StorageTek™ Virtual Tape Control System

MSP Software

Installing and Configuring VTCS

Revision A

PN 316110401

Version 6.2

VTCS/MSP™

Installing and Configuring VTCS

PN 316110401

Version 6.2

Sun Microsystems, Inc.
www.sun.com

Revision A
September 2007

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Notices

Please read the following compliance and warning statements for this product.

Caution – *Potential equipment damage:* Cables that connect peripherals must be shielded and grounded; refer to descriptions in the cable instruction manuals. Operation of this equipment with cables that are not shielded and not correctly grounded might result in interference to radio and TV reception.

Changes or modifications to this equipment that are not expressly approved in advance by StorageTek will void the warranty. In addition, changes or modifications to this equipment might cause it to create harmful interference.

United States FCC Compliance Statement

The following compliance statement pertains to Federal Communications Commission Rules 47 CFR 15.105:

Note – This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

CISPR 22 and EN55022 Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Japanese Compliance Statement

The following compliance statement in Japanese pertains to VCCI EMI regulations:

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

English translation: This is a Class A product based on the Technical Requirement of the Voluntary Control Council for Interference by Information Technology (VCCI). In a domestic environment, this product may cause radio interference, in which case the user may be required to take corrective actions.

Taiwan Warning Label Statement

The following warning label statement pertains to BSMI regulations in Taiwan, R.O.C.:

警告使用者：這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策

English translation: This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take adequate measures.

Internal Code License Statement

The following is the Internal Code License Agreement from StorageTek:

The following is the Internal Code License Agreement from StorageTek:

NOTICE

INTERNAL CODE LICENSE

PLEASE READ THIS NOTICE CAREFULLY BEFORE INSTALLING AND OPERATING THIS EQUIPMENT. THIS NOTICE IS A LEGAL AGREEMENT BETWEEN YOU (EITHER AN INDIVIDUAL OR ENTITY), THE END USER, AND STORAGE TECHNOLOGY CORPORATION ("STORAGETEK"), THE MANUFACTURER OF THE EQUIPMENT. BY OPENING THE PACKAGE AND ACCEPTING AND USING ANY UNIT OF EQUIPMENT DESCRIBED IN THIS DOCUMENT, YOU AGREE TO BECOME BOUND BY THE TERMS OF THIS AGREEMENT. IF YOU DO NOT AGREE WITH THE TERMS OF THIS AGREEMENT, DO **NOT** OPEN THE PACKAGE AND USE THE EQUIPMENT. IF YOU DO NOT HAVE THE AUTHORITY TO BIND YOUR COMPANY, DO **NOT** OPEN THE PACKAGE AND USE THE EQUIPMENT. IF YOU HAVE ANY QUESTIONS, CONTACT THE AUTHORIZED STORAGETEK DISTRIBUTOR OR RESELLER FROM WHOM YOU ACQUIRED THIS EQUIPMENT. IF THE EQUIPMENT WAS OBTAINED BY YOU DIRECTLY FROM STORAGETEK, CONTACT YOUR STORAGETEK REPRESENTATIVE.

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   c. "Maintenance Code" is defined as Microcode and other software, including data files, which may reside or execute in or be used by or in connection with Equipment, and which detects, records, displays, and/or analyzes malfunctions in the Equipment.
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   Any such transfer by you is automatically (without further action on the part of either party) expressly subject to all the terms and conditions of this Notice passing in full to the party to whom such Equipment is transferred, and such transferee accepts the provisions of this license by initial use of the Internal Code. You cannot pass to the transferee of the Equipment any greater rights than granted under this Notice, and shall hold StorageTek harmless from any claim to the contrary by your transferee or its successors or assigns. In addition, the terms and conditions of this Notice apply to any copies of Internal Code now in your possession or use or which you hereafter acquire from either StorageTek or another party.
8. You acknowledge that copies of both Internal Code and Maintenance Code may be installed on the Equipment before shipment or included with the Equipment and other material shipped to you, all for the convenience of StorageTek's service personnel or service providers licensed by StorageTek, and that during the warranty period, if any, associated with the Equipment, and during periods in which the Equipment is covered under a maintenance contract with StorageTek or service providers licensed by StorageTek, both Internal Code and Maintenance Code may reside and be executed in or used in connection with such Equipment, and you agree that no rights to Maintenance Code are conferred upon you by such facts.

   StorageTek or the licensed service provider may keep Maintenance Code and service tools and manuals on your premises but they are to be used only by StorageTek's customer service personnel or those of service providers licensed by StorageTek. You further agree that upon
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   (ii) transfer of possession of the Equipment to another party, StorageTek and its authorized service providers shall have the right with respect to the affected Equipment to remove all service tools and manuals and to remove or disable all Maintenance Code and/or replace Microcode which includes both Internal Code and Maintenance Code with Microcode that consists only of Internal Code.

Revision History

EC	Date	Description
132902	September 2007	Revision A

Preface

Virtual Tape Control System/MSP 6.2.0 (VTCS/MSP 6.2.0, hereafter referred to as "VTCS") is MVS host software, which together with the portions of Nearline Control System (NCS) 6.2.0 that support VTCS and the Virtual Tape Storage Subsystem (VTSS), comprises Virtual Storage Manager (VSM).

Audience

This guide is for StorageTek or customer personnel who are responsible for installing and configuring VTCS. See *VTCS Command and Utility Reference* for information about the following:

- VTCS and NCS (virtual) commands and utilities
- HSC SMF records for VTCS
- VTD commands

Prerequisites

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

- MSP/EX operating system
- JES
- System Management Facility (SMF)
- System Modification Program Extended (SMP)
- Nearline Control Solution (NCS)

About This Book

For VTCS 6.2, the title is the same, but the book is different. It's been reorganized/rewritten to delete some artifacts that no longer apply, add some information about new procedures and capabilities, and reworked so that the work flow is more straightforward, logical, and complete. This guide now contains the following sections:

What's New in This Guide?

Revision A

The VTCS 6.2.0, Revision A of this guide contains information about the VTCS 6.2 enhancements described in TABLE P-1.

TABLE P-1 VTCS 6.2.0 Updates to Installing and Configuring VTCS 6.2, Revision A

This Enhancement...	...is described in...
Standard/Large VTV Pages	"CDS VTCS Level" on page 25 "VTV Page Size" on page 32
400Mb/800Mb/2Gb/4gb VTVs	"CDS VTCS Level" on page 25 "Maximum VTV Size" on page 33
65000 VTVs per MVC	"CDS VTCS Level" on page 25 "Maximum VTVs per MVC" on page 35

Related Publications

The following publications provide additional information about VSM and StorageTek's Automated Cartridge System software and hardware.

NCS/VTCS

- *Introducing VSM*
- *NCS/VTCS XML Guide*
- *NCS Installation Guide*

VTCS and VSM

The VTCS and VSM documentation set consists of the following:

- *Installing and Configuring VTCS*
- *Managing VTCS*
- *Beyond the Basics: VTCS Leading Edge Techniques*
- *VTCS Command and Utility Reference*
- *VTCS Messages and Codes*
- *VTCS Quick Reference*
- *The VTCS Information CD-ROM, which conta*ins PDF file formats of the preceding publications

VTSS

- *Virtual Storage Manager Planning, Implementation, and Usage Guide*
- *Virtual Storage Manager Physical Planning Guide*
- *VTSS Installation Guide*

HSC

- *Configuration Guide*
- *Operator's Guide*
- *System Programmer's Guide*
- *Messages and Codes*
- *System Programmer's Reference Summary*
- *Operator's Reference Summary*

SMC

- *SMC Configuration and Administration Guide*

ExPR

- *Introduction to ExPR*
- *ExPR SMP/E Installation*
- *ExPR MVS Configuration*
- *ExPR MVS Reports*
- *ExPR MVS Reference*

ExLM

- *ExLM Installation and Maintenance Guide*
- *ExLM User's Guide*
- *ExLM Messages and Codes*
- *ExLM Quick Reference*

IBM Publications

- *IBM ESA/390 Common I/O-Device Commands and Self Description*
- *IBM 3490 Magnetic Tape Subsystem*
  Models A01, A02, A10, A20, B02, B04, B20, and B40
  Introduction
- *IBM 3490 Magnetic Tape Subsystem*
  Models A01, A02, A10, A20, B02, B04, B20, and B40
  Hardware Reference
  (Referred to in this book as the *IBM 3490 Hardware Reference*)
- *IBM 3490 Command Reference*
- *IBM 3480 Magnetic Tape Subsystem Reference*
- *IBM 3480 Installation Guide and Reference*
- *OS/390 V2R4.0 MVS Planning: Global Resource Serialization*
- *MVS Authorized Assembler Services Guide*

Conventions for Reader Usability

Conventions are used to shorten and clarify explanations and examples within this book.

Typographic

The following typographical conventions are used in this book:

- **Bold** is used to introduce new or unfamiliar terminology.
- Letter Gothic is used to indicate command names, filenames, and literal output by the computer.
- `Letter Gothic Bold` is used to indicate literal input to the computer.
- *Letter Gothic Italic* is used to indicate that you must substitute the actual value for a command parameter. In the following example, you would substitute your name for the "username" parameter.
- Logon *username*
- A bar (|) is used to separate alternative parameter values. In the example shown below either username or systemname must be entered.
- Logon *username|systemname*
- Brackets [ ] are used to indicate that a command parameter is optional.
- Ellipses (...) are used to indicate that a command may be repeated multiple times.
- The use of mixed upper and lower case characters (for non–case sensitive commands) indicates that lower case letters may be omitted to form abbreviations. For example, you may simply enter **Q** when executing the **Quit** command.

