term: check the settings that control reorganization by means of the GXCC function “Physical Volume Groups” (see page 181).

Check the following values:

– soft minimum number of empty PV
– hard minimum number of empty PV
– absolute minimum number of empty PV
– amount of valid data for REORG
– timeframe for REORG

The margin between “soft” and “hard” should be large enough, and the REORG interval should be suitably big. Normally, the value specified for the degree to which the cartridge for reorganization is filled should be large.

If everything is as it should be and if the average degree to which all physical volumes are filled is more than 50%, mount cartridges.

SXPL009 PLM(#9): NOTICE: number of free PVs of PVG <name>, TL <name> over hard minimum (<num>) again

Meaning
The number of available tapes is again greater than <num>.

SXPL010 PLM(#10):ALERT: absolute minimum of free PVs (<num>) of PV-group <PVG> reached

Meaning
Only <num> tapes are still free. Aside from reorganization, no more save operations will be executed. The effective throughput of CentricStor is significantly reduced.

Response
This state must be avoided at all costs.
Temporary relief for throughput problems: mount new tapes.
In the long term: check the settings that control reorganization by means of the GXCC function “Physical Volume Groups” (see page 181).

Check the following values:

– soft minimum number of empty PV
– hard minimum number of empty PV
– absolute minimum number of empty PV
– amount of valid data for REORG
– timeframe for REORG

The margins between “soft”, “hard” and “absolute” should be large enough and the REORG interval should be suitably big. If CentricStor often ends up with an insufficient number of free tapes, you should try and select a higher threshold for “soft” and increase the degree to which a physical volume can be filled. This allows larger reserves to be created on available physical volumes during reorganization.

SXPL011 PLM(#11):NOTICE: number of free PVs of PV-group <PVG> over absolute minimum (<num>) again

Meaning
The number of free tapes is again greater than the absolute minimum.

SXPL012 PLM(#12): ERROR: <PDS-name> doesn't eject a volume, probably hardware error

Meaning
The PDS <PDS-name> has not ejected a physical volume in such a way that the robot can grab it.

Response
Check whether the physical volume involved is jammed in the device identified by the PDS number.

SXPL013 PLM(#13): ERROR: <PDS-name> reports media error on PV <PV-name>

Meaning
A media error has been reported on the physical volume <PV-name>.

Response
The physical volume has been marked by the PLM as read-only. Any logical volumes still located on this physical volume should be moved by means of a reorganization. Once this has been done, replace the physical volume. If a read error occurs during reorganization, this fact will be reported by the PLM error message SXPL020 (see page 474).

SXPL014 PLM(#14): ERROR: <PDS-name> reports hardware error

Meaning
The PDS <PDS-name> has reported a hardware error.

Response
Notify maintenance staff.

SXPL015 PLM(#15): ERROR: <PDS-name> reports sense = <Sense-Byte-Value> on PV <PV-name>

Meaning
The PDS <PDS-name> has reported an error code for the physical volume <PV-name>.

Response
Notify maintenance staff.

SXPL016 PLM(#16): ERROR: <PDS-name> reports error = <PDS-error-string> on PV <PV-name>

Meaning
The PDS <PDS-name> has reported a class-3 error (ERR_PDS_03...).

Response
The meaning of the error texts transferred in <PDS-error-string> and any actions to be taken are listed below.

List of the error strings reported with PLM/RPLM(#16)

`ERR_PDS_03_INIT:`

Meaning
Error while initializing/opening the device node.
Illegal device node (path).
Illegal directory in the cartridge's memory chip[1] (tape directory corrupted).

Response
Evaluate physical error code.
This error can occur if the SCSI devices/controllers cannot be accessed when CentricStor is started up. Therefore check whether all the drives have been switched on and are online and whether the cables are okay. In the event of an illegal directory in the memory chip, PLM attempts to read the directory at the end of the cartridge and to store it in the memory memory chip. If the error occurs regularly despite this the cartridge must be replaced. Notify maintenance staff if necessary.

`ERR_PDS_03_POSITION`

Meaning
Positioning error: the position is beyond the end of the tape or < 0 or
the position is at exactly the same position as the tape mark.

Response
Notify maintenance staff.

`ERR_PDS_03_READ`

Meaning
Read error on tape cartridge
Cartridge is not ready
Cartridge is defective

Response
The tape cartridge may well be defective. Notify maintenance staff if necessary.

`ERR_PDS_03_WRITE`

Meaning
Write error to tape

Response
This may be normal (if the sense ASC reports a tape length error), but it could also indicate that the MTC drive or the tape cartridge is defective. Notify maintenance staff if necessary.

[1] Memory chip: An embedded non-contact electronics and interface module that can store and retrieve information relevant to the cartridge.

ERR_PDS_03_DRV_NOTREADY

Meaning
MTC drive/tape cartridge is not ready. Timeout expired. Error on TestUnitReady.

Response
Evaluate physical error code and sense bytes!
Normal behavior on unload if error information ASC/ASCQ 3A/00 or 04/03 present. In this case, the message was caused by a preventive unload to an empty or already unloaded drive.
Malfunction, if, for example, Test Unit Ready is terminated with errors other than “Medium not present” or “Logical Unit Not Ready, Manual Intervention Required” or with a timeout. Notify maintenance staff.

ERR_PDS_03_WRITE_FMARK

Meaning
Error when writing a tape mark (file mark). Possible cause: full tape.

Response
Notify maintenance staff.

ERR_PDS_03_UNLOAD_TAPE

Meaning
Error while executing Unload and Test Unit Ready.
MTC drive is not ready.
No tape cartridge has been inserted.

Response
This is normal if the error information includes ASC/ASCQ 53/01 or 53/00. If this is the case, the message is triggered by a preventative Unload on an empty drive.
It indicates a functional fault if, for example Test Unit Ready is terminated with errors other than “Medium not present” or timeout. Notify maintenance staff.

ERR_PDS_03_REWIND_TAPE

Meaning
Error while executing REWIND. Possible cause: defective tape.

Response
Notify maintenance staff.

ERR_PDS_03_READ_CDB_HISTORY

Meaning
Error while reading the CDB history. Internal error of the SCSI magnetic tape driver.

Response
Notify maintenance staff.

ERR_PDS_03_POS_NOT_AFTER_TAPEMARK

Meaning
Positioning error: There is no tape marke immediately in front of the read/write position that is to be adopted. The block position transferred is presumably not correct.

Response
Evaluate the physical error code and sense bytes. It may be that the PLM has transferred an incorrect block number. If you think this is the case, save the diagnostic documentation.

SXPL017 PLM(#17) ERROR: <PDS-name> reports error = <PDS-error-string> on PV <PV-name>

Meaning
The PDS <PDS-name> has reported a class-2 error (TFS errors). Class-2 errors are all errors which occur when accessing the TFS (access, open, read, write).

Response
The meaning of the error texts transferred in <PDS-error-string> and any actions to be taken are listed below.

List of the error strings reported with PLM(#17)

ERR_PDS_02_GENERIC

Meaning
Generic error

Response
Notify maintenance staff.

ERR_PDS_02_OPEN

Meaning
Possible causes:
- Error while opening the TFS cache file
- File ID is not correct (-F)
  Through asynchronous backup of the logical volume to tape with a time delay caused by other backup jobs or long positioning times on the tape, the host can have modified the logical volume in the meantime and thus have changed the file ID. The backup is started again by this modification.
- Illegal path name
- No write/read access to file

Response
Notify maintenance staff.

ERR_PDS_02_READ

Meaning
Error while reading from the cache file

Response
Notify maintenance staff.

ERR_PDS_02_WRITE

Meaning
Error while writing to the cache file

Response
Notify maintenance staff.

ERR_PDS_02_SEEK

Meaning
Error while positioning in the cache file

Response
Notify maintenance staff.

SXPL018 PLM(#18): ERROR: <PDS-name> reports error = <PDS-error-string> on PV <PV-name>

Meaning
The PDS <PDS-name> has reported a class-1 (general) error (ERR_PDS_01...). All generic errors that occur during program start, evaluation of <vtls.conf>, communication, etc. are classified as class-1 errors.

Response
The meaning of the error texts transferred in <PDS-error-string> and any actions to be taken are listed below.

List of the error strings reported with PLM/RPLM(#18)

ERR_PDS_01_INVALID_DEF

Meaning
Invalid definition in vtls.conf
Problems while copying the PV directory from the VLP to the IDP or vice versa.

Response
Notify maintenance staff.

ERR_PDS_01_INVALID_DEVICE

Meaning
Invalid definition of the device node in <vtls.conf>.
Device nodes do not match VTLS nodes in <vtls.conf>.
Device nodes do not match the CentricStor definition of a MTC drive.

Response
Notify maintenance staff.

ERR_PDS_01_INVALID_HEADER_SIGN

Meaning
Tape header has no valid identifier (POS1) at position 0.

Response
Notify maintenance staff.

ERR_PDS_01_TAPE_NON_VTLS

Meaning
Tape header does not have a valid CentricStor identifier.

Response
The volume was probably not imported correctly. Repeat the import procedure.
If necessary, delete header (“Erase physical Volume”) and write a new CentricStor-compatible header to the tape (“Add physical Volume”).

ERR_PDS_01_STATE_NOT_INVALID

Meaning
Tape header does not have the status INVALID and cannot therefore be overwritten with a new header.

Response
Check whether this is the correct physical volume. If so, remove it with the GXCC function “Erase Physical Volumes” (see section “Physical Volume Operations » Erase Physical Volumes” on page 226).

ERR_PDS_01_STATE_NOT_VALID

Meaning
Tape header has the status INVALID and can therefore no longer be used for write/read operations. A new header must be written to the tape.

Response
The problem was probably caused by manual intervention in the tape archive. If this is definitely not the case, notify maintenance staff.

ERR_PDS_01_NOT_ERASED

Meaning
Tape header is not marked with the status INVALID and can therefore not be assigned a new header.

Response
This is probably due to an operating error while inserting a cartridge, or the cartridge was not removed properly from CentricStor earlier. Export the cartridge in the proper manner or, if necessary, write a header marking the tape as INVALID to the tape using the utility routine.

ERR_PDS_01_VSN_NOT_VALID

Meaning
VSN in the tape header and the transferred VSN are not identical. The operation can therefore not be performed.

Response
This is probably due to manual intervention. If you are sure that there is no user data on the cartridge, write the correct header.

ERR_PDS_01_GROUP_NOT_VALID

Meaning
PV group in the tape header and the transferred PV group are not identical. The operation can therefore not be performed.

Response
This is probably due to manual intervention. If you are sure that there is no user data on the cartridge, write the correct header.

ERR_PDS_01_TAPE_NOT_INIT

Meaning
No tape has yet been initialized and activated. Therefore, the operation cannot be performed. It is possible that no physical volumes have so far been declared in CentricStor or that they have not yet been fully initialized.

Response
Notify maintenance staff.

SXPL019 PLM(#19): NOTICE: job cancelled on PDS <PDS-name>, PV <PV-name>, LV<LV-name>

Meaning
A job for the logical volume <LV-name> was aborted due to a timeout.

Response
Notify maintenance staff.

SXPL020 PLM(#20): NOTICE: Reorganisation failed for LV <LV-name> on PV <PV-name>, trying another PV

Meaning
Reorganization was aborted for this physical volume, the process will be continued with a different physical volume.

Response
Check whether the physical volume is accessible and can be read.

SXPL021 `LM(#21): NOTICE: Reorganisation failed for LV <LV-name> on PV <PV-name>, continue`

Meaning
A reorganization operation initiated by the user encountered an error. The logical volume <LV-name> could not be read from the physical volume <PV-name>. An attempt will be made to move any other logical volumes from this physical volume.

Response
If this message occurs repeatedly, check whether the physical volume is accessible. There may be a media error. The logical volume mentioned in the error message is not currently available.

SXPL022 `PLM(#22): ERROR: PLS reports VSN_NOEXIST on PDS <PDS-name>, PV <PV-name>`

Meaning
The robot does not recognize the physical volume <PV-name>.

Response
This may be temporary. You should nevertheless check whether the relevant tape cartridge is known to the robot. Notify maintenance staff if necessary.

SXPL023 `PLM(#23): ERROR: <PDS-name> has been disabled`

Meaning
An error, categorized by the PLM as a drive error, has occurred. The corresponding drive is logically deactivated. This may also happen if the DTV filesystem is not mounted on the PDS computer or the robot is unable to operate the drive.

Response
- Check whether the filesystems are correctly mounted
- Sense byte analysis of the corresponding PDS
- Reactivate the PDS using the XTCC function “Insert Drive”

Notify maintenance staff if necessary.

SXPL024 `PLM(#24): NOTICE: Invalidation of PV-Header failed for PV <name>, PV-Group <group>`

Meaning
The header on the physical volume could not be invalidated.

Response
- Check the cause of error (PLS, PDS).
- Repeat the delete job with the `-f` option.

Notify maintenance staff.

SXPL025 PLM(#25): WARNING : <num> single saved LVs in dual save LV-group <name> found

Meaning
Following a disaster recovery it is possible that logical volumes were first saved in a group or, if a dual save group has been created from a single save group, old logical volumes which have only been saved only once were found.
The PLM automatically attempts to save these logical volumes a second time.

Response
You can use the GXCC function “Show logical Volumes” (see section “Logical Volume Operations » Show Logical Volumes” on page 203) to find out the logical volumes in question. If they are no longer required, you can delete them.

SXPL026 PLM(#26): ALERT: LV-group file BASE in backup-dir, but not in LV-dir, start aborted

Meaning
The PLM has detected an inconsistency between primary and secondary data maintenance. Possible reasons for this inconsistency:
– The /DB directory is not mounted.
– Primary data maintenance was not restored after the RAID system was replaced.

Response
Notify maintenance staff.

SXPL027 PLM(#27): NOTICE: PV <name> of tapelibrary <name> is faulty !

Meaning
The PLS or a PDS have reported an error indicating that this physical volume can no longer be used.

Response
If the (possibly manually started) physical volume is reorganized (if this is possible), then it can be removed. In the case of the PLS, the error may be due to a temporary robot problem. For this reason, when PLS errors occur, you should check whether the error message is justified or whether the cause can be eliminated by intervening in the robot. Notify maintenance staff if necessary.

SXPL028 PLM(#28): NOTICE: No PVs existing for PV-group <name>

Meaning
When the PLM was started, a physical volume group without physical volumes was found.

Response
If this state of affairs is intentional, you do not need to do anything. Otherwise add physical volumes to this group.

SXPL029 PLM(#29):CRITICAL: missing licence for dual save !

Meaning
An LV group is configured for dual save, but the required license key is missing.

Response
Install the appropriate license key.

SXPL030 PLM(#30):CRITICAL: missing licence for optional function "Multiple Library Support", exiting !

Meaning
Several physical library servers are configured, but the required license key is missing.

Response
Install the appropriate license key.

SXPL031 PLM(#31):WARNING: Initialization failed for PV <name>, PV-group <name>; PV-file will be removed !

Meaning
During initialization of the tape header an error occurred or the robot was unable to access the physical volume.

Response
Notify maintenance staff.

SXPL037 PLM(#37): NOTICE: Reorganisation: PV <PV-Name> of PV-group <pv-group> selected, reason: <reason>

Meaning
<reason> may be one of the following:
- PV is faulty
- refresh interval reached
- soft minimum reached
- hard minimum reached
- user request
- forced erase

SXPL038 PLM(#38): NOTICE: PDS <name> has to be cleaned

Meaning
A drive has reported that it needs to be cleaned.

SXPL039 PLM(#39): NOTICE: PDS <name>: cleaning finished

Meaning
A clean operation has been successfully terminated.

SXPL040 PLM(#40): NOTICE: Tape-library <name> has no cleaning-group, tape-library is responsible for cleaning !

Meaning
No cleaning group has been configured.

SXPL041 PLM(#41): NOTICE: Cleaning-group of Tape-library <name> has no cartridge, tape-library is responsible for cleaning !

Meaning
No cleaning cartridge is present.

Response
It is only necessary to enter cleaning cartridges if CentricStor is to clean the physical drives.

SXPL042 PLM(#42): NOTICE: Cleaning-cartridge <name> of Tape-library <name> is unusable !

Meaning
A cleaning cartridge is unusable.

Response
Remove cleaning cartridge and insert a new one.

SXPL043 PLM(#43): WARNING: soft minimum of free cleancycles (<num> of tape-library <name> reached

Meaning
The soft minimum for cleaning cycles has been reached.

Response
Mount new cleaning cartridges.

SXPL044 PLM(#44): ERROR: hard minimum of free cleancycles (<num>) of tape-library <name> reached

Meaning
The hard minimum for cleaning cycles has been reached.

Response
Mount new cleaning cartridges.

SXPL045 PLM(#45): CRITICAL: no free cleancycles for tape-library <name> available

Response
Mount new cleaning cartridges.

SXPL046 PLM(#46): NOTICE: more than soft minimum cleancycles (<num>) for tape-library <name> available again

Meaning
PLM(#43) has been correctly responded to.

SXPL047 PLM(#47): NOTICE: more than hard minimum cleancycles (<num>) for tape-library <name> available again

Meaning
PLM(#44) has been correctly responded to.

SXPL048 PLM(#48): NOTICE: <num> cleancycles for tape-library <name> available again

Meaning
PLM(#45) has been correctly responded to?

SXPL049 PLM(#49): WARNING: ejected PV <name> of tapelibrary <name> is needed for restore !

Meaning
The PV of a vault group has been removed from the robot, but is now required for a restore job.

Response
The PV must be imported.

SXPL050 PLM(#50): NOTICE: PV <name> of tapelibrary <name> is ready for eject !

Meaning
Information that this PV of a vault group can be removed from the robot.

SXPL051 PLM(#51): ERROR: <pds> reports errno = <num> (<string>) on PV <name>

Meaning
The PDS has detected an error.

Response
Check PDS.

SXPL053 PLM(#53): NOTICE: writing of directory failed for PV <name> on PDS <name> !

Meaning
Error when writing the tape directory. Possible causes: No space available on the tape or tape damaged. This is normally not a problem; only in the event of a disaster recovery does the time for reading in the physical volume increase.

Response
Check whether the PV is defective.

SXPL054 PLM(#54): WARNING: PV <name> of tapelibrary <name> is inaccessible !

Meaning
The PLM does not have access to the physical volume. Further VLM restore requests for logical volumes on this physical volume are rejected with PLM_RELV_PVAC_ERR.

Response
Check the robot for why the access failed.

SXPL055 PLM(#55): WARNING: Capacity of PV <PV-name> is too small for PVG <PVG-name>; PV-file will be removed!

Meaning
The capacity of the cartridge which was reported during initialization is not sufficient. It must be at least twice as large as the largest LV that is to be saved in this group.

Response
Only use cartridges with enough capacity.

SXPL056 PLM(#56): NOTICE: all PVGs of TL <name> deactivated

Meaning
This message is output after the `plmcmd conf -e -T <TL>` command has been issued: All physical volume groups of the specified robot have been deactivated.

SXPL057 PLM(#57): NOTICE: all PVGs of TL <name> reactivated

Meaning
This message is output after the `plmcmd conf -a -T <TL>` command has been issued: All physical volume groups of the specified robot have been reactivated.

SXPL058 PLM(#58): NOTICE: LVG <name>: Duplicating single saved LVs

Meaning
The duplication of LVs that were only saved 1x is started for the specified LVG.

SXPL059 PLM(#59): NOTICE: LVG <name>: Duplicating single saved LVs failed

Meaning
The duplication of LVs that were only saved 1x is aborted again for the specified LVG. Bottlenecks have occurred again on the back end, e.g. library failure, failure of all physical drives or lack of physical volumes.

Response
The bottlenecks mentioned must be cleared.

SXPL060 PLM(#60): NOTICE: LVG <name>: Duplicating single saved LVs finished

Meaning
The duplication of LVs that were only saved 1x has been completed for the specified LVG.

SXPL061 PLM(#61): NOTICE: retries exceeded on PDS <PDS-name> at unload/umount

Meaning
Despite several attempts the PLM was not able to unload the drive <PDS-name> or the robot was not able to reset the cartridge. To avoid unnecessary robot movements the drive is placed in the 'out of service' state (see message SXPL023 on page 475).

Response
The drive must be checked to see whether the cartridge is jammed. It may be necessary to unload the cartridge manually. A robot fault may also be involved. In this case notify the maintenance staff. After the fault has been cleared the drive can reset to 'in service'.

SXPL062 PLM(#62): ERROR: LV <name> can not be reorganized, reason: <reason>. It was set to inaccessible at the PLM.

Meaning
The PLM attempts to reorganize an LV. This LV is unknown to the VLM or in the “faulty” status and can therefore not be read in. To prevent reorganization from being obstructed, the PLM sets this LV to “inaccessible”.

Response
The following two cases must be distinguished:

– LV is not known to the VLM:
  When the LV is no longer required, add it again and then delete it. If it has been deleted by mistake, add it again as “migrated” and reset the LV to “accessible” on the PLM (in the case of dual save this must be done in both groups).

– LV is in the “faulty” status for the VLM:
  This can occur in the case of RAID access errors. Reset the status of the LV on the VLM and set the LV to “accessible” again on the PLM (in the case of dual save this must be done in both groups).

SXPL063 PLM(#63): ERROR: Invalid PV-file '<name>' of TL <name> was moved to the error-directory

Meaning
An error was detected when the PV file was analyzed. In order not to disturb operations, the PV has been moved to the error directory. It cannot be accessed, neither can any logical volumes stored on it.

Response
The PV file must be analyzed. Notify maintenance staff.

SXPL996 PLM 996 NOTICE "Stop for Maintenance."

Meaning
The PLM was stopped via a menu of the graphical user interface.

SXPL997 PLM 997 NOTICE "Automatically restarted after %d tries."

Meaning
The PLM was automatically restarted after %d attempts.

SXPL998 PLM 998 NOTICE "Automatically restarted."

Meaning
The PLM was automatically restarted.

SXPL999 PLM 999 ALERT "Auto restart %d times failed. Intervention required."

Meaning
The PLM could not be restarted even after %d attempts. Manual intervention is required.

9.2.14 SXPS... (PLS: Physical Library Server)

For the messages SXPS000 to SXPS008 of the robot software, only error numbers #4000 - #4008 are described because these error messages are dependent on the robot. The various error messages for robot types supported by at the current time are no longer individually listed.

SXPS000 PLS(#4000) ERROR: 'vsn': <robot error message>

This message may also be issued if 'vsn' is jammed in a drive.

Meaning
The volume 'vsn' could not be found.

Response
Notify maintenance staff.

SXPS001 PLS(#4001) ERROR: `PDS-name`: <robot error message>

Meaning
The robot software does not know the LibDevName of the `PDS-name`.

