
The graphic on the left side of the slide features the text "HP WORLD 2005" in a large, white, serif font, with "Conference & Expo" in a smaller, white, sans-serif font below it. A blue, stylized circular logo is positioned behind the text. Below the text is a stylized illustration of a city skyline, including the Golden Gate Bridge, several skyscrapers, and a cable car. The background is a dark purple with a subtle pattern of white dots.

**Case Study:
ABS/SLS,
DCSC and
StorageTek
ACSLs**

David J Dachtera

DJE Systems



SLS DCSC STK Case Study

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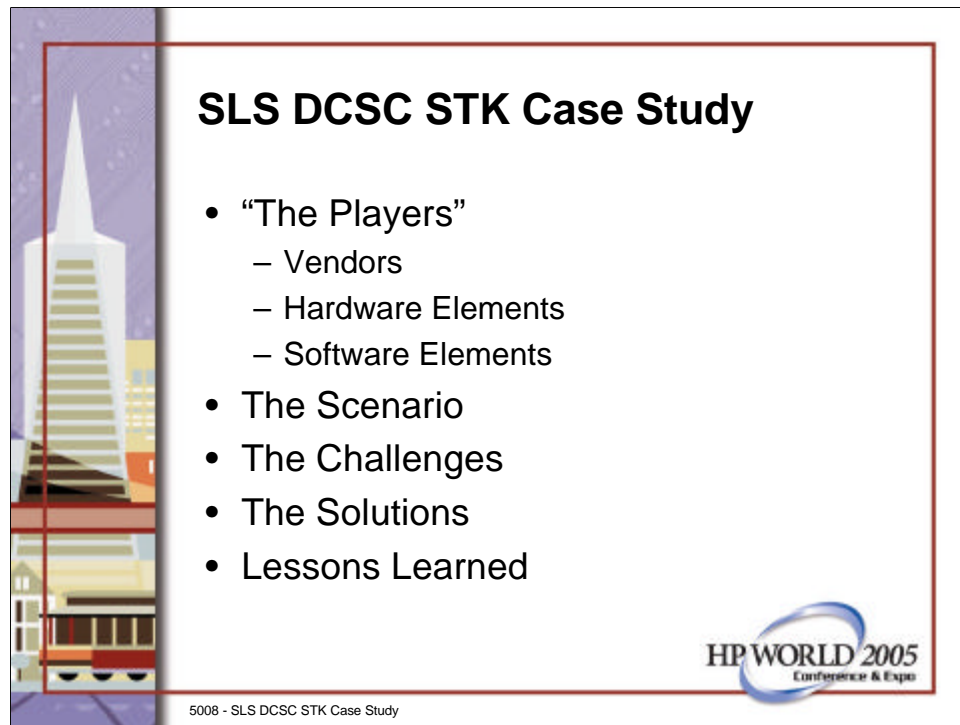
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The slide features a vertical illustration on the left side showing a stylized white tower with a pointed top, set against a purple and blue background. Below the tower, there are some colorful rectangular shapes. The main content area is white with a red border. The title 'SLS DCSC STK Case Study' is in bold black text. Below the title is a bulleted list with five items. In the bottom right corner of the slide, there is a logo for 'HP WORLD 2005 Conference & Expo' and a small text '5008 - SLS DCSC STK Case Study' in the bottom left corner of the slide frame.

SLS DCSC STK Case Study

- “The Players”
 - Vendors
 - Hardware Elements
 - Software Elements
- The Scenario
- The Challenges
- The Solutions
- Lessons Learned

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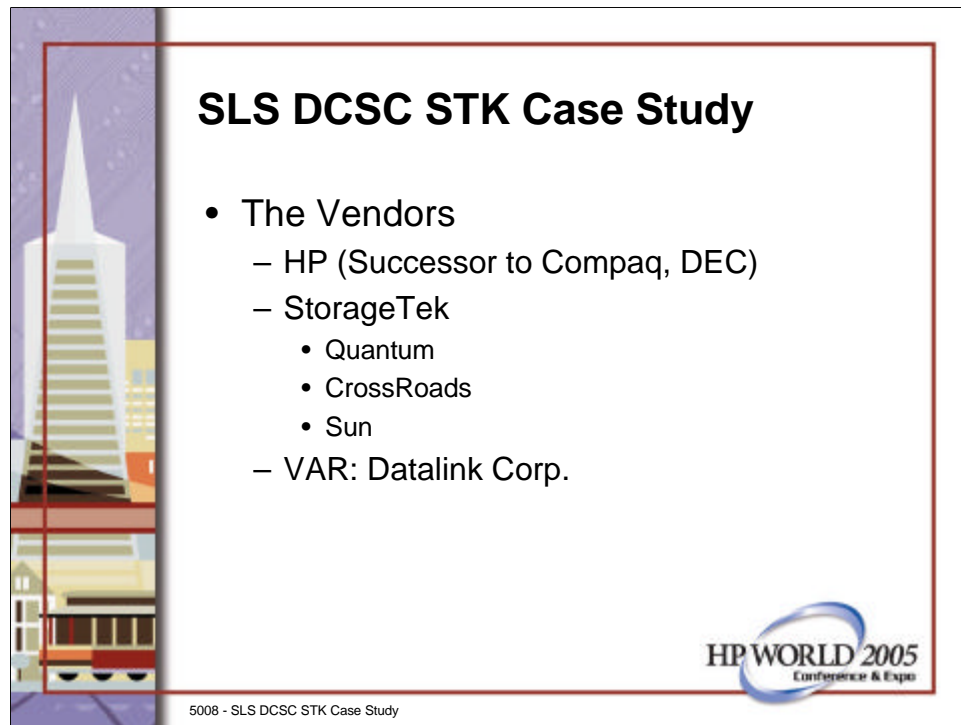
In this presentation, we’ll examine a case study from an actual installation.

The players in this case are the vendors of the various hardware and software elements, and the elements themselves.

As we examine the scenario, we’ll look at how the various hardware and software elements have been integrated into a synergistic solution, sometimes even against their “will” and nature.

We’ll look at the challenges that were faced in attempting to integrate these elements into a working solution, and we’ll discuss the various individual solutions and work-arounds that were devised.

Finally, we’ll review some of the lessons learned about the various hardware and software elements, how they work and how they play together with each other with the assistance of the work-arounds devised.

A presentation slide titled "SLS DCSC STK Case Study". On the left side, there is a vertical graphic of a stylized building with a pointed top, resembling the Transamerica Pyramid, set against a purple and blue background. The main content area is white with a red border. It contains a bulleted list of vendors. In the bottom right corner, there is a logo for "HP WORLD 2005 Conference & Expo". At the bottom left of the slide, the text "5008 - SLS DCSC STK Case Study" is visible.

SLS DCSC STK Case Study

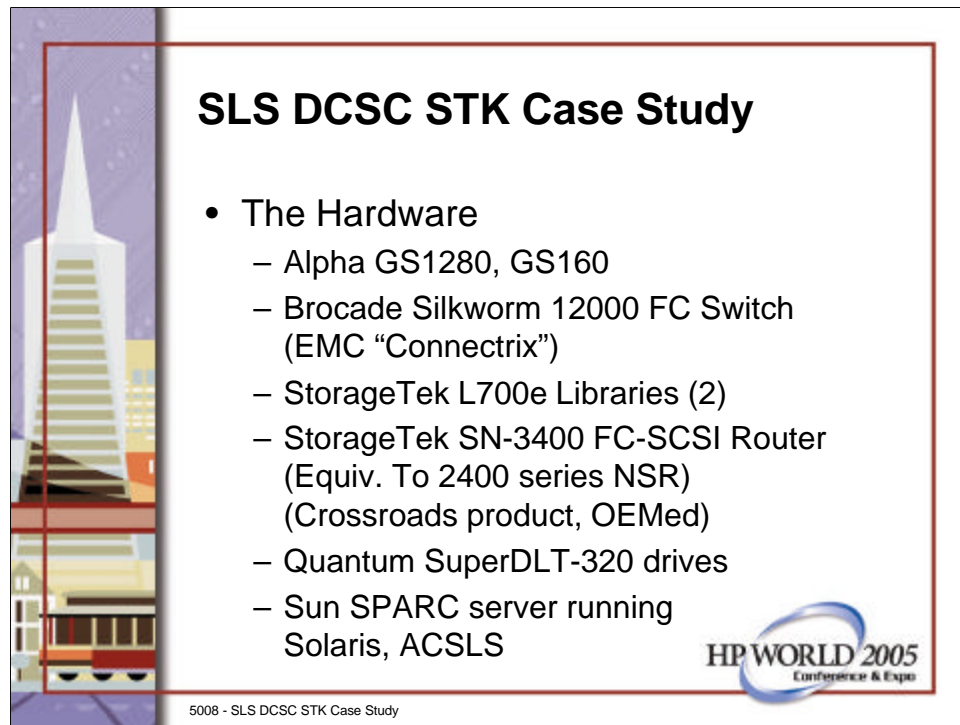
- The Vendors
 - HP (Successor to Compaq, DEC)
 - StorageTek
 - Quantum
 - CrossRoads
 - Sun
 - VAR: Datalink Corp.

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The vendors involved in this case study are:

- Hewlett Packard Corp., as the successor to Compaq and Digital
- StorageTek, vendor of the tape libraries and tape library software called ACSLS. Integrated into the libraries are products from Quantum Corp., the makers of the tape drives, CrossRoads the makers of the SCSI-FC multi-protocol routers and Sun whose Solaris and SPARC platforms provide the operating environment in which ACSLS runs.
- Datalink Corporation, Valued-Added Reseller of the StorageTek Libraries.

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SLS DCSC STK Case Study

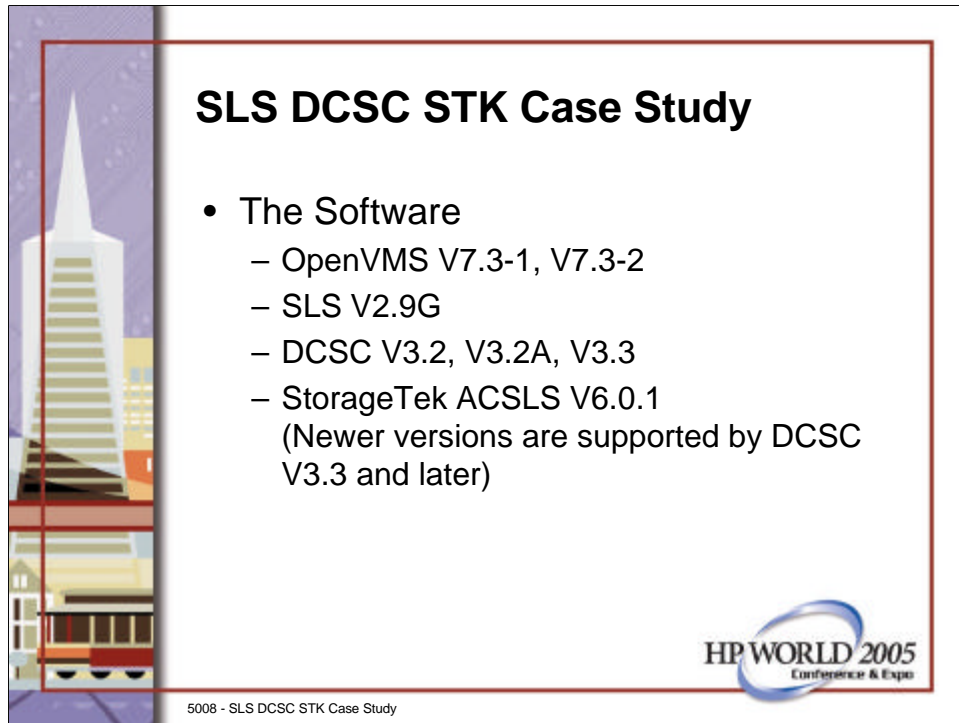
- The Hardware
 - Alpha GS1280, GS160
 - Brocade Silkorm 12000 FC Switch (EMC “Connectrix”)
 - StorageTek L700e Libraries (2)
 - StorageTek SN-3400 FC-SCSI Router (Equiv. To 2400 series NSR) (Crossroads product, OEMed)
 - Quantum SuperDLT-320 drives
 - Sun SPARC server running Solaris, ACSLS

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The hardware involved in this study:

- Alpha GS1280 and GS160 (host systems, clustered)
- Brocade Silkorm 12000 Fibre Channel Switch (as provided in an EMC “Connectrix” unit).
- StorageTek L700e Tape Libraries (2 units)
- StorageTek SN3400 FC-SCSI Router
Equivalent to 2400 series Network Storage Router (NSR). Like NSRs, these are rebadged CrossRoads products.
- Quantum SuperDLT-320 drives as supplied by StorageTek

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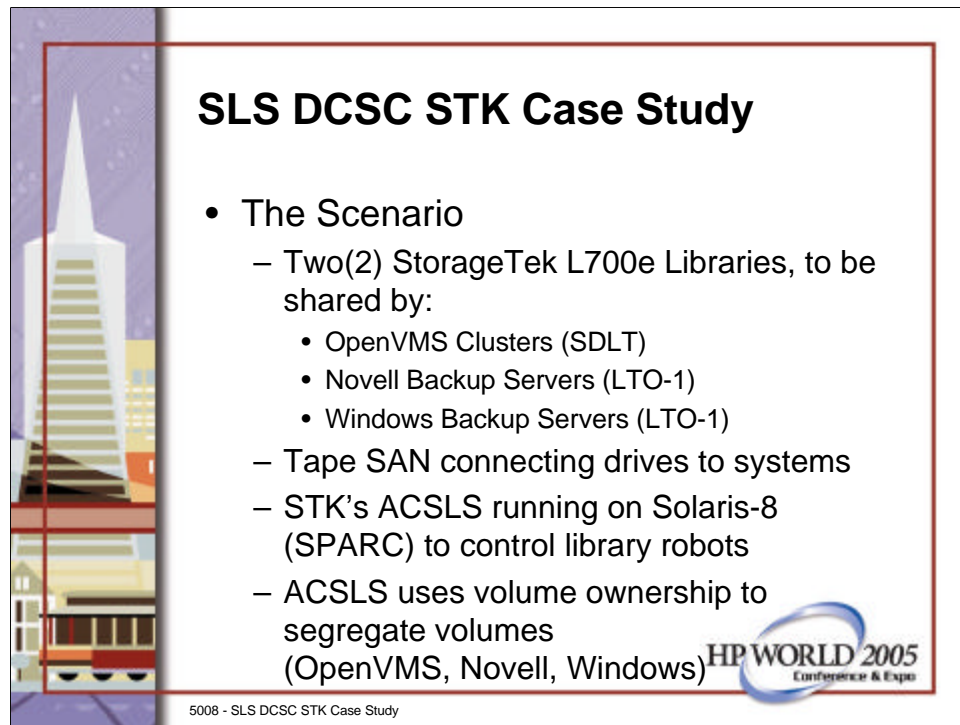
- The Software
 - OpenVMS V7.3-1, V7.3-2
 - SLS V2.9G
 - DCSC V3.2, V3.2A, V3.3
 - StorageTek ACSLS V6.0.1
(Newer versions are supported by DCSC V3.3 and later)

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The Software involved in this study:

- OpenVMS V7.3-1 and V7.3-2
- Storage Library System (SLS) V2.9G
Equivalent to ABS
- Data Cartridge Server Component (DCSC) V3.2, V3.2A and V3.3
- Automated Cartridge System Library Software (ACSL) from StorageTek V6.0.1. Newer ACSLS versions (V6.1, V7.x) are supported by DCSC V3.3 and later.



