

StorageTek Enterprise Library Software

Introducing ELS

Version 7.1
MSP Environment

ORACLE

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Introducing ELS

E29677-01

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Preface

Sun StorageTek™ Enterprise Library Software (ELS) 7.0 is a solution consisting of the following products:

- ⌚ Library control - Sun StorageTek Storage Management Component™ (SMC) and Sun StorageTek Host Software Component™ (HSC). **Note that** the HTTP server, previously a separate component, is now an SMC component.
- ⌚ Virtual tape support - Sun StorageTek Virtual Tape Control Software™ (VTCS).
- ⌚ Library reporting and management - Library Content Manager™ (LCM) , which includes the product formerly known as Offsite Vault Feature.
- ⌚ Enterprise Library Management Station (ELMS), a workstation-based GUI, is the storage management appliance for ELS.

Audience

This book presents information for anyone involved in planning for and implementing an ELS solution. This audience could include MIS managers, system programmers, storage administrators, and performance specialists.

Contents

Preface iii

Audience iii

1. What is Enterprise Library Software? 1

ELS Base Software 2

HSC 3

SMC and HTTP Server 3

VTCS 3

CDRT 4

2. How Does ELS Work? 5

How Does SMC Work? 6

How Does HSC Work? 6

How Does VTCS Work? 7

How Does CDRT Work? 8

3. What Enhancements Does ELS 7.1 Offer? 9

SMC 7.1 Enhancements 9

HSC 7.1 Enhancements 10

VTCS 7.1 Enhancements 11

4. How Do I Find Out More About ELS 7.1? 13

What is Enterprise Library Software?

Enterprise Library Software (ELS) is the software solution that enables and manages StorageTek's Automated Cartridge System (ACS) and Virtual Storage Manager (VSM) hardware.

The Modular Libraries are the centerpieces of automated tape because these libraries turn labor-intensive manual tape operations into *automated* tape. For example, the SL8500 automates cartridge tape mounts and dismounts via HandBot High Performance™ robotics. The SL8500 is highly scalable for the short or long term. RealTime Growth™ capability, for example, means you can add more slots, drives, and robotics to handle increased workload (for example, year end processing) without disruption. The SL8500 supports any combination of StorageTek enterprise and midrange drives, which means that the SL8500 is ideal for consolidating many smaller libraries into one high-performance system. The SL8500 supports StorageTek's latest generation tape drives, the access-centric T9840D and the capacity-centric T10000C, which also provide the ability to encrypt mission-critical data.

Virtual Storage Manager (VSM) is StorageTek's virtual storage solution to the problem of inefficient use of tape media and transports. VSM solves this problem by storing virtual tape volumes (VTVs) on a disk buffer on the Virtual Tape Storage Subsystem (VTSS). VSM then migrates (and stacks) the VTVs to real automated tape volumes called multi-volume cartridges (MVCs) that are mounted on Real Tape Drives (RTDs). When needed by the host, if the migrated tape volumes are not VTSS-resident, they are automatically recalled to the VTSS. The VTSS and VTVs allow VSM to optimize access time, throughput, and physical media and transport use. VSM consists of Virtual Tape Control System (VTCS), which is the MVS host software, the portions of ELS that support VTCS, and the VTSS. The VSM5, which is the latest generation VTSS, provides significantly greater throughput and capacity than its predecessors.

The following sections discuss the ELS software components.

ELS Base Software

The ELS Base Software consists of Host Software Component (HSC), Storage Management Component (SMC), and HTTP Server, and Virtual Tape Control Software (VTCS) as shown in [FIGURE 1-1](#).