Response
If the LibDevName of the `PDS-name` has been entered incorrectly, correct this in the configuration (in SCSI robots the LibDevName is a number between 0 and the number of drives minus 1). Or if the drive has not been released for the CentricStor system in the robot software, release the drive on the robot control processor for the CentricStor system.

SXPS005 PLS(#4005) ERROR: 'PDS-name': <robot error message>

Meaning
The PDS <PDS-name> has not ejected a physical volume in a way that permits the robot to take hold of it.

Response
Notify maintenance staff.

SXPS006 PLS(#4006) ERROR: <robot error message>

Meaning
A general robot error which is not necessarily traceable to a device or a cassette.
The meaning of the error message can be found in the relevant robot documentation.

Response
The robot error messages are mostly self-explanatory.
Typical reasons for errors include:

- Communication errors:
  - LAN connection to the AMU PC or ACSLS server is defective
  - Incorrect IP address for the AMU PC or ACSLS server in the VLP
  - Incorrect IP address for the VLP in the AMU PC (Check of file `\mptn\etc\hosts` in AMU-PC)
  - There is no address for the AMU PC or ACSLS server in the VLP's `/etc/hosts`
  - There is no system name (`SYSNAME` in `vtls.conf`) in the VLP's `/etc/hosts`
  - Client not defined in robot software (AMU-PC, LMF Lite Server)
- Robot problems
  - Error in the configuration file of the AMU PC (in the case of ADIC-AML robots)
  - Cartridge is jammed
  - Cartridge has fallen out of the grab attachment, etc.

Notify maintenance staff.

SXPS007 PLS(#4007):ERROR: <PDS-name>: <robot error message>

Meaning
The robot is experiencing difficulties loading or unloading the device designated by the PDS number.

Response
Notify maintenance staff.

SXPS008 PLS(#4008) ERROR: 'vsn' <robot error message>

Meaning
The robot has difficulty loading or unloading the cassette described by 'vsn'.

Response
Check the cassette described by 'vsn'. There may be a problem in reading the barcode.

SXPS096 PLS(#996) NOTICE: Stop `PLS-name` for Maintenance

Meaning
The PLS `PLS-name` was stopped via the GUI.

SXPS996 PLS 996 NOTICE "Stop %s for Maintenance."

Meaning
%s stands for: PLS name (e.g. PLS1, ...).
The PLS process %s was stopped via a menu in the graphical user interface.

PLS 997 NOTICE "%s automatically restarted %s after %d tries."

Meaning
%s stands for: PLS name (e.g. PLS1, ...).
The PLS process %s was automatically restarted after %d attempts.

PLS 998 NOTICE "%s automatically restarted."

Meaning
%s stands for: PLS name (e.g. PLS1, ...).
The PLS process %s was automatically restarted.

PLS 999 ALERT "Auto restart %d times %s failed. Intervention required."

Meaning
%s stands for: PLS name (e.g. PLS1, ...).
The PLS process %s could not be restarted even after %d attempts. Manual intervention is required.

9.2.15 SXRD... (FibreCAT: RAID)

The table below shows the message numbers with the RAID systems which issue the messages:

Message number	RAID system	Page
SXRD001 SXRD100 - SXRD104	internal RAID	485
SXRD002 - SXRD009	S80	488
SXRD010	CX500, CX3-20	489
SXRD501, SXRD901	CX500, CX3-20	490

9.2.15.1 Messages of the monitoring daemon for the internal RAID

Messages during ongoing operation

```
SXRD001    NOTICE: raidd: 0:BBU - charging [xx] completed
SXRD001    NOTICE: raidd: 0:BBU - charging [xx] in progress
```

Meaning
These messages are normal when the BBU on controller 0 is in operation.

```
SXRD001    ALERT: raidd: 0:BBU - charging [xx] failed
SXRD001    ALERT: raidd: 0:BBU - pack not present
SXRD001    ALERT: raidd: 0:BBU - module not present
SXRD001    ALERT: raidd: 0:BBU - high temp
SXRD001    ALERT: raidd: 0:BBU - low voltage
SXRD001    ALERT: raidd: 0:BBU - cycles exceeded
```

Meaning
These messages indicate a hardware problem with the BBU on controller 0.

Response
Notify maintenance staff.

```
SXRD001    ALERT: raidd: 0:0:1 - disk state changed (Online -> Dead)
```

Meaning
The physical disk of controller 0, channel 0, target ID 1 has failed. All the associated logical disks are without redundancy.

Response
Notify maintenance staff.

SXRD001 NOTICE: raidd: 0:0:1 – disk state changed (Dead -> Write-Only)

Meaning
A rebuild is active for the physical disk of controller 0, channel 0, target ID 1.

SXRD001 NOTICE: raidd: 0:0:1 – disk state changed (Dead -> Online)

Meaning
A rebuild was successful for the physical disk of controller 0, channel 0, target ID 1. All the associated logical disks are fully operational (redundant) again.

SXRD001 ALERT: raidd: c5Od0 – state changed (Online -> Critical)

Meaning
The logical disk 0 on controller 0 no longer provides any redundancy. This indicates a hardware problem with a physical disk belonging to the addressed logical disk.

Response
Notify maintenance staff.

SXRD001 ALERT: raidd: c5Od0 – state changed (Critical -> Offline)

Meaning
A further physical disk belonging to the logical disk 0 on controller 0 has failed. The addressed logical disk is no longer accessible.

Response
Notify maintenance staff.

SXRD001 NOTICE: raidd: c5Od0 – state changed (Critical -> Online)

Meaning
The logical disk 0 on controller 0 has completed a rebuild and once again provides redundancy.

Messages during the start phase

SXRD001 ALERT: raidd: 0:0:3 – disk state is Dead

Meaning
This message is only generated when the raidd is started at system boot. The physical disk on controller 0, bus 0, target 3 was failed as the system booted. This indicates a hardware problem with the addressed physical disk.

Response
Notify maintenance staff.

SXRD001 ALERT: raidd: 0:0:3 – disk state is Write-Only

Meaning
This message is only generated when the raidd is started at system boot. As the system was started a rebuild was active for the physical disk on controller 0, bus 0, target 3.

SXRD001 ALERT: raidd: c50d0 – state is Critical

Meaning
This message is only generated when the raidd is started at system boot. The logical disk 0 on controller 0 no longer provides any redundancy. This indicates a hardware problem with a physical disk belonging to the addressed logical disk.

Response
Notify maintenance staff.

SXRD001 ALERT: raidd: c50d0 – state is Offline

Meaning
This message is only generated when the raidd is started at system boot. A further physical disk belonging to the logical disk 0 on controller 0 has failed. The addressed logical disk is no longer accessible.

Response
Notify maintenance staff.

SXRD100 ALERT: c50d0 RAID-1, Critical, 17300 MB, Write Back

Meaning
Logical disk 0 of controller 0 has no error redundancy.

Response
Notify maintenance staff.

SXRD101 ALERT: c50d0 RAID-1, Offline, 17300 MB, Write Back

Meaning
Logical disk 0 of controller 0 is not operable.

Response
Notify maintenance staff.

SXRD102 ALERT: raid 0:1:0 – Disk: Dead, 17300 MB

Meaning
The physical disk of controller 0, channel 1, target ID 0 has failed. All the associated logical disks are without redundancy.

Response
Notify maintenance staff.

SXRD103 NOTICE: raid 0:1:0 – Disk: Standby, 17300 MB

Meaning
The physical disk of controller 0, channel 1, target ID 0 is not active.

SXRD104 WARNING: raid 0:1:0 - Disk: Write-Only, 17300 MB

Meaning
A rebuild is active for the physical disk of controller 0, channel 1, target ID 0.

9.2.15.2 FibreCAT S80 messages

SXRD00<n> s80d: RAID: <weight>: <raid-id> Raid<raid#> enclosure <shelf#> <component> <status>

Meaning
If there is a status change in a S80 component, a message will be output on the console.

The terms used here have the following meanings:

n 1 - 8

weight Error severity:

NOTICE	information	n=8,9
WARNING	soft error	n=6,7
ERROR	error	n=4,5
ALERT	critical error	n=2,3

raid-id FibreCAT identification (target# of the 2 RAID controllers)

raid# Number of the RAID system (1 – 8)

shelf# Number of the shelf (1 – 7)

component Internal component of the shelf
- Disk drive (1 – 14)
- Power supply (1 – 2)
- Cooling fan (1 – 4)
- Enclosure services module (1 – 2)
- Loop monitor
- Voltage sensor (1 – 6)
- Current sensor (1 – 6)
- Temperature sensor (1 – 4)

status Status of the component

OK	Error corrected
Warning	Non-critical error (sensor only)
Critical	Critical error
Not Installed	Component removed or faulty
Not Available	Component not in operation
Unknown	Status not available (sensor only)

Response
In the event of a message with the error weight ALERT: Notify maintenance staff.

Example

```
SXRD003 s80d: RAID: ALERT: #212215 Enclosure 3, Power Supply 2 Critical
```

Connection between status and error weighting:

OK	NOTICE
Warning	WARNING
Not Available	ERROR
Unknown	ERROR
Critical	ALERT
Not Installed	ALERT

Messages with the error weighting ALERT trigger a teleservice call. For the S80 this applies to all faulty components with the status “Critical” or “Not Installed” (faulty hard disks have the status “Not Installed”).

A hardware fault can result in several different messages.

SXRD009 `s80d: RAID: NOTICE: Raid<raid#>: <ccnt> Controller OK`

Meaning
When the monitoring daemon starts (for example on reboot), information is read from the connected FibreCAT S80 and the number of RAID controllers found per S80 is displayed on the console.

The terms used here have the following meanings:

`raid#`	Number of the RAID system (1 – 8)
`ccnt#`	Number of the Controller (1 or 2)

9.2.15.3 FibreCAT CX500 and CX3-20 messages

SXRD010 `RAID: ALERT <raid-id> Raid<raid#>: not all HBAs of <isp-name> registered`

Where:

`<raid-id>`	ID of the FibreCAT (target# of the two RAID controllers)
`<raid#>`	Sequence RAID# (1 - 8)
`<isp-name>`	Name of the ISP concerned

Meaning
One or both HBAs of the specified ISP are not registered in the FibreCAT named.

Response
Notify maintenance staff.

9.2.15.4 FibreCAT CX500 and CX3-20 messages

SXRD501 RAID: NOTICE <raid-id> Hard SCSI Error recovered (<#501>) c<ctrl>t<tgt>l<lun>

Where:

<raid-id>	ID of the FibreCAT (target # of the two RAID controllers)
c<ctrl>t<tgt>l<lun>	Path via which the message was transferred (ctrl = controller#, tgt = target#, lun = logical device)

Meaning
Access via the specified path is possible again (positive message, cf. SXRD901).

SXRD901 RAID: ALERT <raid-id> Hard SCSI Error (<#901>) c<ctrl>t<tgt>l<lun>

Where:

<raid-id>	ID of the FibreCAT (target # of the two RAID controllers)
c<ctrl>t<tgt>l<lun>	Path via which the message was transferred (ctrl = controller#, tgt = target#, lun = logical device)

Meaning
An error occurred while accessing the specified path. This can be the result of a defective controller in theFibreCAT, an error in the FC switch or a defective cable.

Response
Notify maintenance staff.

9.2.16 SXRP... (RPLM: Recovery Physical Library Manager)

SXRP003 RPLM(#3): ALERT: <PDS-name> on <hostname> not reachable

Meaning
It was not possible to send a message to the PDS <PDS-name> on the host <hostname>.

Response
Check whether the PDS and/or host are running and whether the TCP/IP connection is okay. If the corresponding IDP is running but the connection is not working, check the cables and the hubs. Notify maintenance staff if necessary.

SXRP004 RPLM(#4): NOTICE: <PDS-name> on <hostname> reachable again

Meaning
The PDS <PDS-name> can be reached again.

SXRP005 RPLM(#5): CRITICAL: Physical Library Server <name> not reachable

Meaning
It was not possible to send a message to the PLS.

Response
Check whether the PLS is functioning.

SXRP006 RPLM(#6): NOTICE: Physical Library Server <name> reachable again

Meaning
It was again possible to send a message to the PLS.

SXRP013 RPLM(#13): ERROR: <PDS-name> reports media error on PV <PV-name>

Meaning
A media error has been reported on the physical volume <PV-name>.

Response
The physical volume has been marked by the PLM as read-only. Any logical volumes still located on this physical volume should be moved by means of a reorganization. Once this has been done, replace the physical volume.

SXRP014 RPLM(#14): ERROR: <PDS-name> reports hardware error

Meaning
The PDS <PDS-name> has reported a hardware error.

Response
Notify maintenance staff.

SXRP015 RPLM(#15): ERROR: <PDS-name> reports sense = <Sense-Byte-Value> on PV <PV-name>

Meaning
The PDS <PDS-name> has reported an error code for the physical volume <PV-name>.

Response
Notify maintenance staff.

SXRP016 RLM(#16): ERROR: <PDS-name> reports error = <PDS-error-string> on PV <PV-name>

Meaning
The PDS <PDS-name> has reported a class-3 error (ERR_PDS_03...).

Response
The meaning of the error texts transferred in <PDS-error-string> and any actions to be taken are described in the section "List of the error strings reported with PLM/RPLM(#16)" on page 469.

SXRP018 RPLM(#18): ERROR: <PDS-name> reports error = <PDS-error-string> on PV <PV-name>

Meaning
The PDS <PDS-name> has reported a class-1 (general) error (ERR_PDS_01...). All generic errors that occur during program start, evaluation of <vtls.conf>, communication, etc. are classified as class-1 errors.

Response
The meaning of the error texts transferred in <PDS-error-string> and any actions to be taken are described in the section "List of the error strings reported with PLM/RPLM(#18)" on page 472.

SXRP019 RPLM(#19): NOTICE: job canceled on PDS <pds>, PV <pv>, state <state>

Meaning
The PLS or the PDS could not execute a job because of a timeout.

<state> Describes the command in which the timeout occurred.

For the PLS:
PLS_INSPECT
MOUNT
UMOUNT

For the PDS:
PDS_INSPECT
RDIR
INIT
UNLOA

The command is extended by the suffix _SENT_TIMECHECK.

After the RPLM has started, the commands PLS_INSPECT, UMOUNT and UNLOAD can be preceded by 'INITIAL_' in the initialization phase. This occurs if a PV was mounted in a PDS.

Response
The RPLM repeats the command automatically. If the message appears frequently, check the device and/or the communication path. Notify maintenance staff if necessary.

SXRP022 RPLM(#22): ERROR: PLS reports VSN_NOEXIST on PDS <PDS-name>, PV <PV-name>

Meaning
The robot does not recognize the physical volume <PV-name>.

Response
This may be temporary. You should nevertheless check whether the relevant tape cartridge is known to the robot. Notify maintenance staff if necessary.

SXRP027 RPLM(#27): ALERT: Number of LVs over maximum

Meaning
The number of logical volumes is above the permitted maximum.

Response
Correct the configuration or remove some logical volumes with the command plmcmd dele -v <VSN>.

SXRP028 RPLM(#28): NOTICE: Number of LVs under maximum again

Meaning
The number of logical volumes is again below the permitted maximum.

SXRP051 RPLM(#51): ERROR: <pds> reports errno = <num> (<string>) on PV <name>

Meaning
The PDS has detected an error.

Response
Notify maintenance staff if necessary.

SXRP052 RPLM(#52): NOTICE: PLS reports VOLUME ERROR for PV <pv>, PV-file will be removed

Meaning
The physical library does not know this PV.

Response
Check the VSN of the PV, correct it, and notify the robot of the new VSN.

9.2.17 SXSB... (Sadm Driver: SCSI bus error)

SXSB001 chim1 (sadm9): SCSI-Bus reset
None

Meaning
This message is part of a message complex (see the section “Bus Reset for SCSI Controller” on page 542).

SXSB003 chim1 (sadm9): reinit of target <t> lun <l> failed
None

Meaning
One of the targets could not be initialized again after a bus reset. As this initialization is repeated automatically, this message can be ignored.

SXSB005 chim1 (sadm9): RESETTING CONTROLLER
None

Meaning
This message is part of a message complex (see the section “Bus Reset for SCSI Controller” on page 542).

SXSB007 <PC> : fcpal<n> (sadm<m>): timeout on target <t> lun <l> CDB <some bytes>
ALERT

For more information, see the section “Timeout on the RAID disk array” on page 538 and section “Timeout on the MTC drives” on page 539.

Meaning
An I/O operation has taken too long (minutes!), and as a result has been stopped and started again.

Response
Notify maintenance staff.

9.2.18 SXSC... (Savecore: organize coredump)

SXSC001 <timestamp> syslog: savecore: dump has been saved in /var/crash
ALERT

Meaning
The previous SINIX session was terminated with a crash. A crash dump was taken which was automatically saved in the /var/crash directory when the system was rebooted.

Response
Notify maintenance staff.

9.2.19 SXSD... (SCSI Disks: driver shd)

SXSD010 shd<k>t<ctl>: Hostadapter error
ALERT

Meaning
This message indicates a serious error in the communication with the RAID system.

Response
If this message is preceded by the message
xxx: response: error = 0x03, vendor = 0x1d, ... (the 0x1d is important)
it does not have to be analyzed further. In all other cases, notify maintenance staff.

SXSD013 shd<k>t<ctl>: TIMEOUT @ nnnnnnn
ALERT

See the section “Failover at the RAID system” on page 541

SXSD015 shd<k>t<ctl>: cmd "Write or Read" @ blk <number> key "Not Ready" (0x02) asc "Drive Not Ready" (0x04) ascq 0x02
WARNING

See the section “Failover at the RAID system” on page 541

SXSD017 shd<k>t<ctl>: cmd "Read" @ blk <n> key "Medium Error" (0x03) asc ....
ALERT

Meaning
Irrecoverable read errors occur sporadically on the FibreCAT RAID disk array despite mirroring.

Response
Notify maintenance staff.

SXSD018 shd<k>t<ctl>: Target vanished

See the section “Failover at the RAID system” on page 541

9.2.20 SXSE... (EXABYTE Tapes)

SXSE005 WARNING: exa: out of spt, deconfiguring exa

Meaning
The driver could not allocate any virtual adresses for IO mapping. No tape devices will be usable for this ISP. Reason: the kernel has been modified. This error does not occur if the standard kernel is used without any further tuning or modification.

Response
Notify maintenance staff.

SXSE006 mbk<n>t<t>: cmd 1B failed; status <...>
ALERT

This message is part of a message complex (see the section “Timeout on the MTC drives” on page 539).

9.2.21 SXSM... (Server Management)

The term “sma#” used in this description is a collective term for the process names “sma”, “sma02”, “sma03”, “sma04”, “sma05” and “sma06” which are specified in the error messages in accordance with the hardware type of the SINIX server.

With the fan messages, the fan IDs <Id> have the following meaning:

SysFanx	System fan number x (e.g. SysFan3)
Cpux Fan	CPU fan number x (e.g. Cpu0 Fan)
PSx Fan	Power supply fan number x (e.g. PS1 Fan)

All error messages are also recorded in the default log file via V3 logging.

SXSM001 sma#: Power supply <Id> is not present
ALERT

Meaning
Redundant power supply module <Id> has not been installed.

Response
Notify maintenance staff.

SXSM002 sma#: Power supply <Id> is present and failed
ALERT

Meaning
Redundant power supply module <Id> has failed.

Response
Notify maintenance staff.

SXSM004 sma#: Fan <Id> is not working
ALERT

Meaning
Fan <Id> has failed and must be replaced. If the fan is inoperable for more than 3 minutes, the SINIX system is shut down and the server deactivated to prevent the server from overheating.

Response
Notify maintenance staff.

SXSM006 sma#: *** SHUTDOWN *** (Shutdown because of defective Fan [<Id>])
ALERT

Meaning
The SINIX system is shut down because a fan is defective and the server deactivated to prevent the server from overheating.

Depending on the Primergy type the server will be reactivated after the wait time specified in the BIOS setup and the system started up. This mechanism is governed by the “ASR&R Boot Delay” and “Boot Retry Counter” entries in the BIOS setup.

Response
Notify maintenance staff.

SXSM006 ALERT
`sma#: *** SHUTDOWN *** (Shutdown temperature = <value> degrees Celsius at sensor <Id>)`

SXSM006 ALERT
`sma#: *** SHUTDOWN *** (Shutdown because of critical temperature)`

Meaning
The critical temperature of a sensor has reached the shutdown threshold value. The SINIX system is shut down and the server deactivated.

Depending on the Primergy type the server will be reactivated after the wait time specified in the BIOS setup and the system started up. This mechanism is governed by the “ASR&R Boot Delay” and “Boot Retry Counter” entries in the BIOS setup.

A defective temperature sensor[1] can also trigger this message.

Response
Notify maintenance staff.

SXSM009 ALERT
`sma#: Critical temperature = <value> degrees Celsius at sensor <Id>`

Meaning
The temperature of sensor `<Id>` is in the critical range. If a further temperature increase exceeds a predefined limit value, a controlled shutdown will be initiated by the monitoring software and the server deactivated.

A defective temperature sensor[1] can also trigger this message.

Response
Notify maintenance staff.

[1] On the Primergy F250 the temperature sensors have the following meanings:
Sensor 0: CPU 0 temperature
Sensor 1: Inside temperature
Sensor 2: CPU 1 temperature
Sensor 3: Auxiliary = ambient temperature

```
SXSM010     sma#: Memory Module <Id> disabled
ALERT
SXSM010     sma#: Memory Module disabled; Module# = <Id>
ALERT
```

Meaning
Memory module <Id> is in the “disabled” state. This can be caused by the following:
a) The memory module was disabled in the BIOS setup.
b) The memory module was enabled in the BIOS setup, but has been disabled because of too many memory errors.

Response
Notify maintenance staff.

```
SXSM011     sma#: Correctable Memory Error occurred; Module# = <Id>
ALERT
```

Meaning
A correctable memory error has occurred in memory module <Id>.

Response
Notify maintenance staff.

```
SXSM012     sma#: Uncorrectable Memory Error occurred; Module# = <Id>
ALERT
```

Meaning
An uncorrectable memory error has occurred in memory module <Id>.

Response
Notify maintenance staff.

```
SXSM016     sma#: Fan <Id>: Fan failed
ALERT
```

Meaning
Non-redundant fan <Id> has failed and must be replaced.

If the fan is inoperable for more than 3 minutes, the SINIX system is shut down and the server deactivated to prevent the server from overheating.

Response
Notify maintenance staff.

```
SXSM017     sma#: Fan <Id>: Redundant fan failed
ALERT
```

Meaning
Redundant fan <Id> has failed. As this fan is redundant, the SINIX system is not shut down.

Response
Notify maintenance staff.

SXSM018 sma#: Fan <Id>: Fan is not manageable
ALERT

Meaning
Fan <Id> has failed and must be replaced.

If the fan is inoperable for more than 3 minutes, the SINIX system is shut down and the server deactivated to prevent the server from overheating.