Keys

Single keystrokes are represented by double brackets [[ ]] surrounding the key name. For example, press [[ESC]] indicates that you should press only the escape key.

Combined keystrokes use double brackets and the plus sign (+). The double brackets surround the key names and the plus sign is used to add the second keystroke. For example, press [[AL]] + [[C]] indicates that you should press the alternate key and the C key simultaneously.

Enter Command

The instruction to "press the [[ENTER]] key" is omitted from most examples, definitions, and explanations in this book.

For example, if the instructions asked you to "enter" **Logon pat**, you would type in **Logon pat** *and* press [[ENTER]].

However, if the instructions asked you to "type" **Logon pat**, you would type in **Logon pat** and you would *not* press [[ENTER]].

Warnings, Cautions, and Notes

The following are used in this book.

Warning. Information necessary to keep you from damaging your hardware or software.

Caution – Information necessary to keep you from corrupting your data.

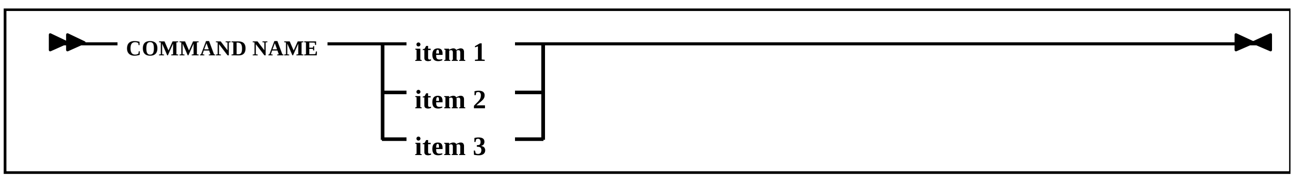
Tip – Information that can be used to shorten or simplify your task or they may simply be used as a reminder.

Note – Information that may be of special interest to you. Notes are also used to point out exceptions to rules or procedures.

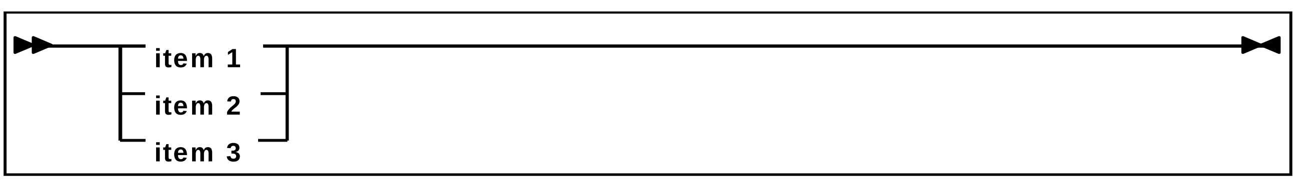
Syntax

Syntax flow diagram conventions include the following:

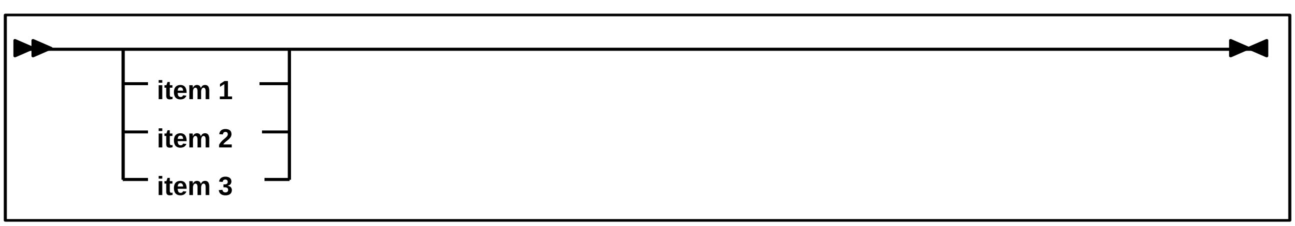
Flow Lines—Syntax diagrams consist of a horizontal baseline, horizontal and vertical branch lines and the command text. Diagrams are read left to right and top to bottom. Arrows show flow and direction.



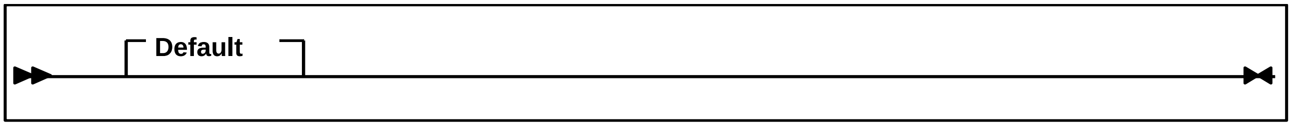
Single Required Choice—Branch lines (without repeat arrows) indicate that a single choice must be made. If one of the items to choose from is on the baseline of the diagram, one item must be selected.



Single Optional Choice—If the first item is on the line below the baseline, one item may optionally be selected.



Defaults—Default values and parameters appear above the baseline.



Repeat Symbol—A repeat symbol indicates that more than one choice can be made or that a single choice can be made more than once. The repeat symbol shown in the following example indicates that a comma is required as the repeat separator.

Keywords—All command keywords are shown in all upper case or in mixed case. When commands are not case sensitive, mixed case implies that the lowercase letters may be omitted to form an abbreviation.

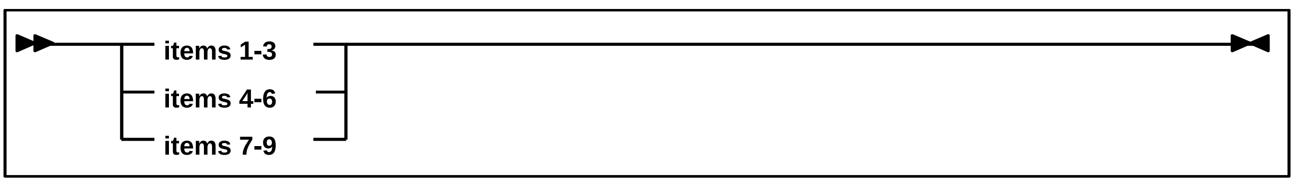
Variables—Italic type is used to indicate a variable.

Alternatives—A bar (|) is used to separate alternative parameter values.

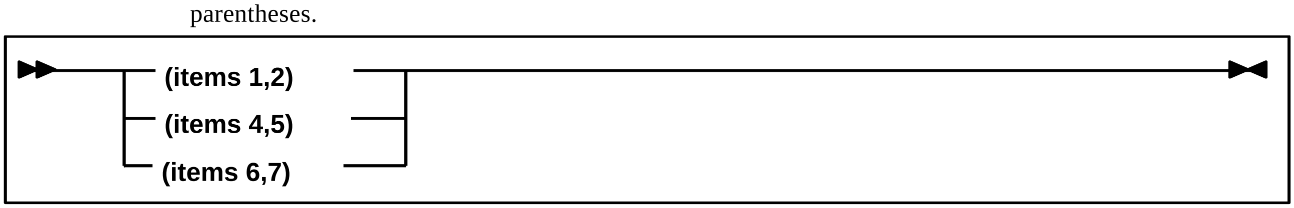
Optional—Brackets [ ] are used to indicate that a command parameter is optional.

Delimiters—If a comma (,), a semicolon (;), or other delimiter is shown with an element of the syntax diagram, it must be entered as part of the statement or command.

Ranges—An inclusive range is indicated by a pair of elements of the same length and data type, joined by a dash. The first element must be strictly less than the second element.



Lists—A list consists of one or more elements. If more than one element is specified, the elements must be separated by a comma or a blank and the entire line must be enclosed by parentheses.



Additional Information

Sun Microsystems, Inc. (Sun) offers several methods for you to obtain additional information.

Sun's External Web Site

Sun's external Web site provides marketing, product, event, corporate, and service information. The external Web site is accessible to anyone with a Web browser and an Internet connection.

The URL for the Sun external Web site is: http://www.sun.com

The URL for Sun StorageTek™ brand-specific information is:
http://www.storagetek.com

Customer Resource Center

The Sun StorageTek product Customer Resource Center (CRC) is a Web site that enables members to resolve technical issues by searching code fixes and technical documentation for StorageTek brand products. CRC membership entitles you to other proactive services, such as HIPER subscriptions, technical tips, answers to frequently asked questions, addenda to product documentation books, and online product support contact information. Customers who have a current warranty or a current maintenance service agreement may apply for membership by clicking on the Request Password button on the CRC home page. Sun employees may enter the CRC through the SunWeb PowerPort.

The URL for the CRC is http://www.support.storagetek.com

Partners Site

The StorageTek Partners site is a Web site for partners with a StorageTek Partner Agreement. This site provides information about products, services, customer support, upcoming events, training programs, and sales tools to support StorageTek Partners. Access to this site, beyond the Partners Login page, is restricted. On the Partners Login page, Sun employees and current partners who do not have access can request a login ID and password and prospective partners can apply to become StorageTek resellers.

The URL for the StorageTek Partners site is:
http://members.storagetek.com

The URL for partners with a Sun Partner Agreement is:
http://www.sun.com/partners/

Third-Party Web Sites

Sun is not responsible for the availability of third-party web sites mentioned in this document. Sun does not endorse and is not responsible or liable for any content, advertising, products, or other materials that are available on or through such sites or resources. Sun will not be responsible or liable for any actual or alleged damage or loss caused by or in connection with the use of or reliance on any such content, goods, or services that are available on or through such sites or resources.