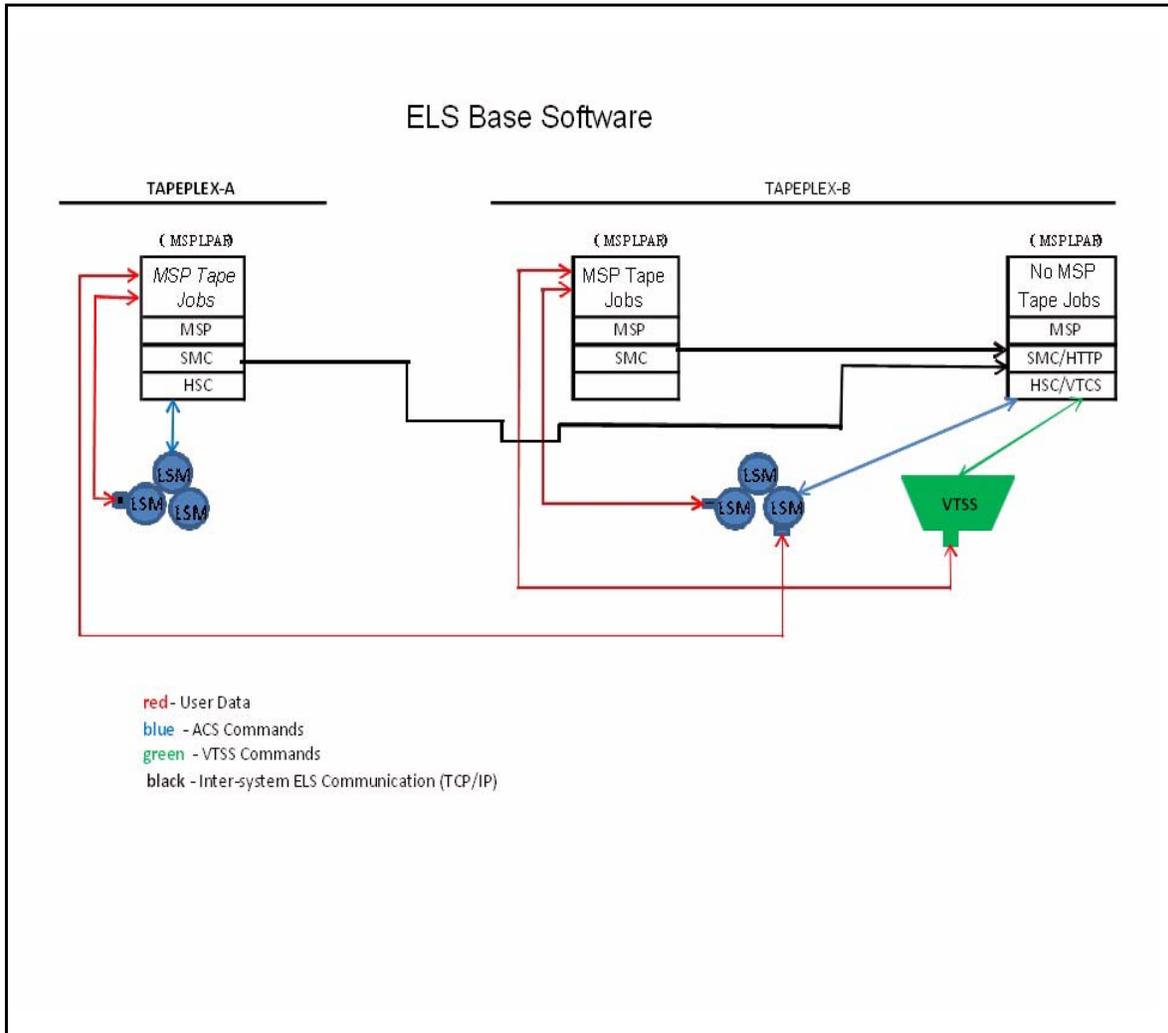


FIGURE 1-1 ELS Base Software

HSC

HSC does the following:

- ? Maintains the Control Data Set (CDS), which contains information about the physical and virtual drives and corresponding media in a TapePlex.
- ? Receives requests from SMC for mounts, dismounts, and swaps, and queries and sends these requests to the LMU, which automatically carries out these operations.
- ? Manages Automated Cartridge Systems (ACSs) and the LSMs that comprise ACSs.
- ? Manages error conditions, such as lost cartridges.

