StorageTek Enterprise Library Software

Introducing ELS

Version 7.3

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Preface

Oracle's StorageTek Enterprise Library Software (ELS) is a solution consisting of the following base software:

- StorageTek Storage Management Component (SMC)
- StorageTek Host Software Component (HSC)
- StorageTek Virtual Tape Control Software (VTCS)
- StorageTek Concurrent Disaster Recovery Test (CDRT)

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.

Prerequisites

To perform the tasks described in this guide, you should already understand the following:

- MSP/EX operating system
- JES
- Enterprise Library Software (ELS)

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What's New?

The ELS 7.3 enhancements consist of the following:

- VSM 6 32GB VTVs. In addition to existing VTV sizes, ELS 7.3 supports VSM 6 32GB VTVs.
- XAPI Security. ELS 7.3 implements authentication using a challenge/response protocol to authenticate individual XAPI client/server transactions. If XAPI security protocol is implemented in both client and server, the server can trust client identity, for example, VM Client 7.3 and SMC 7.3. If XAPI security protocol is implemented in server but not client, the server can use XCLIENT command to exclude clients from XAPI Security. For example, VM Client 7.2 and SMC 7.3.
- SMC now supports an XAPI client interface to an ACSLS server (Release 8.4 or later) with the XAPI service enabled.

  The XML API (XAPI) is Oracle's StorageTek API that enables StorageTek clients and servers to communicate using a common protocol over TCP/IP.

1

What is Enterprise Library Software?

Enterprise Library Software (ELS) is the software solution that enables and manages Oracle 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 Oracle enterprise and midrange drives, which means that the SL8500 is ideal for consolidating many smaller libraries into one high-performance system. The SL8500 supports Oracle's latest generation tape drives, the access-centric T9840D and the capacity-centric T10000C, which also provide the ability to encrypt mission-critical data.

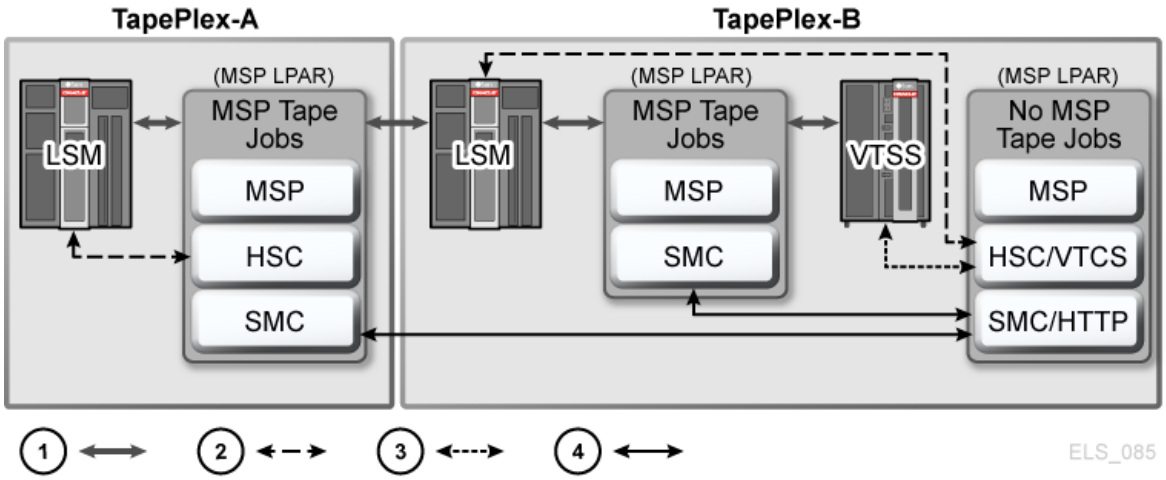
Virtual Storage Manager (VSM) is Oracle StorageTek's virtual storage solution to the problem of inefficient use of tape media and transports. VSM solves this problem by storing virtual tape volumes (VTVs) on a disk buffer on the Virtual Tape Storage Subsystem (VTSS). VSM then migrates (and stacks) the 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 MSP host software, the portions of ELS that support VTCS, and the VTSS.

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



1. User data
2. ACS commands
3. VTSS commands
4. Inter-system ELS communication (TCP/IP)

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 system and HSC. SMC is a required ELS component, and must reside on every MSP host that accesses automated real tape and/or VSM virtual tape. SMC runs on JES systems and 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 HSC.
- Coordinates requests among multiple TapePlexes. These requests can consist of mounts, dismounts, and swaps, and queries (configuration, volume lookup).

  A TapePlex is a single 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 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.

2

How Does ELS Work?

This chapter describes how ELS works.

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**. Oracle 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?

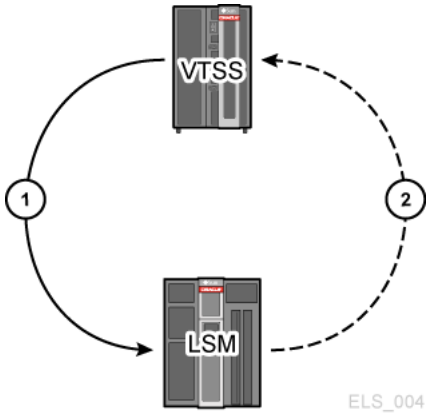
The VTSS provides Virtual Tape Drives (VTDs) that emulate 3490E devices. VSM uses the VTDs to write data to virtual tape volumes (VTVs) on the VTSS.

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 shows the VTV migration/recall cycle.

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

Figure 2–1 VTV Migration/Recall Cycle



1. Migration — virtual mount data set written to VTV, virtual dismount of VTV resident on VTSS, VTV is collected with other VTVs, real mount of VTV stacked on MVC, and real dismount.
2. Recall — real mount for recall of VTV, VTV recalled to VTSS, and virtual mount.