Hardcopy Publications

Contact a Sun sales or marketing representative to order additional paper copies of this publication or to order other StorageTek brand product customer publications in paper format.

Customer Support

Customer support is available 24 hours a day, seven days a week, to customers with Sun or StorageTek maintenance contracts and to Sun employees. You can find additional information about customer support on the Customer Resource Center (CRC) Web site at: http://www.support.storagetek.com

Customer-initiated Maintenance

Customer-initiated maintenance begins with a telephone call from you to Sun Microsystems StorageTek Support. You receive immediate attention from qualified personnel, who record problem information and respond with the appropriate level of support.

To contact Sun Microsystems StorageTek Support about a problem:

1. Use the telephone and call:

   800.872.4786 (1.800.USA.4Sun)

   800.722.4786 (Canada)

   For international locations, go to
   http://www.sun.com/service/contacting/solution.html
   for the appropriate telephone number

2. Describe the problem to the call taker. The call taker will ask several questions and will either route your call to or dispatch a support representative.

   If you have the following information when you place a service call, the process will be much easier:

Account name	
Site location number	
Contact name	
Telephone number	
Equipment model number	
Device address	
Device serial number (if known)	
Urgency of problem	
Fault Symptom Code (FSC)	
Problem description	

Sun’s Worldwide Offices

You may contact any of Sun’s worldwide offices to discuss complete storage, service, and support solutions for your organization. You can find address and telephone number information on ’s external Web site at:
http://www.sun.com/worldwide/

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Tables

CHAPTER 1

Planning for Installation

Planning...yes, we know, the activity we all know we need to do most but want to do least. Most of this is pretty dry stuff, so I'm not going to try real hard to spice it up.

As a time-saver, what you *should* do before diving into the bits and bytes is take a quick look at the checklist in TABLE 1-1. This table is designed to help plan and verify completion of your system's installation and configuration tasks, and if you look at the notes, you'll see that, depending on your situation (new or upgrade install, adding hardware or not, etc.), you may not have to do any more than say "Yep, been there, done that" for a specific task and check it off...

TABLE 1-1 VTCS Installation Summary and Checklist

Task	Notes	✓ to Verify Completion
"Verifying VSM Software and Hardware Prerequisites" on page 5	Ensure that you have the prerequisites. for VTCS 6.2 and the features and hardware you intend to use.	
"Determining VSM Configuration Values" on page 9 "HSC CDS DASD Space" on page 28	Plan configuration values...a must do, because you can't just take default here. **Note especially!** The VSM Extended Format CDS requires additional DASD space!	
"Planning VTCS Operating Policies" on page 29	You have a choice...that is, you can take the defaults and worry about tuning up these knobs and dials later. If you take that route, it's not a bad idea to take a high level pass through this chapter with an eye toward reading it thoroughly when you have the time...	

TABLE 1-1 VTCS Installation Summary and Checklist

Task	Notes	✓ to Verify Completion
Chapter 3, "Preparing for Installation"		
	None of these tasks is difficult, but they are **all** critical. For example, Depending on the default settings of your security system, VSM may not be able to mount and to write to MVCs until you have defined a security system user ID for HSC and TAPEVOL profiles for the MVCs!	
"Defining A Security System User ID for HSC, SMC, and VTCS" on page 46		
"Configuring MSP Device Numbers and Esoterics" on page 47		
"Setting the MSP Missing Interrupt Handler (MIH) Value" on page 48		
"Specifying the Region Size" on page 48		
Chapter 4, "Installing VTCS Base"		
"Ensuring that HSC and SMC Are Installed" on page 50	Basic SMP/E installation. **Note that** order is important, and you have to coordinate VTCS installation with NCS (including SMC) installation. As you can see, you now have a choice of installation media and procedure.	
"Reviewing Coexistence Requirements" on page 51		
"Verifying Base VTCS Base Tape" on page 52		
"Unloading the SMP JCL Library" on page 55		
"Allocating VTCS Target and Distribution Library Data Sets and Required DDDEF Entries" on page 54		
"Applying the VTCS 6.2.0 FMID" on page 56		
"Accepting the VTCS 6.2.0 FMID" on page 57		
"Adding SWSLINK to the Authorized Program List" on page 60		
"Modifying the HSC Startup Procedure to include the VTCS 6.2.0 LINKLIB" on page 61		
Chapter 5, "Installing VTCS Maintenance"		
"Verifying Service Tape" on page 63	All the good stuff about applying cumulative maintenance from the service media...something you must do after installing VTCS 6.2 Base...	
"Receiving the VTCS 6.2 Maintenance" on page 64		
"Applying the VTCS 6.2 Maintenance" on page 65		
"Accepting the VTCS 6.2 Maintenance" on page 65		
Chapter 6, "Reconfiguring HSC" **Tip –** Optionally, you can do all these tasks **before** you install VTCS.		
"Creating or Updating the HSC LIBGEN" on page 68	**Note that** if your system's RTDs are new transports, you must update the HSC LIBGEN by adding a SLIDRIVS macro to define the device addresses you determined.	
"Verifying the LIBGEN" on page 69	...as you do with any new or updated LIBGEN...	

TABLE 1-1 VTCS Installation Summary and Checklist

Task	Notes	✓ to Verify Completion
"Formatting the New CDS" on page 70	If required, this is where you use the HSC SLICREAT macro to format the CDS to the larger size you determined in the planning section.	
"Creating VOLATTR Statements for VTVs" on page 71	In Chapter 7, "Configuring VTCS", you define VTVs and MVCs to VTCS via the CONFIG utility, but you also need to define these entities to HSC.	
"Defining MVCs to HSC" on page 71		

TABLE 1-1 VTCS Installation Summary and Checklist

Task	Notes	✓ to Verify Completion
Chapter 7, "Configuring VTCS"		
"Building a Simple CONFIG Deck" on page 75	A step procedure to create a plain-vanilla, works every time CONFIG deck.	
"Special Cases: A Gallery of Advanced Uses of CONFIG" on page 79	Variations on the theme...	
Chapter 8, "Completing the VSM Configuration"		
"Updating the HSC PARMLIB Member (SLSSYSxx)" on page 86	This is where your "DEF" statements reside, plus other critical items such as the COMMPATH and FEATURES statements. As above, don't overlook this step...	
"Adding SMF Parameters for VTCS to SYS1.PARMLIB" on page 87	Technically speaking, this is optional...but **highly recommended**, because you need the SMF information to know how your system is performing.	
"Using the SMC Client/Server Feature" on page 88	How to run efficiently in a multi-host environment.	
"Updating the Tape Management System" on page 92	You might not have to do anything here, unless you're adding VTV ranges or MVCs...but read through this section to make sure everything's set up correctly with your TMS(s)...	
"Defining VSM Security" on page 93	Required to ensure that the correct personnel and applications have access to the VSM resources required.	
"Routing Data Sets to VSM" on page 95	The part we've all been waiting for. If you're doing an upgrade install, you might not have to do anything here, but read through this in case you have some new or changed jobs coming to VSM. There are some changes in the way things work (hint: it's simpler), which you can probably put to good use...	
"Restarting NCS/VTCS" on page 97	...to make the NCS/VTCS reconfiguration take effect...	

Verifying VSM Software and Hardware Prerequisites

VTCS System Software Requirements

Verify the software prerequisites for VTCS 6.2.0 listed in TABLE 1-2.

TABLE 1-2 VTCS 6.2.0 Minimum Software Requirements

Software Description	Minimum Version/Release
Operating System	MSP/EX at C04061 or higher and Multiple Address Facility (MAF). Consult your Fujitsu SE for the feature number for MAF applicable to your CPU.
Nearline Control Solution	NCS 6.2 **Note:** VTCS 6.2.0 requires HSC 6.2.0 and will not run with previous versions of HSC.
Expert Performance Reporter (optional software)	ExPR 4.0
Expert Library Manager (optional software)	To use Expert Library Manager (ExLM) with VSM for VTV consolidation using ExLM, ExLM, HSC, and VTCS 6.2. For more information about using ExLM with VSM, see “Using ExLM to Manage VSM Resources” in Chapter 2 of the ExLM *System Administrator’s Guide*.

CDS Locations

Caution – VSM **does not** support copies of the CDS at multiple sites (for example, Primary CDS at one site and Secondary at another). A link failure would allow the two sites to run independently, and VSM cannot enforce separation of all resources. This prevents reconciliation of the two divergent CDSs as can be accomplished in a pure NCS environment.

Third Party Tape Copy Software for Migrating Data to VSM

TABLE 1-3 lists Third Party tape copy software for migrating data to VSM.

TABLE 1-3 Third Party Tape Copy Software for Migrating Data to VSM

Product Name	Vendor
Beta55	Beta Systems Software AG
TelTape/390	Cartagena Software Limited
CA-1®/Copycat	Computer Associates International
CA-Dynam®/TLMS/ Copycat	Computer Associates International
MediaMerge	eMag Solutions
FATSCopy	Innovation Data Processing
Tape/Copy	OpenTech Systems, Inc.
Zela	Software Engineering of America
CARTS-TS TapeSaver	UNICOM Systems, Inc.

Nearline Hardware Requirements

Verify the minimum Nearline hardware requirements listed in TABLE 1-4 and TABLE 1-5.