SMC and HTTP Server

SMC is the interface between Fujitsu's MSP/EX operating systems and HSC and MVS/CSC. SMC is a required ELS component, and must reside on every MSP host that accesses automated real tape and/or VSM virtual tape. SMC does the following:

- ? Influences tape device allocation (real and virtual).
- ? Intercepts tape management, and operating system mount, dismount, and swap messages and creates a request for this functions and routes the request to either HSC or MVS/CSC.
- ? Coordinates requests among multiple StorageTek *TapePlexes*. These requests can consist of mounts, dismounts, and swaps, and queries (configuration, volume lookup).

A TapePlex is a single StorageTek hardware configuration, usually represented by a single HSC Control Data Set (CDS).

A TapePlex can contain multiple ACSs and Virtual Tape Storage Subsystems (VTSSs).

SMC can communicate with any number of TapePlexes, using cross address space facilities to communicate with HSC or MVS/CSC running on the same host, and TCP/IP to communicate with HSC systems executing on other hosts.

The SMC HTTP server is a component of SMC that manages inbound TCP/IP transactions from a remote SMC client. Starting and stopping of the HTTP component is controlled with an SMC command. The HTTP component is normally started only on the host where HSC is running. For more information, see *Configuring and Managing SMC* .

VTCS

VTCS, which works as an extension to HSC/SMC, does the following:

- ? Influences the allocation of virtual tape drives (VTDs)
- ? Manages the use of VTVs
- ? Manages the migration and recall of virtual volumes
- ? Manages use of real tape media and transports used by VSM.

CDRT

The Concurrent Disaster Recovery Test (CDRT) feature is integrated into ELS and can assist customers in demonstrating their business continuance (Disaster Recovery) plan to satisfy insurance, regulatory or audit requirements by:

- ? Allowing ACS and VSM hardware to be shared between both a disaster recovery site and a production site simultaneously without the purchase of additional ACS or VSM hardware.
- ? Separating a customer-defined portion of existing ACS hardware and tape volume pools for the period of the disaster recovery test to allow concurrent use of ACS hardware.
- ? Supporting a parallel test of customer applications executing simultaneously from a disaster site sharing production data on the separated ACS and/or VSM hardware while concurrently running production processing using production data.
- ? Allows for easily combining separated hardware back into production use at the termination of the disaster recovery test without interruption of normal production processing.

How Does ELS Work?

How Does SMC Work?

SMC does the following:

1. Influences tape allocation based on policies, and on volume and drive characteristics supplied by HSC/VTCS:

For example, the SMC POLICY command can be used to direct scratch allocations to either real or virtual devices, can select scratch subpools, and can assign a management class name that VTCS uses to manage virtual volumes.

2. Intercepts MSP mount, dismount, and swap messages and directs them to HSC or VTCS for automation.

SMC must execute on every host where tape processing occurs. The ELS server component (HSC/VTCS) may execute on the same MSP/EX host as the SMC, or may execute on a separate, remote host. When SMC and HSC/VTCS reside on different MSP/EX hosts, TCP/IP is used to send requests from the client host to the server host. In order to receive HTTP requests from a remote SMC client, the HTTP component must be activated on the SMC executing on the server host.

The SMC client/server feature lets you run SMC only on the client hosts and HSC/VTCS and the HTTP server on one or more server hosts. Using the SMC client/server feature provides the following benefits:

- ? **Reduces the number of hosts on which you run HSC/VTCS.** StorageTek recommends that you execute HSC/VTCS on only two hosts (primary and backup). Running HSC/VTCS on fewer hosts reduces CDS contention and eliminates the need to manage multiple MSP syslog files.
- ? **Communicates with multiple HSC/VTCS TapePlex systems** representing physically different hardware configurations.
- ? **Provides failover capabilities** when an HSC is recycled for maintenance.

How Does HSC Work?