SLS DCSC STK Case Study

- The Scenario
 - Two(2) StorageTek L700e Libraries, to be shared by:
 - OpenVMS Clusters (SDLT)
 - Novell Backup Servers (LTO-1)
 - Windows Backup Servers (LTO-1)
 - Tape SAN connecting drives to systems
 - STK's ACSLS running on Solaris-8 (SPARC) to control library robots
 - ACSLS uses volume ownership to segregate volumes (OpenVMS, Novell, Windows)

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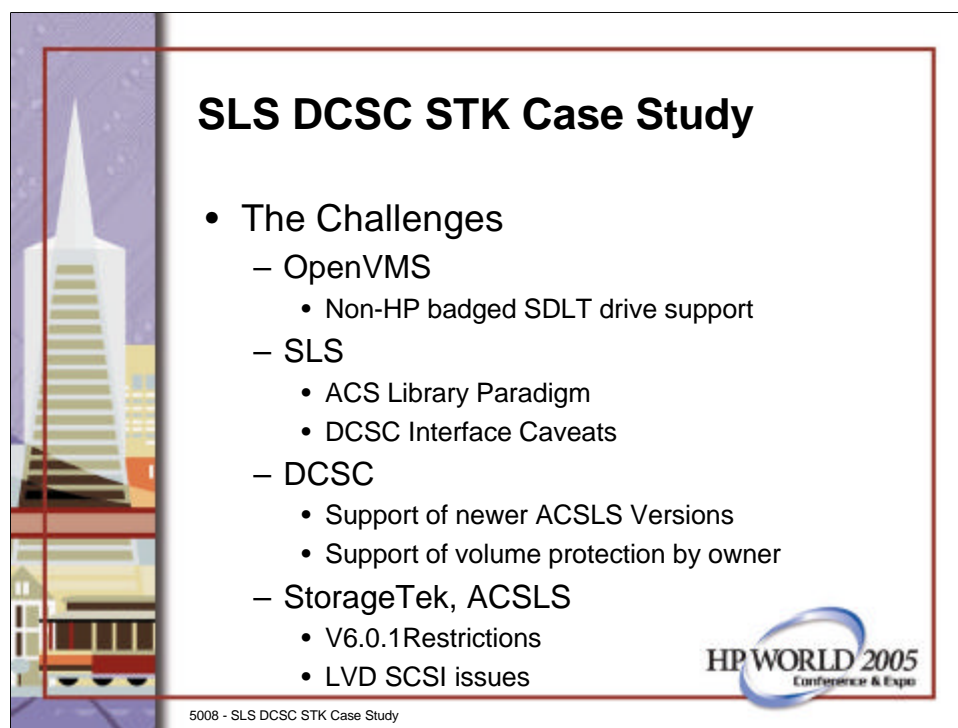
Here's the scenario with which the Technical Analyst was presented:

Two StorageTek L700e Libraries to be shared by both the OpenVMS clusters and Novell and Windows backup servers.

A Fibre Channel Switched Fabric Tape SAN (TSAN) for connecting the tape drives to host systems.

STK's ACSLS running on a small Solaris-8 system to control the library robots enabling them to be shared by the multi-vendor systems.

ACSLs volume ownership is employed to segregate volumes between types of host systems (OpenVMS, Novell, Windows).



The slide features a vertical image on the left showing a stylized building with a spire. The main content is a list of challenges under the heading 'SLS DCSC STK Case Study'. The HP WORLD 2005 logo is in the bottom right corner of the slide area.

SLS DCSC STK Case Study

- The Challenges
 - OpenVMS
 - Non-HP badged SDLT drive support
 - SLS
 - ACS Library Paradigm
 - DCSC Interface Caveats
 - DCSC
 - Support of newer ACSLS Versions
 - Support of volume protection by owner
 - StorageTek, ACSLS
 - V6.0.1 Restrictions
 - LVD SCSI issues

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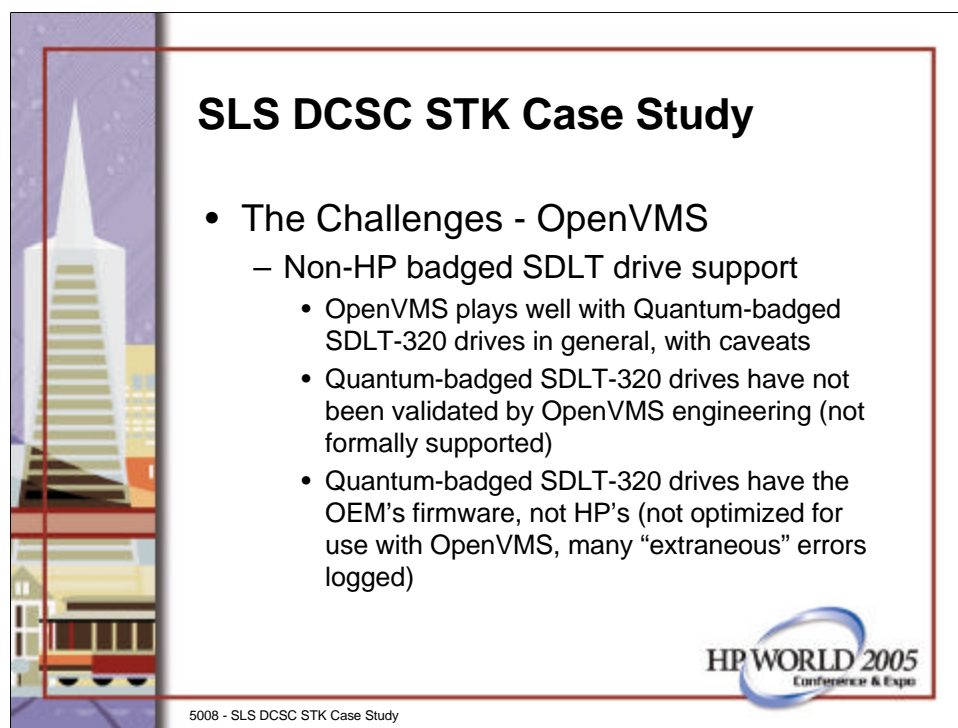
The hardware and software elements presented the Technical Analyst with a number of challenges:

Support of SCSI devices in OpenVMS is very much limited to those devices which most closely resemble the ones HP (and predecessors) OEM from other vendors as their own. In this case, issues were encountered with the SDLT drives which are not HP-badged.

The SLS software's support of StorageTek Libraries using ACSLS was designed around a single paradigm: Each ACSLS server is viewed as a single Library Management domain. No provision is made for distinguishing between Library Storage Modules (LSMs) within a Library Management Unit (LMU). Even though DCSC passes to SLS information regarding the LSM location of a cartridge or drive, SLS does not provide for this as a distinction between autonomous hardware units.

The DCSC Software is a bit behind STK in its support for current ACSLS versions. DCSC and SLS are in maintenance mode, not actively being developed.

The SCSI cables connecting the drives to the NSRs needed to be upgraded to deal with EMI issues.



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- The Challenges - OpenVMS
 - Non-HP badged SDLT drive support
 - OpenVMS plays well with Quantum-badged SDLT-320 drives in general, with caveats
 - Quantum-badged SDLT-320 drives have not been validated by OpenVMS engineering (not formally supported)
 - Quantum-badged SDLT-320 drives have the OEM's firmware, not HP's (not optimized for use with OpenVMS, many "extraneous" errors logged)

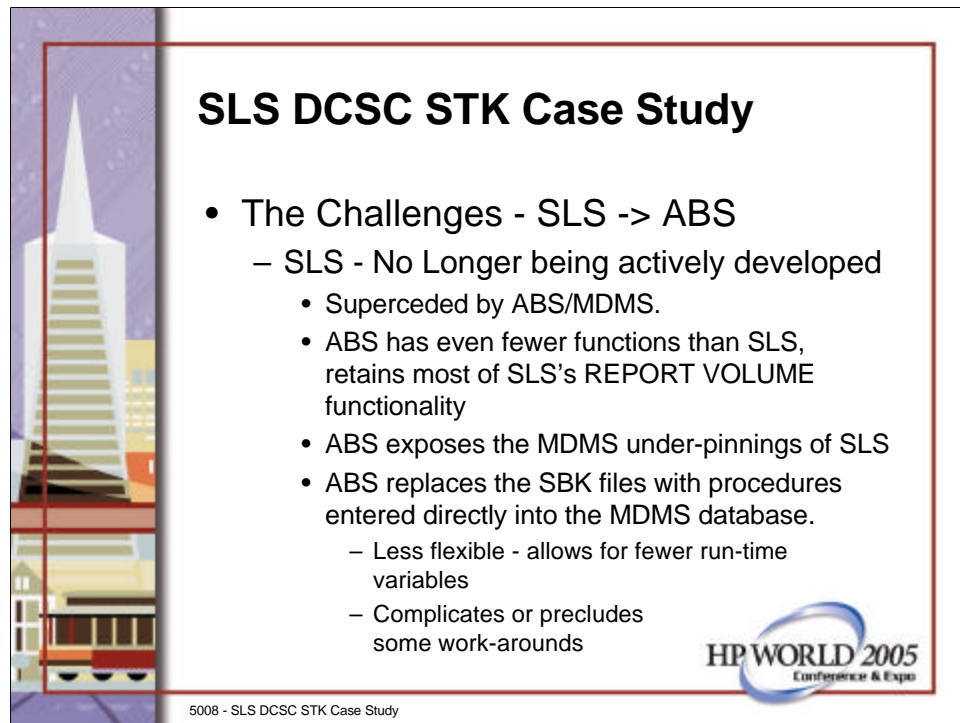
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OpenVMS seems to play well, in general, with the Quantum badged SDLT-320 drives provided by StorageTek. However, a number of new errors are logged during each backup run on each drive due to conditions that would be handled differently by the HP-badged SDLT-320 drives and their HP-validated firmware. This is not an operational problem. However, it does suggest tape drive issues where none actually exist. Restore tests have always been successful, even on tapes where errors were logged during BACKUP.

The Quantum-badged SDLT-320 drives in use at this site are provided by StorageTek and are not much different from Quantum-issued drives. STK uses their own packaging and provides their own QA. STK does not submit these drives to HP's OpenVMS group for validation.

The SDLT-320 drives that HP would provide for use in their libraries have gone through some testing with OpenVMS. HP provides some firmware tweaks to make drive performance and behavior consistent with the software specifications. Since the drives in his study are not the HP-badged versions, VMS logs many errors that can be considered extraneous, and do not necessarily indicate problems.



SLS DCSC STK Case Study

- The Challenges - SLS -> ABS
 - SLS - No Longer being actively developed
 - Superseded by ABS/MDMS.
 - ABS has even fewer functions than SLS, retains most of SLS's REPORT VOLUME functionality
 - ABS exposes the MDMS under-pinnings of SLS
 - ABS replaces the SBK files with procedures entered directly into the MDMS database.
 - Less flexible - allows for fewer run-time variables
 - Complicates or precludes some work-arounds

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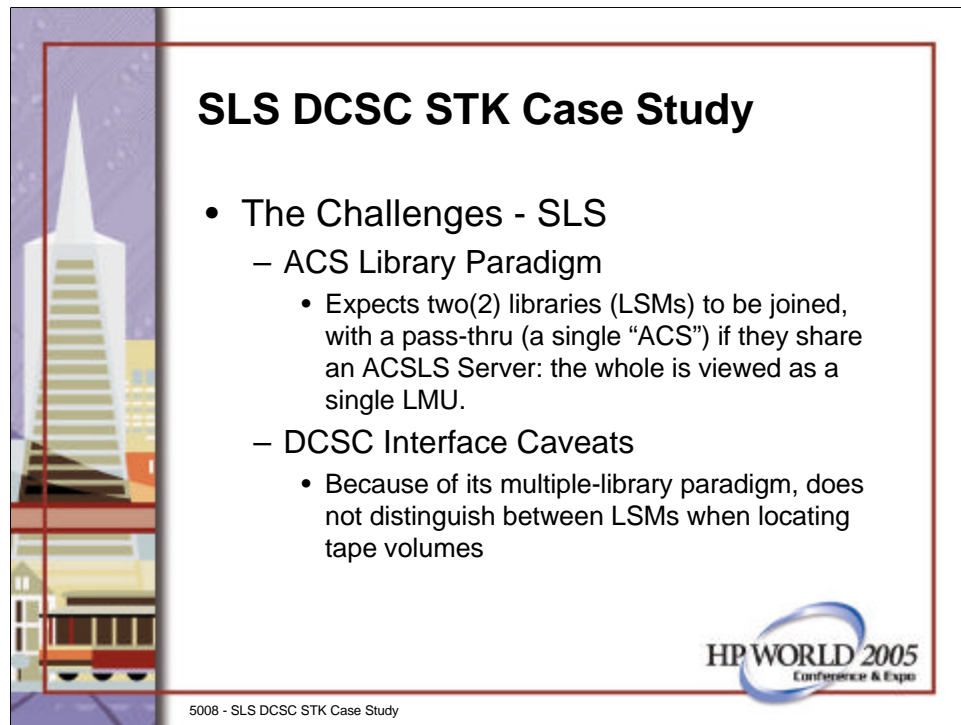
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The SLS product is no longer being actively developed. Some minor engineering changes have been made in V2.9. The current version seems to be V2.9H. (As of 20-Oct-2006, this is V2.9J.)