TABLE 1-4 VSM Nearline Hardware Requirements

Hardware	Requirement
LSMs	Any of the following but SL8500, 9310, or 9740 recommended by StorageTek: 4410, 9310, 9740, 9360, and SL8500
Transports and media	VSM RTDs can be a mixture of 9490 (Timberline), 9490EE (Timberline EE), T9840A, T9840B,T9840C, T9940A, T9940B, and T10000 transports (see TABLE 1-5). Each VTSS must have a minimum of two library-attached transports for each media type used for MVCs. For example, if your MVCs are STANDARD and ECART, you need a minimum of *either* two 9490s *or* two 9490EEs as RTDs. If your MVCs are STANDARD, ECART, ZCART, and STKIR, you need a minimum of two 9490EEs *and* two 9840s as RTDs. Valid media types for the supported RTDs are: 9490: STANDARD, ECART 9490EE: STANDARD, ECART, ZCART T9840A, T9840B, T9840C: See “Special VTCS Considerations for T9840C Media” on page 24. T9940A, T9940B: See “Special VTCS Considerations for T9940B Media” on page 23.

TABLE 1-5 Prerequisites for T10000 Drives as RTDs

Description	**Requirement**
NCS/VTCS	6.0 with the following PTFs: ■ LF600G9 (SO@6000) ■ LF600H6 (SW@6000) 6.1 with the following PTFs: ■ LF61003 (SO@6100) ■ LF61004 (SW@6100) 6.2
LSMs	9310 and SL8500 at LMU Compat Level 13
protocol	FICON
VTSSs	VSM4 and VSM5
media	T10000T1 (full capacity 500GB cartridge) T10000TS (120GB sport cartridge)

How VSM Measures Sizes and Capacities

VTCS uses the binary standard rather than the decimal standard in displaying and calculating sizes and capacities for VTVs and MVCs. Thus:

- 1 kilobyte(KB)=1024 bytes
- 1 megabyte(MB)=1000 kilobytes or 1000*1024 byte
- 1 gigabyte(GB)=1000 megabytes or 1000*1000*1024 bytes

Note, however, that VTCS uses the decimal standard in displaying and calculating sizes and capacities for VTSSs. Thus:

- 1 kilobyte(KB)=1000 bytes
- 1 megabyte(MB)=1000 kilobytes or 1000*1000 bytes
- 1 gigabyte(GB)=1000 megabytes or 1000*1000*1000 bytes

Determining VSM Configuration Values

The following sections tell how to determine configuration values for your VSM system. Use TABLE A-1 on page 99 to record these values. This table also provides a record of your site's VSM configuration, which can help you and StorageTek service troubleshoot problems with your VSM system.

Note – Unless otherwise noted, in each of the following sections, the values you determine must match wherever you use them. For example, the unit addresses described in "RTD Definitions" on page 19 must match on the following:

- The HSC SLIDRIVS macro.
- If you will share these transports with MSP, when you assign MSP device addresses to these transports via the IOGRP facility.

HSC and SMC Definition Data Set Names

Determine the names of the HSC data sets that will contain your VSM system's VOLATTR, MVCPool, MGMTclas and STORclas statements. MGMTclas and STORclas statements must reside in the same file (sequential data set or PDS member) for cross-validation.

VTSS Names

Determine your system's 1 to 8 character VTSS names, which you specify when you run VTCS CONFIG to initially install and configure your VSM system as described in Chapter 7, "Configuring VTCS".

Caution – Note the following:

- The VTSS name can consist of the characters "A-Z", "0-9", "@", "$", and "#".
- You specify the VTSS name *only* via the NAME parameter, which sets the VTSS name in both the VTSS microcode (as displayed in the Subsystem Name field in the LOP or VOP) and in the configuration area of the HSC CDS. After VSM is put into operation, the VTSS name is also stored in each VTV record in the CDS. Each VTV record contains the VTSS name on which that VTV is resident or, if the VTV is migrated, the VTV record contains the VTSS name from which the VTV was migrated.
- Once you set the VTSS name via the NAME parameter, you *cannot* change this identifier in the HSC CDS. That is, the CONFIG utility *will not* let you change the NAME parameter after an initial setting and changing the VTSS name using the Subsystem Name field of the LOP or VOP *cannot* change the VTSS name in the HSC CDS.
- It is especially critical that you *do not* attempt to rename a VTSS that contains data on VTVs, which includes VTSS-resident VTVs and migrated VTVs!
- For an initial setting *only* (not a change), you can set the VTSS name in the NAME parameter only if the VTSS name value in the VTSS microcode is:
  - The factory setting (all blanks).
  - A value of 99999999 (eight 9s).
- Therefore, for an initial setting *only,* if the name in the VTSS microcode *is not* all blanks or 99999999, your StorageTek hardware representative must use the VTSS LOP or VOP to set the VTSS name to 99999999 so you can set the VTSS name to the value you want via the NAME parameter.

Caution –

VTD Unit Addresses

Determine MSP unit addresses for your system's VTDs as follows:

- For each VTSS in your VSM configuration, determine a unique unit address range for the VTDs in that VTSS. Do not use duplicate addresses or overlapping address ranges, either within the VTDs in a VTSS or across VTSSs.
- For each VTSS in your VSM configuration, you must define its VTD unit addresses to VTCS via CONFIG.

  In a multi-host, multi-VTSS configuration, you can configure your VTD unit addresses to restrict host access to VTSSs. Note that the VTVs created and MVCs initially written to from a VTSS are considered that VTSS's resources, so only hosts with access to a VTSS also have access to its VTVs and MVCs. For more information, see Chapter 7, "Configuring VTCS".
- For each HSC host, use the IOGRP facility to define to MSP the VTDs that host can access as described in "Configuring MSP Device Numbers and Esoterics" on page 47. The unit addresses you specify via the IOGRP facility *must* match the unit address range you specified for that host via CONFIG.
- If you use GDM, add VTDs to the list of managed devices.

VSM Esoterics and Esoteric Substitution

The following sections tell how to use VSM esoterics and esoteric substitution to influence VTD allocation for the following methods for routing data sets to VSM:

- "General Guidelines and Requirements for VSM Esoterics" on page 12
- SMC TAPEREQ statements and POLICY commands; see "VSM Esoterics and Esoteric Substitution for SMC TAPEREQ Statements and POLICY Commands" on page 13.

General Guidelines and Requirements for VSM Esoterics

- To ensure that virtual requests actually go to virtual, StorageTek recommends that esoterics contain **only** VTDs.
- For any esoteric that you design, you must define the esoteric and associate it with the MSP device numbers for the VTDs you have chosen for that esoteric; see "Associating VTD MSP Device Numbers and Esoterics" on page 47.
- Assigning a Management Class to a VTV **requires** allocating a VTD in a VTSS that can satisfy the requirements of the assigned Management Class. For any jobs that route data to VSM via esoteric substitution **and** assign a Management Class to the data, **ensure** that you specify an esoteric that includes VTSSs that can satisfy the requirements of the Management Class!

VSM Esoterics and Esoteric Substitution for SMC TAPEREQ Statements and POLICY Commands

With the SMC TAPEREQ statements and POLICY commands, you can specify an esoteric on the SMC POLICY statement and specify the policy name on the TAPEREQ statement. StorageTek **strongly recommends** this method because esoterics on a TAPEREQ statement will be unsupported in a future release.

For example, for scratch VTV mounts, if the esoteric VIRTUAL represents all VTDs in your system and the esoteric VTSS1 represents all VTDs in VTSS1, the following POLICY statement allows SMC to allocate to VTSS1 providing that Management Class ACCOUNT is compatible with VTSS1. Otherwise, allocation will go to another VTD in esoteric VIRTUAL that is compatible with Management Class ACCOUNT:

```
POLICY NAME(VSMPOL1) MGMT(ACCOUNT) ESOT(VTSS1) -
IDASESOT(VIRTUAL)
```

Next, you select Policy VSMPOL1 with a TAPEREQ for data set with an HLQ of ACCOUNTS:

```
TAPEREQ DSN(ACCOUNTS.**) POLICY(VSMPOL1)
```

See *SMC Configuration and Administration Guide* for more information.

Designing VSM Esoterics for Esoteric Substitution

VSM Esoterics for JES without Tape SETUP

In JES without tape SETUP, for TAPEREQ statements or User Exits, esoteric definition and substitution is as follows:

- Esoteric definition is **optional** with these interfaces in these environments. That is, if you do not use esoteric substitution for VSM, you do not have to define any VSM esoterics.
- As long as the esoteric is a valid esoteric defined to MSP, esoteric substitution works as follows:
  - Allocation determines the common drives between the specified esoteric and the Eligible Device List (EDL).
  - As long as there are sufficient drives in the list of common drives, then allocation continues using this list of common drives.
- If you use esoteric substitution in a multi-VTSS environment, StorageTek recommends that you**:**
  - Define an esoteric for each VTSS.
  - Ensure that each VTSS esoteric represents exactly the entire range of devices for only that VTSS.
  - Ensure that the VTSS esoteric name matches the VTSS name defined via the CONFIG utility.

  This approach allows you to do esoteric substitution at the VTSS level and also allows you to use the same VTSS name defined via the CONFIG utility.

  - You can also define other virtual esoterics. For example, you can define and substitute an esoteric that represents all of the VTDs in all VTSSs or an esoteric that represents all VTSSs that comprise VTSS Clusters.

VSM Esoterics for JES

FIGURE 1-1 is an example of a VSM esoteric structure for JES with tape SETUP.