Response
Notify maintenance staff.

SXSM019 sma#: Fan <Id>: Removable fan is not installed
ALERT

Meaning
Fan <Id> is not installed or has failed.

If the fan is inoperable for more than 3 minutes, the SINIX system is shut down and the server deactivated to prevent the server from overheating.

Response
Notify maintenance staff.

SXSM021 sma#: Power Supply <Id> AC fail occurred
ALERT

Meaning
Power supply module <Id> is either not installed or not connected or defective.

Response
Notify maintenance staff.

SXSM022 sma#: Power Supply <Id> DC fail occurred
ALERT

Meaning
Power supply module <Id> has failed.

Response
Notify maintenance staff.

SXSM024 sma#: Power Supply <Id> is not manageable.
ALERT

Meaning
Power supply module <Id> has failed.

Response
Notify maintenance staff.

SXSM026 ALERT `sma#: <Id> Voltage is too low`

Meaning
The voltage with ID <Id> is too low.

This message can also be triggered by faulty regulators, sensors, batteries or power supplies.

Response
Notify maintenance staff.

SXSM027 ALERT `sma#: <Id> Voltage is too high`

Meaning
The voltage with ID <Id> is too high.

This message can also be triggered by faulty regulators, sensors, batteries or power supplies.

Response
Notify maintenance staff.

SXSM030 ALERT `sma#: Warning temperature = <value> degrees Celsius at sensor <Id>`

Meaning
The temperature of sensor <Id> is in the warning range.

If a further temperature increase exceeds a predefined limit value, a controlled shutdown will be initiated by the monitoring software and the server deactivated.

A defective temperature sensor (see footnote on page 498) can also trigger this message.

Response
Notify maintenance staff.

SXSM031 ALERT `sma#: Temperature Sensor <Id> is not working`

Meaning
Temperature sensor <Id> is defective (see footnote on page 498).

Response
Notify maintenance staff.

SXSM032 ALERT `sma#: Fan <Id>: Fan not available`

Meaning
Fan <Id> has failed.

If the fan is inoperable for more than 3 minutes, the SINIX system is shut down and the server deactivated to prevent the server from overheating.

Response
Notify maintenance staff.

SXSM033 sma#: Fan <Id>: Fan was removed
ALERT

Meaning
Fan <Id> has been removed or has failed.

If the fan is inoperable for more than 3 minutes, the SINIX system is shut down and the server deactivated to prevent the server from overheating.

Response
Notify maintenance staff.

SXSM034 sma#: Fan <Id>: Unknown indicator for fan status <value>
ALERT

Meaning
Fan <Id> has an undefined status <value>.

Response
Notify maintenance staff.

SXSM034 sma#: <Component-Id>: Unknown indicator for sensor status <value>
ALERT

Meaning
Component <Component-Id> (fan, power supply etc.) has an undefined status <value>.

Response
Notify maintenance staff.

SXSM035 sma#: CPU <Id> not enabled
ALERT

Meaning
CPU <Id> is not in the “enabled” status. This can be due to one of the following reasons:
a) The CPU was not enabled in the BIOS setup.
b) The CPU was enabled in the BIOS setup, but an error resulted in it being disabled again when the BIOS was rebooted.

Response
Notify maintenance staff.

SXSM036 sma#: CPU <ID> internal error occurred
ALERT

Meaning
An internal error was detected in CPU <Id>.

Response
Notify maintenance staff.

SXSM037 sma#: Fan <Id> connection to fanboard defective
ALERT

Meaning
The cable connection from the motherboard to the fan board does not exist or is defective.

Response
Notify maintenance staff.

SXSM038 sma#: Fan <Id>: Fan prefailure
ALERT

Meaning
Fan <Id> is no longer operating at full capacity and may soon break down.

Response
Notify maintenance staff.

SXSM039 sma#: Memory Parity Error occurred; Module# = <Id>
ALERT

Meaning
A parity error has occurred in memory module <Id>.

Response
Notify maintenance staff.

SXSM040 sma#: Memory scrub failed
ALERT

Meaning
During the boot phase errors were detected in the memory test.

Response
Notify maintenance staff.

SXSM041 sma#: Power supply <Id> failed
ALERT

Meaning
Power supply module <Id> has failed.

Response
Notify maintenance staff.

SXSM042 sma#: Memory Error Logging limit reached
ALERT

Meaning
The limit for the Memory Error Log was reached because of too many correctable memory errors. No further correctable memory errors are recorded.

Response
Notify maintenance staff.

SXSM043 sma#: Memory Module configuration error; [Module# = <Id>]
ALERT

Meaning
The memory configuration is errored.

Response
Notify maintenance staff.

SXSM044 sma#: Prefailure of Memory Module indicated; Module# = <Id>
ALERT

Meaning
A large number of correctable errors have occurred in memory module <Id>.

Response
Notify maintenance staff.

SXSM045 sma#: PCI parity error at slot <id>
ALERT

Meaning
A parity error has occurred at the slot with the number <id>.

Response
Notify maintenance staff.

SXSM045 sma#: PCI parity error; bus# <a>; device# <b>; function# <c>
ALERT

Meaning
A PCI parity error is indicated by an onboard device. The onboard device is indicated by the bus/device/function <a, b, c> parameters.

Response
Notify maintenance staff.

SXSM046 sma#: PCI system error at slot <id>
ALERT

Meaning
A system error has occurred at slot number <id>.

Response
Notify maintenance staff.

SXSM046 ALERT
`sma#: PCI system error; bus# <a>; device# <b>; function# <c>`

Meaning
A PCI system error is indicated by an onboard device. The onboard device is indicated by the `bus/device/function <a, b, c>` parameters.

Response
Notify maintenance staff.

SXSM047 ALERT
`sma#: PCI Bus correctable error at slot <id>`

Meaning
A correctable PCI bus error has occurred at slot number `<id>`.

Response
Notify maintenance staff.

SXSM047 ALERT
`sma#: PCI Bus correctable error; bus# <a>; device# <b>; function# <c>`

Meaning
A correctable PCI bus error is indicated by an onboard device. The onboard device is indicated by the `bus/device/function <a, b, c>` parameters.

Response
Notify maintenance staff.

SXSM048 ALERT
`sma#: Bus uncorrectable error`

Meaning
An uncorrectable bus error has occurred.

Response
Notify maintenance staff.

SXSM049 sma#: Primergy Product Serial Number not available
ALERT

Meaning
The product serial number of the Primergy is not available. This can be caused by the following:
a) The product serial number is not entered in the Primergy IdProm (e.g. after the ID chip has been replaced).
b) The ID chip is defective.
c) The connection (cable/connector) to the IdProm is defective.

Response
Notify maintenance staff.

SXSM050 smasv: Server Management terminated (unrecoverable error or unsupported HW)
ALERT

Meaning
The Server Management has shut down. This can be caused by the following:
a) An unrecoverable error while the Server Management was running
b) An unrecoverable error while accessing the Primergy hardware/firmware
c) Primergy type not supported

Response
Notify maintenance staff.

SXSM051 sma#: Fan <Id>: Fan is working [again]
WARNING

Meaning
Fan <Id>, which was previously reported to be defective, is operating again.

Response
If error messages frequently occur for the fan in question: Notify maintenance staff.

SXSM052 sma#: CPU <Id> is not present
ALERT

Meaning
CPU <Id> has been removed or has failed.

Response
Notify maintenance staff.

SXSM053 sma#: CPU <Id> prefailure detection event
ALERT

Meaning
A large number of internal recoverable errors have occurred in CPU <Id>. This could result in a CPU failure.

Response
Notify maintenance staff.

SXSM054 ALERT `sma#: CPU <Id> automatically throttled`

Meaning
The CPU performance has been reduced because the CPU temperature was high. This is designed to prevent the CPU from becoming any hotter and entering the critical temperature range.
The increase in the CPU temperature can, for example, be caused by a fan which is no longer fully operational (e.g. if a fan prefailure has occurred).

Response
Notify maintenance staff.

SXSM055 ALERT `sma#: Fan <Id> is not installed`

Meaning
Fan <Id> is not installed or has failed. If the fan concerned is inoperable for more than 3 minutes, the SINIX system is shut down and the server is switched off to prevent the server from becoming too hot.

Response
Notify maintenance staff.

SXSM056 ALERT `sma#: Memory automatically throttled; Module# = <Id>`

Meaning
The memory performance performance has been reduced because the temperature in memory module <Id> was high. This is designed to prevent the memory module from becoming any hotter and entering the critical temperature range.
The increase in the memory temperature can, for example, be caused by a fan which is no longer fully operational (e.g. if a fan prefailure has occurred).

Response
Check the ambient temperature and the fan situation Notify maintenance staff if required.

SXSM057 ALERT `sma#: Memory device critical overtemperature; Module# = <Id>`

Meaning
Excessive temperatures were detected in memory module <Id>.
The increase in the memory temperature can, for example, be caused by a fan which is no longer fully operational (e.g. if a fan prefailure has occurred).

Response
Check the ambient temperature and the fan situation. Notify maintenance staff iff no connection to increased ambient temperatures or fan faults could be determined and this message continues to appear.

```
SXSM058    sma#: Fatal general memory error; Module# = <Id>
ALERT
SXSM059    sma#: Recoverable general memory error; Module# = <Id>
ALERT
SXSM060    sma#: Recoverable ECC memory error; Module# = <Id>
ALERT
SXSM061    sma#: Recoverable CRC memory error; Module# = <Id>
ALERT
SXSM062    sma#: Fatal CRC memory error; Module# = <Id>
ALERT
```

Meaning
An internal error has occurred in memory module <Id>.

Response
Notify maintenance staff iff the message continues to appear.

```
SXSM063    sma#: Recoverable thermal memory event occurred; Module# = <Id>
ALERT
SXSM064    sma#: Fatal thermal memory error; Module# = <Id>
ALERT
```

Meaning
High temperatures were detected in memory module <Id>. The increase in the memory temperature can, for example, be caused by a fan which is no longer fully operational (e.g. if a fan prefailure has occurred).

Response
Check the ambient temperature and the fan situation. Notify maintenance staff iff no connection to increased ambient temperatures or fan faults could be determined and this message continues to appear.

```
SXSM065    sma#: Predictive memory error without spare memory; Module# = <Id>
ALERT
```

Meaning
A large number of internal recoverable errors have occurred in memory module <Id>. This could result in a failure of the memory module.

Response
Notify maintenance staff.

SXSM501 sma#: BIOS Boot Retry Counter countdown occurred – maybe watchdog timeout
ALERT

Meaning
The Boot Retry Counter[1] (BIOS setup, menu item Server) has timed out.

Response
Notify maintenance staff.

SXSM502 sma#: Internal error at communication with autoss
ALERT

Meaning
Internal communication to the autoss process (for shutting down the system) is down. One reason for this could be that autoss has been terminated.

Response
Notify maintenance staff.

SXSM503 sma#: Internal error at communication with <name> driver
ALERT

Meaning
Internal process communication to Server Management driver <name> is down.

Response
Notify maintenance staff.

SXSM509 sma#: Internal error at HW-access
ALERT

Meaning
An error occurred during internal accesses to hardware components containing information for monitoring the server.

Response
Notify maintenance staff.

[1] The Boot Retry Counter defines the maximum number of attempts that may be made to start the SINIX system after an error has occurrred. This relates to errors such as software watchdog timeout or server shutdown owing to the temperature being too high. The automatic SINIX reboot after a system failure with crash dump is not dependent on this mechanism. With each SINIX reboot following such an error the Retry Counter is decremented. If the Retry Counter has reached the value 0, no automatic SINIX reboot takes place when the next fault occurs.

9.2.22 SXSW... (Software Mirror)

SXSW010 SWM(#10): ALERT: <dev> mirror degrade: <part> failed

Meaning
Part of the mirror (<part>, primary or secondary) has failed. As the device <dev> is designed with redundancy, operations can continue. However, the remaining part is no longer failsafe. To restore failsafe performance, the failed part should be repaired.

Response
Notify maintenance staff.

SXSW011 SWM(#11): NOTICE: <dev> mirror synchronized

Meaning
The device <dev> is is mirrored again. Failsafe performance has thus been restored.

9.2.23 SXTF... (Tape File System)

SXTF001 ALERT: dtv_iflush(ino=<num>): i/o error

Meaning
This class of error messages indicates that write operations on the metadata could not be performed. If the problem is temporary, the write operation will be performed later. If the problem remains until the system is shut down, or the system crashes before the problem is rectified, the CentricStor data maintenance system will be inconsistent.

Response
Check that the RAID controller and the Fibre Channel connection are okay. If the problem cannot be rectified, notify maintenance staff.

SXTF003 ERROR: dtv_AddToReplay(): Out of buffer space!

Meaning
The log replay buffer is too small. The consistency of the data maintenance system after a system crash can therefore no longer be guaranteed if the system crashes during a sequence of consistency-critical I/Os.

Response
Operation can be continued. Notify maintenance staff.

SXTF003 ERROR: dtv_RemoveFromReplay(ino=<num>): Entry not found!

Meaning
Internal DTV error. This does not impair operation but does increase the risk (see above).

Response
Notify maintenance staff.

SXTF003 ERROR: dtv_ipalloc: dtv_ipsize too big, set to <val>

Meaning
The value of the Inode pool size that can be configured using `space.c` is invalid and is replaced by the maximum permitted value. The result is that the maximum permitted value is used.

Response
Notify maintenance staff.

SXTF004 WARNING: dtv_balloc(hd): not enough memory!
SXTF004 WARNING: dtv_binit: buffer pool allocation failed!
SXTF004 WARNING: dtv_binit: resource map allocation failed!
SXTF004 WARNING: dtv_irwopen: not enough memory!
SXTF004 WARNING: dtv_rdget() failed: not enough memory!
SXTF004 WARNING: dtv_readdir() failed: not enough memory!
SXTF004 WARNING: dtvinit() failed: not enough memory!
SXTF004 WARNING: dtvopen() failed: not enough memory!"

Meaning
Insufficient memory, serious operational problems with standstill/crash of the DTV system in this processor.

Response
Notify maintenance staff.

SXTF004 WARNING: dtv_binit: illegal value <val> for variable <var>, use default <def>
SXTF004 WARNING: dtv_iocache_alloc: PG_ISVALID: ppte=<ppte>(<*ppte>)
SXTF004 WARNING: dtv_ipalloc: dtv_ipsize too big, set to <max>

Meaning
One or more of the following messages is output if illegal parameters are supplied to DTV on start-up. Although this does not usually impair operation, the system will probably run with settings different from the intended ones.

Response
Notify maintenance staff.

SXTF004 WARNING: dtv_binit: resource map allocation failed!

Meaning
The mapping information for the virtual volume could not be allocated. The host operation will be rejected with “Medium Error”. The error may be of a temporary nature.

It may be that memory size is too small or part of the working memory is defective and is not recognized by BIOS.

Response
Notify maintenance staff.

SXTF004 WARNING: dtv_mount: setopt(CLUSTER_READS) failed!

Meaning
The disk controller intended as the volume cache cannot perform cluster read operations. This error should only occur during test operation if no RAID controller is available. Performance may be reduced.

Response
Notify maintenance staff if message occurs during normal operation.

SXTF004 WARNING: dtv_balloc(buf): i/o cache full!

Meaning
Warning; performance may be impaired. This may be due to an unsuitable system configuration.

Response
Notify maintenance staff.

SXTF004 WARNING: dtv_balloc(buf): not enough memory!

Meaning
An I/O of the DTV could not be executed due to insufficient memory. This is reported to the host as a media error. The error may be of a temporary nature.

Response
Notify maintenance staff.

SXTF004 WARNING: dtv_balloc(buf): i/o cache full!

Meaning
The system identified that the I/O cache was full when attempting to allocate a buffer. The result is that if the limit for dynamically allocatable memory has not yet been reached then the buffer is dynamically allocated. Otherwise the system waits until memory becomes available again.

Response
Notify maintenance staff.

SXTF004 WARNING: dtv_mount(%d,%d): setopt(CLUSTER_READS) failed!

Meaning
The hard disk driver (shd, vdrv, raid, ...) currently in use does not support the specified option (optimization).

```
SXTF005   NOTICE: dtv_iread: root directory stale!
SXTF005   NOTICE: dtv_rdlookup: root directory stale: <name>, ino=<num>
```

Meaning
These error messages indicate that, due to manual intervention, the image of the root directory stored in the working memory is no longer up to date. This does not impair operation but, if it occurs frequently, there will be a loss of performance because the root directory has to be read in again.

```
SXTF005   NOTICE: dtv_iocache_alloc: memory resource limits exceeded
SXTF005   NOTICE: dtv_iocache_alloc: not enough virtual address space
SXTF005   NOTICE: dtv_iocache_alloc: not enough physical memory
```

Meaning
It was not possible to allocate the necessary resources for the DTV I/O cache. As a result, operator message `DTV(# 7)` is output.

Response
Notify maintenance staff.

```
SXTF005   NOTICE: dtv_binit: not enough physical memory
SXTF005   NOTICE: dtv_binit: syssegsz <size>, too small
SXTF005   NOTICE: dtv_binit: <resource> allocation failed
```

Meaning
The DTV file system interface could not be initialized. As a result, operator message `DTV(# 7)` is output.

Response
Notify maintenance staff.

```
SXTF005   NOTICE: dtv_binit: address map allocation for data compression failed
```

Meaning
It was not possible to allocate the necessary resources for DTV data compression. As a result, operator message `DTV(# 5)` is output.

Response
The system is configured incorrectly. Notify maintenance staff.

```
SXTF005   NOTICE: dtv_ta_cleanup(<maj,min>): pending meta data update, aborted!
```

Meaning
The specified file system has been unmounted, even though it was not possible to write all metadata successfully. As a result, operator message `DTV(# 2)` is output.

Response
Notify maintenance staff.

```
SXTF005   NOTICE: dtv_iread(<maj,min>: ino=<ino>): root directory stale!
SXTF005   NOTICE: dtv_rdlookup(<maj,min>: ino=<ino>): root directory stale!
```

Meaning
When reading in a file or searching the root directory on a DTV client system (e.g. ICP), it was determined that the specified file has been deleted or renamed at some point.
As a result, the root directory is reloaded.

```
SXTF005   NOTICE: dtv_irwclose(<maj,min>: ino=<ino>): cannot sync data to disk
SXTF005   NOTICE: dtv_irwclose(<maj,min>: ino=<ino>): cannot sync inode to disk
```

Meaning
The (meta)data of a volume file could not be written to the hard disk when closing the file.
As a result, operator message `DTV(# 6)` is output.

Response
Rewrite the volume.

```
SXTF005   NOTICE: dtv_iflush(<maj,min>: ino=<ino>): i/o error
SXTF005   NOTICE: dtv_rdflush(<maj,min>): i/o error
SXTF005   NOTICE: dtv_sbflush(<maj,min>): i/o error
SXTF005   NOTICE: dtv_bp0flush(<maj,min>): i/o error
SXTF005   NOTICE: dtv_auhflush(<maj,min>): i/o error
```

Meaning
I/O error when writing the following metadata:
`iflush ::` Inode of a file
`rdflush ::` Root directory of the file system
`sbflush ::` Superblock of the file system
`bp0flush ::` Superblock, RootInode, CoreBlockMap of the file system
`auhflush ::` Allocation unit headers (AU BlockMaps) - " -

As a result, operator message `DTV(# 3)` is output.

Response
If these error messages recur, determine the source of the error and correct it. Notify maintenance staff if necessary.

Bulletins are issued during startup of the DTV if the “verbose” mode has been activated.

```
SXTF006   dtv_binit: allocated <n> contiguous memory chunks of size <size>
SXTF006   dtv_binit: *** <n> chunks non contiguous
SXTF006   dtv_binit: iocache=<addr>(<size>MB)
SXTF006   dtv_binit: bhpool=<addr>(<size>KB,<n> free)
```

Meaning
For information purposes only and only if “verbose” = on.

Response
None. If, however, memory problems occur later, notify maintenance staff.

SXTF006 PANIC: dtv_iactive(<maj,min>: <cnt> inode(s) in use

Meaning
The file system has been unmounted even though it was currently in use. This results in a system crash.

Response
Notify maintenance staff if necessary.

SXTF007 ERROR: <func>:\ illegal value <val> for variable <var>, use default <val>

Meaning
The value of a variable configurable using `space.c` is invalid. As a result, the variable is set to the default value.

Response
Notify maintenance staff.

SXTF008 DTV_FSCK(dev=<maj,min>): assertion failed: <which> ...programming error!

Meaning
The implicit file system check carried out when mounting a DTV file system has identified an unexpected status.

Response
Notify maintenance staff if necessary.

SXTF009 ALERT: <fun>: cannot flush meta data to disk!

Meaning
This class of error messages indicates that write operations on the metadata could not be performed. If the problem is temporary, the write operation will be performed later. If the problem remains until the system is shut down, or the system crashes before the problem is rectified, the CentricStor data maintenance system will be inconsistent.

Response
Check that the RAID controller and the Fibre Channel connection are okay. If the problem cannot be rectified, notify maintenance staff.

SXTF010 DTV_FSCK(dev=<maj,min>):
unexpected inconsistency: <which> ...run fsck (-o'full') manually!
ALERT

Meaning
The implicit file system check carried out when mounting a DTV file system has identified an inconsistency. As a result, the file system cannot be mounted.

Response
Notify maintenance staff if necessary.

SXTF011 DTV_FSCK(dev=<maj,min>): <message> ...<message>

Meaning
Normal output of the implicit file system check carried out when mounting a DTV file system.

9.2.24 SXVD... (Distributed Tape Volume Driver)

SXVD001 vdrv<n> (FAILOVER): switch ...
ERROR

See the section “Failure of RAID systems” on page 540 and the section “Failover at the RAID system” on page 541.

SXVD002 vdrv<n> (FAILOVER): Error exit 0130002A E54EC000

See the section “Failure of RAID systems” on page 540.

SXVD003 vdrv<n> (MULTIPATH): switch 0:<n-2>->1:<n-1>
SXVD003 vdrv<n> (MULTIPATH): switch 1:<n-1>->0:<n-2>

Meaning
The path between the PC and the FC switch was switched over to a redundant (fallback) path. This was due to disruption of the connection between the PC and the FC switch caused, for example, by a controller failure (in the PC), GBIC failure, cabling problems, or incorrectly identified topology.

Response
Notify maintenance staff.

SXVD004 vdrv<n> (FAILOVER): int switching

See the section “Failover at the RAID system” on page 541

9.2.25 SXVL... (VLM: Virtual Library Manager)

SXVL001 `VLM(# 1): ALERT: ???: cannot register as supervisor - not mounted ?`

Meaning
The VLM cannot log on as supervisor for a specific cache filesystem. The reason for this is usually that the filesystem specified in the error message is not mounted.
You can use the `mount` command to determine whether the filesystem is mounted. The named filesystem must be present in the output list.