The replacement product is ABS. ABS is, in general, SLS with the MDMS underpinnings more exposed. The ABS verbs in DCL have fewer options than their SLS counter parts, and some SLS functions are now performed using MDMS commands rather than SLS's STORAGE commands.

One major change is that in ABS, the backup "procedures" are entered directly into the MDMS database rather than using the "*_SBK.COM" files as SLS does. Support for SLS *_SBK.COM files is continued, however.

This renders ABS unsuitable for use with the solutions in the scenario presented in this study, since run-time functions available in DCL are key elements of the strategies employed to circumvent limitations of SLS's media management.

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SLS DCSC STK Case Study

- The Challenges - SLS
 - ACS Library Paradigm
 - Expects two(2) libraries (LSMs) to be joined, with a pass-thru (a single "ACS") if they share an ACSLS Server: the whole is viewed as a single LMU.
 - DCSC Interface Caveats
 - Because of its multiple-library paradigm, does not distinguish between LSMs when locating tape volumes

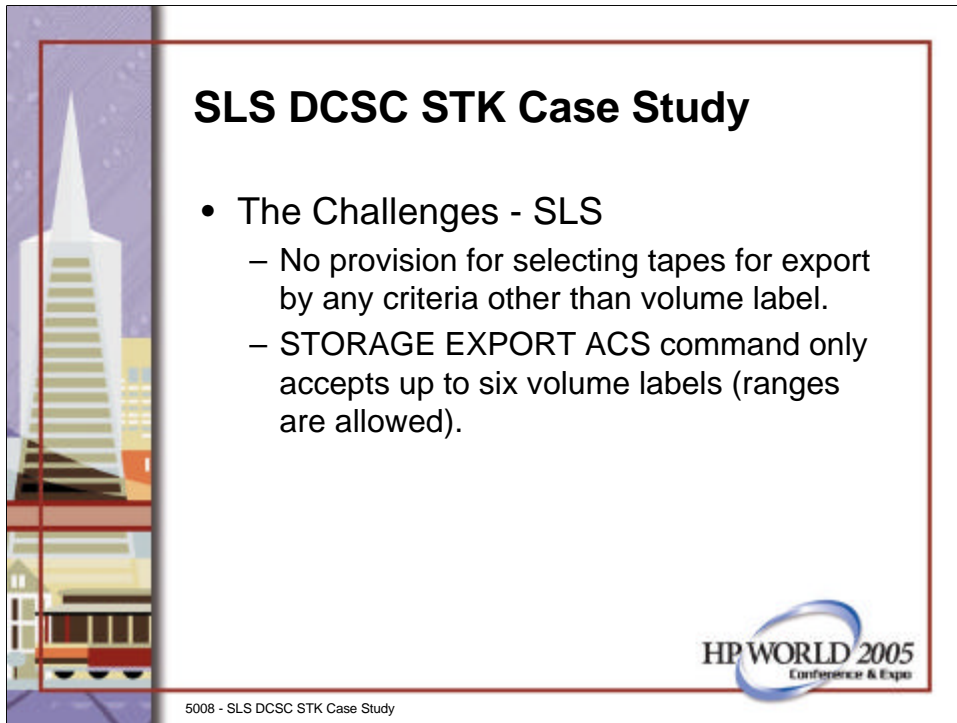
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When two libraries are served by the same ACSLS server, both SLS and DCSC tend to view both libraries as being a single Media Management Domain and a single Library Management Unit (LMU) or Automated Cartridge System (ACS).

Thus, if not configured properly, when selecting a tape and a drive into which to load the tape, SLS may select a drive in one Library Storage Module (LSM) and a cartridge located in the other LSM, resulting in an error at run time.

SLS can detect the error once it has occurred, but cannot prevent it from occurring.

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SLS DCSC STK Case Study

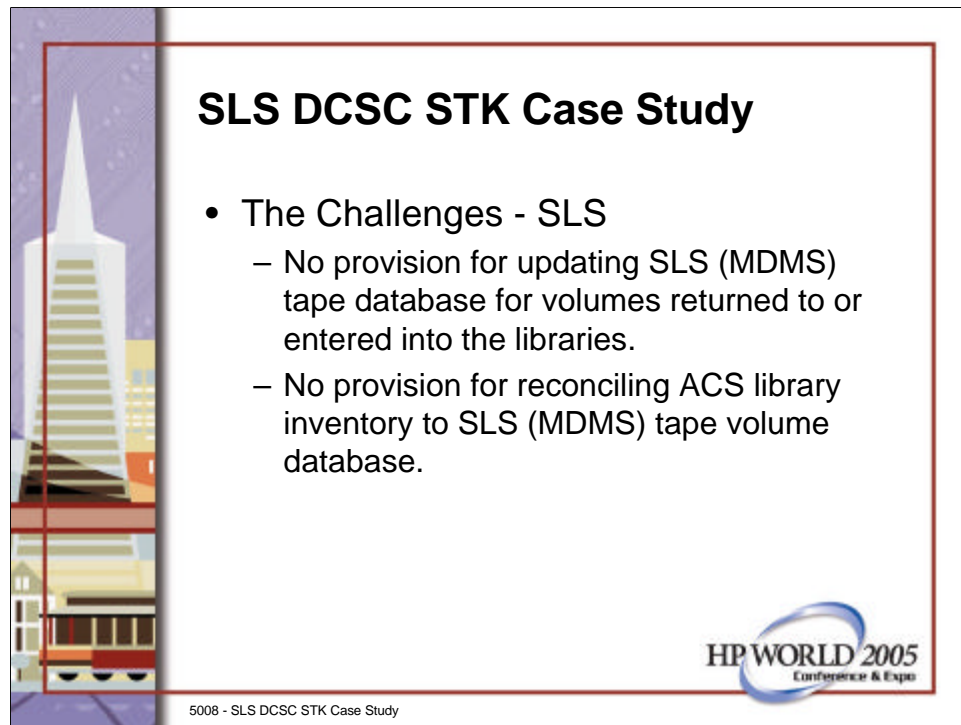
- The Challenges - SLS
 - No provision for selecting tapes for export by any criteria other than volume label.
 - STORAGE EXPORT ACS command only accepts up to six volume labels (ranges are allowed).

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SLS does not provide a way to select tapes for export, whether by date, media type, or any other except by volume label.

The STORAGE EXPORT ACS command only allows for up to six(6) unique volume labels to specified, although volume ranges are supported.

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SLS DCSC STK Case Study

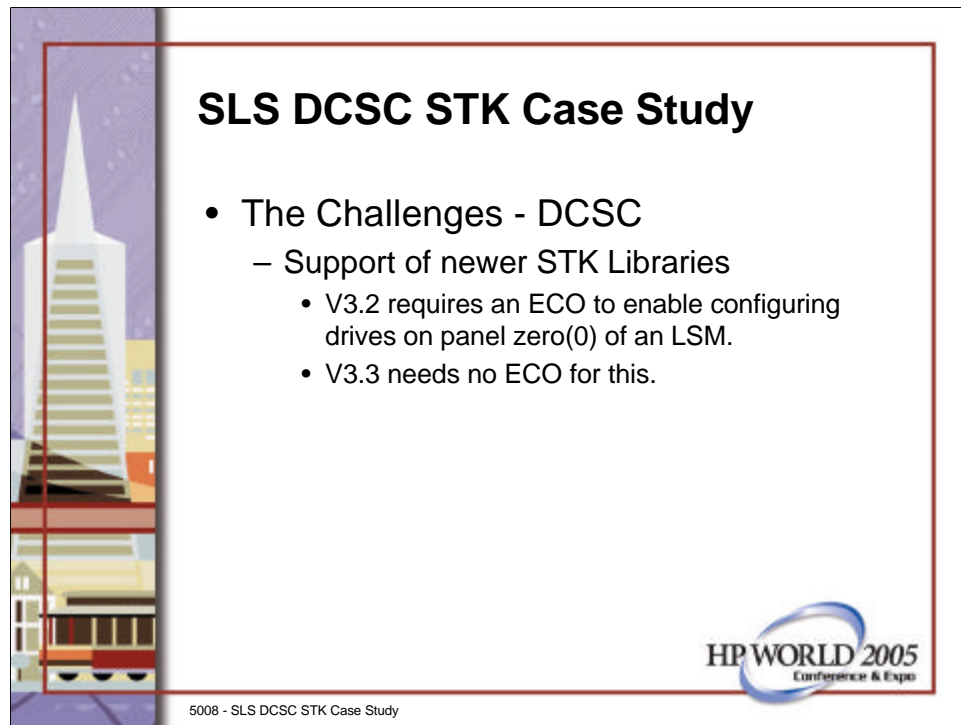
- The Challenges - SLS
 - No provision for updating SLS (MDMS) tape database for volumes returned to or entered into the libraries.
 - No provision for reconciling ACS library inventory to SLS (MDMS) tape volume database.

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SLS does not provide an automated way to reconcile the SLS database to the current ACSLS volume inventory.

This includes the process of returning volumes to the libraries after they have been exported for temporary off-site storage, for example.



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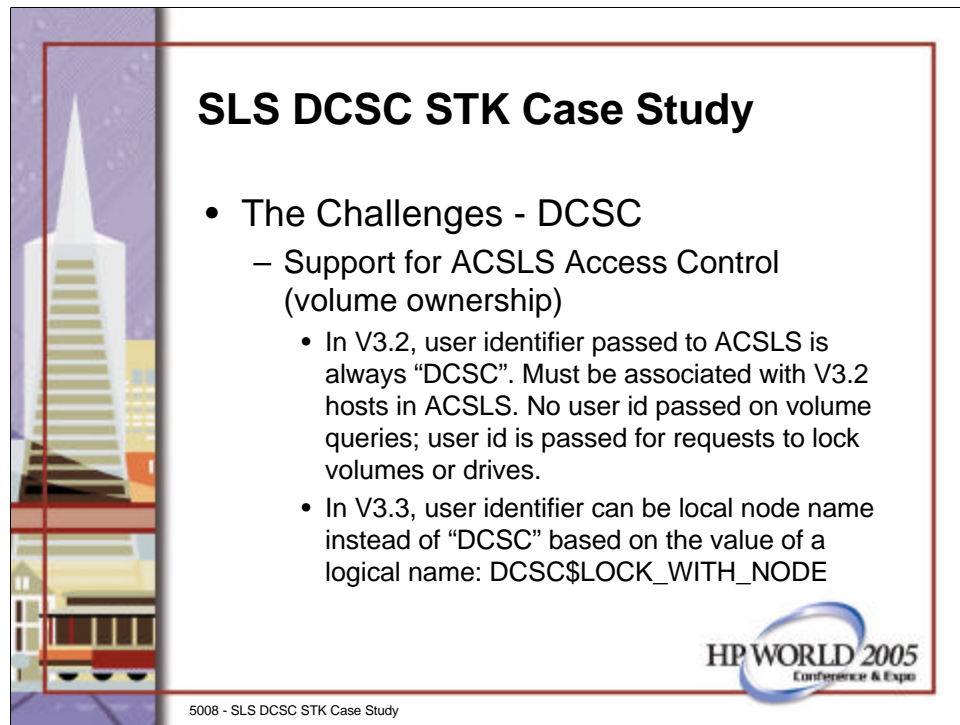
- The Challenges - DCSC
 - Support of newer STK Libraries
 - V3.2 requires an ECO to enable configuring drives on panel zero(0) of an LSM.
 - V3.3 needs no ECO for this.

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Data Cartridge Server Component (DCSC) V3.2 needs an ECO to make it work with the L700e libraries. In previous StorageTek libraries, tape drives were usually not located on panel zero(0). L700e is one of those newer STK products where tape drives are found on panel zero(0) of the LSM.

DCSC V3.3 is aware of newer STK products and needs no fix for this.

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SLS DCSC STK Case Study

- The Challenges - DCSC
 - Support for ACSLS Access Control (volume ownership)
 - In V3.2, user identifier passed to ACSLS is always “DCSC”. Must be associated with V3.2 hosts in ACSLS. No user id passed on volume queries; user id is passed for requests to lock volumes or drives.
 - In V3.3, user identifier can be local node name instead of “DCSC” based on the value of a logical name: DCSC\$LOCK_WITH_NODE

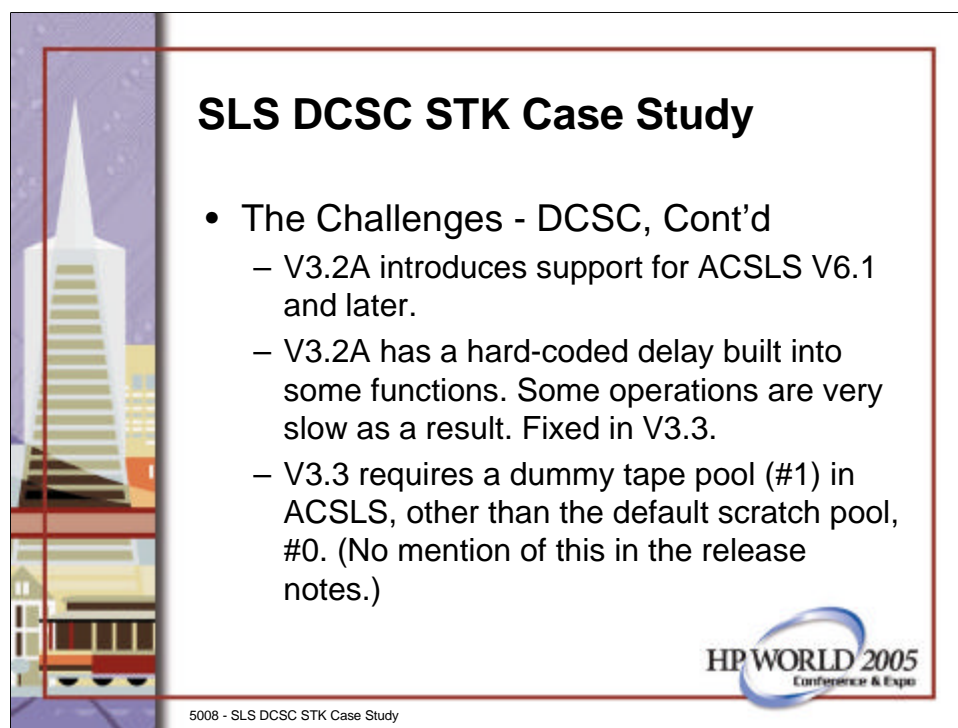
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ACSLs employs a method called Access Control where volumes are owned by specific entities, entities being identified by an entry in the host system’s /etc/hosts table as well as in ACSLS’s files. This raises some issues with DCSC. In DCSC V3.2, volume inquiries are sent to ACSLS without a user identifier. Thus, when ACSLS is configured to use volume access control, it identifies the remote system by its IP address via the host table. However, when requesting a volume lock, an explicit user identifier of “DCSC” is passed to ACSLS. Unless an alias for the VMS system running DCSC is setup on the ACSLS platform and within ACSLS, access to volumes will be denied.