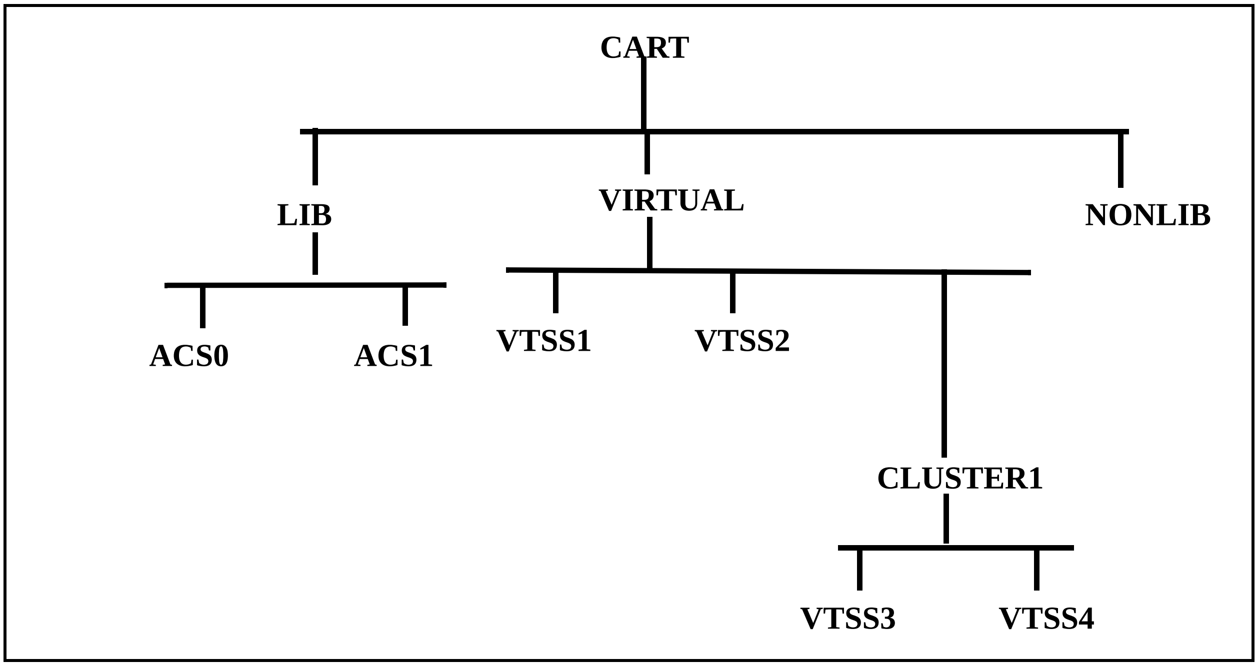

FIGURE 1-1 Example VSM Esoteric Structure for JES

Defining VSM Esoterics for JES

FIGURE 1-1 illustrates the VSM requirements and recommendations for defining esoterics in JES as follows:

Requirement

Esoteric definition is **required** with these interfaces in this environment. That is, even if you do **not** use esoteric substitution for VSM, you must define VSM esoterics as described in the following sections.

Recommendation

StorageTek recommends that you begin the esoteric structure with a high-level esoteric that allocates all tape jobs. Your system typically has this esoteric previously defined, which is **CART** in FIGURE 1-1.

Requirement

For Nearline systems, under the high-level esoteric, you must have defined:

- A subesoteric for “library” (Nearline managed) real tape jobs (**LIB** in FIGURE 1-1). Under **LIB** are the subesoterics **ACSO** and **ACS1** that represent drives in two different ACSs. You specify **ACSO** and **ACS1** in the HSC LIBGEN on the ACSDRV parameter of the SLIACS macro.
- A second subesoteric for “non-library” (not Nearline managed) tape jobs (**NONLIB** in FIGURE 1-1).

Requirement

For multi-VTSS environments, you **must** define an esoteric that represents all VTDs in your system (**VIRTUAL** in FIGURE 1-1 on page 15).

Requirement

StorageTek recommends that you place the esoteric that represents all VTDs in your system (**VIRTUAL** in FIGURE 1-1 on page 15) under the high-level esoteric.

Recommendation

For multi-VTSS environments, StorageTek recommends that you define an esoteric for each VTSS **(VTSS1**, **VTSS2**, **VTSS3**, and **VTSS4** in FIGURE 1-1 on page 15). Each esoteric *must* represent the entire range of devices for only that VTSS and the esoteric name *must* match the VTCS name on the VTCS CONFIG statement.

Note – In JES with tape SETUP, you can also define other esoterics, such as an esoteric that represents all VTDs in all VTSSs or all VTDs in all VTSSs that comprise a VTSS Cluster (for example, **CLUSTER1** in FIGURE 1-1 on page 15). You can use these esoterics for esoteric substitution and JCL reference.

VTV Definitions

You define your system's VTV volsers to VTCS by volser ranges with the following:

- VTCS CONFIG. as described in Chapter 7, "Configuring VTCS".
- HSC VOLATTR statement as described in Chapter 6, "Reconfiguring HSC".

Determine your system's VTV volser ranges as follows:

- For an initial CONFIG definition, consider defining only enough VTVs for reasonable growth. This method allows for growth without rerunning CONFIG but does not reserve unnecessary space in the CDS, which can impact VTV processing performance. Note that if the CDS does not contain sufficient space to run VTCS CONFIG, you will also have to run HSC RECONFIG. For more information about sizing the CDS for VSM, see "HSC CDS DASD Space" on page 28.

  If your VTV requirements expand beyond initial definition, then rerun CONFIG to define additional VTVs.
- You can only add new VTV ranges. A range can consist of a single volume. You cannot delete or modify existing ranges.
- If you are currently writing files to non–standard length tapes and will route these files to VTVs, you may need additional VTVs because VTVs emulate standard–length cartridges. This may require a change to the JCL volume count parameter.
- NCS/VTCS **does not allow** allocation of unlabeled tapes to VTVs. Unlabeled VTVs can cause the following for scratch VTV allocation requests:
  - If your JCL specifies a virtual esoteric, the NCS Storage Management Component (SMC) fails the allocation.
  - If you have a default esoteric such as CART and specify allocation to virtual (via SMC TAPEREQ or HSC User Exit), the allocation will go to a non-virtual device.
- You must define VTV volsers to your tape management system; for more information, see Chapter 8, "Completing the VSM Configuration".
- Ensure that VTV volser ranges do not duplicate or overlap existing TMS ranges or volsers of real tape volumes, including Nearline volumes, *including* MVCs and Nearline volumes that are regularly entered and ejected from the ACS!
- If VTDs are being used across multiple MSP images and VTV volsers are unique, add a generic entry for SYSZVOLS to the SYSTEM inclusion RNL to insure that a VTV is used by only one job at a time. If you are using automatic tape switching, also add a generic entry for SYSZVOLS to the SYSTEM inclusion RNL to prevent a system from holding a tape device while it waits for a mount of a volume that is being used by another system.
- If you specify scratch subpools for scratch mounts of VTVs (for example, with the SMC TAPEREQ SUBPOOL parameter or SMC User Exit 01), use the following guidelines:
  - If you need to define new subpools, add SCRPOOL statements to HSC IPLLIB for the VTV volsers.

- HSC mixed-media support lets you mix VTV and real volume types in the same scratch pool. In this case, ensure that the mount request specifies a VTD as transport type (for example, via TAPEREQ MEDIA (VIRTUAL). In addition, if you are routing data to a specific VTSS (for example, by using esoteric substitution as described in "VSM Esoterics and Esoteric Substitution" on page 12) and the request specifies a subpool, ensure that the subpool contains scratch VTVs.

Tip – Note the following:

- You can use Query to display the available scratch count of a subpool.
- You can dynamically reload SCRPOOL statements via the SCRPDEF command. For more information, see *HSC System Programmer's Guide for MSP.*
- The Warn SCRatch, Display SCRatch, and Display THReshld commands are enhanced to let you manage and monitor scratch VTVs. For more information, see Chapter 2, "Commands, Control Statements, and Utilities," in *HSC Operator's Guide for MSP*.

- By default, VTCS assigns a Management Class to VTVs only on scratch mounts. You can, however, specify that VTCS assigns a Management Class whenever VTCS mounts a VTV (for read or write).

Caution – If you specify that VTCS assigns a Management Class whenever VTCS mounts a VTV, these attributes can change, which can cause undesirable or unpredictable results.
For example, if an application writes data set PROD.DATA to VTV100 with a Management Class of PROD, then writes data set TEST.DATA to VTV100 with a Management Class of TEST, then the VTV (and both data sets) has a Management Class of TEST. Similarly, it is possible to write SMC TAPEREQ statements or SMS routines that assign different Management Classes to the same data set (for example, based on jobname), which can also cause a VTV's Management Class to change.

RTD Definitions

RTDs, which are Nearline transports, require LIBGEN definitions.

If your system's RTDs are new transports, determine 4-digit hexadecimal MSP unit addresses for these transports. The addresses you choose must be the same for all hosts in the configuration. You will use these addresses to:

- Add a SLIDRIVS macro to define RTD device addresses during the HSC LIBGEN update as described in Chapter 6, "Reconfiguring HSC".
- Run the IOGRP facility to assign MSP device numbers to these transports as described in "Configuring MSP Device Numbers and Esoterics" on page 47.

Caution – Note the following:

StorageTek **strongly recommends** that you define your RTDs to MSP (as normal 3490 tape drives), even if you do not intend to vary them online to MSP. This prevents the RTD addresses used in CONFIG and LIBGEN from accidentally being used for other devices. If you do not do this, and subsequently use the addresses for other MSP devices, you will cause problems with LOGREC processing, because VTCS will write records using the RTD addresses, and MSP will write records for other devices with those same addresses.