Response
Notify maintenance staff.

SXVL002 `VLM(# 2): NOTICE: move ???: volume not found`

Meaning
The PLM wants to reorganize the specified logical volume. However, the VLM is not aware of this volume. The cause lies in an inconsistency between the VLM and PLM data maintenance systems.

Response
This error is not usually critical. However, you should check whether the volume exists and delete it in the PLM if necessary.

SXVL003 `VLM(# 3): WARNING: no space in cache ???, mount of volume ??? queued`

Meaning
The mount job for a logical volume has been queued because there is no further free space available in the cache filesystem.

This error occurs if the data is not saved to tape quickly enough, e.g. in the case of PLM/PLS/PDS errors or an incorrect configuration (not enough physical drives).

SXVL004 `VLM(# 4): ERROR: volume group for volume ??? not configured: ???`

Meaning
Configuration error: a volume group has been deleted even though a logical volume exists for it.

Response
You must recreate the volume group.

SXVL005 `VLM(# 5): ERROR: volume ???: more than one cache entry, cannot remove ???, aborting`

Meaning
This error occurs after system crashes: there are then two files for one logical volume (following a move to another filesystem) but the VLM is unable to delete the superfluous file.

Response
Notify maintenance staff.

SXVL006 VLM(# 6): ERROR: volume ??? set to 'Faulty' (???)

Meaning
This error can have a number of different causes. It is usually caused by problems accessing the DTV filesystem. Further details can be found in the logging information.

Response
The logical volume can be reset using the XTCC function “Reset Logical Volume”. However, you should first check the cause as it may then be necessary to check the data on the volume.

SXVL007 VLM(# 7): ERROR: Mount: <ldxx> on <icpyy> not reachable: <errormsg> (<errno>)
SXVL007 VLM(# 8): ERROR: Unload: <ldxx> on <icpyy> not reachable: <errormsg> (<errno>)

Meaning
The VLM cannot access the logical drive <ldxx>.

Response
Notify maintenance staff.

SXVL009 VLM(# 9): ALERT: no database file found, aborted, see log for details

Meaning
The VLM has not found a data maintenance file but, instead, a backup data maintenance system. It is possible that the file system containing the data maintenance system is not mounted.

Response
Notify maintenance staff.

SXVL010 VLM(#10): WARNING: too many open files in cache ???, mount of volume ??? queued

Meaning
The mount job for a logical volume has been queued because no more files can be opened in the cache filesystem. This error may occur, for example, if the configuration is incorrect: maximum number of files that can be opened in the TVC is too small.

Response
In unfavorable instances, this behavior may be normal, for example:
– The mount jobs are distributed unequally to the individual caches.
– The reorganization of physical tapes requires too many restore jobs.

SXVL011 VLM(#11): ERROR: Mount: mount server on <icpyy> not reachable: <errmsg> (errno)
SXVL012 VLM(#12): ERROR: Unload: mount server on <icpyy> not reachable: <errmsg> (errno)

Meaning
The VLM cannot access the mount server on the ICP <icpyy>.

Response
Notify maintenance staff.

SXVL013 VLM(#13):ALERT: FATAL: database inconsistencies !

Meaning
Inconsistencies have occurred in the VLM data maintenance system.

Response
Notify maintenance staff!

SXVL014 VLM(#14): FATAL: more files in cache X than allowed: NNN (max. MMM)

Meaning
This message occurs only if the VLM is configured for cache only mode, for example if the system was previously not configured for cache only mode and now the number of logical volumes exceeds the limit which depends on the cache size.

Response
It is not possible to use a system in cache only mode if it was previously configured differently. Notify maintenance staff.

SXVL015 VLM(#15): WARNING: no space in cache ???, reorganisation of volume ??? queued

Meaning
Reorganization for a logical volume has been queued because there is no more free space available in the cache file system.

The error occurs when the data is not saved to tape quickly enough, e.g. in the event of PLM/PLS/PDS errors or incorrect configuration (too few physical drives).

Response
If the error only occurs periodically it can be ignored. In any other case: notify maintenance staff.

SXVL018 VLM(#18): ALERT: wrong DTV version: X.Y.Z (must be at least N.M.O)

Meaning
After an update installation the version of the DTV file system no longer matches the existing software status.

Response
Notify maintenance staff.

SXVL019 VLM(#19): NOTICE: LVG <name>: Accepting single save

Meaning
In the specified LVG, LVs are only saved 1x because the conditions configured for this (e.g. cache utilization level) are satisfied. This can occur when bottlenecks occur on the back end, e.g. library failure, failure of all physical drives or lack of physical volumes.

Response
The bottlenecks mentioned must be cleared.

SXVL020 VLM(#20): ALERT: vtls.conf: SCRATCH_LABEL_<???>: wrong format

Meaning
When the VLM was started errors were found in configuration file vtls.conf. The VLM is terminated.

Response
Notify maintenance staff.

SXVL021 VLM(#21): ALERT: vtls.conf: SCRATCH_BLOCK<???>: wrong format

Meaning
When the VLM was started errors were found in configuration file vtls.conf. The VLM is terminated.

Response
Notify maintenance staff.

SXVL022 VLM(#22): ALERT: wrong DTV version for cache X: maximal LV size should be at least NNN, is only MMM

Meaning
After an update installation the version of the DTV file system no longer corresponds to the existing software status.

Response
Notify maintenance staff.

SXVL023 VLM(#23): ALERT: X: not accessible (<errmsg>), giving up

Meaning
Cache file system X cannot be accessed; the VLM has been terminated.

Response
Hardware faults are possibly the cause. If this is not the case or they cannot be rectified: notify the maintenance staff.

SXVL024 VLM(#24): ALERT: more than NN logical volumes faulty in less than XXs, giving up

Meaning
In a relatively short period more than a particular number of logical volumes has been placed in the “Faulty” status, i.e. is no longer accessible. The VLM has been terminated to prevent further problems.

Response
Hardware faults are possibly the cause. If this is not the case or they cannot be rectified: notify the maintenance staff.

SXVL996 VLM 996 NOTICE "Stop for Maintenance."

Meaning
The VLM was stopped via a menu in the graphical user interface.

SXVL997 VLM 997 NOTICE "Automatically restarted after %d tries."

Meaning
The VLM was automatically restarted after %d attempts.

SXVL998 VLM 998 NOTICE "Automatically restarted."

Meaning
The VLM was automatically restarted.

SXVL999 VLM 999 ALERT "Auto restart %d times failed. Intervention required."

Meaning
The VLM could not be restarted even after %d attempts. Manual intervention is required.

9.2.26 SXVLS... (VT_LS: Virtual Tape and Library System)

SXVLS75 s75vtls: file system <name> is not mounted
ALERT

Meaning
The DTV file system <name> is not mounted.

Response
Notify maintenance staff.

9.2.27 SXVS... (VLS: Virtual Library Server)

SXVS995 VLS(#995): NOTICE "%s started."

Meaning
%s stands for: VLS name (e.g. VA02, VC03, etc.).
The VLS process %s was started via a menu in the graphical interface.

SXVS996 VLS(#996): NOTICE "Stop %s for Maintenance."

Meaning
%s stands for: VLS name (e.g. VA02, VC03, ...).
The VLS process %s was stopped via a menu in the graphical user interface.

SXVS997 VLS(#997): NOTICE "%s automatically restarted %s after %d tries."

Meaning
%s stands for: VLS name (e.g. VA02, VC03, ...).
The VLS process %s was restarted automatically after %d attempts.

SXVS998 VLS(#998): NOTICE "%s automatically restarted."

Meaning
%s stands for: VLS name (e.g. VA02, VC03, ...).
The VLS process %s was automatically restarted.

SXVS999 VLS(#999): ALERT "Auto restart %d times %s failed. Intervention required."

Meaning
%s stands for: VLS name (e.g. VA02, VC03, ...).
The VLS process %s could not be restarted even after %d attempts. Manual intervention is required.

9.2.28 SXVW... (VLPWATCH)

VLP failover messages

SXVW001 VLPWATCH: ALERT: AutoVLP-Failover: switch SVLP_to_VLP successfully completed!

Meaning
The switchover from the SVLP to the VLP has been successfully completed.

SXVW002 VLPWATCH: ALERT: AutoVLP-Failover: SVLP is not alive!

Meaning
The AutoVLP function is active on the VLP. The VLP has detected that there is no sign of life from the required SVLP. The function is activated on the VLP, but without an active SVLP no switchover is possible in the event of a failover. As long as the SVLP is missing, the AutoVLP failover function is ineffective.

Response
You must investigate why the SVLP is not available. The SVLP and the AutoVLP failover function must be activated.

SXVW003 VLPWATCH: NOTICE: VW(#003) AutoVLP-Failover: terminated, VLPwatch is already started!

Meaning
The VLPwatch daemon for the AutoVLP failover function is already activated. The daemon may only be activated once.

SXVW004 VLPWATCH: ERROR: VW(#004) AutoVLP-Failover: missing Licence of AutoVLP (<lizenz>)!

Meaning
The license is not available for the AutoVLP failover function. This is required as of CentricStor V3.0.

Response
Read in the license.

SXVW005 VLPWATCH: NOTICE: VW(#005) AutoVLP-Failover: VLPwatch is already active, process terminated!

Meaning
The AutoVLP failover function has already been started on this ISP.

SXVW006 VLPWATCH: NOTICE: VW(#006) AutoVLP-Failover: VLPwatch started!

Meaning
The AutoVLP failover function has been started. This message is only for logging purposes.

```
SXVW007   VLPWATCH: ALERT: VW(#007) AutoVLP-Failover: Raid1 (cache 100 | 101) not mounted!
SXVW007   VLPWATCH: ALERT: VW(#007) AutoVLP-Failover: connection to LAN and start of vtls
          prevented!
SXVW007   VLPWATCH: ALERT: VW(#007) AutoVLP-Failover: please correct the Raid1-connection
          and reboot the system!
```

Meaning
No connection to RAID1 could be set up. Mounting of the tape file system is forbidden. The LAN interface has been disabled so that no “duplicate address” can be created. This ISP can only be operated via the console.

Response
The RAID problem must be examined and rectified. If it was only necessary to correct connection problems, only a reboot is then required. If maintenance work needs to be performed on the RAID system, the function must be deconfigured explicitly on the VLP and SVLP.

```
SXVW008   VLPWATCH: ALERT: VW(#008) AutoVLP-Failover: internal or external LAN connection
          is down; terminated!
SXVW008   VLPWATCH: ALERT: VW(#008) AutoVLP-Failover: please correct the LAN-connection
          and reboot the system!
```

Meaning
The internal or external LAN connection is defective. The function cannot start its task correctly and is terminated immediately. If the problem is detected on the VLP a “shutdown halt” takes place.

Response
Examine and rectify the LAN problem. A reboot must then be performed.

```
SXVW009   VLPWATCH: NOTICE: VW(#009) AutoVLP-Failover: terminated!
```

Meaning
The AutoVLP failover function has been terminated on this ISP.

```
SXVW010   VLPWATCH: ALERT: VW(#010) AutoVLP-Failover: LAN_0 connection is DOWN; shutdown!
```

Meaning
link_status=down was detected for the LAN interface iee0/bge0. A shutdown with Power OFF was performed for the ISP.

Response
Rectify the LAN connection problems and reboot the ISP.

```
SXVW011   VLPWATCH: ALERT: VW(#011) AutoVLP-Failover: LAN_1 connection is DOWN; shutdown!
```

Meaning
link_status=down was detected for the LAN interface iee1/bge1. A shutdown with Power OFF was performed for the ISP.

Response
Rectify the LAN connection problems and reboot the ISP.

SXVW012 VLPWATCH: ALERT: VW(#012) AutoVLP-Failover: FC connection to RAID is DOWN; shutdown!

Meaning
There is no connection to the 1st RAID system. A shutdown with Power OFF was performed for the ISP.

Response
Rectify the RAID problems and reboot the ISP.

SXVW013 VLPWATCH: ALERT: VW(#013) AutoVLP-Failover: SVLP (<isp_name>) is alive; VLPwatch on <isp_name> not running!

Meaning
The VLP has detected that the SVLP can be reached via the LAN, but the VLPwatch daemon for the AutoVLP failover function is not running on the SVLP.

Response
The function must be stopped manually via the interface (as of V3.0) and then restarted.

SXVW014 VLPWATCH: ALERT: VW(#014) AutoVLP-Failover: VLP (<isp_name>) is alive; VLPwatch on <isp_name> not running!

Meaning
The SVLP has detected that the VLP can be reached via the LAN, but the VLPwatch daemon for the AutoVLP failover function is not running on the VLP.

Response
The function must be stopped manually via the interface (as of V3.0) and then restarted.

SXVW015 VLPWATCH: NOTICE: VW(#015) AutoVLP-Failover: Raid currently not available!")

Meaning
The RAID is not available in the boot phase. Access to RAID is not yet possible. This occurs, for example, when the entire CS system starts up again after a power failure. Access is constantly repeated (timeout=30 minutes!).

Response
Check whether RAID is activated. If the message keeps appearing on the console (>10 MAL), abort the boot and examine why RAID access is not possible.

SXVW016 VLPWATCH: ALERT: VW(#016) AutoVLP-Failover: switch SVLP to VLP failed!

Meaning
The switchover of the SVLP to a VLP was aborted. The requirements were not met!

Response
The function should already have been stopped on the VLP; if it has not been, it must be stopped on the VLP. The additional messages must be taken into account; detailed information is stored in the `log_VLPwatch` and `log_vlpwatch` files in the logging directory `/etc/vtls/log`. The function can then be restarted via the interface.

SXVW016 `VLPWATCH: ALERT: VW(#016) AutoVLP-Failover: switch VVLP to SVLP failed!`

Meaning
The switchover of the VLP to a SVLP was aborted. The requirements were not met!

Response
The function should already have been stopped on the SVLP; if it has not been, it must be stopped on the SVLP. The additional messages must be taken into account; detailed information is stored in the `log_VLPwatch` and `log_vlpwatch` files in the logging directory `/etc/vtls/log`. The function can then be restarted via the interface.

SXVW017 `VLPWATCH: ALERT: VW(#017) AutoVLP-Failover: Failover defect: configurate new - terminated!`

Meaning
The AutoVLP failover function is in an undefined status.

Response
Deconfigure the function, distribute it and then reconfigure it.

SXVW018 `VLPWATCH: ALERT: VW(#018) AutoVLP-Failover: communication sector could not be determined! (fc-card may have changed)!`
SXVW018 `VLPWATCH: ALERT: VW(#018) AutoVLP-Failover: connection to LAN and start of vtls prevented!`
SXVW018 `VLPWATCH: ALERT: VW(#018) AutoVLP-Failover: please reconfigure this function!`

Meaning
The hardware has changed; the assignment of VLP/SVLP is no longer definitely possible.

Response
The function must be deconfigured. This can only take place by performing several manual activities.

SXVW019 `VLPWATCH: ALERT: VW(#019) AutoVLP-Failover: communication sector corrupted!`

Meaning
The communication sector on RAID1 is unusable or has been destroyed. The function can no longer be guaranteed and has been terminated.

Response
The function must be deconfigured. The preceding messages must be taken into account; detailed information is stored in the function log. The communication sector is created again by subsequently reconfiguring the SVLP.

SXVW020 VLPWATCH: ALERT: VW(#020) AutoVLP-Failover: VLPwatch is started first on SVLP

Meaning
The VLPwatch monitoring wizard was started on the SVLP first. This is not permissible. (Can only be done in the case of manual activation.)

Response
Restart the AutoVLP failover function via the interface.

SXVW021 VLPWATCH: ALERT: VW(#021) AutoVLP-Failover: check of /etc/vfstab failed

Meaning
Incorrect configuration of the caches and DB.

Response
Check the configuration of the caches and the DB and correct it for the VLP and SVLP.

SXVW022 VLPWATCH: ALERT: VW(#022) AutoVLP-Failover: Type of /etc/vfstab is SVLP but my type in communication sector is VLP.

Meaning
The ISP is configured as an SVLP but is entered as a VLP in the AutoVLP communication sector.

Response
An additional message is always output with this message. The response specified there must be implemented.

SXVW023 VLPWATCH: ALERT: VW(#023) AutoVLP-Failover: connection to LAN and start of CentricStor prevented!.
SXVW023 VLPWATCH: ALERT: VW(#023) AutoVLP-Failover: please reconfigure this function!.

Meaning
The ISP is placed in Disconnect mode. No connection to: LAN, cache and DB.

Response
The function must be deconfigured manually and disconnect mode must be canceled. Check and correct the configuration of the VLP and SVLP. Depending on the analysis, the ISP must then be rebooted or the vtls started.

SXVW024 VLPWATCH: NOTICE: VW(#024) correct CS Site

Meaning
The master VLP is on the correct CentricStor site.

SXVW025 VLPWATCH: ERROR: VW(#025) no correct CS Site

Meaning
The master VLP is not on the correct CentricStor site

Response
If the VLP and SVLP are running correctly automatic switchover should be initiated manually.

SXVW026 VLPWATCH: ALERT: VW(#026) switch VLP/SVLP to SVLP/VLP timed out – reboot!

Meaning
The switchover from the VLP to the SVLP or from the SVLP to the VLP cannot be completed. The ISP is rebooted.

Response
A reboot is the automatic response.

SXVW027 VLPWATCH: NOTICE: VW(#027) AutoVLP-Failover: other ISP is currently switching – wait maximum %d minutes

Meaning
The automatic switchover is currently running on the other ISP of the type “VLP”.

SXVW028 VLPWATCH: ALERT: VW(#028) AutoVLP-Failover: both communication sectors are empty in bootphase!
SXVW028 VLPWATCH: ALERT: VW(#028) AutoVLP-Failover: connection to LAN and start of CentricStor prevented!
SXVW028 VLPWATCH: ALERT: VW(#028) AutoVLP-Failover: please reconfigure this function!

Meaning
In the boot phase it is ascertained that the AutoVLP failover function is to be activated, but the communication sectors are empty; the function is configured incorrectly. The ISP is placed Disconnect mode. No connection to: LAN, caches and DB.

Response
The function must be deconfigured manually and disconnect mode must be canceled (see Service Manual), and the ISP must then be rebooted.

SXVW029 VLPWATCH: NOTICE: VW(#029) AutoVLP-Failover: wait until other ISP is switching – wait maximum %d minutes

Meaning
Max. %d minutes are waited until the other ISP (SVLP) has taken over the VLP functionality.

SXVW030 VLPWATCH: ALERT: VW(#030) AutoVLP-failover: other ISP does not start switch – continue

Meaning
The VLP is rebooted by “swap master” and waits until the SVLP switches to become the VLP. If this does not happen within 10 minutes the boot procedure is continued and, depending on the current situation, the old VLP switches to become the SVLP or retains its VLP status.

Response
None or repeat “swap master”.

SXVW031 VLPWATCH: ALERT: VW(#031) AutoVLP-failover: internal or external LAN connection is not configured; terminated!
SXVW031 VLPWATCH: ALERT: VW(#031) AutoVLP-failover: please correct the LAN-connection and reboot the system!

Meaning
Less than 2 LAN interfaces are configured, and this means that the internal or external LAN is not configured.

Response
Check the LAN configuration and configure the missing interface.

SXVW032 VLPWATCH: NOTICE: VW(#032) AutoVLP-failover: switch_SVLP_to_VLP!

Meaning
The switchover of “SVLP to VLP” has been started. This message can only occur on the current SVLP.

SXVW033 VLPWATCH: NOTICE: VW(#033) AutoVLP-failover: switch SVLP_to_VLP is running!

Meaning
The switchover of “SVLP to VLP” is running. This is logged every 30 seconds with this message.

SXVW034 VLPWATCH: NOTICE: VW(#034) AutoVLP-failover: switch SVLP_to_VLP end with nothing todo!

Meaning
The switchover of “SVLP to VLP” has been completed and nothing needed to be done; the current ISP is already the VLP. This message can only occur after the AutoVLP failover function has been started for the first time.

SXVW035 VLPWATCH: NOTICE: VW(#035) AutoVLP-failover: %s not configured for mirror!

Meaning
The mirror key exists but the RAID node is not configured for CMF.

SXVW036 VLPWATCH: NOTICE: VW(#036) AutoVLP-Failover: wait max. 420 seconds before a failover after boot, if VLP is not alive

Meaning
The SVLP waits for 7 minutes in its boot phase for a sign of life from the VLP. If there is no sign of life after this period has elapsed the switchover of “SVLP to VLP” is started.

SXVW037 VLPWATCH: NOTICE: VW(#037) AutoVLP-Failover: wait max. 300 seconds before a failover after start, if VLP is not alive

Meaning
The AutoVLP failover function has been started on the SVLP and the latter is not in the boot phase. A sign of life from the VLP is waited for for 5 minutes. If there is no sign of life after this waiting time the switchover of “SVLP to VLP” is started.
This message can only occur on the current SVLP.

SXVW038 VLPWATCH: NOTICE: VW(#038) AutoVLP-Failover: VLP is alive: wait max. 180 seconds before a failover, if VLP is not alive

Meaning
The VLP has already provided a sign of life in the extended monitoring time of 7 or 5 minutes in the boot or start phase; the monitoring time is now reduced to 3 minutes (default).
This message can only occur on the current SVLP.

SXVW039 VLPWATCH: NOTICE: VW(#039) AutoVLP-Failover: reboot to switch!

Meaning
A manual VLP switchover was initiated via “swap master”. The VLP is therefore rebooted.
This message can only occur on the current VLP.

SXVW040 VLPWATCH: NOTICE: VW(#040) AutoVLP-Failover: open error of /etc/vtls/vlpwatch_started (errno=%d); terminated

Meaning
The AutoVLP failover function was started a second time on this ISP. That is not permissible and is prevented!

SXVW041 VLPWATCH: NOTICE: VW(#041) AutoVLP-Failover: lock error of /etc/vtls/vlpwatch_started (errno=%d), terminated

Meaning
The AutoVLP failover function was started a second time on this ISP. That is not permissible and is prevented!

SXVW042 VLPWATCH: NOTICE: VW(#042) AutoVLP-Failover: open error of /etc/vtls/vlpwatch_daemon_started (errno=%d); terminated!

Meaning
The AutoVLP failover function was started a second time on this ISP. That is not permissible and is prevented!

SXVW043 VLPWATCH: NOTICE: VW(#043) AutoVLP-Failover: lock error of /etc/vtls/vlpwatch_daemon_started (errno=%d), terminated!

Meaning
The AutoVLP failover function was started a second time on this ISP. That is not permissible and is prevented!

SXVW044 VLPWATCH: NOTICE: VW(#044) AutoVLP-Failover: VLP is alive!

Meaning
The SVLP logs that the VLP is available.

SXVW045 VLPWATCH: NOTICE: VW(#045) AutoVLP-failover: VLP is not alive (%d Seconds)!