This is an issue when two clusters will be accessing libraries served by a single ACSLS server or set of servers.

This changes in DCSC V3.3. Now, the local node name can be sent to DCSC as a “user identifier”. This is controlled by using the logical name DCSC\$LOCK_WITH_NODE. However, DCSC has an additional ACSLS configuration requirement which will be detailed in the later sections of this presentation.



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- The Challenges - DCSC, Cont'd
 - V3.2A introduces support for ACSLS V6.1 and later.
 - V3.2A has a hard-coded delay built into some functions. Some operations are very slow as a result. Fixed in V3.3.
 - V3.3 requires a dummy tape pool (#1) in ACSLS, other than the default scratch pool, #0. (No mention of this in the release notes.)

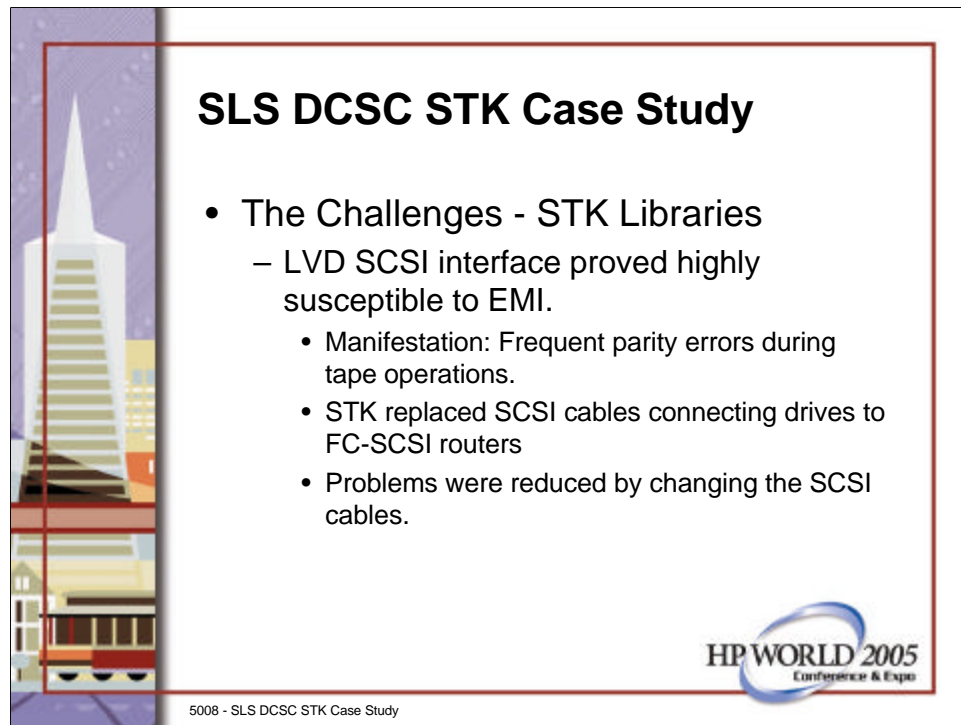
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DCSC V3.2A was provided to introduce support for more current versions of ACSLS, such as V6.1 and later.

However, DCSC V3.2A has an issue of its own: a hard-coded delay occurs in certain operations interacting with ACSLS. As a result, most operations occur quite slowly. This is fixed in V3.3.

DCSC V3.3 depends on a dummy tape pool being set up in ACSLS, other than the default scratch pool. The purpose of this additional requirement was not clear at the time this presentation was prepared. This requirement is not documented in the V3.3 release notes. There is no update to the DCSC documentation for V3.3.



SLS DCSC STK Case Study

- The Challenges - STK Libraries
 - LVD SCSI interface proved highly susceptible to EMI.
 - Manifestation: Frequent parity errors during tape operations.
 - STK replaced SCSI cables connecting drives to FC-SCSI routers
 - Problems were reduced by changing the SCSI cables.

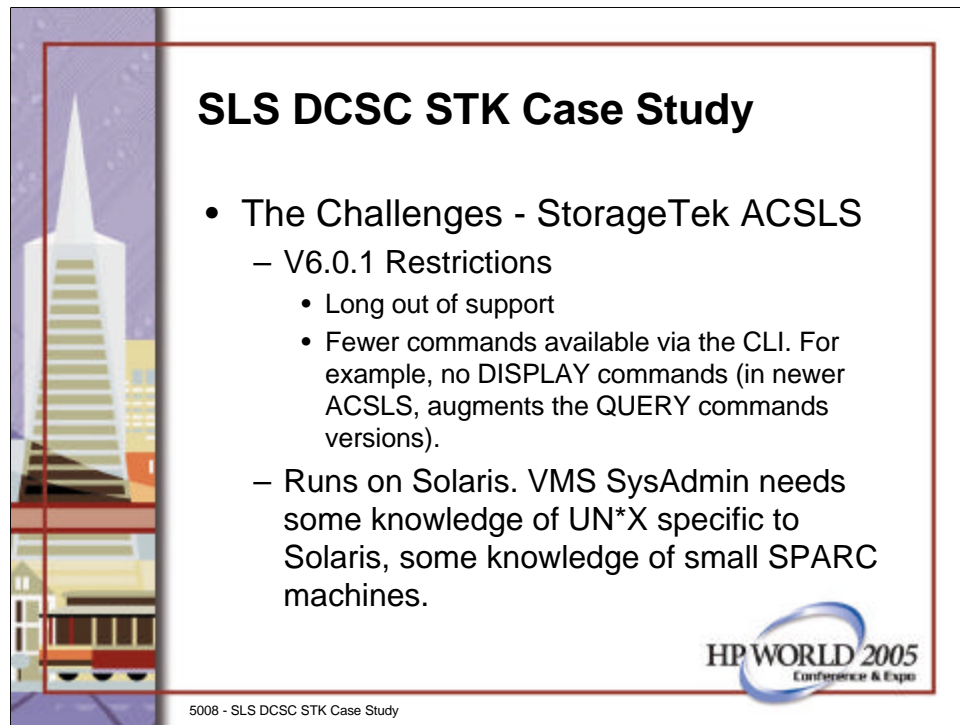
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During the initial implementation, issues arose with frequent parity errors occurring between the SDLT drives and the NSRs.

StorageTek explored this and determined that the environment was electrically noisy, sufficiently so that better SCSI cables were needed to link the drives to the NSRs.

This abated the issue significantly. Parity errors on the SCSI interfaces are now only experienced very seldom.



SLS DCSC STK Case Study

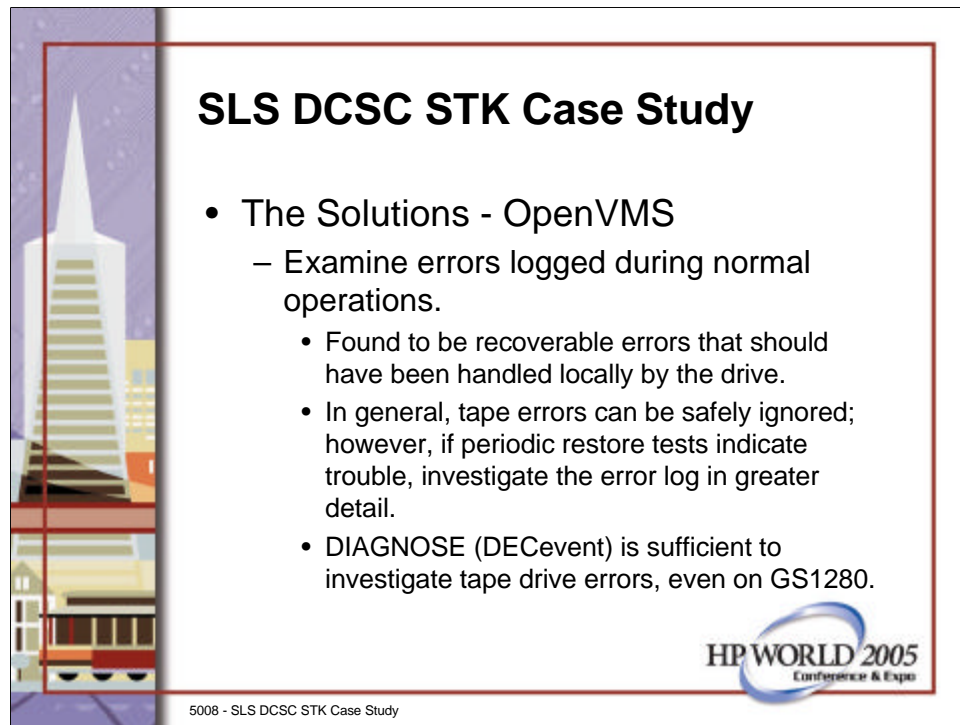
- The Challenges - StorageTek ACSLS
 - V6.0.1 Restrictions
 - Long out of support
 - Fewer commands available via the CLI. For example, no DISPLAY commands (in newer ACSLS, augments the QUERY commands versions).
 - Runs on Solaris. VMS SysAdmin needs some knowledge of UN*X specific to Solaris, some knowledge of small SPARC machines.

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V6.0.1 of ACSLS is quite old and has been out of support for some time now. Later versions (v6.1 and later) provide new commands which give more flexibility in displaying various aspects of the libraries.

ACSLS as installed and implemented on the study site runs on Sun's Solaris. Thus, the VMS System Administrator and/or system programmer requires some basic knowledge of UN*X systems specific to Solaris. Some familiarity with SPARC hardware and its console environment is also helpful.



SLS DCSC STK Case Study

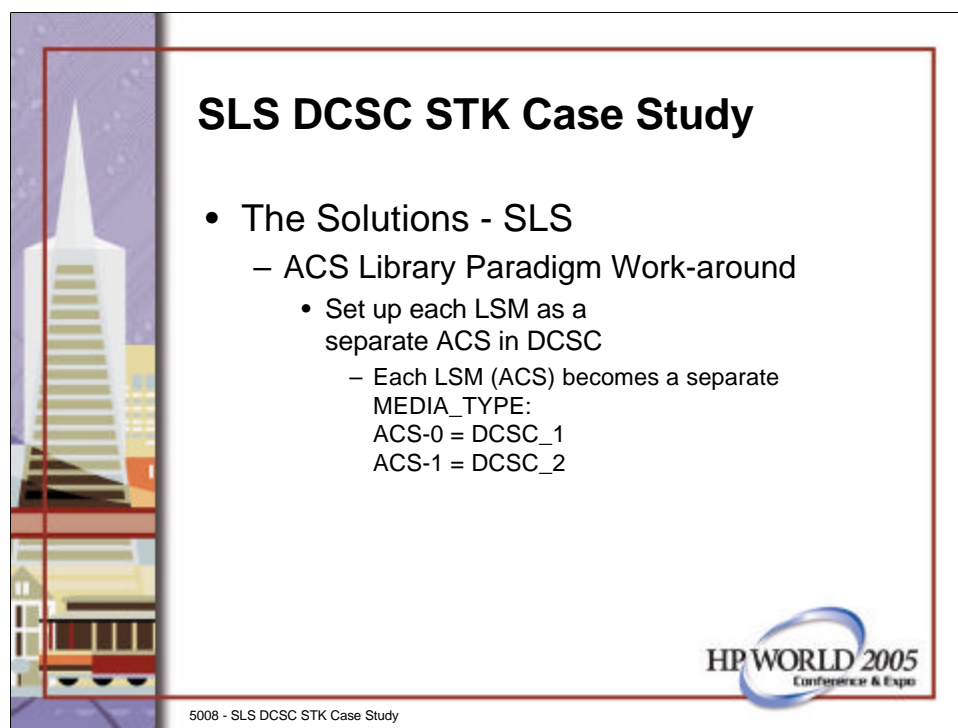
- The Solutions - OpenVMS
 - Examine errors logged during normal operations.
 - Found to be recoverable errors that should have been handled locally by the drive.
 - In general, tape errors can be safely ignored; however, if periodic restore tests indicate trouble, investigate the error log in greater detail.
 - DIAGNOSE (DECevent) is sufficient to investigate tape drive errors, even on GS1280.

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The tape drive errors logged by VMS during the BACKUP runs are generally recoverable errors and are normally not reported to the host by HP-badged drives that have been validated by OpenVMS for use with OpenVMS. They can be safely ignored, in general; however, this creates a “boy who cried wolf” situation. In order to know if these are indeed simply errors that can be ignored, periodic checking and restore tests should be run to verify the integrity of the BACKUP savesets written to tape.

So far, DIAGNOSE (DECevent V3.4) has been sufficient to investigate these error log entries, even on a GS1280 system. No need for WEBES has been identified for this.



SLS DCSC STK Case Study

- The Solutions - SLS
 - ACS Library Paradigm Work-around
 - Set up each LSM as a separate ACS in DCSC
 - Each LSM (ACS) becomes a separate MEDIA_TYPE:
ACS-0 = DCSC_1
ACS-1 = DCSC_2

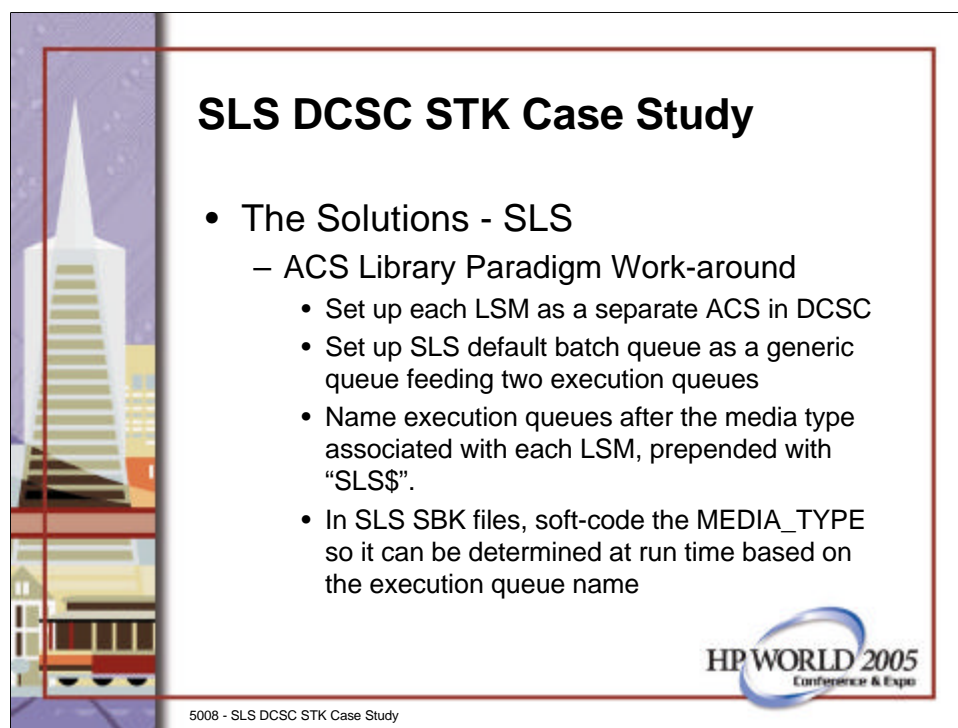
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As a work-around to SLS paradigm regarding the ACS Libraries, each library is set up in SLS as separate media type.