- Specify the MSP device numbers on the CONFIG VTSS RTD DEVNO parameter as described in "Define VTSSs, RTDs, and VTDs." on page 78, and you do this whether your system's RTDs are new or existing transports.

  You also specify the RTD identifier on the CONFIG VTSS RTD NAME parameter. To help identify the RTDs connected to each VTSS, StorageTek recommends that you choose RTD identifiers that reflect the VTSS name (specified on the VTSS NAME parameter) and the RTD's MSP device number (specified on the RTD DEVNO parameter).

  In configurations where multiple VTSSs are connected to and dynamically share the same RTD, in each VTSS definition you can either assign unique RTD identifiers or use the same RTD identifier.

Note –

- You can specify that Nearline transports can only be used as RTDs. For more information, see "Creating or Updating the HSC LIBGEN" on page 68.
- Ensure that you use the drive operator's panel or T10000 Virtual Operator Panel (VOP to enable the SL PROT (Standard Label Protect) function on the RTDs (ESCON or FICON).

MVC Definitions

You define MVCs as described in the following sections:

- "Define and Select Nearline Volumes" on page 20
- "Define Available MVCs with CONFIG" on page 21
- "Define the MVC Pool" on page 21
- "Protect MVCs and Nearline Volumes" on page 22
- "Special VTCS Considerations for T9940B Media" on page 23
- "Special VTCS Considerations for T9840C Media" on page 24

Define and Select Nearline Volumes

First, to define and select Nearline volumes for MVCs, use these guidelines:

- MVCs require VOLATTR statements to ensure that VTCS will select the correct RTD device type for each MVC. Select volumes for MVCs that are compatible with your system's RTD transport types.
- For mixed–media VSM systems, select volumes that include at least one media type compatible with each of your system's RTD transport types. See TABLE 1-4 on page 7 for information about the RTD transport types and media that VSM supports.

  Note that VSM selects media for migration processing and reclaim processing according to the media types of volumes in your system's MVC pool.
- If you define new Nearline volumes as MVCs, you must create MSP volsers for these volumes and initialize STANDARD, ECART, and ZCART volumes as 36-track format standard label volumes.
- As described in "Protect MVCs and Nearline Volumes" on page 22, if possible, create a new and separate volser range for MVCs. Ensure that if you define new volumes, you do not overlap existing TMS ranges.

Define Available MVCs with CONFIG

Second, use VTCS CONFIG to define all MVCs *available* to VTCS. CONFIG reserves space for these volumes in the HSC CDS. The MVCPool statements define the *MVC pool*, which contains the MVCs that VTCS actually *uses*.

For an initial CONFIG definition, consider defining only enough MVCs for reasonable growth of your MVC pool. This method allows you to expand your MVC pool without rerunning CONFIG (you only have to change your MVCPool statements) but does not reserve unnecessary space in the CDS, which can impact MVC processing performance. Note that if the CDS does not contain sufficient space to run VTCS CONFIG, you will also have to run HSC RECONFIG. For more information about sizing the CDS for VSM, see “HSC CDS DASD Space” on page 28.

For example, if you currently need 300 MVCs but will need to add 150 more MVCs within the next 6 months, define an MVC range of 450 volsers with CONFIG, but only apply MVCPool statements to the first 300 “in use” MVCs. As your MVC space requirements increase, update and reapply your MVCPool statements to add the second 150 MVCs.

If your MVC space requirements expand beyond the second 150 MVCs, then rerun CONFIG to define additional MVC ranges and update and reapply your MVCPool statements.

Note –

- You can only add new MVC ranges. A range can consist of a single volume. You cannot delete or modify existing ranges.
- A VSM audit of all MVCs will audit all MVCs defined with CONFIG including those that are *not* specified in the MVCPool statements.

Define the MVC Pool

Third, create MVCPool statements, which specify the pool of MVCs available for migration and consolidation requests, using the following guidelines:

- Because MVCPool statements specify the “in use” MVCs, MVCPool statements can (and typically do) define a subset of the available MVCs you defined via CONFIG. MVCPool statements, however, can only specify MVCs you already defined with CONFIG. For more information about defining an initial MVC pool, see “Defining MVCs to HSC” on page 71.
- StorageTek recommends that you use identical MVCPool statements on all hosts. A host can automigrate any VTV on any VTSS to which the host is connected, including VTVs created by another host. If your VSM configuration consists of hosts cross-connected to multiple VTSSs, therefore, separate MVC pools do not guarantee that a host automigrates only VTVs it creates to only its MVC pool. To most effectively segregate VTVs on groups of MVCs, see *Beyond the Basics: VTCS Leading Edge Techniques*.
- Ensure that your MVC pool consists of volumes that physically reside in ACS that contains your system’s RTDs.
- To redefine your MVC pool, change your MVCPool statements and reload them via the VT MVCDEF command.

Protect MVCs and Nearline Volumes

Fourth, protect MVCs and Nearline volumes that are *not* MVCs from accidental overwrites as follows:

- If possible, create a new and separate volser range for MVCs to prevent HSC from writing to MVCs and to prevent VSM from writing to conventional Nearline volumes.
- VTCS, not MSP, controls access to MVCs. The tape management system does not control VSM access to an MVC volume and does not record its usage. If you choose to define MVCs to the tape management system, to ensure that the tape management system does not accidentally access MVCs, follow the guidelines in "Updating the Tape Management System" on page 92.
- Use your security system to restrict access to MVCs as described in "Defining VSM Security" on page 93.
- HSC automatically marks newly entered MVC volumes as non-scratch. If you define existing Nearline volumes as MVCs, ensure that these volumes do not contain data you need, then run the HSC UNSCratch Utility to unscratch them. For more information, see *HSC System Programmer's Guide for MSP*.

Special VTCS Considerations for T9940B Media

T9940A and T9940B transports use the **same physical form factor** but **different recording techniques** as follows:

- T9940Bs can read from media written to by T9940As, but cannot write to T9940A media **unless** the entire volume is rewritten from beginning of tape.
- T9940As cannot read from or write to media written to by T9940Bs.

To ensure media and transport compatibility, you **must use** separate VOLATTR statements to segregate T9940A and T9940B media as follows:

- **If you have existing** T9940A media, these volumes are **already defined** with the VOLATTR MEDIA parameter value of STK2. If you are adding T9940B media, you **must** change your existing T9940A VOLATTR statements to specify MEDIA(STK2P) and RECTECH(STK2PA). You **also** need to define your new T9940B media with VOLATTR statements that specify MEDIA(STK2P) and RECTECH(STK2PB).

  For example, to define MVCs MVC300-MVC599 as T9940B volumes and to redefine MVCs MVC000-MVC099 as T9940A volumes, you need the following VOLATTR statements:

  ```
  VOLATTR SERIAL(MVC300-MVC599) MEDIA(STK2P) RECTECH(STK2PB)
  VOLATTR SERIAL(MVC000-MVC099) MEDIA(STK2P) RECTECH(STK2PA)
  ```

- **If you are adding both** T9940A and T9940B media, you must create separate VOLATTR statements to segregate the media as follows:
  - Define the T9940A volumes with VOLATTR statements that specify MEDIA(STK2P)**and** RECTECH(STK2PA).
  - Define the T9940B volumes with VOLATTR statements that specify MEDIA(STK2P)**and** RECTECH(STK2PB).

  For example, to define MVCs MVC100-MVC299 as T9940A volumes and MVCs MVC300-MVC599 as T9940B volumes, create the following VOLATTR statements:

  ```
  VOLATTR SERIAL(MVC100-MVC299) MEDIA(STK2P) RECTECH(STK2PA)
  VOLATTR SERIAL(MVC300-MVC599) MEDIA(STK2P) RECTECH(STK2PB)
  ```

Special VTCS Considerations for T9840C Media

T9840A/T9840B and T9840C transports use the **same physical form factor** but **different recording techniques** resulting in the following restrictions:

- T9840Cs can read from media written to by T9840As/T9840Bs, but cannot write to T9840A/T9840B media **unless** the entire volume is rewritten from beginning of tape.
- T9840As and T9840Bs cannot read from or write to media written to by T9840Cs.

To ensure media and transport compatibility, you **must use** separate VOLATTR statements to segregate T9840A/T9840B and T9840C media resulting in the following restrictions:

- **If you have existing** T9840A/T9840B media, these volumes are **already defined** with the VOLATTR MEDIA parameter value of STK1 or STK1R. If you are adding T9840C media, you **must** change your existing T9840A/T9840B VOLATTR statements to specify MEDIA(STK1R) and RECHTECH(STK1RAB. You **also** need to define your new T9840C media with VOLATTR statements that specify MEDIA(STK1R) and RECTECH(STK1RC).

  For example, to define MVCs MVC900-MVC999 as T9840C volumes and to redefine MVCs MVC600-MVC899 as T9840A/T9840B volumes, you need the following VOLATTR statements:

  ```
  VOLATTR SERIAL(MVC900-MVC999) MEDIA(STK1R) RECTECH(STK1RC)
  VOLATTR SERIAL(MVC600-MVC899) MEDIA(STK1R) RECTECH(STK1RAB)
  ```

- **If you are adding both** T9840A/T9840B media and T9840C, you must create separate VOLATTR statements to segregate the media as follows:
  - Define the T9840A/T9840B volumes with VOLATTR statements that specify MEDIA(STK1R)**and** RECTECH(STK1RAB).
  - Define the T9840C volumes with VOLATTR statements that specify MEDIA(STK1R)**and** RECTECH(STK1RC).