Meaning
The SVLP has not been able to reach the VLP for %d seconds!

SXVW046 VLPWATCH: NOTICE: VW(#046) AutoVLP-failover: SVLP is alive!

Meaning
The VLP logs that the SVLP is available.

SXVW047 VLPWATCH: ALERT: VW(#047) AutoVLP-failover: SVLP is not alive!

Meaning
The VLP logs that the SVLP is not available.

Response
The SVLP and its connections to the VLP must be checked.

SXVW048 VLPWATCH: ALERT: VW(#048) AutoVLP-failover: switch SVLP_to_VLP successfully completed!

Meaning
The switchover of the SVLP to the VLP has been successfully completed. Files have been created for restore purposes. The conditions are check again and normally the function is terminated with message SXVW034.

Response
You must investigate the status of or fault on the failed VLP.

SXVW049 VLPWATCH: ALERT: VW(#049) AutoVLP-failover: switch VLP_to_SVLP successfully completed!

Meaning
The switchover of the VLP to the SVLP has been successfully completed.

SXVW050 VLPWATCH: NOTICE: VW(#050) AutoVLP-failover: reboot after %d minutes if switch VLP_to_SVLP doesn't terminate!

Meaning
If a switchover of “VLP to SVLP” runs for a very long time the system logs when a reboot was executed every 5 minutes.

SXVW051 VLPWATCH: NOTICE: VW(#052) AutoVLP-failover: reboot after %d minutes if switch SVLP_to_VLP doesn't terminate!

Meaning
If a switchover of “SVLP to VLP” runs for a very long time the system logs when a reboot was executed every 5 minutes.

SXVW052 VLPWATCH: NOTICE: VW(#052) AutoVLP-Failover: read error of Licence!

Meaning
An error occurred while checking the license.

Response
Check the license.

SXVW053 VLPWATCH: NOTICE: VW(#053) AutoVLP-Failover: system error of getx2kvp()!

Meaning
An error occurred while checking the license.

Response
Check the license.

SXVW054 VLPWATCH: NOTICE: VW(#054) AutoVLP-Failover: error of %d=getx2kvp()!

Meaning
An error occurred while checking the license.

Response
Check the license.

SXVW055 VLPWATCH: ERROR: VW(#055) AutoVLP-Failover: no reboot to switch!: %s

Meaning
The statement for the explicit switchover was issued on the VLP. The SVLP is not available or the VLPwatch daemon is not running:

%s = SVLP is not alive!
%s = SVLP is not alive (%d Seconds)!
%s = SVLP (%s) is alive; VLPwatch on %s not running!

Response
The SVLP must be checked and the AutoVLP function must be activated!

SXVW056 VLPWATCH: ERROR: VW(#056) AutoVLP-Failover: no reboot to switch: not a VLP!

Meaning
The statement for the explicit switchover was issued on an SVLP. However, it may only be issued on the VLP.

Response
Issue the statement for explicit switchover (“swap master”) on the VLP.

SXVW057 VLPWATCH: ALERT: VW(#057) AutoVLP-Failover: LAN_0 connection is DOWN on SVLP; Failover not functional!

Meaning
The SVLP has no connection to the internal LAN. The AutoVLP failover function is not working.

Response
Investigate and correct the LAN connection problem.

SXVW058 VLPWATCH: ALERT: VW(#058) AutoVLP-Failover: LAN_1 connection is DOWN on SVLP; Failover not functional!

Meaning
The SVLP has no connection to the external LAN. The AutoVLP failover function is not working.

Response
Investigate and correct the LAN connection problem.

SXVW059 VLPWATCH: ALERT: VW(#059) AutoVLP-Failover: FC connection to RA ID is DOWN on SVLP; Failover not functional

Meaning
The SVLP has no connection to the RAID and a switchover is not possible! The AutoVLP failover function is not working.

Response
Investigate and correct the FC connection problem to the RAID.

SXVW060 VLPWATCH: NOTICE: VW(#060) AutoVLP-Failover: LAN_0 connection is UP on SVLP

Meaning
The SVLP has a connection to the internal LAN again. The AutoVLP failover function is once more fully operational.

SXVW061 VLPWATCH: NOTICE: VW(#061) AutoVLP-Failover: LAN_1 connection is UP on SVLP

Meaning
The SVLP has a connection to the external LAN again. The AutoVLP failover function is once more fully operational.

SXVW062 VLPWATCH: NOTICE: VW(#062) AutoVLP-Failover: FC connection to RAID is UP on SVLP

Meaning
The FC connection SVLP/RAID is OK again. The AutoVLP failover function is once more fully operational.

SXVW063 VLPWATCH: ALERT: VW(#063) AutoVLP-Failover: one mirror-side is not accessible and SVLP is not alive; shutdown!

Meaning
A mirror side failed 2 minutes ago and the SVLP has given no sign of life. It is not possible to determine without doubt that the SVLP is running. It is therefore assumed that a split-brain situation exists. The VLP master shuts itself down. This ensures that at most one VLP master is active in the CentricStor system.

Response
Check the status of the ISPs of the type VLP (VLP and SVLP), check the LAN connections, and also the RAID status and the connections. Clear any connection problems step by step and reboot the failed VLP master.

SXVW064 VLPWATCH: NOTICE: VW(#064) AutoVLP-Failover: only one mirror-side is accessible wait maximum %d minutes to see an update of the timestamp of SVLP

Meaning
In the boot phase it is detected that only one mirror side is available. The situation and the time stamp of the SVLP are monitored. If the timeout of up to 5 minutes has elapsed, a required action is initiated and logged accordingly.

Response
Take note of the next error message after the timeout!

SXVW065 VLPWATCH: ALERT: VW(#065) AutoVLP-Failover: only one mirror-side is available and timestamp of SVLP is not updated
SXVW065 VLPWATCH: ALERT: VW(#065) AutoVLP-Failover: connection to LAN and start of CentricStor prevented!

Meaning
In the boot phase the VLP master detects that it can only access one mirror side. The time stamp of the SVLP has not been updated for 5 minutes. It is therefore assumed that a split-brain situation exists: The CentricStor side with the SVLP has failed or is no longer accessible. The VLP master is placed in Disconnect mode.

Response
Check the other CentricStor side to see whether a VLP or SVLP is active. Check the LAN and FC connections of the ISPs of the type VLP, rectify any connection problems and reboot the ISP.

SXVW066 VLPWATCH: ALERT: VW(#066) AutoVLP-Failover: Failover defect: check /etc/vtls/log/.sw-<date>.err! - terminated!

Meaning
The check on the prerequisites for the function produced a negative result. The VLPwatch daemon has been terminated.

Response
The cause must be determined by analyzing the `switch-logdatei` file and corrected.

SXVW067 VLPWATCH: ALERT: VW(#067) AutoVLP-Failover: check of /usr/apc/conf/vtls.conf failed

Meaning
The entry for the SVLP or the entry for the VLM host assignment in the `vtls.conf` file is not correct.

Response
The SVLP definition and the VLM host assignment must be checked and corrected if required.

SXVW068 VLPWATCH: ALERT: VW(#068) AutoVLP-Failover: internal or external LAN connection is not configured!

Meaning
The internal or external LAN connection is broken. The function cannot work properly.

Response
Check the LAN connection and make sure it works correctly.

SXVW069 VLPWATCH: ALERT: VW(#069) -Failover: shutdown, because an error occurred!

Meaning
As a consequence of previous messages the is system shut down (power off).

Response
Reboot the ISP. If the problems that caused the shutdown are still present they must be analyzed and fixed.

SXVW070 VLPWATCH: ALERT: VW(#070) AutoVLP-Failover: communication sector could not be determined!

Meaning
The function's communication sectors have been destroyed.

Response
The function must be deconfigured and, once this has been done, configured again. If problems should occur when the configuration is changed, the function must be stopped and the maintenance staff must delete the communication sectors manually.

SXVW071 VLPWATCH: ALERT: VW(#071) AutoVLP-Failover: LAN0 is down - switch not useful

Meaning
The SVLP_to_VLP switch is necessary, but it is not executed on account of a defective internal LAN connection on the SVLP.

Response
Repair the internal LAN connection on the SVLP, check and activate the failed VLP.

SXVW072 VLPWATCH: ALERT: VW(#072) AutoVLP-Failover: LAN1 is down - switch not useful

Meaning
The SVLP_to_VLP switch is necessary, but it is not executed on account of a defective external LAN connection on the SVLP.

Response
Repair the external LAN connection on the SVLP, check and activate the failed VLP.

SXVW073 VLPWATCH: ALERT: VW(#073) AutoVLP-Failover: VLPwatch on <isp_name> is running, communication to <isp_name> is defective (internal LAN or Broker on <isp_name> down)!

Meaning
VLPwatch on the SVLP is running, but communication to the SVLP via the Broker has been interrupted. The Broker on the SVLP is not running or the internal LAN on the SVLP is interrupted.

Response
Determine the Broker status and the internal LAN status on the SVLP. Rectify the LAN or Broker problems.

SXVW074 VLPWATCH: ALERT: VW(#074) AutoVLP-Failover: Communication to <isp_name> is functional again!

SXVW098 VLPWATCH: WARNING: VW(#098) AutoVLP-Failover: VLPwatch is configured, but not activated!

Meaning
The function is configured and has not yet been activated or has been deactivated manually via the interface or has been deactivated implicitly by `vtcon stop`.

Response
The function must be activated via the GXCC interface (switch ON AutoVLP failover).

SXVW099 VLPWATCH: WARNING: VW(#099) AutoVLP-Failover: VLPwatch is configured, but not activated!

SXVW099 VLPWATCH: WARNING: VW(#099) AutoVLP-Failover: VLPwatch must be deconfigured and configured again!

Meaning
The function is still configured, but the initialization no longer exists. This is a possible consequence of manual interventions or of implicit deactivation via `vtcon stop`.

Response
The function must be deconfigured via the interface (GXCC) with distribution to the entire CentricStor system. If you require the function to be activated again, it must be configured and distributed again.

9.2.29 SXVX... (Veritas File System)

SXVX001 `WARNING: vxfs: vx_idelxwri_done – inode 487921 on /usr had a write error at offset 147456`

Meaning
When trying to write FS meta information (i.e. inodes) to disk, an IO error happened. The file denoted by the inode number will not be updated properly and information is lost.

Response
You may use `find /usr –inum 487921 –print` to find out which file was damaged. The `ls –i` command will report inode numbers also.

SXVX002 `WARNING: vxfs: vx_flushsuper – / file system had an I/O error, setting VX_FULLFSCK`

Meaning
When trying to write FS meta information (i.e. superblock) to disk, an IO error happened. The meta information is inconsistend and must be checked in depth by the `fsck`.

Response
The meta information must be checked in depth by the `fsck`.

9.3 Message complexes

9.3.1 Timeout on the RAID disk array

```
SXSB007     fcpal0 (sadm12): timeout on target <t> lun <l> CDB ....F C0 00 01 80 00
ALERT

            0007b790: fc_send_fcp: FCP_ABORT...
            0007b790: response: error = 0x03, vendor = 0x16, expl = 0x00, reason = 0x00,
            action 0x00
            0007b790: freeing FC_E_ABORT_REQUESTED

SXSD013     shd<k>t<ctl>: TIMEOUT @ nnnnnnn
            shd<k>t<ctl>: REZEROING
            shd<k>t<ctl>: rezero status = 2
```

Meaning
The message complex indicates a “normal” timeout on the RAID disk array, recovery normally repeats the command with success.

Response
If the error messages occur sporadically, save the error messages. Otherwise they do not indicate any significant operating problems. Notify maintenance staff.

9.3.2 Timeout on the MTC drives

```
SXSB007     adsl1 (sadm<n>): timeout on target <t> lun <l> CDB ....
ALERT
```

or

```
SXSB007     adsl2 (sadm<n+1>): timeout on target <t> lun <l> CDB ....
ALERT
```

followed by

```
WARNING: (adsl,3rd) Adaptec AIC-7870 PCI SCSI HBA: CH0 TARGET<t> LUN<l> is being
reset
Ph_NonInit: calling Ph_AbortDev
Ph_AbortDev: scanning for target <t>
Ph_AbortDev: calling Ph_ScbAbort
adsl2: Ph_ScbAbort scb_ptr->SP_MgrStat 00000040
OptimaAbort
found
abort active
ready to send
done
AbortOptima -> 00000001
complete: 00000000 00000004
```

```
SXSE006     mbk<n>t<t>: cmd 1B failed; status -2
ALERT
```

or other messages with a negative MTC status such as

```
SXSE006     mbk<n>t<t>: cmd 1B failed; status -<x>
ALERT
```

Meaning
This message sequence indicates a timeout at the MTC drives.

Response
Notify maintenance staff.

9.3.3 Failure of RAID systems

```
SXVD001    vdrv<n> (FAILOVER): switch 0:40->1:41
SXVD001    vdrv<n> (FAILOVER): switch 1:41->0:40
SXVD002    vdrv<n> (FAILOVER): Error exit 0130002A E54EC000
```

Meaning
Both RAID controllers have failed. A failover (1st line) and switchback (2nd line) have been performed but both without success; the RAID disk array with the next highest minor number can no longer be accessed.

Example for vdrv3

The error message is:

```
vdrv3 (FAILOVER): Error exit 0130002A E54EC000
```

The directory of the vdrives has the following contents:

```
$ ls -l /dev/vdrv
total 0
brw-------   1 root     other     76, 13 May 15 15:44 raid1.st1.fo.b
crw-------   1 root     other     76, 13 May 15 15:44 raid1.st1.fo.c
brw-------   1 root     other     76, 26 May 15 15:44 raid1.st2.fo.b
crw-------   1 root     other     76, 26 May 15 15:44 raid1.st2.fo.c
brw-------   1 root     other     76, 39 May 15 15:47 raid2.st1.fo.b
crw-------   1 root     other     76, 39 May 15 15:47 raid2.st1.fo.c
```

The minor numbers here are 13, 26 and 39. The error was reported by vdrv3.

The next highest device is always decisive. Therefore the RAID disk array involved is raid1.st1.fo.c (minor number 13), i.e. the first RAID disk array.

Only an error which occurs exactly on a minor number (i.e. here on vdrv13) is forwarded. If required, errors on other subordinate devices will be corrected elsewhere by means of configuring or restarting the IO.

Response
Notify maintenance staff.

9.3.4 Failover at the RAID system

```
SXSD018    shd<k>t<ctl>: Target vanished
```

or

```
SXSD015    shd<k>t<ctl>:  cmd "Write or Read" @ blk <number> key "Not Ready" (0x02) asc
           "Drive Not Ready" (0x04) ascq 0x02
WARNING
```

followed by

```
SXVD004    vdrv<n> (FAILOVER): int switching
SXVD001    vdrv<n> (FAILOVER): switch 0:4->1:5
```

but not followed directly by another “switch” message.

Meaning
Normal failover. If one of the two RAID controllers (each CX500/CX3-20 has 2 of them) or the corresponding cable fails then this message sequence is displayed.The RAID disk array involved is the disk array with the next highest minor number:

Example (vdrv6)

```
$ ls -l /dev/vdrv
total 0
brw-------   1 root     other     76, 13 May 15 15:44 raid100.b
crw-------   1 root     other     76, 13 May 15 15:44 raid100.c
brw-------   1 root     other     76, 26 May 15 15:44 raid101.b
crw-------   1 root     other     76, 26 May 15 15:44 raid101.c
brw-------   1 root     other     76, 39 May 15 15:47 raid102.b
crw-------   1 root     other     76, 39 May 15 15:47 raid102.c
```

The minor numbers here are 13, 26 and 39. The error was reported by vdrv6. Therefore the RAID disk array involved is raid100.c (minor number 13), i.e. the first RAID disk array. (Compare 6 of the vdrv with the minor numbers)

Response
Notify maintenance staff.

9.3.5 Bus Reset for SCSI Controller

```
SXCM001    chim1 (sadm9): SCSI-Bus reset
None
SXSB001    chim1 (sadm9): SCSI-Bus reset
None
SXSB005    chim1 (sadm9): RESETTING CONTROLLER
None
```

Meaning
A bus reset was triggered for SCSI controller 9 (in this example, chim/Adaptec controller 1).

10 Waste disposal and recycling

CentricStor is a product with a long life. The decisive factors here are not just the expansion options but also the quality.

However development is ongoing. Amounts of data which can hardly be foreseen today will have to be processed in the future. The demands on storage space, speed and design of computers are increasing. The time will arrive at which the hardware components of the CentricStor will be replaced by successor modules and the old devices will have to be disposed of. Here too our company provides support.

At Fujitsu Siemens Computers GmbH recycling of old computer equipment has already become a tradition: For more than ten years worn-out computers have been taken back and recycled.

Even during construction great importance is attached to reuse of components and recyclability of materials. For example, all larger parts made of plastic are clearly identified as to their material components to make subsequent recycling easier.

The hardware components of the CentricStor too have been largely made from materials which can be disposed of in an environmentally-friendly manner and sent for appropriate recycling.

Fujitsu Siemens Computers GmbH will take back worn-out computers at your request.

If you have questions about waste disposal, please contact your local branch, our Service facility or get in touch directly:

Siemens AG
SPLS LCA
Werner-von-Siemens-Straße 6
D-86159 Augsburg

Tel.: (0821) 599-2424
Fax: (0821) 599-3298

11 Contacting the Help Desk

The telephone numbers for the Fujitsu Siemens Computers Help Desk can be found at the following URL:

http://www.fujitsu-siemens.com/helpdesk

When you call, please have the serial number of your device available.

12 Appendix

12.1 Integration of CentricStor V3.1 in SNMP

This document describes how CentricStor can be monitored using SNMP. What does the system administrator need to configure on the CentricStor side for this purpose, and what can be monitored?

An installation package is available from FSC specifically for the SNMP Management Station CA Unicenter. The customer is provided with comprehensive support for installation on CA Unicenter (NMS Version 3.0) under Microsoft Windows through installation scripts. This is described in the sections “Installation on the Management Station CA Unicenter” on page 552 and “Working with CA Unicenter and CentricStor” on page 554.

12.1.1 Structure

The section “Activating SNMP on CentricStor” on page 548 first of all describes the configuration steps on CentricStor. The section “Monitoring CentricStor” on page 549 shows the options for monitoring CentricStor and describes the key data for SNMP. The sections “Installation on the Management Station CA Unicenter” on page 552 and “Working with CA Unicenter and CentricStor” on page 554 deal with the SNMP Management Station CA Unicenter, describing installation on CA Unicenter NMS and how to work with this.

12.1.2 Activating SNMP on CentricStor

12.1.2.1 Configuring SNMP under CentricStor

The CentricStor system's VLP establishes the connection to the outside world. Consequently SNMP only needs to be configured on this processor. If a standby VLP exists (VLP1), SNMP configuration must also be performed on this processor.

To configure SNMP the system administrator logs on to the VLP under "root" and calls `sysadm`. The SNMP configuration menu is opened under sinix_2000 -> snmp. After SINIX-2000 has been installed the SNMP agent does run, but no replies from any Management Stations are responded to (owing to the preset value `public 0.0.0.0 NONE`). For configuration you must select the menu item `config`. Under `location` you enter the contact address for any problems, with the name and telephone number and the location of the system.

The community name of the SNMP network and the IP address of the SNMP Management Station are stored under `communities` and `add`. The only privilege required is READ. The default Management Station with the `public 0.0.0.0 NONE` data should be deleted using the `delete` function. If the entry is not deleted, a relic without any meaning remains. Failing to delete the entry has no effect on the performance or functionality.

The next function you must call is `traps`, and under this `add`. Once again you must enter the Management Station's community name and IP address. The number of SNMP Management Stations is not restricted.

12.1.2.2 Activating the configuration

If you do nothing more, the changes made will only become fully effective when the VLP is rebooted again. However, you can activate these immediately by calling the `update` item. The changes then take effect immediately.

12.1.2.3 Changes in central files

This item is no longer relevant. As of CentricStor V3.0 no central system files such as `/etc/hosts`, `/etc/default/inet` or `/.rhosts` are modified for SNMP operation. The changes made in the `/etc/hosts` file are undone automatically when the system is started up.

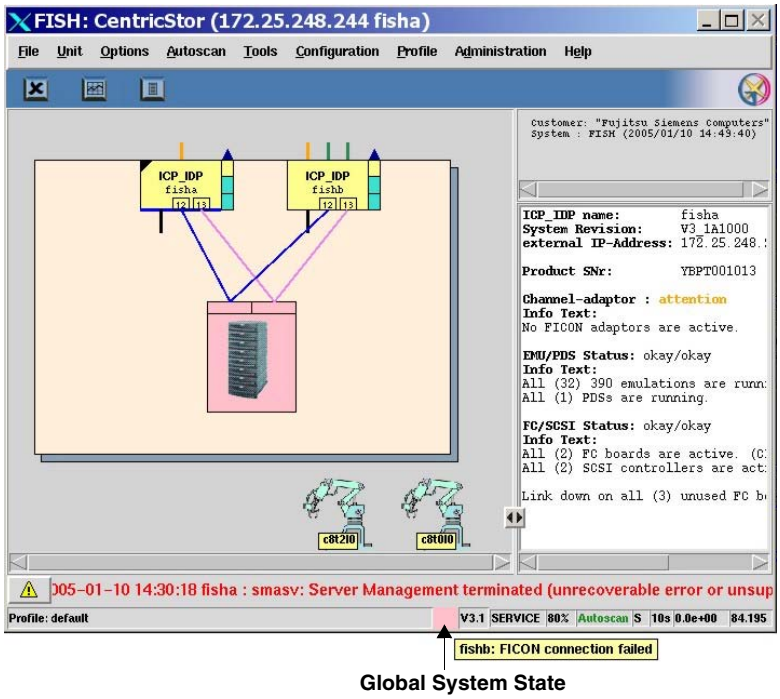
12.1.3 Monitoring CentricStor

12.1.3.1 GXCC as a monitoring tool without SNMP

This item is totally independent of SNMP and indicates that GXCC is fundamentally an effective monitoring tool.

GXCC and XTCC together with Tcl/Tk must be installed from the GUI CD supplied with CentricStor. If Tcl/Tk is already installed and is not to be overwritten, Tcl/Tk is installed in an arbitrary directory. On Windows systems, Tcl/Tk is a part of GXCC. It is not necessary to reboot after installation. A README file is provided on the CS-GUI CD for this purpose.

GXCC enables CentricStor to be monitored and controlled fully without SNMP.
All that is required for this is a Windows, LINUX, Solaris or SINIX-Z system. For details, refer to the README file on the CentricStor GUI CD.



Global System State

GXCC shows the “Global System State”. This is a concentrator for the CentricStor state, which is obtained from many individual states of different things.