The first library, known in ACSLS as ACS-0 becomes media type DCSC_1 in SLS. In STORAGE EXPORT ACS commands, it is selected via the /ACS qualifier with the value “0” (zero), which is the default value for this qualifier. In other STORAGE commands, it is selected using the /LIBRARY qualifier with the value “1” (one), which is the default value for this qualifier.

Similarly, the second library, known in ACSLS as ACS-1 becomes media type DCSC_2 in SLS. In STORAGE EXPORT ACS commands, it is selected via the /ACS qualifier with the value “1” (one). In other STORAGE commands, it is selected using the /LIBRARY qualifier with the value “2” (two).



SLS DCSC STK Case Study

- The Solutions - SLS
 - ACS Library Paradigm Work-around
 - Set up each LSM as a separate ACS in DCSC
 - Set up SLS default batch queue as a generic queue feeding two execution queues
 - Name execution queues after the media type associated with each LSM, prepended with "SLS\$".
 - In SLS SBK files, soft-code the MEDIA_TYPE so it can be determined at run time based on the execution queue name

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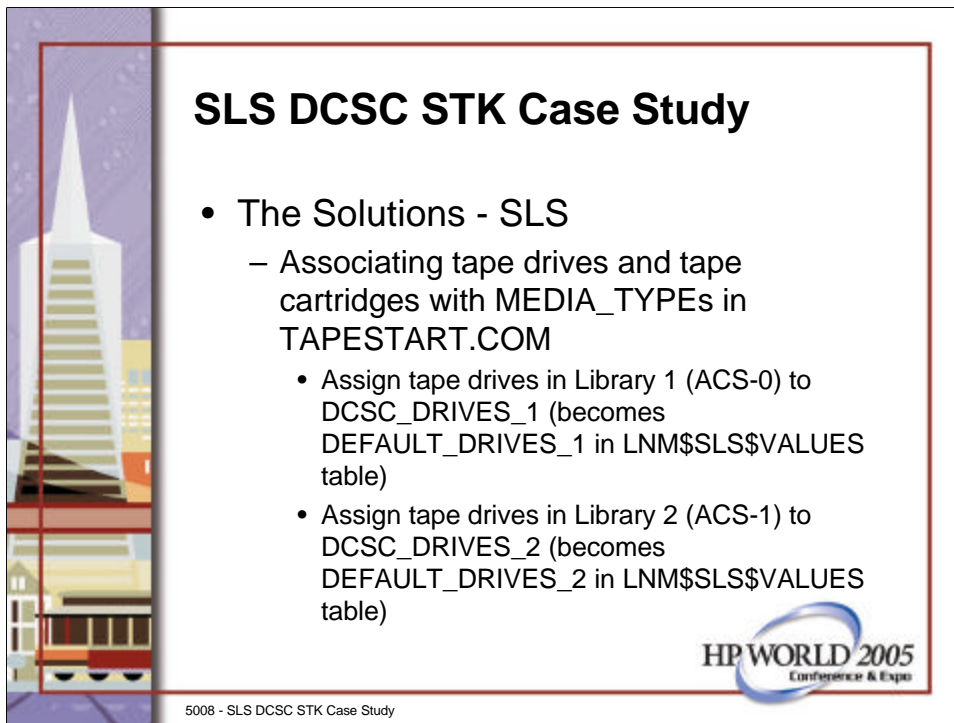
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To allow for the automation of SLS backup jobs and to allow any tape volume to be entered into any library, the SLS work-around depends on appropriate setups in DCSC which will be detailed in a later slide.

The SLS default batch queue is setup as a generic queue with two execution queue targets.

The targets of the generic default batch queue are named after the associated SLS media type, with the string "SLS\$" prefixed.

The SLS SBK files, the MEDIA_TYPE is soft-coded and is determined at batch job run time based on the execution queue name. Details are found on the next slide(s).



The slide features a vertical image on the left showing a stylized building with a pointed top. The main content is enclosed in a red-bordered box. The title 'SLS DCSC STK Case Study' is in bold. Below it is a bulleted list. At the bottom right is the 'HP WORLD 2005' logo, and at the bottom left is the text '5008 - SLS DCSC STK Case Study'.

SLS DCSC STK Case Study

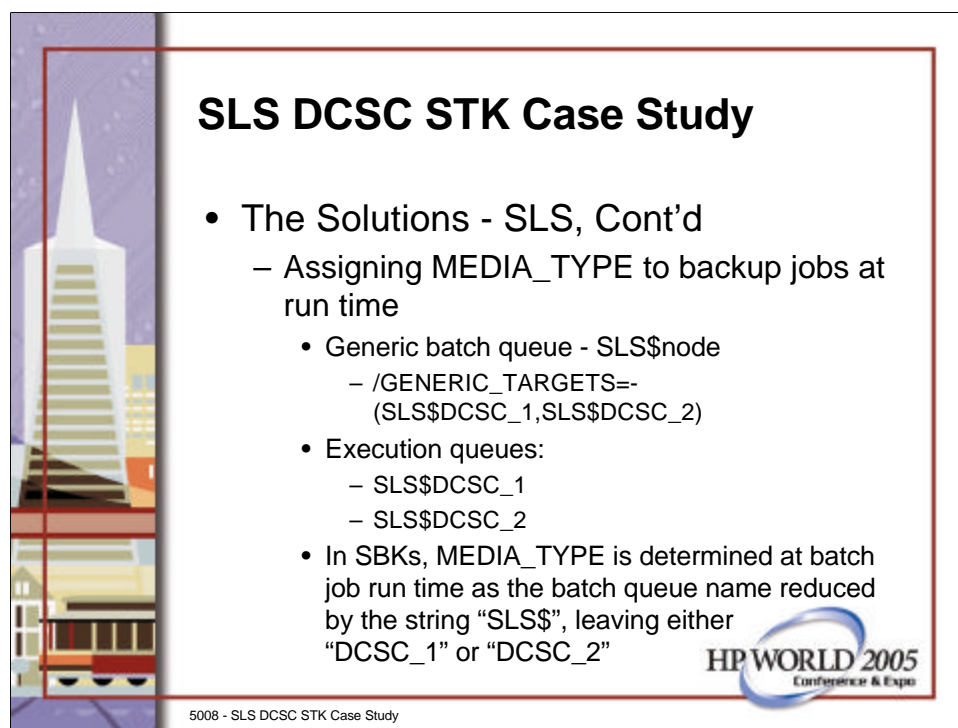
- The Solutions - SLS
 - Associating tape drives and tape cartridges with MEDIA_TYPES in TAPESTART.COM
 - Assign tape drives in Library 1 (ACS-0) to DCSC_DRIVES_1 (becomes DEFAULT_DRIVES_1 in LNM\$SLS\$VALUES table)
 - Assign tape drives in Library 2 (ACS-1) to DCSC_DRIVES_2 (becomes DEFAULT_DRIVES_2 in LNM\$SLS\$VALUES table)

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In the SLS TAPESTART.COM file, which is part of the SLS startup procedure, tape drives in the first library are associated with the symbol DCSC_DRIVES_1 and are associated with the media type DCSC_1. These are listed in the translation of the DEFAULT_DRIVES_1 logical name in the LNM\$SLS\$VALUES logical name table.

Tape drives in the second library are associated with the symbol DCSC_DRIVES_2 and are associated with the media type DCSC_2. These are listed in the translation of the DEFAULT_DRIVES_2 logical name in the LNM\$SLS\$VALUES logical name table.



SLS DCSC STK Case Study

- The Solutions - SLS, Cont'd
 - Assigning MEDIA_TYPE to backup jobs at run time
 - Generic batch queue - SLS\$node
 - /GENERIC_TARGETS=-
(SLS\$DCSC_1,SLS\$DCSC_2)
 - Execution queues:
 - SLS\$DCSC_1
 - SLS\$DCSC_2
 - In SBKs, MEDIA_TYPE is determined at batch job run time as the batch queue name reduced by the string “SLS\$”, leaving either “DCSC_1” or “DCSC_2”

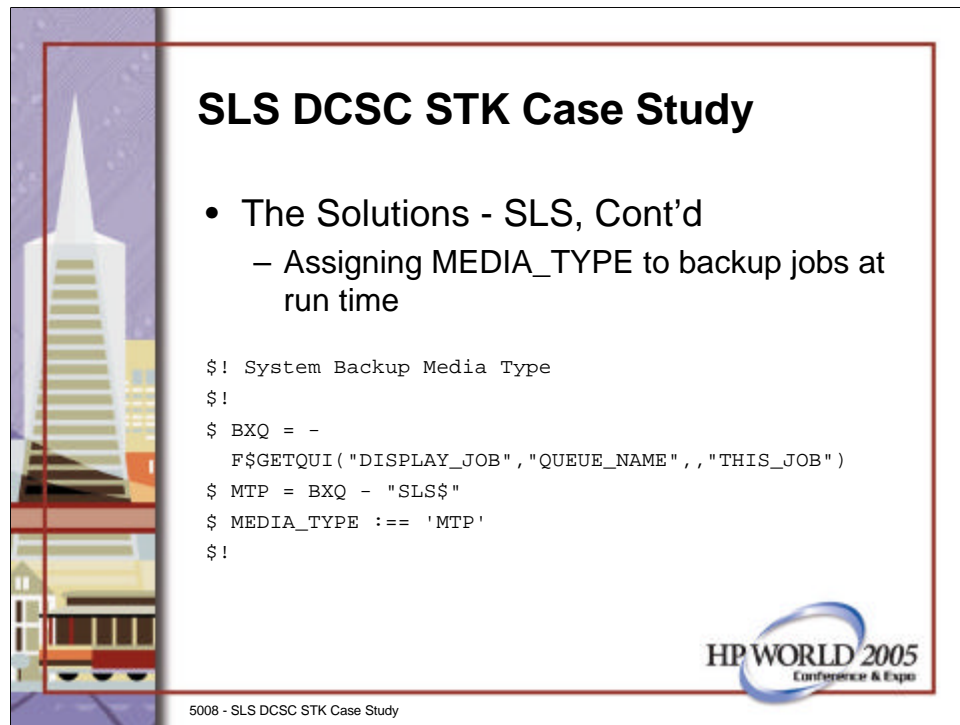
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The process of assigning a MEDIA_TYPE to batch job at run was facilitated in this way:

In VMS, a generic queue was setup with two target execution queues. The generic queue was named using the SLS convention, SLS\$node. The execution queue names were modelled on that convention using the associated media type in place of the node name: SLS\$DCSC_1 and SLS\$DCSC_2.

In the SLS SBK files, the media type is determined at batch job run time. The queue name is obtained using the F\$GETQUI() lexical function in DCL. The sub-string “SLS\$” is reduced out of the queue name. What is left identifies the MEDIA_TYPE name associated with the target library: either DCSC_1 or DCSC_2.



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- The Solutions - SLS, Cont'd
 - Assigning MEDIA_TYPE to backup jobs at run time

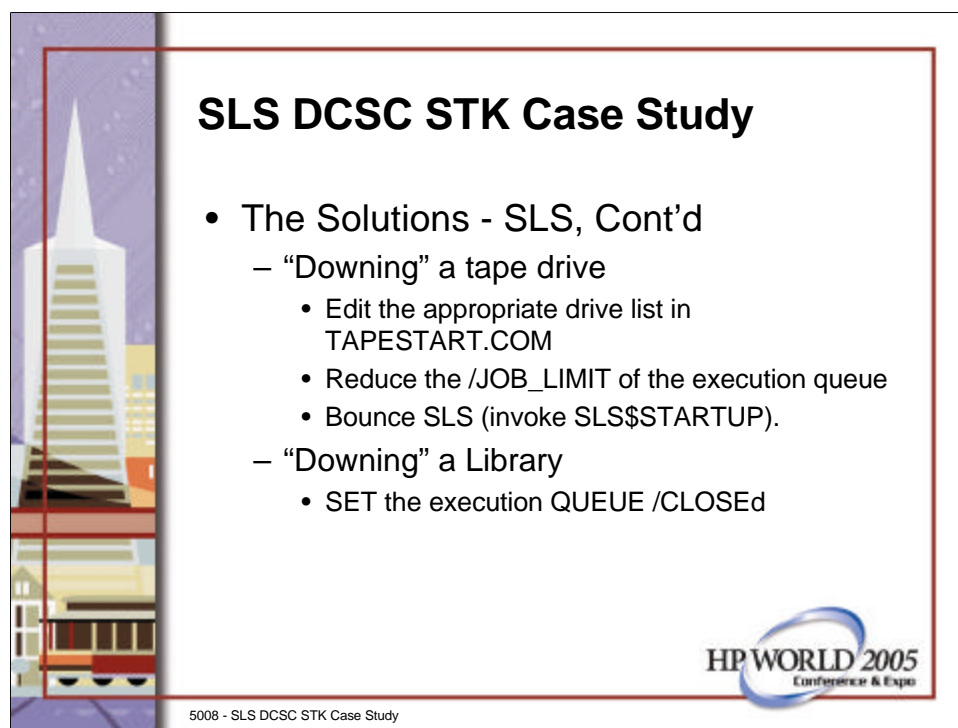
```
$! System Backup Media Type
$!
$ BXQ = -
  F$GETQUI( "DISPLAY_JOB", "QUEUE_NAME", , "THIS_JOB" )
$ MTP = BXQ - "SLS$"
$ MEDIA_TYPE ::= 'MTP'
$!
```

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Here is DCL code segment for determining the MEDIA_TYPE at batch job run time.