  For example, to define MVCs MVC600-MVC899 as T9840A/T9840B volumes and MVCs MVC900-MVC999 as T9840C volumes, create the following VOLATTR statements:

  ```
  VOLATTR SERIAL(MVC600-MVC899) MEDIA(STK1R) RECTECH(STK1RAB)
  VOLATTR SERIAL(MVC900-MVC999) MEDIA(STK1R) RECTECH(STK1RC)
  ```

CDS VTCS Level

You can determine what level CDS you currently have with the HSC D CDS command as shown in the example in FIGURE 1-2.

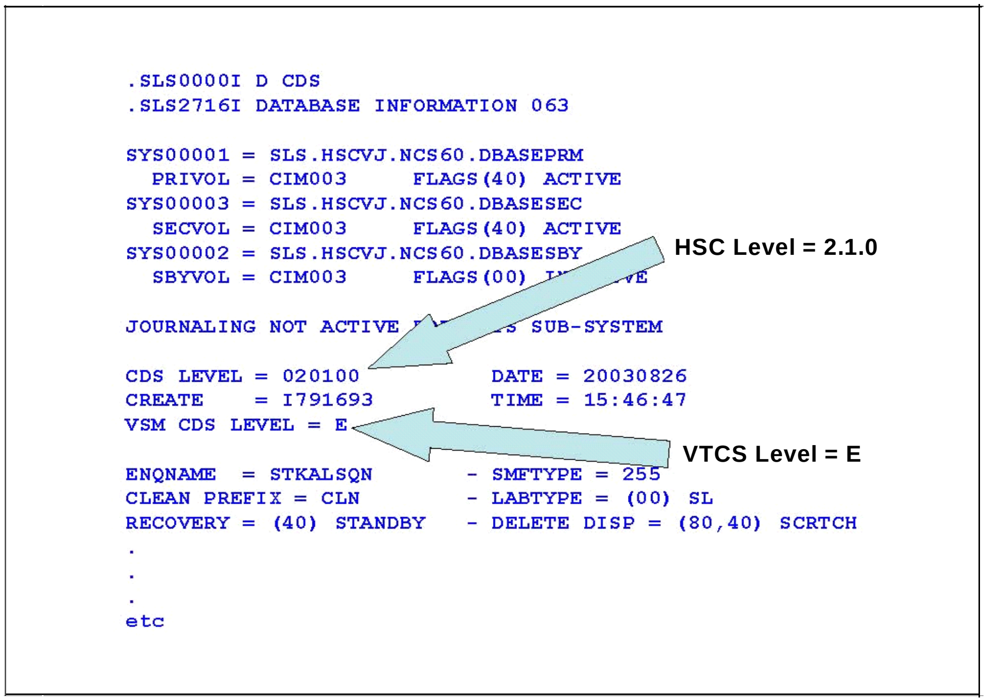

FIGURE 1-2 Example Output from the HSC D CDS Command

The HSC CDS manages HSC and VTCS. There is only one CDS, but internally it has two elements – the HSC portion and the VTCS portion. In FIGURE 1-2, note that a CDS consists of an **HSC Level** (2.1.0 in this example) and a **VTCS Level** (E, in this example).

As described in TABLE 1-6 on page 26, each supported VTCS version supports **only** a subset of these VTCS Levels. If you are, therefore, running with a mixed set of VTCS versions against a CDS it is important to ensure that the CDS is set at a Level that is supported by **all** the versions being run. **Also note that** certain VTCS functions are **only** available by running with the CDS at a certain Level.

TABLE 1-6 CDS Levels for Supported VTCS Versions

This VTCS CDS Level...	...is valid for these VTCS/NCS versions...	...and this VTSS hardware...	...and provides these enhancements
E	6.0, 6.1, 6.2	VSM2 and VSM3 VSM4 with up to 256 VTDs per VTSS and/or up to 16 RTDs per VTSS. RTD sharing **except** for paired RTDs (a paired RTD shares a CIP with another Nearlink connection, either an RTD or a CLINK).	■ 4 MVC copies ■ 800 Mb VTVs
F	6.1, 6.2		■ Near Continuous Operations (NCO) ■ Bi-directional clustering ■ Improved CDS I/O performances - reduces the I/O required to manage virtual scratch sub-pools
G	6.2		■ 400Mb/800Mb/2Gb/4Gb VTVs ■ Standard/Large VTV Pages ■ 65000 VTVs per MVC

Guidelines for Changing CDS VTCS Levels

Note the following:

- TABLE 1-7 describes the supported CDS levels for VTCS 6.2 and the corresponding CONFIG CDSLEVEL values.

TABLE 1-7 Valid CONFIG CDSLEVEL Values for VTCS 6.2

CDS VTCS Level	CDSLEVEL Value
E	V6ABOVE
F	V61ABOVE
G	V62ABOVE

- E, F, and G formats are considered "VSM Extended Format CDSs." The VSM Extended Format CDS **is required for VTCS 6.2. Also note that** after you convert the CDS to VSM Extended Format, you **cannot** run VTCS 4.0 or lower against the converted CDS. VTCS 4.0 and below **is incompatible with** and **will not initialize with** the VSM Extended Format CDS. If you are a **new** VTCS 6.2 customer, VSM Extended Format is the default, so no conversion is required.
- "Building a Simple CONFIG Deck" on page 75 tells how to specify the CDS Level. **Note that** VTCS **will not start** with an unsupported CDS Level.

Note –

- Regressing from an E, F, or G Level CDS can cause unpredictable results if the 4 VTV copy feature has been used. Any copies above the maximum of two allowed on a 'B' to 'D' Level CDS will be dropped!
- To regress from a G Level CDS:
  - No MVCs can contain greater than 32000 migrated VTVs. This is not the same as the count reported on the MVC displays and reports. Any MVCs greater than 32000 migrated VTVs must then be drained.
  - Any VTVs written in large page format and/or any VTVs written in either 2 Gb or 4Gb sizes must be deleted, which can be done by changing the VTV's Management Class to a Management Class with DELSCR(YES) and then scratching VTV.

  Therefore, you may want to install E, F, G in a test system only, or run it in production without using an E, F, G feature until you are sure that the environment is stable.
- The upgrade to a G is non-disruptive (can be done without bringing HSC/VTCS down), but all hosts **must** be at 6.2.
- Upgrades to/downgrades from G level typically take less time than upgrades to/downgrades from previous levels.

HSC CDS DASD Space

Before installing VTCS, you must calculate the DASD space required for the HSC control data set (CDS). The DASD space for the CDS must be increased to accommodate your VSM system's resource definitions. The additional number of 4k blocks required in the CDS for VTCS can be expressed as:

- **For B format CDSs**:

  (number of VTVs /58) + (number of MVCs/71) + 17(number of VTSS) + number of configured MVC ranges + number of configured VTV ranges + 13

- **For C, D, and E format CDSs**:

  (number of VTVs /23) + (number of MVCs/37) + 17(number of VTSS) + number of configured MVC ranges + number of configured VTV ranges + 13

- **For F and G format CDSs**:

  (# VTV ranges) + (# VTV ranges)/862 + (# VTVs defined)/23 + (# VTVs defined)/19826 + (# MVC ranges) + (# MVCs defined)/37 + 18*(# of VTSSs) + 14

Tape Management System DASD Space

To accommodate your VSM system's VTVs, you may need to increase the DASD space for your tape management system. After you determine the number and range of VTVs your VSM system requires, see your tape management system documentation for specific information on calculating the DASD space requirements.

VSM Candidate Data Sets

Your StorageTek representative will run the VSM pre-sales planning tool to identify VSM candidate data sets. You choose a method to route these data sets to VSM as described in "Routing Data Sets to VSM" on page 95.

HSC COMMPath METHod Value

To optimize performance, StorageTek recommends that you set the HSC COMMPath METHod parameter to LMU, *not* to CDS to allow even sharing of resources in a multi-host configuration as shown in the example in "Updating the HSC PARMLIB Member (SLSSYSxx)" on page 86.

Data Chaining a VTD Read Forward or Write Command

Note that when data chaining a Read Forward or Write command, the VTSS requires the minimum data chained update count.

CHAPTER 2

Planning VTCS Operating Policies

We're going to take one more pause and talk about VTCS Operating Polices now, even though you don't actually implement them until you get to Chapter 7, "Configuring VTCS". That's because here you're doing your final planning tasks, and starting with "Preparing for Installation" on page 45, you're just doing stuff and checking the boxes.

Operating policies...one way to approach operating policies is to take the defaults, run for a while, and see what's working/not working and adjust accordingly[1]. Or you can take a quick glance at this chapter, which is designed as a sort of Cliff's Notes on VTCS policies. The idea of a quick once-over is to see how the policies can affect your site's operations...and either adjust as needed or take the defaults and make a mental note to come back and check up on things in a week or two.

The following sections describe VTCS operating policies:

Note that these are **rough** groupings only. All the pieces are parts of VSM interact with each other constantly, so it's impossible to talk VTVs without thinking about MVCs, and vice versa. These policies are all set globally on the CONFIG statement[2], some of which you can override on a per job basis.

1.Exceptions: you must set MINMIG and MAXMIG.

2.There is one exception, and that's VTV size (MAXVtvsz on MGMTclas).