With it a simple statement can be provided on the operating condition of CentricStor:

turquoise: CentricStor is working (OK)
yellow: CentricStor is working with restrictions (degraded, attention)
pink: CentricStor is in fail state

The “Global System State” is shown by a colored square in the bottom line of the GXCC. If the mouse is positioned on this square, more details of the current state are shown in the form of a Balloon Help.

12.1.3.2 Monitoring using any SNMP Management Station

The functional integrity of the carrier system on CentricStor and its LAN card can be monitored by means of `ping` and/or MIB-II. Configuration options are provided in the SNMP management software for checking the functional integrity cyclically. However, this only enables you to see that the carrier system is still running. It does not allow you to check whether the CentricStor firmware is still operating properly.

Consequently CentricStor sends traps to the Management Stations. In addition to the standard traps (linkUp, linkDown, coldStart, etc.), CentricStor sends important error events concerning the software or the hardware to the Management Station as a trap.

- Important key data of a CentricStor’s MIB-II:

  Sysobjectid: enterprises.231.1.19.1

- Important key data of the standard traps:

  Sysobjectid: enterprises.231.1.19.1

- Important key data ofImportant key data of CentricStor-specific traps:

  ObjectID: enterprises.231.2.48.2.2
  Specific Trap #: 0
  Var. Binding 1: enterprises.231.2.48.2.1.2: CS-MsgManager
  (instance on CentricStor which sends the trap)
  Var. Binding 2: enterprises.231.2.48.2.1.3: Device on which the error occurred
  Var. Binding 3: enterprises.231.2.48.2.1.4: Weight of the message
  Var. Binding 4: enterprises.231.2.48.2.1.5: Actual message text

  The weights 5=ERROR, 6=CRITICAL, 7=ALERT and 8=EMERGENCY are reported as traps. Currently no traps are generated for the other weights 1=INFO, 2=DEBUG, 3=NOTICE and 4=WARNING.

- Storing the MIB for the CentricStor trap:

  The MIB of the CentricStor trap is stored in the ASN-1 code in the directory `/usr/apc/lib/mib` with the file name `centricstor.mib` and the MIB for the SysObjID in the file `sni.mib` in each CentricStor system and can be obtained with ftp when necessary

12.1.3.3 CentricStor Global System State

Every 300 seconds the Global System State (see the section “GXCC as a monitoring tool without SNMP” on page 549) of CentricStor is sent via a trap. It is not meaningful to write this trap onto the SNMP Management Station. This trap is designed to control the color of the ICON. The format of this trap is identical to the CentricStor Trap.

The various bindings are set as follows:

ObjectID:	enterprises.231.2.48.2.0
Specific Trap #:	0
Var. Binding 1:	enterprises.231.2.48.2.1.2: CS-SNMP_Mgr (the CentricStor tool which sends the trap)
Var. Binding 2:	enterprises.231.2.48.2.1.3: device on which the state of CentricStor was built.
Var. Binding 3:	enterprises.231.2.48.2.1.4: weight of the Global State Trap
Var. Binding 4:	enterprises.231.2.48.2.1.5: Text: “Global System State”

The following weights are sent:

1: green	CentricStor is ready
4: yellow	A part of CentricStor is defective, but CentricStor can go on working with restrictions.
7: red	CentricStor cannot work correctly.

A MIB call for returning the CentricStor Global System State is not possible.

12.1.3.4 GXCC on the SNMP Management Station

If permitted by the SNMP Management Station, the GXCC can be activated by means of application launching either with a mouse click or using a start button in order to obtain further information.

12.1.3.5 Sending a trap to the Management Station

To test the connection, a test trap can be sent after the SNMP trap has been activated on CentricStor (see the section “Activating the configuration” on page 548) and the MIB has been made known on the SNMP Management Station. A menu item is provided for this under sysadm -> sinix_2000 -> snmp -> config -> traps -> send. The following data should be output on the Management Station:

Var. Binding 1: enterprises.231.2.48.2.1.2: CS-MsgManager
Var. Binding 2: enterprises.231.2.48.2.1.3: VLP0
Var. Binding 3: enterprises.231.2.48.2.1.4: 6 (=weight)
Var. Binding 4: enterprises.231.2.48.2.1.5: Test message

12.1.3.6 Monitoring of CentricStor V2/V3.0 and V3.1

If an SNMP Management Station is required to monitor a CentricStor V3.1 and a CentricStor V2/V3.0 simultaneously, the following applies:

On the Management Station the GUI CD of CentricStor V3.1 is read in as described here. The V3.1 systems can be monitored as described. As the V2/V3.0 systems have different object IDs (this includes the sysobjectID, too) and the format of the traps is changed, the appearance differs between CentricStor V3.1 and older systems, but monitoring of both systems is possible. You are referred here to the documentation for V2/V3.0. However, the global state concentrator is not available in V2/V3.0. GXCC is always called with the popup menu which serves and monitors CentricStor V2/V3.0, too. Only new V3.1 options of GXCC lead to an error message.

CentricStor V2/V3.0 and V3.1 can thus be monitored by the same Management Station with minor restrictions for GXCC handling of CentricStor V2/V3.0. If you do not want this, GXTCC (for CentricStor V2/V3.0) can be installed parallel to GXCC (for CentricStor V3.1) and can be called manually.

12.1.4 Installation on the Management Station CA Unicenter

A system on which the CA Unicenter and GXCC run is required as the base system. A Windows-2000 system has been tested and is recommended.

12.1.4.1 Reading in the GUI CD

First GXCC and XTCC together withTcl/Tk must be installed from the GUI CD (as described in the section “GXCC as a monitoring tool without SNMP” on page 549).

After this you should attempt to call GXCC and to set up a connection to a CentricStor. If this works, then the GXCC has been correctly installed and the LAN connection to the CentricStor is working.

12.1.4.2 Installation of the CA Unicenter extensions for CentricStor

Tools for adding and deleting CA Unicenter extensions were stored under Start -> Programs -> Fujitsu Siemens Computers -> Tape Control Center -> Setup through the installation of the GUI CD 2. The tool *Add CentricStor to CA Unicenter* must be called to install the extensions. This tool stores all associated files which are needed for CA Unicenter operation in the associated directories. Because of repository access for database administration, CA Unicenter requires a user ID with a password which is inquired in a dialog box.

At the end of the installation script the following question is asked:

```
Do you want to "ResetDSM" ? yes, no or cancel
```

If `no` or `cancel` is specified (the two responses are equivalent), no ResetDSM is performed, and therefore no reconfiguration of the CA Unicenter agent technology. The ResetDSM command must then be issued later.

If `yes` is specified, ResetDSM is called immediately and the DSM is thus reconfigured. The agent technology services are stopped for this purpose and started automatically again. The new object class *fscCentricStor* now exists in the "WorldView - Repository". It is now known in the CA Unicenter and can be used.

All the add-ons can be deinstalled with the function "Delete CentricStor from CA Unicenter".

12.1.4.3 Identification and editing of the CentricStor traps

After CA Unicenter add-ons have been installed for CentricStor, on receipt of CentricStor traps messages are written which are formatted on the Event Console. The Global System State trap leads to the icon being colored (green, yellow or red). Installation of a part of the BS2000 integration package SMBS2-WIN (as with CentricStor V2/V3.0) is no longer necessary.

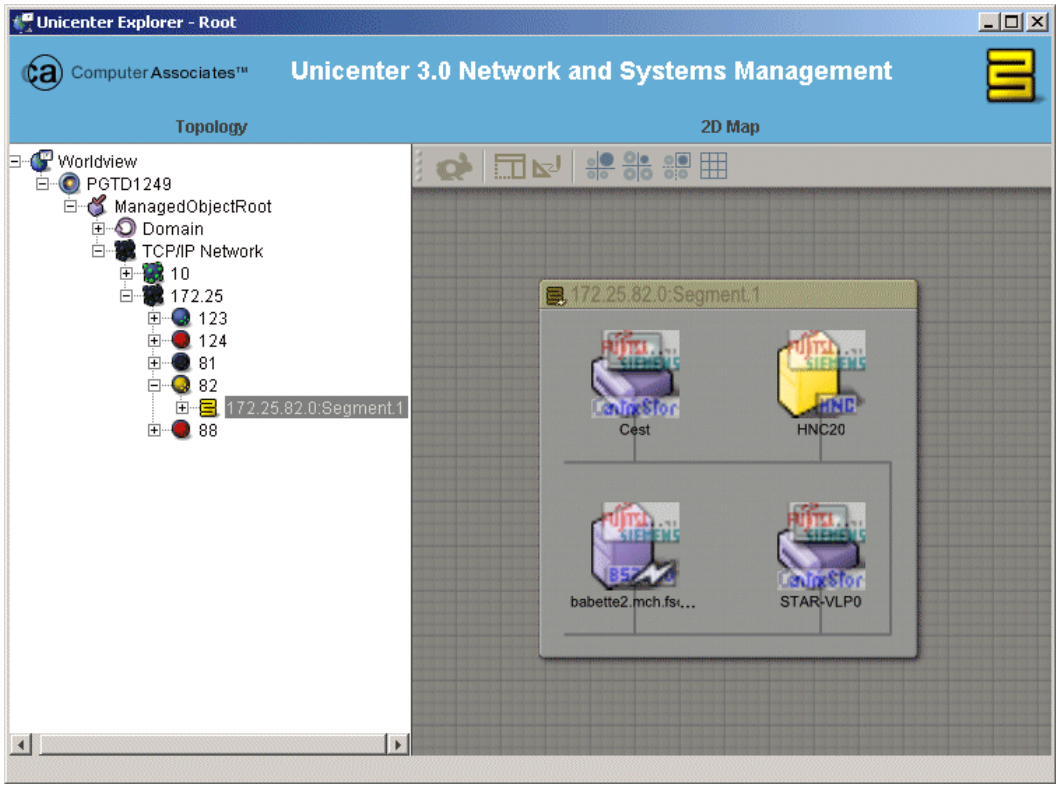
12.1.5 Working with CA Unicenter and CentricStor

12.1.5.1 CentricStor icon under CA Unicenter

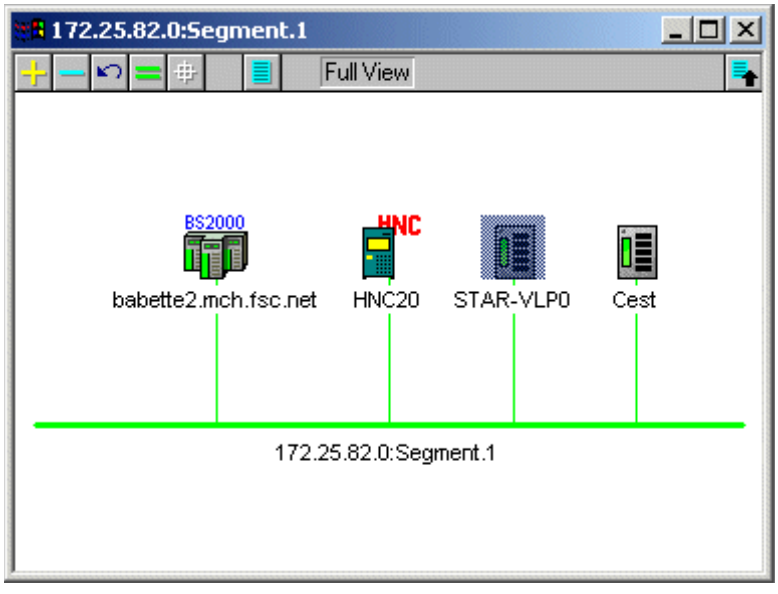
The following icon was selected for CentricStor in 3-D format:

It contains the texts Fujitsu Siemens and CentricStor.

In the WorldView tree you see the CentricStor systems Cest and STAR-VLP0 in the figure below:



In 2D format CentricStor is represented as follows:



The Global System State trap is automatically set to green, yellow or red.

12.1.5.2 Identifying a CentricStor and assigning the icon

After the add-ons have been activated with *Add CentricStor to CA Unicenter*, a CentricStor System is automatically recognized in the Unicenter-Discovery and is assigned to the *fscCentricStor* class with the appropriate icon. To do this, Unicenter must work with the appropriate community and thus be able to read the system's SysObjID. The network manager can now invoke GXCC directly from the popup menu of the newly added CentricStor object.

Tip for the community string

For safety reasons CentricStor cannot work with the *public* community, which is the default for CA Unicenter.

12.1.5.3 Receipt and preparation of a CentricStor trap

On receipt of CentricStor traps, messages are output on the Event Console. The standard traps (e.g. coldStart) are issued without special preparation and appear on the Event Console with the lead text `%CATD_I_060, SNMPTRAP:`.

Example

```
%CATD_I_060, SNMPTRAP:-c public 231 <ip-addr> <name of CentricStor>
<standard trap typ> <specific trap type>
```

`0 0` shows a coldStart
`2 0` shows linkDown with the additional binding interface etc.

A text message is shown for the enterprise-specific trap of a CentricStor.

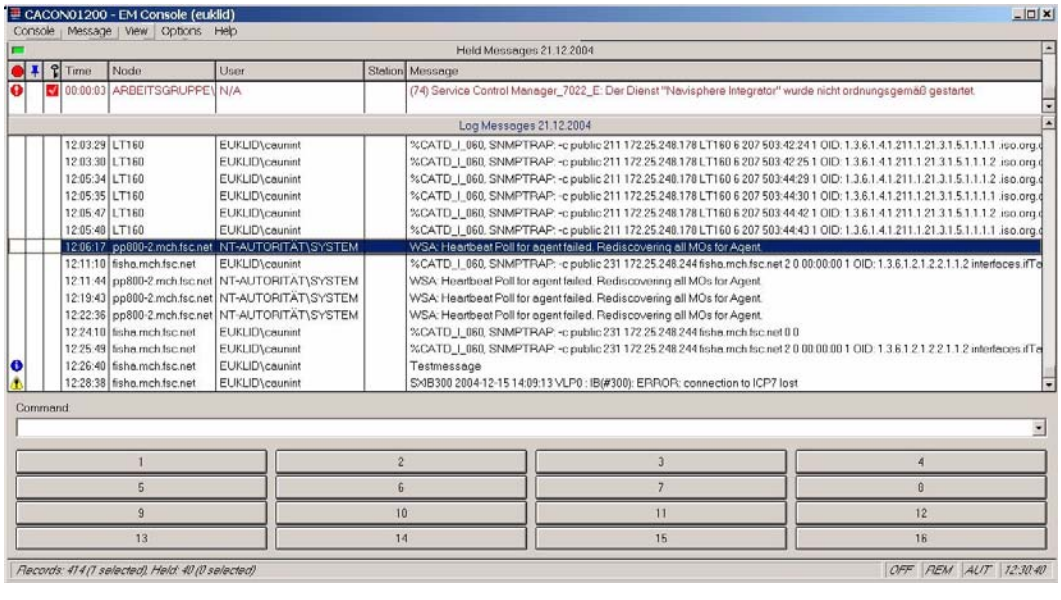
Example of an error message text of a CentricStor component

```
SXIB300 2004-12-15 14:09:13 VLP0: IB(#300): ERROR: connection to ICP7 lost
```

After a CentricStor system has been entered in a CA Unicenter, you can send a test trap to test the connection. The menu item sysadm -> sinix_2000 -> snmp -> config -> traps -> send is available on the VLP for this purpose. The output on the Management Station is:

```
<name of CentricStor> Testmessage
```

The following figure shows the standard trap coldStart (0 0), then the standard trap `linkDown (2 0)`, then the CentricStor test trap, and finally the CentricStor trap with the key `SXB300 ... (14:09:13)`:



12.1.5.4 Monitoring CentricStor using ping and MIB-II

All objects entered in CA Unicenter are automatically moitored by means of `ping` and MIB-II. This requires that the agent “Mib2” works with the right community. The administrator must make any necessary adjustments in the Pollset Browser of CA Unicenter.

12.1.5.5 Calling the GXCC from the pop-up menu of CA Unicenter

Clicking on the CentricStor icon with the right mouse button causes a pop-up menu to open. The item at the bottom contains GXCC, which can then be opened directly.

12.1.6 Monitoring of CentricStor V2/V3.0 and V3.1 with CA Unicenter

If an SNMP Management Station is required to monitor a CentricStor V3.1 and a CentricStor V2/V3.0 simultaneously, the following applies:

On the Management Station the GUI CD of CentricStor V3.1 is read in and the CA Unicenter add-ons are installed as described. The V3.1 systems can be monitored as described. The V2/V3.0 systems are initially recognized as SiemensUX systems and can then be assigned to the class *fscCentricStor* as described in the documentation for CentricStor V2/V3.0.

The traps of CentricStor V2/V3.0 are still recognized and prepared by the installed BS2000 part as described in the documentation for CentricStor V2/V3.0. However, GXCC is now always called with the popup menu which serves and monitors CentricStor V2/V3.0, too. Only new V3.1 options of GXCC lead to an error message.

CentricStor V2/V3.0 and V3.1 can thus be monitored by the same Management Station with minor restrictions for GXCC handling of CentricStor V2/V3.0. If you do not want this, GXTCC (for CentricStor V2/V3.0) can be installed parallel to GXCC (for CentricStor V3.1) and can be called manually.

12.1.7 Summary

After the activities described above have been performed, a CentricStor system can be integrated in any SNMP environment, CA Unicenter being supported in particular by installation scripts and the editing of traps.

12.2 E-mail support in CentricStor

12.2.1 Sendmail configuration

sendmail is started only if the configuration file `/etc/mail/sendmail.cf` exists. This file is not generated, but under certain conditions it is modified to correct errors.

During installation a sample file is created under `/etc/mail/sendmail.cf.sample` which can be used as `/etc/mail/sendmail.cf`. This file may need to be adapted.

In CentricStor systems *sendmail* cannot automatically determine the external name and the customer domain. As a result, the file `/etc/mail/sendmail.cf` must be adjusted manually as follows:

1. After the section

   ```
   # my official domain name
   #  ... define this only if sendmail ...
   #Dj$w.Foo.COM
   ```

   you must enter the following lines:

   ```
   Dw<node-name>
   Dm<name-of-the-customer-domain>
   Dj$w.$m
   ```

2. If the mail host (smarterhost) is not `mail.<name-of-the-customer-domain>`, the entry `DSmail.$m` must be altered accordingly.

12.2.2 Setting up the DNS domain service

If the host is not or not fully configured as a DNS client, the following message is issued at startup during installation:

```
WARNING: local host name (....) is not qualified; ...
```

To ensure complete *sendmail* functionality, the host must be configrued as a DNS client as follows:

– The file `/etc/resolv.conf` must contain the following entries (the separator is the tabulator!):

  ```
  domain      <name-of-the-customer-domain>
  nameserver  <ip-address-nameserver1>
  nameserver  <ip-address-nameserver2>
  ```

  The `nameserver` must be entered with the IP address.

– In the file `/etc/netconfig`, the entries which have "`inet`" in the 4th column must be complemented by the entry "`,/usr/lib/resolv.so`" in the last (7th) column.

Example

Thus (the separator is the tabulator!)

```
tcp tpi_cots_ord v inet tcp /dev/tcp /usr/lib/tcpip.so
udp tpi_clts vb inet udp /dev/udp /usr/lib/tcpip.so
rawip tpi_raw - inet - /dev/rawip /usr/lib/tcpip.so
icmp tpi_raw - inet icmp /dev/icmp /usr/lib/tcpip.so
```

becomes:

```
tcp tpi_cots_ord v inet tcp /dev/tcp
/usr/lib/tcpip.so,/usr/lib/resolv.so
udp tpi_clts vb inet udp /dev/udp
/usr/lib/tcpip.so,/usr/lib/resolv.so
rawip tpi_raw - inet - /dev/rawip
/usr/lib/tcpip.so,/usr/lib/resolv.so
icmp tpi_raw - inet icmp /dev/icmp
/usr/lib/tcpip.so,/usr/lib/resolv.so
```

– A DNS entry must exist in the customer domain with the host name which returns "`uname -n`". In CentricStor "`uname -n`" does not return the name which the host has in the customer domain but the internal name (e.g. `VLP0`).

In the following tests the name of the host in the customer domain must be used:

– *nslookup* for the fully qualified host/domain name must return the correct IP address.

– *nslookup* for the simple host name (from "`uname -n`") must return the correct IP address. In CentricStor the name of the host in the customer domain must be used.

– *nslookup* for the IP address must return the fully qualified host/domain name.

– *ping* for the fully qualified host/domain name must supply "`... is alive`".

If the customer is still using NIS, the general technical conditions must be clarified with the network management before a congiruation change is made in the file `/etc/mail/service.switch`.

12.2.3 Configuring the e-mail template

The configurable data of the e-mail can be set in e-mail-format-specific configuration files. The configuration file must be created by copying a sample file and then be adapted to the conditions.

If a customer-specific configuration file exists for an e-mail format, an e-mail is created and sent in accordance with the configuration file.

The following entries can be configured in each e-mail-format-specific configuration file:

– Recipient
– Selection criterion

Recipients

Up to 8 recipients can be entered.

Example

```
# list with the recipients of the error information mail
#
RECEIVER1=""
RECEIVER2=""
RECEIVER3=""
RECEIVER4=""
RECEIVER5=""
RECEIVER6=""
RECEIVER7=""
RECEIVER8=""
```

Selection criterion

The Message Management defines which error messages can be sent by e-mail. In the configuration file it is only possible to reduce this set. The criterion used for this purpose is the error weight of a message (see section “General” on page 441).

Example

```
# define error levels to be reported by email
# values: yes/no
#
MAIL_NOTICE="no"
MAIL_WARNING="no"
MAIL_ERROR="no"
MAIL_CRITICAL="yes"
MAIL_ALERT="yes"
MAIL_EMERGENCY="yes"
```

The normal procedure is for an e-mail to be sent starting with the error weight ERROR. In the case of the error weights NOTICE and WARNING, only very few, specially selected messages are offered for e-mail dispatch, for example SXPL027 (page 476), SXPL049 (page 479) and SXPL050 (page 479).

12.2.4 Description of the e-mail formats

The sample file has the name:

```
/usr/apc/bin/msg_mail.config.sample
```

The e-mail-format-specific configuration file must be stored under the following name:

```
/usr/apc/conf/msg_mail.conf
```

The content of the e-mail can be defined using the configuration variables shown below:

- System details

```
Device_name=""
Serial_Number=""
```

- Customer details:

```
Customer_number=""
Customer_name=""
Customer_phone=""
Customer_email=""
Freely usable text area:
Remark1=""
Remark2=""
Remark3=""
Remark4=""
Remark5=""
Remark6=""
```

Undefined entries (=""") are masked out in the e-mail.

The subject of the mail is made up of error-related entries:

```
Message from $Device_name $Serial_Number $ErrorWeight $MSG_NUMBER
```

In addition to the information shown above, the e-mail contains the error message and details of the kernel version installed.

12.3 Transferring volumes

12.3.1 Introduction

A transfer enables LVs to be exported from a CentricStor system and imported into another CentricStor.