The queue name is obtained using the F\$GETQUI() lexical function in DCL. The sub-string “SLS\$” is reduced out of the queue name. What is left identifies the MEDIA_TYPE name associated with the target library and is assigned to the appropriate global symbol.

A presentation slide titled "SLS DCSC STK Case Study". The slide features a vertical image on the left side showing a stylized building with a pointed top. The main content area contains a bulleted list under the heading "The Solutions - SLS, Cont'd". The list includes two main items: "Downing" a tape drive and "Downing" a Library, each with sub-bullets. In the bottom right corner, there is a logo for "HP WORLD 2005 Conference & Expo". At the bottom left of the slide, the text "5008 - SLS DCSC STK Case Study" is visible.

SLS DCSC STK Case Study

- The Solutions - SLS, Cont'd
 - “Downing” a tape drive
 - Edit the appropriate drive list in TAPESTART.COM
 - Reduce the /JOB_LIMIT of the execution queue
 - Bounce SLS (invoke SLS\$STARTUP).
 - “Downing” a Library
 - SET the execution QUEUE /CLOSEd

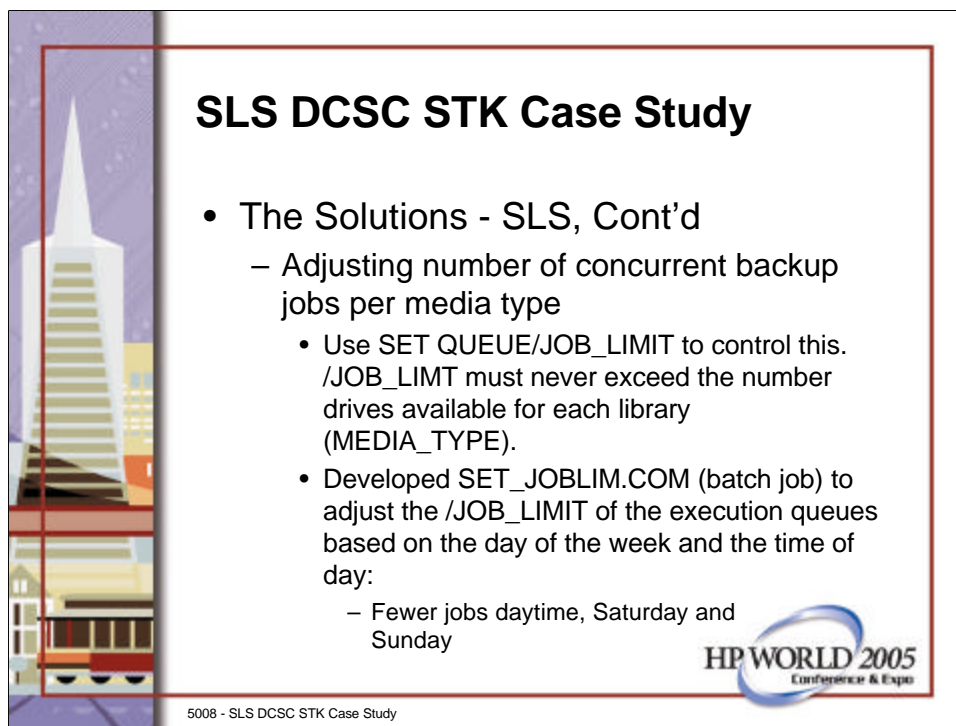
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Since tape drives do occasionally fail, as can the communication path to a drive, drives must sometimes be removed from SLS’s list of valid drives. The folks working the Novell or Windows end refer to this as “downing” a drive.

The most successful technique for this has proven to be to edit the TAPESTART.COM procedure and removed the bad drive from the appropriate list of drives. Then, reduce the /JOB_LIMIT of the associated execution queue and bounce SLS (SLS\$STARTUP will shutdown SLS if it is running, then it will restart SLS). This survives a reboot, should a crash or other system interruption occur.

Sometimes, an issue can be experienced with a library. In this case, the associated execution queue can be SET /CLOSEd. This survives a reboot, should a crash or other system interruption occur.

A presentation slide titled "SLS DCSC STK Case Study". The slide features a vertical image on the left side showing a stylized building with a spire. The main content area contains a bulleted list under the heading "The Solutions - SLS, Cont'd". The list includes: "Adjusting number of concurrent backup jobs per media type", which is further detailed with two sub-bullets: "Use SET QUEUE/JOB_LIMIT to control this. /JOB_LIMIT must never exceed the number drives available for each library (MEDIA_TYPE)." and "Developed SET_JOBLIM.COM (batch job) to adjust the /JOB_LIMIT of the execution queues based on the day of the week and the time of day:", which is further detailed with a sub-bullet: "Fewer jobs daytime, Saturday and Sunday". In the bottom right corner of the slide, there is a logo for "HP WORLD 2005 Conference & Expo". At the bottom left of the slide, the text "5008 - SLS DCSC STK Case Study" is visible.

SLS DCSC STK Case Study

- The Solutions - SLS, Cont'd
 - Adjusting number of concurrent backup jobs per media type
 - Use SET QUEUE/JOB_LIMIT to control this. /JOB_LIMIT must never exceed the number drives available for each library (MEDIA_TYPE).
 - Developed SET_JOBLIM.COM (batch job) to adjust the /JOB_LIMIT of the execution queues based on the day of the week and the time of day:
 - Fewer jobs daytime, Saturday and Sunday

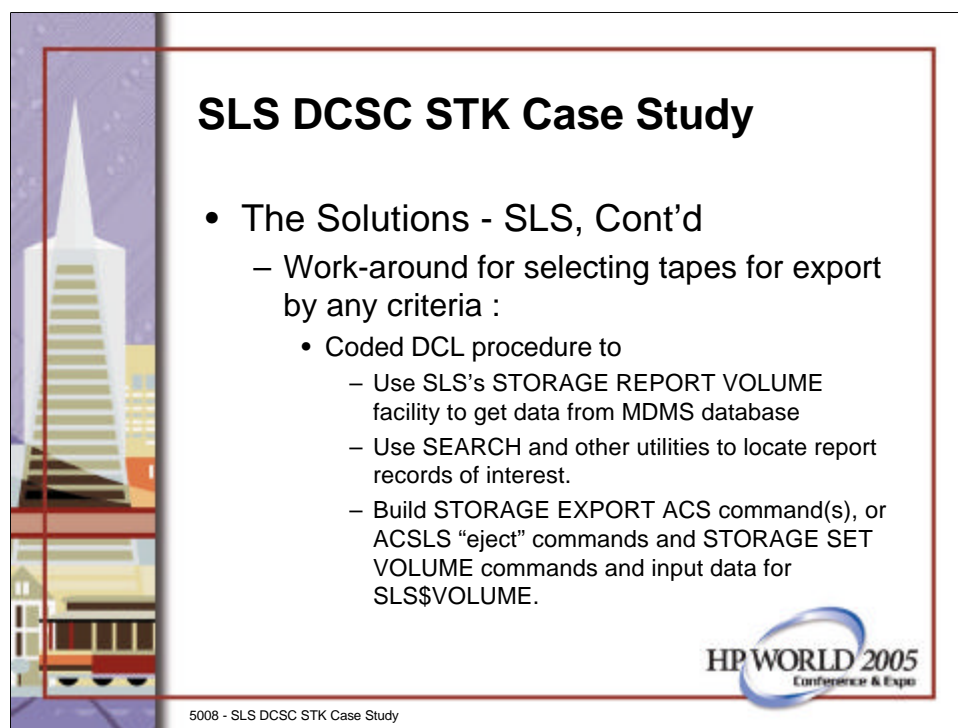
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Sometimes, for performance reasons, it become necessary to limit the number of concurrent SLS backup jobs running at any given time.

This can be done manually by adjusting the /JOB_LIMIT of either or both execution queues, or adjusting one queue's /JOB_LIMIT while SETting the other QUEUE /CLOSEd.

An automated solution was developed for this as well. Named SET_JOBLIM.COM, this solution provides an automated way of changing the /JOB_LIMIT for a batch queue based on a pre-determined policy of weekdays and times, and the number of jobs to allow during those times. For example, the study site reduces system loading imposed by backups by restricting the number of concurrent SLS backup jobs running during the daytime, especially Saturday and Sunday when database tape backups are being run.



The slide features a vertical image on the left showing a stylized building with a spire. The main content is a white box with a red border containing the title and a bulleted list. In the bottom right corner of the box is the HP World 2005 logo. At the bottom left of the slide, outside the box, is the text '5008 - SLS DCSC STK Case Study'.

SLS DCSC STK Case Study

- The Solutions - SLS, Cont'd
 - Work-around for selecting tapes for export by any criteria :
 - Coded DCL procedure to
 - Use SLS's STORAGE REPORT VOLUME facility to get data from MDMS database
 - Use SEARCH and other utilities to locate report records of interest.
 - Build STORAGE EXPORT ACS command(s), or ACSLS "eject" commands and STORAGE SET VOLUME commands and input data for SLS\$VOLUME.

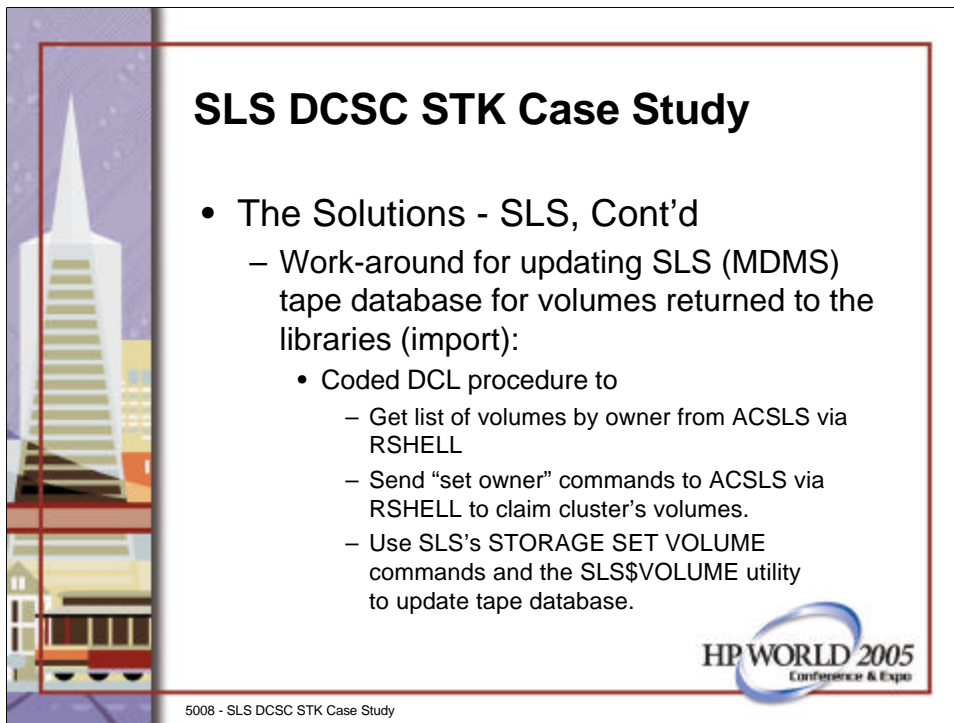
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To achieve a workable solution for exporting tapes for off-site storage, a DCL procedure was developed which employs an SLS report of volumes for a specific off-site date or allocation date, then SEARCHes that report for the detail records, and reads through the selected records to perform the exports.

Due to SLS's "six volumes" limitation, commands are built and sent directly to ACSLS via RSHELL to export up to twenty(20) volumes at a time (the number of slots in the Cartridge Access Port (CAP)). STORAGE EXPORT ACS commands were used to perform this part of the export operation.

SLS commands are then used to mark the exported volumes with the export media type, and the SLS\$VOLUME program is used (automated) to mark the volumes as outside of the libraries. This was developed as a work around to the slowness problems encountered in DCSC V3.2A. Originally, STORAGE INVENTORY ACS commands were used to perform this part of the export operation.

A presentation slide titled "SLS DCSC STK Case Study". On the left side, there is a vertical graphic of a modern building with a pointed top. The main content area contains a bulleted list of solutions. At the bottom right of the slide is the "HP WORLD 2005" logo, and at the bottom left is the text "5008 - SLS DCSC STK Case Study".

SLS DCSC STK Case Study

- The Solutions - SLS, Cont'd
 - Work-around for updating SLS (MDMS) tape database for volumes returned to the libraries (import):
 - Coded DCL procedure to
 - Get list of volumes by owner from ACSLS via RSHHELL
 - Send “set owner” commands to ACSLS via RSHHELL to claim cluster’s volumes.
 - Use SLS’s STORAGE SET VOLUME commands and the SLS\$VOLUME utility to update tape database.

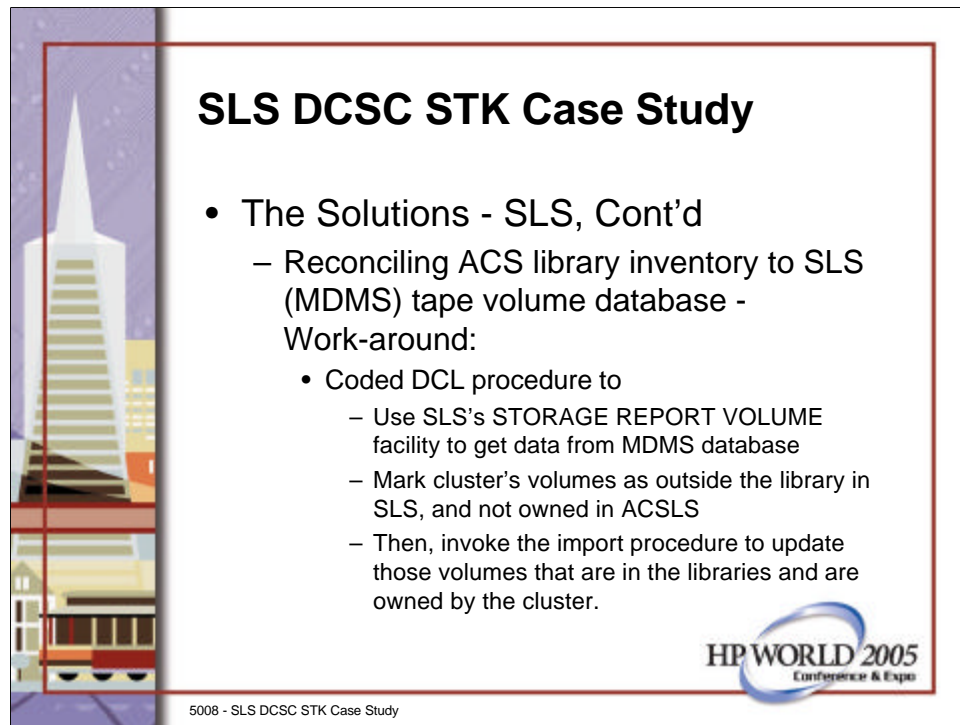
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To achieve a workable solution for updating volumes in the SLS database which have been returned to the libraries, a DCL procedure was developed to get the list of volumes by owner from ACSLS, and use SEARCH to identify volumes with the appropriate labels which are owned by the ACSLS default owner (“SYSTEM”). That list of volumes is then compared to the SLS(MDMS) volume database using STORAGE SHOW VOLUME/SYMBOL commands to identify volumes owned by the cluster.