HSC controls the physical tape environment. HSC, responding to requests from SMC, directs an LSM robot or handbot to mount and dismount physical tapes. HSC controls all other physical tape operations as well, including moves, swaps, and so forth. HSC also manages the CDS (Control Data Set) where information about the real and virtual tape environments is stored.

How Does VTCS Work?

Each VTSS provides 64 virtual tape drives (VTDs) for VSM2s and VSM3s, and 256 VTDs for VSM4s and VSM5s. VTDs emulate F6473K devices. VSM uses the VTDs to write data sets to virtual tape volumes (VTVs) on the VTSS. The VTSS storage is provided by a RAID-6+ DASD configuration.

VTCS is the software that controls the VTSS hardware. For example, you specify the VTSS's high and low Automatic Migration Thresholds (AMTs), which control the VTSS space management/VTV migration cycle. Real tape drives (RTDs) write migrated VTVs to physical multi-volume cartridges (MVCs). VTCS controls RTDs (although HSC provides mount and dismount services for MVCs), while HSC controls ACS tape drives that are not allocated to VSM.

If the host requests a mount of a VTV that was migrated to an MVC and is not VTSS-resident, VSM automatically recalls the migrated VTV to the VTSS. [FIGURE 2-1 on page 7](#) shows the VTV migration/recall cycle.

Note – VSM supports dynamic sharing of RTDs between VTSSs. **Note, however, that when VTSSs share RTDs, the VTSSs must have access to all the same hosts.**

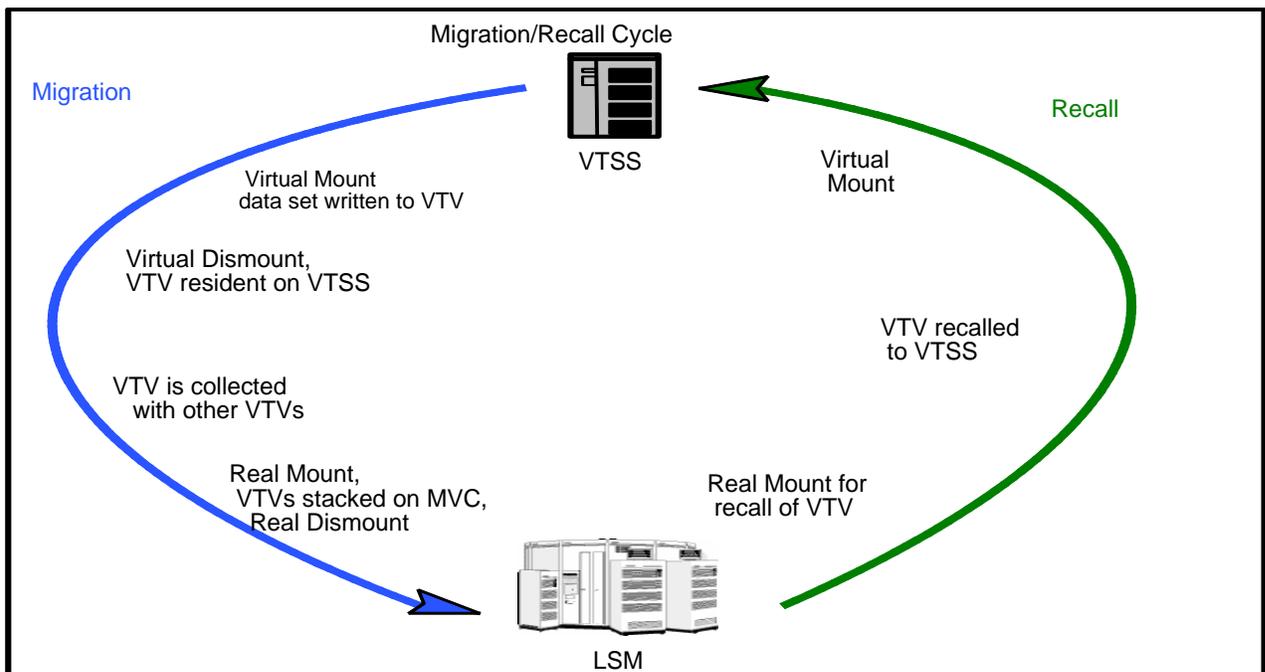


FIGURE 2-1 VTV Migration/Recall Cycle

How Does CDRT Work?