For the export these LVs are temporarily copied into the special LV group TR-LVG using “plmcmd trans …” commands and saved on PVs of the special PV group TR-PVG.

These PVs can then be removed and transported to another CentricStor.

For importing these PVs can be included in the TR-PVG and the LVs contained there can be read into CentricStor using “plmcmd trans …” commands.

For this purpose one LVG group and one PVG group, named TR-LVG and TR-PVG respectively, are available in CentricStor which are statically linked. The connection cannot be canceled. The TR-PVG cannot be assigned to any other LVG.

Both groups are additive, i.e. 100 PV and 512 LV groups are still freely available (not counting BASE). They are used for the temporary addition of the logical and physical volumes during the export and import.

These two groups cannot be reached or administered via the GUI; PVs must therefore be added or removed via the CLI.

To add: `plmif conf -a -V <PV> -t <type> -G TR-PVG [-l <loop>]`
To remove: `plmif conf -e -V <PV> [-l <loop>]`

The following must be entered for `<type>`:

`3580` for LTO drives
`3590` for Magstar and Eagle drives

Volume export and import is a solution which runs only **within CentricStor**.

It is **not** controlled by the tape management tools on the hosts via the commands which a DAS server provides with `dasadmin eject / insert ...` or an ACSLS server with `eject / enter ...`. These commands are not currently supported by the VDAS and VACS in CentricStor.

This solution is specially designed for the transfer of logical volumes from one CentricStor system to another CentricStor system, i.e. export in system 1 and import in system 2.

To handle large quantities of data, the copying operation of the LVs can take place in parallel on multiple physical disk servers (PDSs).

The transfer operation and the next backup to the same LVs may not overlap.

12.3.2 Export procedure

1. Copying LVs

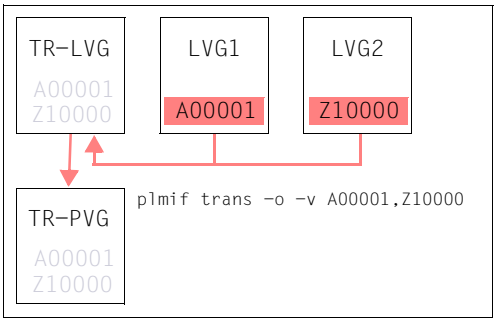


Figure 36: Copying an LV to TR-PVG

With the aid of the transfer-out command (see the section “Transfer-out” on page 566), the PLM creates an additional copy of the LVs selected for export in a special transfer LVG, theTR-LVG. This is always permanently linked to a special transfer PVG, the TR-PVG, on who’s PVs the additional copy is then stored.

Before the transfer, sufficient PVs must be added to the TR-PVG:

```
plmif conf -a -V <PV> [-l <loop>] -G TR-PVG -t <type>
```

Before the next step, `plmif query -g` should be used to check whether the transfer has terminated. In this case `0 recover jobs` may be outstanding in the TR-LVG.

2. Removing PVs from the CentricStor data maintenance system

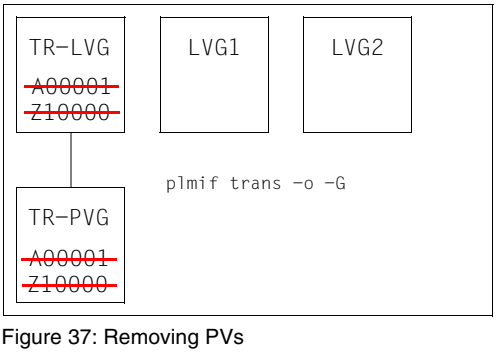


Figure 37: Removing PVs

The `plmif query -G TR-PVG -V` command can be used to recognize PVs which have been fully written using the `transfer-out command` from the status 'r' = read for PVs which can only be read. These must be removed from the PLM’s data maintenance system (see the section “Removing PVs and LVs” on page 568). CentricStor no longer has information on the export and location of these exported LVs and PVs.

The transfer volume groups TR-LVG and TR-PVG are now ready for another transfer.

3. Removing PVs from a library

   The PVs determined above can now be physically removed from the library using a DAS or ACSLS command (see the section “Library commands” on page 571).

The existing copies of these LVs on other PVs when *Mono Save* or *Dual Save* is used remain unaffected by the transfer: These copies are retained in the physical library unchanged.

After the export the exported LVs thus remain in CentricStor and also in the host’s tape management tool.

12.3.3 Import procedure

1. Adding PVs to a library

   The PVs to be imported are physically added to the library with the aid of a DAS or ACSLS command (see the section “Library commands” on page 571).

2. Adding PVs in CentricStor and copying LVs

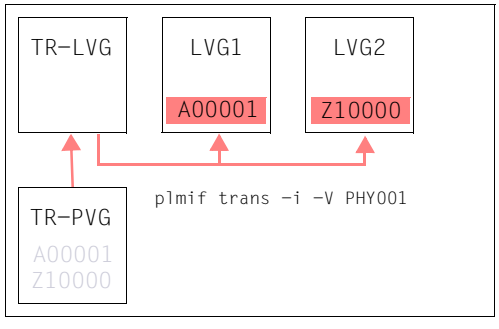


Figure 38: Importing LVs

The transfer-in command (see the section “Adding a PV to the transfer-in” on page 568) is used to add the LVs again to the same or another CentricStor system. More precisely, a set of PVs is specified, the LVs contained on these being added. All LVs that are to be added must, however, already exist in the VLM! Only in this way can the LVs be added to a normal LVG, any LVs which are already present and contain data being overwritten in the process.

The LVs are not visible in the TR-LVG after the transfer-in. However, the PVs in the TR-PVG with the status [old]-scratch ('o'), which can then be used for another transfer-out, are visible.

12.3.4 Special features of the PVG TR-PVG

- PVs in the `unknown` status cannot be deleted using `plmif conf -e ... .`
- No reorganization takes place, neither can it be initiated using a command.
- Limits:

  `PV_SCRATCH_SOFT_MIN`: not observed
  `PV_SCRATCH_HARD_MIN`: 2
  `PV_SCRATCH_MIN`: -1

- Similarly to cleaning groups, no configuration parameters are output in response to `plmif query -c`.
- No values for this group are forwarded to the InfoBroker.
- While save jobs are present, the PLM does not return a drive for this group so as to prevent unload/umounts.
- The transferred LVs are not part of the 'normal' PLM data maintenance. In the event of a `query`, 2 lines are shown for the same LV, one for the location, one for the PV of the PVG TR-PVG.

12.3.5 Additional command line interface (CLI)

12.3.5.1 Transfer-out

```
plmif trans -o ( -t HH:MM [-g <LVG>] | -v <LV>[,<LV>]* | -f <HOST>:<file> )
```

A transfer-out is initiated using this command.

– The PLM causes LVs which are located in normal LVGs to be copied to the special LVG TR-LVG. The LVs are not moved, which means that the originals are still present after the transfer-out.

– The LVs are copied from the TVC to the PVs. If the LVs there are no longer present in the TVC, a restore is initiated.

– As usual, 2 normal PVGs can also be assigned to the normal source LVG in accordance with Dual Save 2.

If another transfer-out or transfer-in has not yet been terminated, the command is rejected. LVs which are not known to the PLM are ignored (message: `LV <name> is unknown, not transferred`).

Options

`-t` This option selects all LVs of an LVG which were stored during a time period:

`HH:MM` defines the start of the time period, the range of values being within [`00:00`,`23:59`].

– If the time is in the past, before the current time, the time period is determined by [`HH:MM`, `current time`].
– If the time is in the future, after the current time, the time period is determined by [`HH:MM-24:00`, `current time`].

`-g` Specifies the LVG

If the `-g` parameter is not entered, the command applies to all LVGs.

`-v` This option enables a list of LVs to be specified. Blanks are not permitted in the list.

`-f` The `-f` option enables a file to be entered with LV names (one LV per line). This file is copied into a temporary local file using `remote copy`.

Example of an output when no transfer-out is active

```
AZUR-VLP0# plmif query -g
pos LV-Group PVGroup1  PVGroup2    LVs   pending jobs  recover jobs
  1        A      P16   ======   10010          0           0
  2     BASE     BASE   ======       0          0           0
  3        C      P19   ======   10000          0           0
  4        D   ======   ======       0          0           0
  5   TR-LVG   TR-PVG   ======       0          0           0
  6      ksp   ======   ======       0          0           0
```

Example of the start of a transfer-out

```
AZUR-VLP0# plmif trans -o -v EXIM00,EXIM01,EXIM02
LV EXIM00 scheduled for transfer.
LV EXIM01 scheduled for transfer.
LV EXIM02 scheduled for transfer.
```

Example of the output during a transfer-out

```
AZUR-VLP0# plmif query -G
pos  name   Type     PVs scratch    LVs tapelib jobs(wait-work) Reorg.(PV)
  1  BASE   stacked    0      0      0 P_HORN       0 -     0  ======
  2  PHORN  stacked    0      0      0 P_HORN       0 -     0  ======
  3  P16    stacked   49     45  10010 TLIDP1       0 -     0  ======
  4  P19    stacked   66     64  10000 S1000        0 -     0  ======
  5  TR-PVG transfer   2      1      3 S1000        0 -     0  ======

AZUR-VLP0# plmif query -g
pos LV-Group PVGroup1  PVGroup2    LVs   pending jobs  recover jobs
  1 A        P16       ======    10007          0           0
  2 BASE     BASE      ======        0          0           0
  3 C        P19       ======    10003          0           0
  4 D        ======    ======        0          0           0
  5 TR-LVG   TR-PVG    ======      349          5         651
  6 ksp      ======    ======        0          0           0

AZUR-VLP0# plmif query -j -g TR-LVG
pos name    PVGroup1  PVGroup2  pending jobs
  1 TR-LVG  TR-PVG    ======          3
     pos name    cmd     TR-PVG    ======             timestamp
       1 EXIM00  SAVE    pending   -------       21.11.2002 15:17:37
       2 EXIM01  SAVE    pending   -------       21.11.2002 15:17:50
       3 EXIM02  SAVE    pending   -------       21.11.2002 15:18:00
dumping recover-list:
     pos name         timestamp
       1 EXIM00        21.11.2002 15:19:42
       2 EXIM01        21.11.2002 15:19:42
       3 EXIM02        21.11.2002 15:19:42
```

Example of an output after termination of the transfer-out

```
AZUR-VLP0# plmif query -g
pos LV-Group PVGroup1  PVGroup2    LVs   pending jobs  recover jobs
  1 A        P16       ======    10010          0           0
  2 BASE     BASE      ======        0          0           0
  3 C        P19       ======    10000          0           0
  4 D        ======    ======        0          0           0
  5 TR-LVG   TR-PVG    ======        3          0           0
  6 ksp      ======    ======        0          0           0
```

12.3.5.2 Removing PVs and LVs

```
plmif trans -o -G
```

This command is used to remove all PVs of the group TR-PVG which have the status 'read' from the PLM-DB, and also all LVs which have been transferred to these PVs. This does not affect normal PLM data maintenance.

If a PV of the TR-PVG is mounted when this command is issued, the command is rejected

After the command has been issued, the LVs just transferred no longer exist in the TR-LVG for the PLM, nor do the associated PVs in the PVG TR-PVG, thus allowing the PVs to be removed from the physical library. The special transfer volume groups are now empty and ready for the next transfer.

Example

```
AZUR-VLP0# plmif trans -o -G
PV 000348 exported.
```

12.3.5.3 Adding a PV to the transfer-in

```
plmif trans -i ( -V <PV>[,PV]* | -f <HOST>:<file>] -t <type> )
```

This command is used to add a PV to the transfer-in. Until it has been fully read, it has the status 'unknown' ('----');

With this command only the physical volumes are specified, but implicitly all the logical volumes contained there are added by means of a scan of the PV. All LVs that are to be added must, however, already exist in the VLM! This is normally the case because these were earlier exported from this CentricStor system. However, if these originate from a different CentricStor system, these logical volumes must be added beforehand to a normal LVG in the VLM (`vlmcmd conf -a -v <LV> -g <LVG>`).

If the VLM does not know the LV, no restore command is issued to the PLM for the purpose of actually reading in the LV. The PLM therefore waits for an unlimited time, and no progress can be recognized when you query the jobs (`plmif query -j -G TR-PVG`).

You can then either create this LV in the LVG, or skip this LV using the transfer-in cancel command (see the section “Skipping an LV / removing a PV” on page 570).

Options

`-V` The `-V` option enables a list of PVs to be entered directly; blanks are not permitted here.

`-f` The `-f` option specifies the file which contains the PV names, one name in each line. Thes are copied to the VLP using `rcp`.

Example of the start of a transfer-in

```
AZUR-VLP0# plmif trans -i -V 000348 -t 3580
PV 000348 prepared for transfer-in.
```

Example of the output when starting a transfer-in

```
AZUR-VLP0# plmif query -j -G TR-PVG
dumping worklist:
  pos name   type     PDS    PV     priority(dyn. - static) timestamp
    1 ====== RINIT    PDSI   000348        0 -        0     21.11.2002
15:16:24
no entry in waitqueue
```

Example of the output during a transfer-in

```
AZUR-VLP0# plmif query -j -G TR-PVG
dumping worklist:
  pos name   type     PDS    PV     priority(dyn. - static)  timestamp
    1 EXIM00 REST     PDSI   000348         1000  - 1000     21.11.2002
15:17:13
no entry in waitqueue
```

As with reorganization, the PLM uses a Move command to have the LVs read into the TVC from the transfer PVs and then have them stored again on the relevant PVs of the normal PVG in accordance with the normal affiliation of the LVs to the LVG.

A special option (`-r`) in the internal Move command (from the PLM to the VLM) is used to guarantee that a restore always takes place from the TR-PVG to the TVC, also if a (newer) LV still exists in the TVC. This ensures that the data of an LV which may have been modified during the export is overwritten by the (older or newer) LV in the system.

12.3.5.4 Removing an LV from a transfer list

plmif trans -o -c [-v <LV>]

This command enables an LV to be removed from the list of LVs to be transferred. If it has already been transferred, the command is rejected.

If no LV is specified, the entire transfer-out is aborted. Existing save requests are still processed.

Example

```
AZUR-VLP0# plmif trans -o -c
transfer-out cancelled.
```

12.3.5.5 Skipping an LV / removing a PV

plmif trans -i -c (-v <LV> | -V <PV>)

The `-v` option is used to skip an LV. This is only possible if the PLM is waiting for a VLM restore request, otherwise the command is rejected. This is useful if the VLM does not know the LV concerned and the LV is not to be created.

The `-V` option enables you to remove a complete physical volume which was added inadvertently. This can only be done if the PV is not mounted in a PDS.

12.3.6 Special situations

If you do not wish PVs with the 'read' status to really be deleted but to be reused, you must remove them using `plmif trans -o -G` and then add them again using the command `plmif conf -a -f` (`-f`=force: omit header check).

12.3.7 Library commands

12.3.7.1 ADIC library with DAS server

ejects cartridges from the AML [via the eject area]	`dasadmin eject2 [-c] [-t media-type] volserrange area`
inserts [normal data] cartridges [via the insert area] in the AML	`dasadmin insert2 -n area`

Further information is provided in the DAS manual.

12.3.7.2 StorageTek Library with ACSLS server

Eject volumes [of a cartridge pool] from the library	`eject cap_id vol_id | volrange ...`
Make manual mode CAP ready to enter labelled carts [into a cartridge pool]	`enter cap_id`

Further information is provided in the ACSLS manuals.

12.3.7.3 Fujitsu Library with LMF server (PLP)

Eject volume to MailSlot	`/opt/FJSVlmf/bin/lmeject <volume_name>` (on LMF server)
Enter volume from MailSlot	`/opt/FJSVlmf/bin/lmenter` (on LMF server)

Further information is available in the following PLP manuals:

- FUJITSU LMF SERVER/CLIENT USER'S GUIDE
- ETERNUS LT270 TAPE LIBRARY UNIT INSTALLATION INSTRUCTIONS
- ETERNUS LT270 Tape Library User's Guide
- ETERNUS LT270 Setup Guide
- ETERNUS LT270 Tape Library Maintenance Guide

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6. [7]Karl Berry <karl@owl.HQ.ileaf.com> syslog to file option
7. [8]Greg Brackley <greg.brackley@bigfoot.com> Major rework of WINNT port. Clean up recvbuf and iosignal code into separate modules.
8. [9]Marc Brett <Marc.Brett@westgeo.com> Magnavox GPS clock driver
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12. [13]Casey Crellin <casey@csc.co.za> vxWorks (Tornado) port and help with target configuration
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16. [17]Dennis Ferguson <dennis@mrbill.canet.ca> foundation code for NTP Version 2 as specified in RFC-1119
17. [18]John Hay <jhay@ @icomtek.csir.co.za> IPv6 support and testing
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24. [26]Frank Kardel [27]<kardel (at) ntp (dot) org> PARSE <GENERIC> driver (>14 reference clocks), STREAMS modules for PARSE, support scripts, syslog cleanup, dynamic interface handling
25. [28]William L. Jones <jones@hermes.chpc.utexas.edu> RS/6000 AIX modifications, HPUX modifications
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28. [31]George Lindholm <lindholm@ucs.ubc.ca> SunOS 5.1 port

29. [32]Louis A. Mamakos <louie@ni.umd.edu> MD5-based authentication
30. [33]Lars H. Mathiesen <thorinn@diku.dk> adaptation of foundation code for Version 3 as specified in RFC-1305
31. [34]Danny Mayer <mayer@ntp.org>Network I/O, Windows Port, Code Maintenance
32. [35]David L. Mills <mills@udel.edu> Version 4 foundation: clock discipline, authentication, precision kernel; clock drivers: Spectracom, Austron, Arbiter, Heath, ATOM, ACTS, KSI/Odetics; audio clock drivers: CHU, WWV/H, IRIG
33. [36]Wolfgang Moeller <moeller@gwdgv1.dnet.gwdg.de> VMS port
34. [37]Jeffrey Mogul <mogul@pa.dec.com> ntptrace utility
35. [38]Tom Moore <tmoore@fievel.daytonoh.ncr.com> i386 svr4 port
36. [39]Kamal A Mostafa <kamal@whence.com> SCO OpenServer port
37. [40]Derek Mulcahy <derek@toybox.demon.co.uk> and [41]Damon Hart-Davis <d@hd.org> ARCRON MSF clock driver
38. [42]Rainer Pruy <Rainer.Pruy@informatik.uni-erlangen.de> monitoring/trap scripts, statistics file handling
39. [43]Dirce Richards <dirce@zk3.dec.com> Digital UNIX V4.0 port
40. [44]Wilfredo Sánchez <wsanchez@apple.com> added support for NetInfo
41. [45]Nick Sayer <mrapple@quack.kfu.com> SunOS streams modules
42. [46]Jack Sasportas <jack@innovativeinternet.com> Saved a Lot of space on the stuff in the html/pic/ subdirectory
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45. [49]Jeff Steinman <jss@pebbles.jpl.nasa.gov> Datum PTS clock driver
46. [50]Harlan Stenn <harlan@pfcs.com> GNU automake/autoconfigure makeover, various other bits (see the ChangeLog)
47. [51]Kenneth Stone <ken@sdd.hp.com> HP-UX port
48. [52]Ajit Thyagarajan <ajit@ee.udel.edu>IP multicast/anycast support
49. [53]Tomoaki TSURUOKA <tsuruoka@nc.fukuoka-u.ac.jp>TRAK clock driver
50. [54]Paul A Vixie <vixie@vix.com> TrueTime GPS driver, generic TrueTime clock driver
51. [55]Ulrich Windl <Ulrich.Windl@rz.uni-regensburg.de> corrected and validated HTML documents according to the HTML DTD

References

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12.4.6 tcpd

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12.4.8 openssh

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Glossary

AutoVLP failover function

As the VLP Master plays a central role in the CentricStor system, failure of the VLP Master also causes the entire system to fail. To prevent this, a standby Standby VLP (SVLP) can be integrated into the system as a backup computer. This SVLP is inactive except for the monitoring function.

The *AutoVLP failover function* checks the functional integrity of the VLP Master at regular intervals and, when it detects a malfunction, automatically takes the requisite steps: the current VLP Master is split from the system and the SVLP is integrated into the system as the current VLP Master. The system is then once more fully operational.

➟ section “Automatic VLP failover” on page 52

Battery Backup Unit ➟ BBU

BBU

Emergency power supply which, in the event of a power outage, retains the data which has not been saved in the memory for an unspecified time.

Cache

In the manual the term cache is sometimes used not only in its general sense but as a synonym for Tape Volume Cache (TVC) or Tape Filesystem (TFS).

Cache File System ➟ TFS
Cache Mirroring Feature ➟ CMF

CMF

The *Cache Mirroring Feature* (CMF) is used to ensure data security and to provide greater protection against data loss as the result of disasters. The data stored on the internal hard disk system is mirrored synchronously to a second cluster location. This is done over Fibre Channel connections, also when large distances are involved. Even if a location is completely destroyed, all the data which was saved on such a CentricStor configuration will consequently be available.

Distribute and Activate ➟ DNA
Distributed Tape Volume File System ➟ DTVFS

DNA

The *Distribute and Activate* (DNA) function must be invoked in GXCC every time a change is made to the configuration of the CentricStor system. This ensures that the new configuration is distributed to and activated on all the ISPs.

➟ section “Distribute and Activate” on page 188

DTVFS

DTVFS (Distributed Tape Volume File System) is a file system implementation which was developed specially for CentricStor which has been adapted to the requirements of high concurrence and of high-speed data traffic both between the TVC (Tape Volume Cache) and hosts and between the TVC and tape drives. In CentricStor V3.1D, all Tape File Systems (TFSs) of the TVC are of the type *dtvfs*.

Emulation

An emulation is a functional simulation of one system by another. The emulated system receives the same data, executes the same programs and achieves the same results as the original system.
Example: A logical drive (LD) emulates a physical drive (PD).

Extented Tape Control Center ➟ XTCC
Failover ➟ AutoVLP failover function

FC

Fibre Channel (FC) is a standard which was designed for serial and continuous high-speed transfer of large volumes of data. It is also used in the *Storage Area Network* (SAN) within CentricStor and in some cases for the connections between the ICPs and the hosts and between the IDPs and the back-end devices. The FC controllers used in CentricStor support bandwidths of between 1 Gb/s (Gigabit per second) and 4 Gb/s.

In the case of a Fibre Channel, each device has a WWNN (World Wide Node Name) and each port of a device a WWPN (World Wide Port Name) as a unique worldwide identifier. Each of these is a 64-bit address which is generally presented in hexadecimal format as 8 bytes separated by colons.
A distinction is made between three types of Fibre Channel topologies :

- Switched Fabric (FC-SW)
  In the case of the *Fibre Channel Switched Fabric*, point-to-point connections are switched between the channel via one or more FC switches.
- Arbitrated Loop (FC-AL)
  In the case of the *Fibre Channel Arbitrated Loop* a logical bus is involved on which all terminals share the same bandwidth. In CentricStor, FC-AL can only be used to connect back-end devices.
- Point-to-Point (FC-P2P)
  This refers to a direct connection between two terminals.