Matching volumes are then “claimed” by the cluster by sending commands to ACSLS via RSHHELL to set the volume ownership to that of the cluster.

To complete the process, each volume selected is marked with the appropriate media type using STORAGE SET VOLUME commands, and marked as in the library using appropriate inputs to the SLS\$VOLUME program (automated).



The slide features a vertical image on the left showing a stylized building with a pointed top. The main content is enclosed in a red border. The title 'SLS DCSC STK Case Study' is at the top. Below it is a bulleted list. At the bottom right is the 'HP WORLD 2005' logo, and at the bottom left is the text '5008 - SLS DCSC STK Case Study'.

SLS DCSC STK Case Study

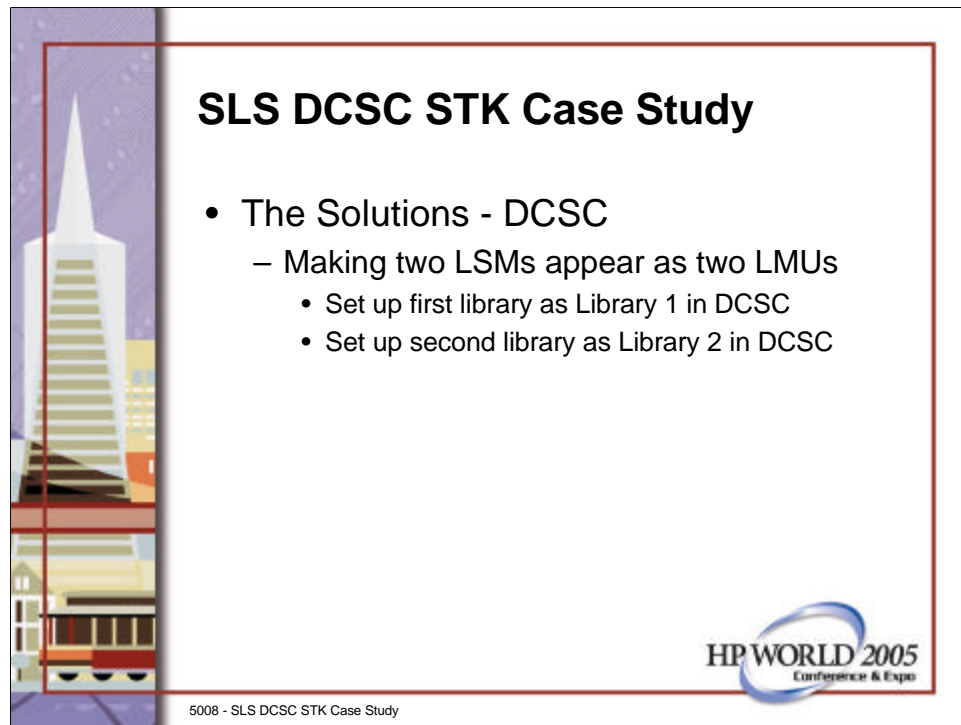
- The Solutions - SLS, Cont'd
 - Reconciling ACS library inventory to SLS (MDMS) tape volume database -
Work-around:
 - Coded DCL procedure to
 - Use SLS's STORAGE REPORT VOLUME facility to get data from MDMS database
 - Mark cluster's volumes as outside the library in SLS, and not owned in ACSLS
 - Then, invoke the import procedure to update those volumes that are in the libraries and are owned by the cluster.

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To achieve a workable solution for reconciling the library inventory to the SLS(MDMS) volume database, a DCL procedure was developed which employs an SLS report of all volumes known to the cluster. This report is used to build a list of ACSLS commands to set the ownership of each volume to the known ACSLS default owner (“SYSTEM”). The same list is used to build a series of STORAGE SET VOLUME commands and SLS\$VOLUME inputs to mark all of the known volumes as outside of any library.

To complete the process, the volume import procedure is invoked to mark those volumes which are actually in the libraries as such in the SLS(MDMS) volume database.



The slide features a vertical decorative strip on the left with a stylized illustration of a building. The main content area is enclosed in a red border and contains the following text:

SLS DCSC STK Case Study

- The Solutions - DCSC
 - Making two LSMs appear as two LMUs
 - Set up first library as Library 1 in DCSC
 - Set up second library as Library 2 in DCSC

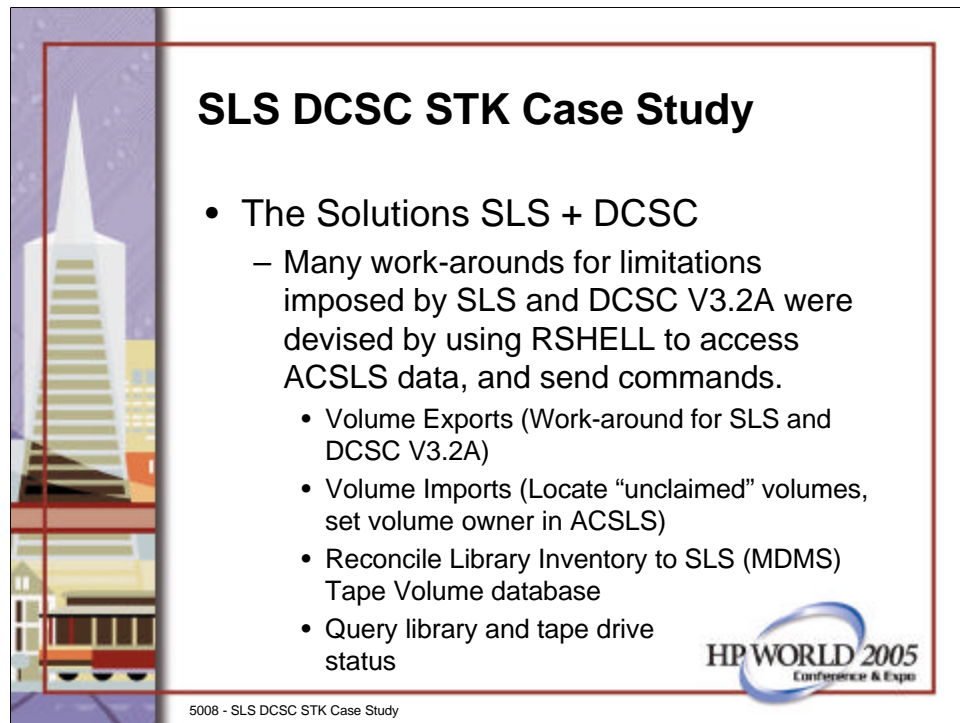
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To complete the solution of making two LSMs connected to one ACSLS server appear to be two separate Library Management Units, the solution provided by DCSC support was to enter each LSM into the DCSC configuration as a separate library entry.

The first library and its tape drives are configured in DCSC as Library 1.

The second library and its tape drives are configured in DCSC as Library 2.



The slide features a vertical image on the left showing a stylized building with a pointed top and a red and white striped base. The main content is enclosed in a red-bordered box. The title 'SLS DCSC STK Case Study' is in bold black text. Below it is a bulleted list of solutions. In the bottom right corner of the box is the 'HP WORLD 2005' logo. At the bottom left of the slide, outside the box, is the text '5008 - SLS DCSC STK Case Study'.

SLS DCSC STK Case Study

- The Solutions SLS + DCSC
 - Many work-arounds for limitations imposed by SLS and DCSC V3.2A were devised by using RSHELL to access ACSLS data, and send commands.
 - Volume Exports (Work-around for SLS and DCSC V3.2A)
 - Volume Imports (Locate “unclaimed” volumes, set volume owner in ACSLS)
 - Reconcile Library Inventory to SLS (MDMS) Tape Volume database
 - Query library and tape drive status

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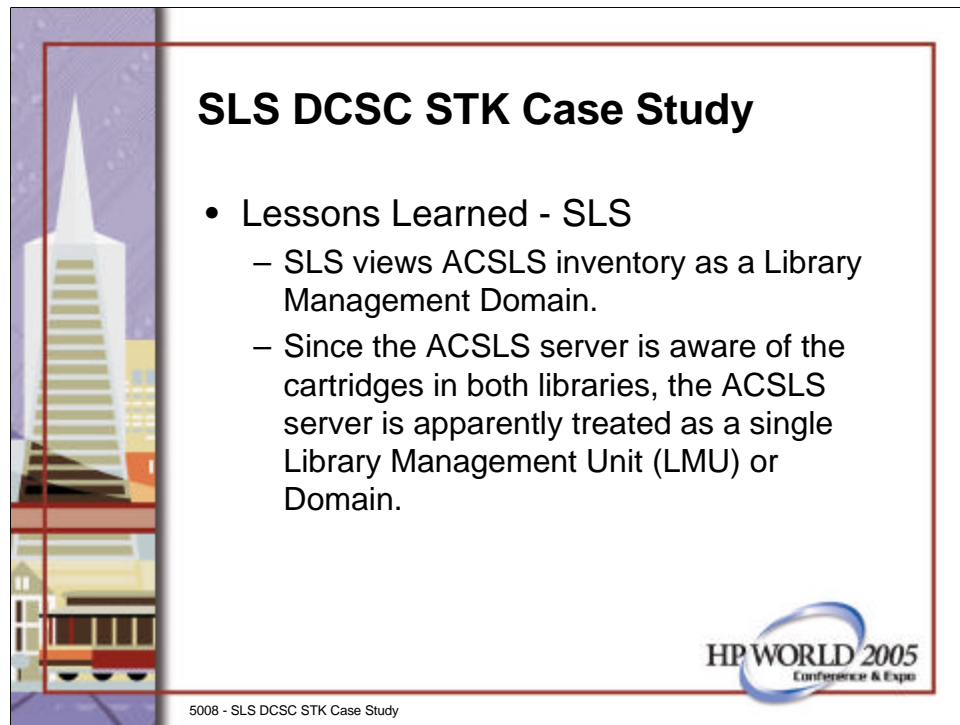
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The slowness problems in DCSC V3.2 presented such significant issues that additional work-arounds were developed for these as well. Also, information available only from ACSLS is retrieved using the same techniques.

SLS’s “six volumes” limitation was worked around by sending “eject” commands directly to ACSLS. STORAGE SET VOLUME commands and the SLS\$VOLUME program are later used to adjust the volume’s status in the SLS(MDMS) database.

The process of importing volumes is driven by a report retrieved from ACSLS via RSHELL. This same technique is employed in the process of reconciling the library inventories to the SLS(MDMS) volume database.

RSHELL is also used to retrieve information directly from ACSLS, such as library, drive and CAP status.

A presentation slide titled "SLS DCSC STK Case Study". On the left side, there is a vertical graphic of a stylized building with a pointed top. The main content area contains a bulleted list under the heading "Lessons Learned - SLS". The list includes two points: "SLS views ACSLS inventory as a Library Management Domain." and "Since the ACSLS server is aware of the cartridges in both libraries, the ACSLS server is apparently treated as a single Library Management Unit (LMU) or Domain." In the bottom right corner of the slide, there is a logo for "HP WORLD 2005 Conference & Expo". At the bottom left of the slide, the text "5008 - SLS DCSC STK Case Study" is visible.

SLS DCSC STK Case Study

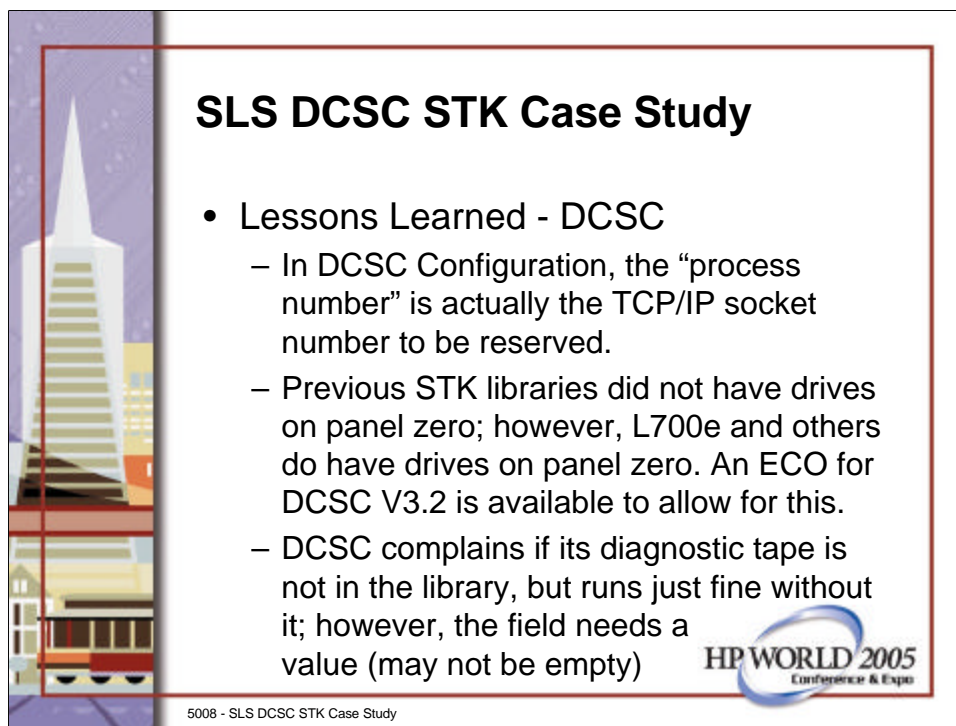
- Lessons Learned - SLS
 - SLS views ACSLS inventory as a Library Management Domain.
 - Since the ACSLS server is aware of the cartridges in both libraries, the ACSLS server is apparently treated as a single Library Management Unit (LMU) or Domain.