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

3

How Do I Find Out More About ELS?

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

Table 3–1 ELS Solution Books

This book...	...contains the following information...
Introducing ELS (this book)	Overview of the entire ELS solution.
Installing ELS	Installing all ELS mainframe software.
ELS Command, Control Statement, and Utility Reference	A single, common reference for HSC, SMC, and VTCS.
ELS Quick Reference	A single, common quick reference for HSC, SMC, and VTCS.
ELS Programming Reference	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 (UUI) and using the UUI to produce XML or CSV output of ELS commands and utilities.
Configuring and Managing SMC	Interfaces that are still supported for ELS but whose use is strongly deprecated; to include but not limited to all other User Exits, HSC PGMI, HSC Batch API, old TAPEREQ format, old DFSMS interface information.
ELS Messages and Codes	A single, common messages and codes for HSC, SMC, and VTCS.
ELS Disaster Recovery and Offsite Data Management Guide	Using ELS for Disaster Recovery (DR) and managing offsite data.

Table 3–2 HSC/SMC/VTCS Books

This book...	...contains the following information...
Configuring HSC and VTCS	How to configure these components for both new and existing customer sites.

Table 3–2 (Cont.) HSC/SMC/VTCS Books

This book...	...contains the following information...
Managing HSC and VTCS	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 VCS problems. This book also unlocks the value add in your VSM system through discussions of Management Class and Storage class basics and implementation scenarios.
Configuring and Managing SMC	Configuring and managing SMC, including implementing and managing device allocation, Tapeplexes, and storage policies.

Glossary

ACS

(1) Oracle StorageTek's Automatic Cartridge System. (2) A multi-LSM configuration.

ACS routine

An SMS term, referring to automatic class selection routine. Not to be confused with the HSC term, ACS, referring to Automatic Cartridge System.

ACSLS

ACSLS (Automated Cartridge System Library Software) enables Automated Tape Libraries to be shared in a heterogeneous environment and functions as the central service provider for library operations in a open-systems environment.

AMT

Automatic migration threshold. AMT values are user–defined percentage values that determine when virtual tape volume migration begins and ends. VTV migration begins when the VTSS buffer reaches the high AMT and ends when the buffer reaches or falls below the low AMT. These thresholds apply to all VTSSs.

CAP

An assembly that allows several cartridges to be inserted into or ejected from an LSM without human entry into the LSM.

CDS

Control data set. The HSC database. In addition to the current information in the CDS, VSM keeps all its persistent data in the CDS as well.

Clustered VTSS Configuration

A configuration that consists of a Primary VTSS and a Secondary VTSS connected by one or more Nearlink connections (cluster links).

You can use the MGMTclas statement REPLICAT parameter (which requires the Advanced Management Feature) to direct the Primary VTSS to replicate (copy) a VTV to the Secondary VTSS via a cluster link. If the Primary VTSS becomes unavailable, you can use the VT VARY VTSS command to vary it offline to VTCS. You then vary the Secondary VTSS's VTDs online to MSP to continue the workload. The Secondary, therefore, acts as a "warm standby" to the Primary VTSS.

DBU

Disk buffer utilization. The ratio of used to total VTSS buffer capacity.

HSC

Sun StorageTek Host Software Component.

HSM

Hierarchical Storage Manager.

LMU

A Library Management Unit that controls one or more LSMs.

LSM

A Library Storage Module that contains storage cells for cartridges, drive panels, and CAPs.

Migration

The movement of data from the VTSS to the RTD where VTVs are stacked onto MVCs. Migration is initiated by VSM when high AMT levels are reached. VTVs are selected for migration based on use and size: the least recently used and the largest VTVs are selected first. VSM provides the ability to migrate VTVs on demand and to migrate multiple copies of the VTV.

MVC

Multi–volume cartridge. The physical cartridge in the LSM that contains one or more VTVs or no VTVs, but has been identified as a volume that can be selected for VTV stacking. This data is stored in the CDS.

Recall

The movement of VTVs back to the VTSS from the MVC. VSM provides the ability to recall VTVs on demand.

Reclaim

Refers to MVC space reclamation. VTCS uses the amount of fragmented free space on the MVC and the amount of VTV data that would have to be moved to determine if space reclamation is justified. VSM provides the ability to reclaim MVCs on demand.

RTD

Real Tape Drive. The physical transport controlled by VSM/HSC. The transport has a data path to a VTSS and may optionally have a data path to MSP or to another VTSS.

SMC

Sun StorageTek Storage Management Component, which is the interface between Fujitsu's MSP/EX operating systems and HSC.

SMS

System Managed Storage

TMM

Tape Mount Management

VSM

Virtual Storage Manager. A storage solution that virtualizes volumes and transports in a VTSS buffer in order to improve media and transport use. The hardware includes VTSS, which is the disk buffer, and RTDs. The software includes VTCS, an HSC–based host software, and VTSS microcode.

VTCS

Virtual Tape Control System. The primary host software that controls activity and information about VTSSs, VTVs, RTDs, and MVCs. This software operates in the same address space from HSC, and communicates closely with HSC.

VTD

Virtual Tape Drive. A transport in the VTSS that emulates a physical 3490E to MSP. The data written to a VTD is really being written to disk. The VTSS has 64 VTDs that do virtual mounts of VTVs.

VTSS

Virtual Tape Storage Subsystem. The disk buffer containing virtual volumes and transports. The VTSS is disk device with microcode that enables emulation of 32 or 64 transports. The device can read and write "tape" data from/to disk, and can read and write the data from/to an RTD.

VTV

Virtual Tape Volume. The "cartridge" whose volume number is known to the MSP catalog and the TMS (Tape Management System) as a tape data set.