CDRT creates a test copy of the production CDS that is used by the DR hosts and therefore allows two ELS subsystems with two different CDSs to manage the same ACS hardware. The CDS reflects changes in the state of tape cartridges and resources in the ACS hardware. However, during a DR test using CDRT, the two ELS subsystems use two different CDSs, and do not communicate. Thus changes that occur in the production CDS are not reflected in the test CDS copy and visa versa. CDRT acts to segregate the test ACS and VSM hardware from the production ACS and VSM hardware, managing the DR test to ensure the integrity of the production data and minimizing conflicts for tape volumes and ACS hardware resources. Central and fundamental to a successful DR test using CDRT is a valid point-in-time copy of the state of all tape volumes managed by ACS and/or VSM hardware and the ELS subsystem. In a tape volume environment, quite often some of this tape volume state data (metadata) is retained and managed outside of the ELS subsystem and ACS/VSM hardware. Typically, tape volume metadata (i.e. VOLSER, DSN, Expiration date, scratch status, real or virtual designation, etc.) is stored in one or more Tape Management Catalogs (TMCs), one or more MSP/EX catalogs and the CDS. Ensuring that the state of tape volumes as reflected on host systems is either the same or equivalent on both production hosts and DR hosts, is critical to successful execution of a DR test. This consistency in the state of tape volumes between the production hosts and the DR hosts at the start of the DR test is what allows the parallel processing of customer applications to assist in validating a business continuance plan. The DR test hosts exercise the segregated hardware while production hosts continue using both the non-segregated and segregated ACS hardware.

The DR test hardware is a minimum of one ACS. Optionally, one or more VTSSs may be employed as DR test hardware. The ACS is shared between the production hosts and the DR hosts. The DR hosts have exclusive use of any segregated VTSSs during the DR test. To produce valid point-in-time copies of any TMCs and MSP/EX catalogs, see the appropriate 3rd party software documentation. At the end of a DR test, all data created from the DR test hosts, including the test copy of the CDS is typically discarded and the segregated hardware is redeployed back to the normal production environment

What Enhancements Does ELS 7.1 Offer?

The following sections describe the ELS 7.1 enhancements.

SMC 7.1 Enhancements

SMC 7.1 provides the following enhancements:

- ? In SMC7.1 the ability to derive TAPEPLEX definitions based on locally defined subsystems is removed. Instead, all TAPEPLEXes must be defined using the TAPEPLEX command. If no TAPEPLEX commands are found at SMC startup, the SMC subsystem terminates.

In ELS 7.0 and above the SMC TapePlex name is automatically inserted into the HSC CDS and is used for HSC statistical reporting. HSC also provides a SET TAPEPLEX utility function to change the TapePlex name in the CDS if desired.

- ? The SMC HELP command displays SMC command and message information.
- ? The messages produced by SMC utility programs are renumbered. The previous messages SMCU0nnn are changed to SMC5nnn.

HSC 7.1 Enhancements

The use of the decimal library location representation will allow clients to be server agnostic whether they are communications with HSC or ACLS, and avoids the complexity of supporting formats for both products. The change to decimal locations affects the following areas:

- ? *Changes to command input.* All HSC commands that accept ACS, LSM or CAP input now require the ACS, LSM and CAP to be specified in decimal rather than hexadecimal. "Old" format commands (such as AAL to represent an ACS/LSM combination) are no longer accepted. All commands where both ACS and LSM are input require a format of AA:LL.
- ? *Output changes.* All command, report, and XML output fields that contain ACS, LSM and CAP Ids are now in decimal rather than hexadecimal format.
- ? *Flat file support.* Although flat files are currently described as a "deprecated interface" in the product, the support is being retained in ELS 7.1. The layout of flat files remains unchanged, but the format of ACS and LSM Ids are changed for hexadecimal to decimal.