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SLS is built around the paradigm that each library has its own inventory and is connected to its own ACSLS server. If a Library Management Unit (LMU) is made up of two libraries, it is assumed that these are joined by a pass-thru and that a drive in either library and can therefore be used with a tape in any library. That is, no distinction is made between Library Storage Modules (LSMs).

When connected to two, unattached libraries, the ACSLS Server is aware of the contents of both libraries, with only the ACS identifier as the distinguishing characteristic. Since SLS is not sensitive to the ACS(LSM) identifier, SLS believes that the two libraries are to be treated as a single Library Management Domain.

A presentation slide titled "SLS DCSC STK Case Study". On the left side, there is a vertical image of a modern building with a pointed top. The main content area contains a bulleted list of lessons learned. At the bottom right of the slide, there is a logo for "HP WORLD 2005 Conference & Expo". At the bottom left, there is a small text identifier "5008 - SLS DCSC STK Case Study".

SLS DCSC STK Case Study

- Lessons Learned - DCSC
 - In DCSC Configuration, the “process number” is actually the TCP/IP socket number to be reserved.
 - Previous STK libraries did not have drives on panel zero; however, L700e and others do have drives on panel zero. An ECO for DCSC V3.2 is available to allow for this.
 - DCSC complains if its diagnostic tape is not in the library, but runs just fine without it; however, the field needs a value (may not be empty)

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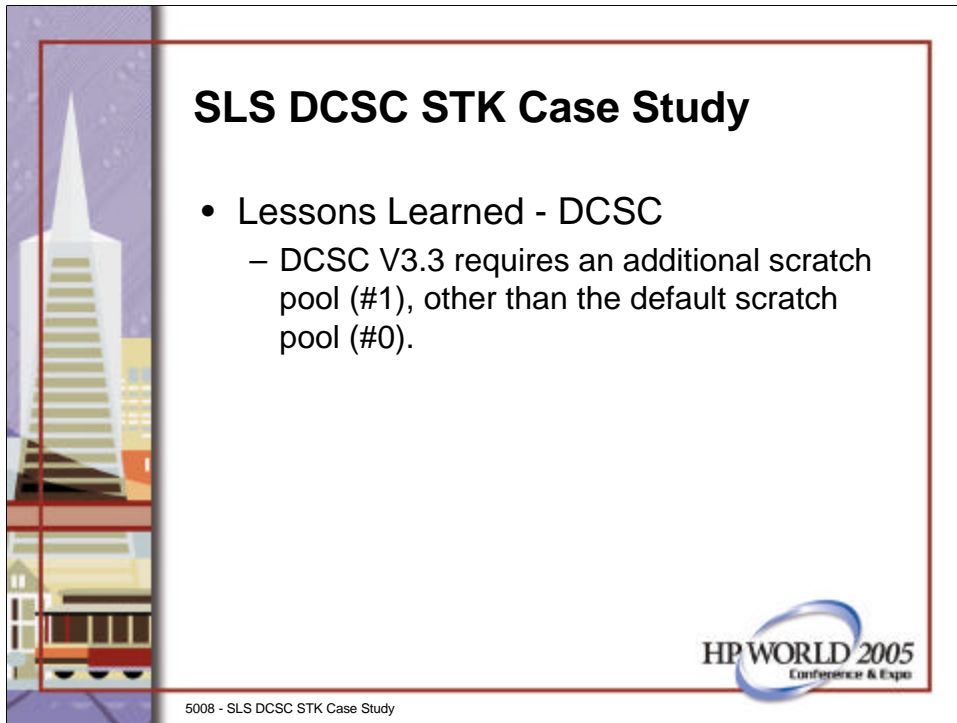
In the DCSC documentation, one of the configuration parameters is identified as the “process number”, with the suggestion that it be obtained from the site’s network administrator.

This is a bit confusing since most TCP/IP literate network admin.’s do not speak about “process numbers”, nor are they likely to be familiar with DCSC.

In actuality, this the TCP port on which the DCSC listeners expect to communicate with the ACSLS software. It should be a port number which has been reserved with your site’s network people.

Previous STK products did not have tape drives on panel zero(0). The L700e libraries use this panel for tape drives and for tape cartridge slots. For DCSC V3.2, an ECO is available to enable L700e drives on panel zero(0) to be configured in DCSC. This is fixed in V3.3.

The DCSC configuration requires an entry in the diagnostic volume field. However, everything runs just fine if the specified volume is not in the library.

A presentation slide titled "SLS DCSC STK Case Study". On the left side, there is a vertical graphic showing a stylized building with a pointed top and a yellow and red train or tram below it. The main content area is white with a red border. It contains a bulleted list under the heading "Lessons Learned - DCSC". The list item is "DCSC V3.3 requires an additional scratch pool (#1), other than the default scratch pool (#0)". In the bottom right corner of the slide, there is a logo for "HP WORLD 2005 Conference & Expo". At the bottom left of the slide, the text "5008 - SLS DCSC STK Case Study" is visible.

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- Lessons Learned - DCSC
 - DCSC V3.3 requires an additional scratch pool (#1), other than the default scratch pool (#0).

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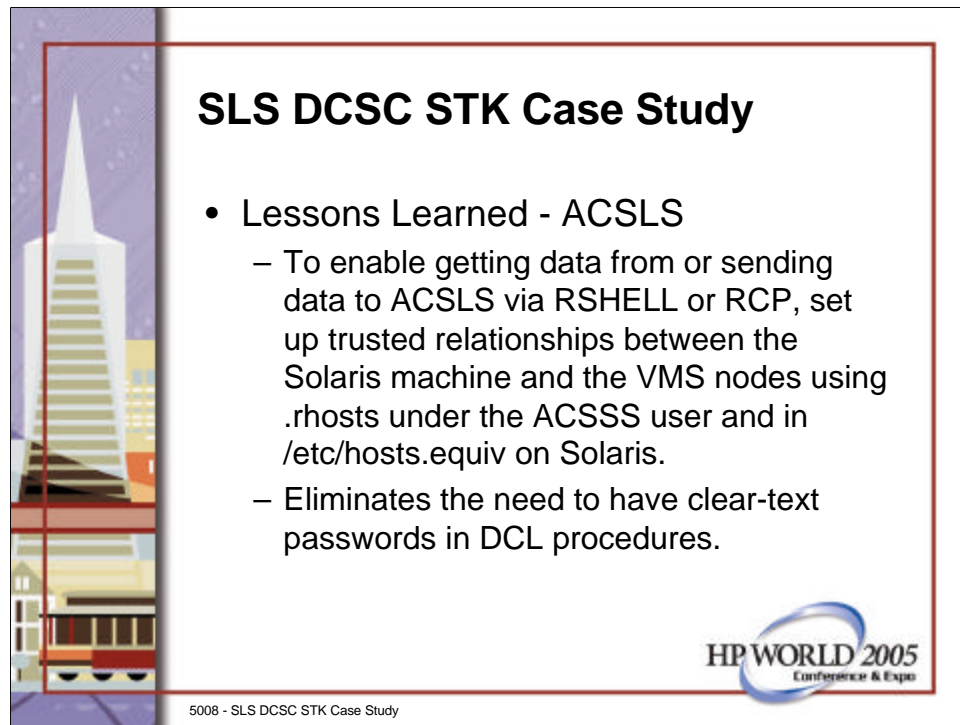
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DCSC V3.3 provides support for newer ACSLS versions, at least through V7.1 of ACSLS.

However, DCSC V3.3 has an additional, undocumented expectation: it expects an additional scratch pool to be defined in ACSLS, other than the default scratch pool.

The ACSLS default scratch pool is pool number zero(0). DCSC V3.3 expects to find an additional scratch pool, identified as pool number one(1).

The study site found no mention of this in the release notes for DCSC V3.3.



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- Lessons Learned - ACSLS
 - To enable getting data from or sending data to ACSLS via RSH or RCP, set up trusted relationships between the Solaris machine and the VMS nodes using `.rhosts` under the ACSLS user and in `/etc/hosts.equiv` on Solaris.
 - Eliminates the need to have clear-text passwords in DCL procedures.

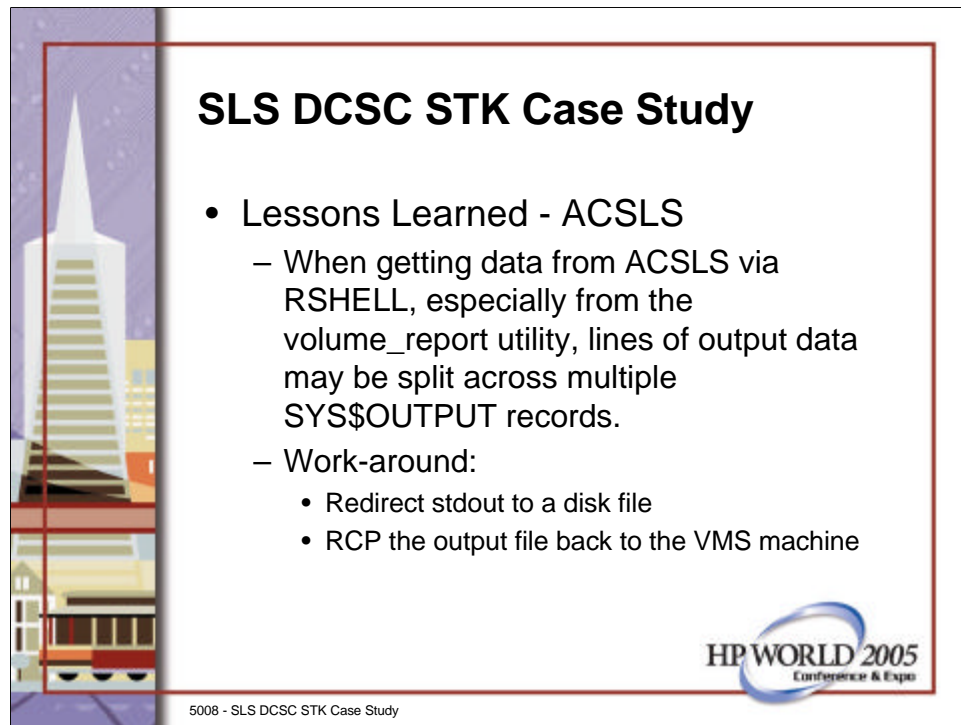
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To enable easier communication between the VMS and Solaris systems via RSH and RCP, it helps to set up trusted relationships between the systems by making appropriate entries in the `.rhosts` file in the ACSLS user's login directory and in the `/etc/hosts.equiv` file on the Solaris machine.

This eliminates the need to have clear-text passwords in your DCL procedures, and being transmitted unencrypted over the network.

This is one of those cases where it helps the VMS SysAdmin to have some working knowledge of UN*X systems specific to Solaris. Other UN*X variants take a similar approach, though the setup is a bit different.

A presentation slide titled "SLS DCSC STK Case Study". On the left side, there is a vertical graphic of a stylized building with a pointed top. The main content area contains a bulleted list under the heading "Lessons Learned - ACSLS". The list includes a general note about data splitting and a "Work-around" section with two sub-bullets. In the bottom right corner of the slide, there is a logo for "HP WORLD 2005 Conference & Expo". At the bottom left of the slide, the text "5008 - SLS DCSC STK Case Study" is visible.

SLS DCSC STK Case Study

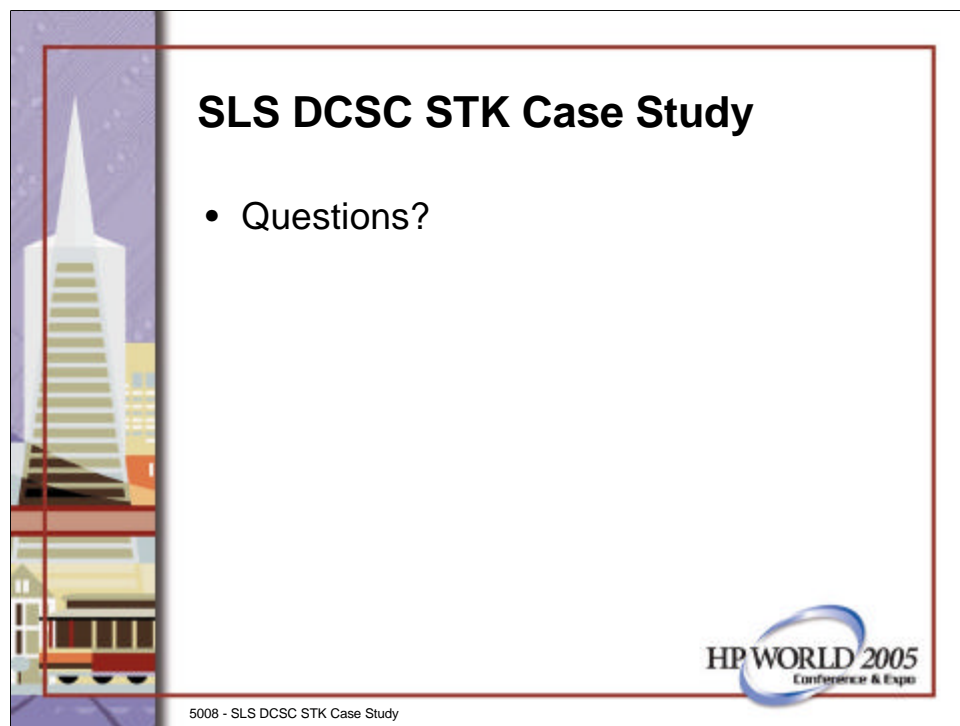
- Lessons Learned - ACSLS
 - When getting data from ACSLS via RSHHELL, especially from the volume_report utility, lines of output data may be split across multiple SYS\$OUTPUT records.
 - Work-around:
 - Redirect stdout to a disk file
 - RCP the output file back to the VMS machine

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During testing of some of the procedures that get data directly from ACSLS, it was discovered that sometimes stdout data from the program in Solaris was split across multiple SYS\$OUTPUT records. This caused the program/procedure reading the data to malfunction.

A good work-around is to redirect stdout to a disk file on the Solaris side, then copy that file over to the VMS system using RCP.



The author of this presentation can be reached by e-mail at one or more of these addresses:

ddachter@nmh.org

djesys@earthlink.net