The FC Layer Model has 5 layers which have the following names:

- FC-0 (Physical Layer)
- FC-1 (Data Link Layer, coding/decoding the signals to be transferred)
- FC-2 (Network Layer, flow control, service classes)
- FC-3 (Common Services Layer, e.g. multicast, striping)
- FC-4 (Protocol Mapping Layer, e.g. FCP, FICON)

FC Layer Model ➟ FC

FCP

FCP, like FICON, is a protocol of the uppermost layer FC-4 (Protocol Mapping Layer) in the FC Layer Model. It defines how the SCSI protocol of the Application Layer above, which is exchanged between the application and the terminal, is mapped onto the services of the lower FC layers.

FC Switch

An FC switch is the central component of an FC-based *Storage Area Network* (SAN). It is capable of connecting each of the terminals which are connected in a star-shaped configuration with any of the others and of guaranteeing a defined bandwidth for each connection. The FC switches used for the internal SAN in the CentricStor VTA models have 16, 24 or 32 ports.

Fibre Connectivity ➟ FICON
Fibre Channel ➟ FC
Fibre Channel Protocol ➟ FCP
Fibre Channel Switch ➟ FC Switch

FICON

FICON, like FCP, is a protocol of the uppermost layer FC-4 (Protocol Mapping Layer) in the FC Layer Model. It defines how the ESCON protocol of the Application Layer above is mapped onto the services of the FC layers below.

Global Extended Control Center➟ GXCC
Graphic User Interface➟ GUI

GUI

The graphical user interface (GUI) contains the following two components:

GXCC: User interface for operation, maintenance and monitoring of the CentricStor system

XTCC: Displays and operations within a CentricStor ISP

GXCC

GXCC is the user interface for operation, maintenance and monitoring of CentricStor .

It is a program with X user interface which supplies a complete graphical image of a CentricStor systems which includes all the connected devices and ISPs, such as ICP, IDP and VLP. GXCC handles all ISPs and other components of a CentricStor network as a unit.

Header

At the start of each physical tape written by CentricStor there is an 80-byte *header* followed by a Tapemark.

ICP

In the CentricStor system the ICP is the interface to the host systems connected. These are connected using ESCON, FICON or FCP.
The ICP's principal task is to emulate the physical drives for the host systems connected.

The predefined host names for this ISP type are ICP0, ICP1, etc.

➟ section "ICP (Integrated Channel Processor)" on page 28

ICP_IDP

An ICP_IDP combines the attributes of an ICP and those of an IDP: this computer has interfaces to the hosts and to the tape drives.

The ICP_IDP is the only ISP type used in the CentricStor models VTA 500 and VTA 1000 and consequently has the attributes of a VLP.

IUP (Integrated Universal Processor) is a synonym for ICP_IDP.

The predefined host names for this ISP type are IUP0 and IUP1.

➟ section "ICP_IDP or IUP (Integrated Universal Processor)" on page 29

IDP

The IDP is the interface to the tape drives connected. Either a SCSI or FC connection is used.

The IDP is responsible for communication with the real tape drives.

The predefined host names for this ISP type are IDP0, IDP1, etc.

➟ section "IDP (Integrated Device Processor)" on page 29

Integrated Channel Processor ➟ ICP
Integrated Device Processor ➟ IDP
Integrated Standard Processor ➟ ISP
Integrated Universal Processor ➟ ICP_IDP

ISP

Depending on the peripherals and the software configuration, CentricStor has different types of ISP:

ICP	ISP with host connection using ESCON, FICON and/or FCP.
IDP	ISP without host adapter but with tape drives.
ICP_IDP	This ISP type combines the attributes of ICP, IDP and VLP in one ISP. An ICP_IDP has both a host adapter and a SCSI or FC controller to operate real tape drives and robots.

VLP — ISP which has neither a host nor a device port. Some central management processes, in particular VLM und PLM, run on this ISP. A CentricStor system can contain two VLP-ISPs. The central management processes then only run on one of these, the VLP Master. The other, the Standby VLP (SVLP), is inactive except for monitoring the VLP Master.

VTC — In the small CentricStor models VTC and SBU this is the only ISP and combines the attributes of the ICP, IDP and VLP. For the TVC the local disks are configured to form a RAID10 instead of an external RAID system.

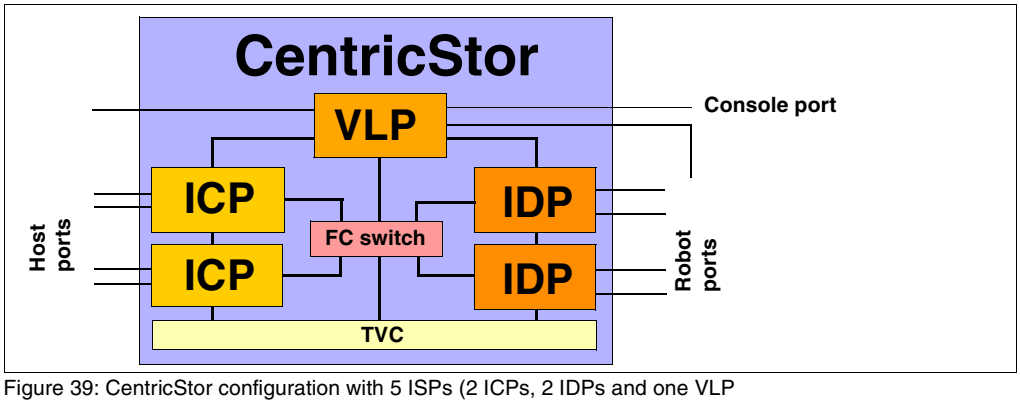

Figure 39: CentricStor configuration with 5 ISPs (2 ICPs, 2 IDPs and one VLP

IUP ➟ **ICP_IDP**

LD

A *logical drive* is a virtual, non-physical drive. In CentricStor up to 64 *logical drives* can be operated per ICP.

Logical Drive ➟ **LD**
Logical Volume ➟ **LV**
Logical Volume Group ➟ **LVG**

LV

A logical volume (LV) is a file which is stored temporarily in a Tape File System of the *Tape Volume Cache* (TVC) and stored permanently in a physical volume (PV). The standard size in an LVG is 900 MB, but this can be selected in discrete steps: 2, 5, 10, 20, 50, 100 oder 200 GB.

No more than 500,000 LVs can be defined in a CentricStor system, the name of each (VSN) being unique in the system.

LVG

Group of logical volumes for which the same rules apply.

Message Manager ➟ MSGMGR

MSGMGR
Exists once in CentricStor. Filters and saves the ISPs' system messages and implements predefined measures (e.g. service call, sends SMS, etc.). The MSGMGR is also responsible for forwarding the system messages to the user interface.

PERFLOG
Exists once in each CentricStor. Obtains and stores the performance data. Global Status supplies the performance data.

Performance Logger ➟ PERFLOG

PD
A *Physical Drive* is a phsysical tape cartridge drive which is connected to the IDP.

PDS
Software for controlling tape cartridge drives.

Physical Device Server ➟ PDS
Physical Drive ➟ PD
Physical Library Manager ➟ PLM
Physical Library Server ➟ PLS
Physical Volume ➟ PV
Physical Volume Group ➟ PVG

PLM
The PLM coordinates all requests for the peripherals connected (robot systems, tape drives). The data management of the PLM contains information about where and on which physical volume (PV) each logical volume (LV) is stored.

PLS
The PLS is the link between CentricStor and the robot archive. Requests to the robots, e.g. to move a tape cartridge in the robot archive, are issued on behalf of the PLM.

PV
This refers to a real tape cartridge.

PVG
Group of physical volumes for which the same rules apply.

RAID system
A RAID (Redundant Array of Independent Disks) system consists of one or two RAID controllers and multiple physical hard disks. These are organized as a logical disk drive which permits a greater storage capacity, greater data security and/or greater throughput than a single physical disk drive.
The TVC of a CentricStor system uses one to up to eight RAID systems.

Redundant Array of Independent Disks ➟ RAID system

Reorganisation

Depending on the configuration paramters, the logical volumes (LVs) saved on the physical volumes (PVs) are automatically copied onto other physical volumes (PVs) of the same physical volume group (PVG). This is done for the following reasons:

– Effective use of the physical volumes (PVs) available
– Prevention of physical and chemical aging processes
– Faulty or inaacessible physical volumes (PVs)

This procedure is called *Reorganisation*. Reorganisation of an individual physical disk (PVs) can also be initiated by the administration.

➟ section “Reorganization of the tape cartridges” on page 37
➟ section “Reorganization” on page 73

SAE

The SAE enables CentricStor to be operated from a remote PC (SAE computer) via the graphical user interface (GUI).

SAN

The entire data flow between all CentricStor components (ISPs and external RAID systems) is handled via an internal *Starage Area Network* (SAN) which can be configured redundantly. It is implemented by one high-performance FC switch or, if redundancy is provided, by two high-performance FC switches.

2 FC technologies are available: *Multi Mode* and *Single Mode*. In Multi Mode the devices which are connected via Fibre Channel can be located up to 300 m from each other; in *Single Mode* the distance can be as much as 10 km.

SBU

The SBU (Small Backup Unit) is a small CentricStor model and consists of a robot system and a VTC with the software components MAREN and ROBAR.

Small Backup Unit ➟ SBU
Standby VLP ➟ SVLP
Storage Area Network ➟ SAN

SVLP

The SVLP (Standby VLP) is an ISP of the type VLP in which the central management processes envisaged for a VLP are inactive until it takes over the tasks of the VLP Master when the latter crashes (AutoVLP failover function).

➟ section “VLP (Virtual Library Processor)” on page 27

System Administrator Edition ➟ SAE

Tape File System ➟ TFS

Tapemark
A *tapemark* identifies the end of a header or logical volume (LV) on a physical tape.

Tape Volume Cache ➟ TVC

TFS
In CentricStor V3.1D a *Tape File System* (TFS) is a file system of the type *dtvfs* (DTVFS) in which the logical volumes (LVs) are stored temporarily. The Tape File Systems as a whole constitute the *Tape Volume Cache* (TVC). In CentricStor the Tape File Systems are tied to a permanent naming schema: `/cache/1nn`, where `nn` stands for `00`, `01`, `02` etc. When the *Cache Mirroring Feature* (CMF) is used, each Tape File System is mirrored. The mirrored Tape File Systems are then called `/cache/2nn`.

TVC
The TVC (Tape Volume Cache) is the core of the entire virtual archiving system. It represents the Tape File Systems as a whole in which the logical volumes are stored temporarily. One or more RAID systems (up to 8) are used for this purpose.

➟ section “RAID systems for the Tape Volume Cache” on page 30

Virtual Library Manager ➟ VLM
Virtual Library Processor ➟ VLP
Virtual Library Service ➟ VLS
Virtual Tape Appliance ➟ VTA
Virtual Tape Controller ➟ VTC
Virtuelles Archivsystem ➟ TVC

VLM
Each robot request of the requesting host system is registered in the VLM. The requisite emulations (VLMF, VAMU, VACS, VDAS, VJUK) are used in CentricStor to support the libraries.

The TVC is always accessed via the VLM.

VLP
The VLP is the central ISP in the larger CentricStor models from VTA 1500. The central management processes run on this, in particular the VLM and the PLM.

A failure of the VLP causes the entire CentricStor system to crash. To prevent this, a standby computer can optionally be integrated into the CentricStor as a Standby VLP (SVLP), and this takes over the tasks of the VLP Master if this should crash.

The predefined host names for this ISP type are VLP0 and VLP1.

➟ section “VLP (Virtual Library Processor)” on page 27

VLP Master

The VLP Master is an ISP of the type VLP in which the central management processes, such as VLM and PLM, are active. VLP is sometimes used as a synonym for VLP Master.

VLS

The tape archives emulated in CentricStor are referred to as *Virtual Library Services* (VLS).

Depending on the type and number of host systems connected, the VLS occurs in various instances:

Host port	Instance	Library
BS2000/OSD, z/OS and OS/390	VAMU	ADIC
Open Systems Server (UNIX, Windows)	VDAS	
CSC Clients of BS2000/OSD	VACS	StorageTek
Open Systems Server (UNIX, Windows) with ACSLS		
LIB/SP Clients from Fujitsu	VLMF	Fujitsu
Open Systems Clients, UNIX and Windows	VJUK	SCSI

Volume Header

Each logical volume (LV) which is written to a physical tape is preceded by a 32,768-byte *Volume Header*.

Volume Serial Number ➟ VSN

VSN

Name of the logical volume (LV). Any combination of up to 6 characters. The following are permitted:

– Alphabetic characters in upper case
– The special characters #, $, @, _, %, +, - (plus and minus characters may not occupy the first position)
– Digits

The *Volume Serial Number* must be unnique in the entire CentricStor network.

VTA

Name of the larger CentricStor models

VTC

VTC is both an ISP type and the name of the smallest CentricStor model, which consists of precisely one ISP of this type.
Like an ICP_IDP it combines the attributes of an ICP, IDP and VLP. In contrast to the ICP_IDP it is equipped with additional boards. These boards and an internal RAID controller are used to configure an internal RAID system which is used for the TVC.
The predefined host name for this ISP type is VTC.

XTCC

The graphical user interface XTCC permits displays and operations within an ISP.

Figures

Abbreviations

Abbreviation	Long form	Explanation
3490E	36-Track Drive from IBM	
3490F	36-Track Drive from IBM	= Berino, successor of 3490E
3590	128-Track Drive from IBM	= Magstar, = SNI 3591
3590E	256-Track Drive from IBM	= successor of Magstar
3592	512-Track Drive (=Jaguar) from IBM	Successor to the 3590 drive family
9490	36-Track Drive from STK	= Timberline
9840	Tape Drive from STK	= Eagle
9940	Tape Drive from STK	
ABBA/x	---	Tape Robot Family from adic/GRAU
ACF	Automatic Cartridge Facility	
ACI	AML Client Interface	Interface to ABBA Robots via DAS
ACS	Automatic Cartridge System	
ACSLS	ACS Library Software	
AML/x	Automatic Media Library	New name for ABBA-x
AMU	AML Management Unit	PC to control the AML Robot including LM
ASR&R	Automatic Server Reconfiguration and Restart	
BBU	Battery Backup Unit	
CDB	Command Descriptor Block	
CMF	Cache Mirroring Feature	
CSI	Client System Interface	

Abbreviation	Long form	Explanation
CSV	Comma Separated Values	
CSW	Console Switch	
CTL	Control, Target, LUN	Relates to SCSI device
CU	Control Unit	
DAS	Distributed AML Server	Interface to control AML Robots (Open Systems)
DASD	Direct Access Storage Device	In CS system usually the TVC
DLDSW0	Dual-Labeled, Dual-Sided, Write Once	
DNA	Distribute and Activate	GXCC function
DTVFS	Distributed Tape Volume File System	Filesystem on RAID Systems which contains the LVs in form of files. The ISPs access different LVs at the same time.
EMU	Virtual EMUlation of 3490E	
ESCD	ESCON Director	
ESCON	Enterprise System Connection	
FC	Fibre Channel	
FCAL	Fibre Channel Arbitrated Loop	FC connection via hub
FCH	Fibre Channel Hub	
FCS	Fibre Channel Switch	
FGM	Release Notice	Release Note
FICON	Fibre Connection	
FID	FRU-Identifier	
FRU	Field Replaceable Unit	
FSC	Fault Symptom Code	
FTP	File Transfer Protocol	
GUI	Grafic User Interface	
FUD	Faulty, Used or Dirty Tapes	

Abbreviation	Long form	Explanation
FW	Firmware	
GXCC	Global Extended Control Center	User interface for CentricStor including administration, service and monitoring in CentricStor V3.x
GXTCC	Global Extended Tape Control Center	User interface for CentricStor including administration, service and monitoring in CentricStor V2.x
HACC	Host Access	from ABBA/x in and OS/390
HDD	Hard Disk Drive	
HSI	Hardware Software Interface	
ICP	Integrated Channel Processor	ISP for satisfying host connection (/390 or SAN)
IDP	Integrated Device Processor	ISP for connection of physical tape drives
ISP	Integrated Standard Processor	Common name for CS Server PCs (ICP, IDP, VLP)
ITC	Intelligent Tape Controller	Smallest CentricStor Model
KVM	Keyboard Video Mouse	In the VTA models, a KVM cable connects an ISP to the Console Switch.
LAN	Local Area Network	
LD	Logical Drive	Tape drive emulated in an ICP
LED	Light-Emitting Diode	
LM	Library Manager	
LMF	Library Management Facility	Interface to Fujitsu robots
LRU	Least Recently Used	
LSM	Logical Storage Module	
LUN	Logical Unit Number	
LV	Logical Volume	Also called virtual volume.
LVG	Logical volume group	Container for LVs, rules are valid for whole groups
LZ	Distribution Center	

Abbreviation	Long form	Explanation
MCP	Master Control Process	
MD	Mount Daemon	
MIB	Management Information Base	
MIM	Media Information Message	Message for a defective cartridge, only 3590-x/3592
MBK	Magnetbandkassette (German)	Magnetic tape cartridge
MM	Multi Mode	
MSGMGR	Message Manager	One instance in CentricStor. Filters and stores the system messages of the ISPs and beforehand takes defined measures (e.g. Service Call, sending SMSs, etc.). The MSGMGR is also responsible for forwarding the system messages to the user interface.
OCI	Operator Command Interface	
PCI	Peripheral Component Interconnect	Bus standard for connecting peripherals with the chip set of a processor
PD	Physical Drive	Physical drive hooked up to IDP
PDS	Physikalischer Device Server	Software to control a PD
PERFLOG	Performance Logger	One instance in each CentricStor. Obtains and stores the performance data. Supplies the performance data to Global Status.
PID	Process ID	
PL	Physical Library	e.g. AML/x, STK9310, STK L180
PLM	Physical Library Manager	Manages all physical library resources (PLs, PDs PVs)
PLS	Physical Library Server	Software to control a PL
PS	Power Supply	
PV	Physical Volume	The real cartridge
PVG	Physical Volume Group	Container for PVs, rules are valid for whole groups

Abbreviation	Long form	Explanation
RAID	Redundant Array of Independent (Inexpensive) Disks	
RMT	Remote Monitoring and Administration	CentricStor expansion for which a license is required
ROBAR	Robot Archive	ROBAR-SW allows BS2000 to talk to an AML/x tape roboter
RPLM	Recovery PLM	
SAE	System Administrator Edition	SAE enables CentricStor to be operated from a remote PC (SAE computer) via the graphical user interface.
SAN	Storage Area Network	
SAS	Serial Attached SCSI	
	Service Access System	
SBU	Smart Backup Unit	
SCP	Slave Control Process	
SCSI	Small Computer System Interface	
SIM	Service Information Message	Only used by 3590-x/3592
SM	Single Mode	
SNMP	Simple Network Management Protocol	
SP	SCSI Parallel Service Pack	
SPCC	Standard Peripheral Channel Connector	Primergy PC which emulates various devices (tapes, disks, printers, archives, terminals …) for a /390-system.
SPS	Standby Power Supply	
SSI	Storage Server Interface	
ssh	Secure Shell	
SVLP	Standby-VLP	
TFS	Tape File System	Converts tape commands to a DASD

Abbreviation	Long form	Explanation
TVC	Tape Volume Cache	File system on RAID system(s) which contain(s) the LVs in the form of files. The ISPs access different LVs at the same time.
UFS	Unix File System	
UPS	Uninterruptable Power Supply	
VACS	Virtual ACSLS	Emulates an ACSLS to the host.
VAMU	Virtual AML Management Unit	Emulates an AMU to the host.
VD	Virtual Drive	
VDAS	Virtual DAS	Emulates an AMU to the host.
VDRV	Virtual Disk Driver	The driver controls data transfer from and to the virtual disks of the RAID system with striping, loadsharing and failover.
VJUK	Virtual Jukebox	Emulated jukebox
VLM	Virtual Library Manager	Manages the logical components in the library
VLP	Virtual Library Processor	PC on which the VT_LS services (VLM, VLS, PLM, PLS) are running
VLS	Virtual Library Server	Emulates different library interfaces, e.g. VAMU, VDAS, VACS
VMD	Virtual Mount Daemon	In each ICP. Forwards the VLM's mount commands to the virtual devices.
VOLSER	Volume Serial Number	Name of a volume
VSN	Volume Serial Number	Name of a volume or a medium
VT_LS	Virtual Tape und Library System	Alias for CentricStor
VTA	Virtual Tape Appliance	Designation for the large CentricStor models
VTC	Virtual Tape Controller	Designation for the smallest CentricStor models
VTD	Virtual Tape Device	Type of tape drive emulation for Open System Hosts
XTCC	Extented Tape Control Center	Graphical interface for an ISP.

Related publications

The manuals are available as online manuals, see http://manuals.fujitsu-siemens.com, or in printed form which must be paid and ordered separately at http://FSC-manualshop.com.

[1] **SINIX-2000 V8.0/V8.1/V8.5**
Installation, Operation and Administration
User Guide

Target group
The manual is intended for privileged users (operators, system administrators) of the service/console processor 3970-2x, the channel adapters 3970 and 3971, the business server SR2000-C, and the enterprise data server DS2000.

Contents
The manual contains all the information required to ensure that the systems service/ console processor 3970-2x, channel adapters 3970 and 3971, business server SR2000-C, and enterprise data server DS2000 are ready for use. This includes helpful information on configuring the systems and a description of important functions for system operation and administration.

Order number
U24789-J-Z385-5-76

[2] **MAREN** (BS2000/OSD)
Volume 1: Basics of MTC Management
User Guide

Target group
This manual is addressed to all BS2000 users, computer center managers, operators and systems support staff.

Contents
Volume 1 contains an introduction to working with MAREN. This covers the MAREN catalog and its migration, the management of magnetic tape cartridges and locations, and the support provided by MAREN for programs for data backup and archiving systems.
The user interfaces are described in Volume 2.

[3] **ROBAR 3.0B** (BS2000/OSD, SINIX)
Tape Cartridge Archiving System
User Guide

Target group
Computer centers working with the ABBA robot system (CC staff, in particular system administrators and archivers), ROBAR users

Contents
The manual describes the ROBAR software product that, in conjunction with the ABBA system, controls automatic operation within a tape cartridge archiving system. It describes:
– the concept and mode of operation
– the user interfaces in BS2000 and SINIX
– installation and messages

[4] **StorageTek User Guide BS2000 CSC version 6.1**
User Guide (in preparation)

Target group
Computer centers working with the StorageTek robot

Contents
The manual describes the Client Software Component CSC for connecting a BS2000 system to a StorageTek robot.

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