VTCS 7.1 Enhancements

ELS 7.1.0 offers a unique solution to the problem of excessive MVC reclaim resource consumption. Reclaim frees areas of tape media (MVCs) that are occupied by expired data. Because tape media is sequential, a standard reclaim requires recalling active VTVs from an MVC to a VTSS and then remigrating the VTVs. This consumes:

- ? VTSS resources
- ? VTSS nearlink channels
- ? One or more RTDs
- ? One or more MVCs.

With ELS 7.1, the reclaim process can consume far fewer resources and have less impact on production workload. ELS 7.1 exploits the Dynamic Reclaim feature of the T10000B and above transports. With Dynamic Reclaim, MVCs are *partitioned*. When the data on a partition expires, VTCS just updates the CDS to mark the freed partitions as writeable; the MVC is not mounted and no data movement occurs.

To exploit this capability requires:

- ? All hosts running ELS to be at version 7.1.0
- ? The CDS to be converted to a VTCS "H" level CDS (this is a non disruptive change)
- ? VSM5 microcode level D02.11.16.00 and above
- ? T10000B drives with firmware 1.41a.209 and above
- ? T10000C drives with any level of firmware; 1.53.311 is recommended
- ? Modify the VTCS CONFIG and STORCLAS definitions to initiate Dynamic Reclaim.

In Version 7.1 you can set separate reclaim thresholds for standard and Dynamic Reclaim. For more information, see *Configuring HSC and VTCS*.

How Do I Find Out More About ELS 7.1?

Now that you have an overview of ELS 7.1 and what it can do, what's next? The following tables describe the rest of the ELS information set by title and contents.

TABLE 4-1 ELS Solution Books

This book...	...contains the following information...
<i>Introducing ELS</i> (this book)	Overview of the entire ELS 7.1 solution.
<i>Installing ELS</i>	Installing all ELS 7.1 mainframe software.
<i>ELS Command, Control Statement, and Utility Reference</i>	A single, common reference for HSC, SMC, and VTCS.
<i>ELS Quick Reference</i>	A single, common quick reference for HSC, SMC, and VTCS.
<i>ELS Programming Reference</i>	Other programming interfaces besides commands, control statements, and utilities, including the Significant Event Notification Facility, HSC LOGREC records, all SMF records, HSC User Exits 6, 14 and 15, and HSC LIBGEN macros. Also information on writing programs to the ELS Unified User Interface (UI) and using the UI to produce XML or CSV output of ELS commands and utilities.
<i>ELS Legacy Interfaces Reference</i>	Interfaces that are still supported for ELS 7.1 but whose use is <i>strongly deprecated</i> ; to include but not limited to all other User Exits, HSC PGMI, HSC Batch API, old TAPEREQ format, old DFSMS interface information.
<i>ELS Messages and Codes</i>	A single, common messages and codes for HSC, SMC, and VTCS.
<i>ELS Disaster Recovery and Offsite Data Management Guide</i>	Using ELS for Disaster Recovery (DR) and managing offsite data.

TABLE 4-2 HSC/SMC/VTCS Books

This book...	...contains the following information...
<i>Configuring HSC and VTCS</i>	How to configure these components for both new and existing customer sites.
<i>Managing HSC and VTCS</i>	Managing HSC, including an overview of HSC management tools and periodic and as-needed management tasks. Managing VTCS, including an overview of VTCS management tools, periodic and as-needed management tasks, and finding and fixing VTCS problems. This book also unlocks the value add in your VSM system through discussions of Management Class and Storage class basics and implementation scenarios.
<i>Configuring and Managing SMC</i>	Configuring and managing SMC, including implementing and managing device allocation, Tapeplexes, and storage policies.