VTSS Policies

The following sections describe these VTSS policies:

- "AMT Settings" on page 31. AMT settings are a biggie because they're the triggers for starting and stopping automatic migration and all its attendant functions. On this one, you have a global setting that you can override with the SET MIGOPT command.
- "VTV Page Size" on page 32 and "Maximum VTV Size" on page 33. These two are linked, and even though they are VTV policies, they are more about optimizing VTSS usage, so they're discussed here. Large VTV page sizes, when matched with the appropriate VTSS model, can optimize performance within the VTSS. VTV page sizes are about the page data size within the VTSS, not the actual VTV size. VTV page sizes, however, are actively linked to VTV sizes, which can improve performance in high-capacity VTSSs. In fact, selecting VTV sizes of 2 or 4 GB **enforces** a Large VTV Page.
- "Maximum and Minimum Concurrent Migration Tasks" on page 34. Something to pay attention to because a thoughtful setting can help optimize your VSM resources. Again, you have a global setting that you can override with the SET MIGOPT command.

AMT Settings

TABLE 2-1 AMT Settings

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Controls the automatic space management/migration cycle. This cycle begins when DBU (Disk Buffer Utilization) exceeds the high AMT (HAMT) or the number of VTVs exceeds 97,000 (for VSM2s and VSM3s) or 291,000 (for VSM4s) and continues until DBU drops below the low AMT (LAMT). AMTs are a percentage of DBU.	■ LAMT - 5 - 95, must be one less than HAMT. ■ HAMT - 5 - 95, must be one greater than LAMT.	■ LAMT - 70 ■ HAMT - 80	■ CONFIG VTSS LOW and HIGH parameters ■ SET MIGOPT HIGHthld and LOWthld parameters.

Usage Notes

- With CONFIG, AMT settings take effect when you start HSC and apply to the specified VTSS.
- With SET MIGOPT:
  - AMT settings take effect immediately and apply to the specified VTSS or if no VTSS is specified, to all VTSSs. If you try to set global values (no VTSS specified) and the values are not valid for one VTSS (for example, MAXMIG(5) and one VTSS only has 4 RTDs connected), VTCS will not set values for any VTSSs
  - You can set the LAMT, the HAMT, or both.
- The following are general guidelines for changing the defaults:
  - The *difference* between the high and low AMTs affects the duration of the space management/migration cycle.
  - *Lowering* the HAMT tends to trigger *more frequent* space management/migration cycles.
  - *Raising* the HAMT tends to trigger *less frequent* space management/migration cycles.
  - *Lowering* the LAMT tends to free more VTSS space *and* migrate *more* VTVs.
  - *Raising* the LAMT tends to keep more VTVs resident in VTSS space *and* migrate *fewer* VTVs.

Tip – You can use Display VTSS to display the DBU, HAMT, and LAMT for each VTSS in your system. You can also use Display MIGrate to display migration status.

VTV Page Size

TABLE 2-2 VTV Page Size

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies the default page size used to store VTV data in the VTSS and on the MVCs for 400 and 800 MB VTVs only. For 2 and 4 GB VTVs (MAXVtvsz 2000 or 4000) a VTVPAGE setting of LARGE is always used.	STANDARD or LARGE	STANDARD	CONFIG GLOBAL VTVPAGE MGMTclas VTVPAGE

Usage Notes

- Large page size (which requires that the CDS is at a G level or above) can provide improved performance within the VTSS and for migrates and recalls. For more information about CDS levels, see "CDS VTCS Level" on page 25.

Caution –

- The page size of a VTV can **only** be changed by a VTV scratch mount. Additional restrictions may also apply for scratch VTVs that were previously resident in a VTSS.
- VTVPAGE **does not** apply to VSM2s. The VTSS microcode requirements are as follows:
  - For VSM3s: microcode level N01.00.77.00 or higher.
  - For VSM4s/VSM5s: microcode level D02.02.00.00 or higher.
- If you specify LARGE and the CDS level and/or VTSS microcode **do not** support LARGE, VTCS issues warning messages and VTVPAGE defaults to STANDARD.
- Creating VTVs with large pages makes these VTVs **unreadable** in configurations that do not support large VTV pages.

Maximum VTV Size

TABLE 2-3 Maximum VTV Size

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies the maximum size of a VTV.	400 - 400 Mb. 800 - 800 Mb. The CDS must be at a D level or above. 2000 - 2 Gb. The CDS must be at a G level or above. 4000 - 4 Gb. The CDS must be at a G level or above.	400	MGMTclas MAXVtvsz

Usage Notes

- The size of a VTV changes *only* after it goes through a scratch cycle. Therefore, if you change the Management Class and DISP=MOD, then it will still retain the original size.
- If you specify a VTV size that is not supported by the configuration, VTCS issues warning messages and MAXVtvsz defaults to the largest VTV size supported by the configuration.
- MAXVtvsz **does not** apply to VSM2s. The VSM3/VSM4 microcode requirements are as follows:
  - For VSM3s and 800MB support: microcode level N01.00.69.04 or microcode level N01.00.71.00 and above.
  - For VSM4s and 800MB support: microcode level D01.00.04.03 or microcode level D01.00.06.03 and above.
  - For VSM3s and 2/4GB support: microcode level N01.00.77.00 or higher.
  - For VSM4s/VSM5s and 2/4GB support: microcode level D02.02.00.00 or higher.

Caution – Specifying 2GB or 4GB VTVs:

- Increases MVC usage.
- May degrade space management of smaller-capacity VTSSs, which have relatively small cache and buffer sizes.
- Increases delays to jobs waiting recalls. Although the actual data transfer time from an MVC is the same and there may be fewer interruptions, each interruption lasts longer, which can cause job time-outs.

Maximum and Minimum Concurrent Migration Tasks

TABLE 2-4 Maximum and Minimum Concurrent Migration Tasks

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies the maximum and minimum number of concurrent automatic migration, immediate migration, and migrate-to-threshold tasks for each VTSS.	■ MAXMIG - 1 to the number of RTDs connected to the VTSS. ■ MINMIG - 1 to the MAXMIG setting.	none	■ Minimum - CONFIG VTSS MAXMIG or SET MIGOPT ■ Maximum - CONFIG VTSS MINMIG or SET MIGOPT

Usage Notes

- Use these parameters to balance migration tasks with other tasks (such as recall and reclaim) for the RTDs you have defined for each VTSS.
- In some situations, VTCS may not be able to activate *all* the migration tasks specified by the MAXMIG parameter. For example:
  - The VSM-wide RTD configuration consists of four 9840 and four 9490 transports.
  - No Storage Classes with STK1R as the primary media have been defined.
  - There is sufficient MVC media for the 9490 transports.

  In this configuration, because only the 9490 media is used, only a maximum of four migration tasks are activated using the 9490 RTDs.
- Similarly, there are circumstances when VTCS will start *less* than the number of migration tasks specified by the MINMIG parameter. For example:
  - The configuration consists of a single VTSS with 4 RTDs in ACS 0 and 4 RTDs in ACS 1. All RTD device types are identical.
  - MINMIG and MAXMIG are both set to 8.
  - Two Storage Classes are defined, which point, respectively, to ACS 0 and ACS 1.

  In this configuration, if there are migrates queued for both Storage Classes, then VTCS will start 8 requests. If however, there are only migrations queued for one Storage Class, then VTCS *will not* start 8 requests because the workload can only be serviced by one Storage Class and this class can only run on 4 RTDs.
- Finally, also note that when you reset the MINMIG and/or MAXMIG values, the actual number of migration tasks may not be immediately affected because of the way that VTCS manages migration tasks.

Tip – You can use Display MIGrate to display migration status.

VTV Policies

The following sections describe these VTV policies, roughly in order of importance:

- Maximum VTVs per MVC. Take the default, unless...well, read the fine print about high-capacity media.
- "Hosts Disabled from Migration, Consolidation and Export by VTV or Management Class" on page 36. I don't really have a "for instance" for this one. If, for whatever reason, you don't want a host to do these things you can explicitly turn them off. The default is not to disable any hosts, so if this isn't an issue, don't worry about it.
- "Recall VTVs with Read Data Checks" on page 36. The default is to recall VTVs with Read Data Checks...might as well try, right? If this doesn't suit you, you can turn it off either globally or per specific operation.

Maximum VTVs per MVC

TABLE 2-5 Maximum VTVs per MVC

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies the maximum number of VTVs that can be migrated to a single MVC.	■ 4 to 32000 for a D, E or F level CDS. ■ 4 to 65000 for a G level CDS.	■ 32000 for a D, E or F level CDS. ■ 65000 for a G level CDS.	CONFIG GLOBAL MAXVTV parameter

Usage Notes

- This policy applies to all MVCs and, at the time you set the policy, applies only to future migrations. That is, it will not lower the number of VTVs already migrated to an MVC. If the policy is not specified, the default is as shown in TABLE 2-5 unless the available MVC space is less than any remaining current VTSS resident VTV.
- Generally, use the default to allow VSM to automatically manage VTV stacking. However, with high-capacity media (for example, in a VSM system where all MVCs are type STK2P), specifying a value lower than the maximum may improve recall performance in some situations. Note, however, that a very low value can reduce that percentage of usable MVC space. If the maximum VTVs per MVC is exceeded, then usable space is reported as 0%.
- For more information about CDS levels, see "CDS VTCS Level" on page 25.

Hosts Disabled from Migration, Consolidation and Export by VTV or Management Class

TABLE 2-6 Hosts Disabled from Migration, Consolidation, or Export by VTV or MGMTclas

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies that a host cannot initiate automatic and demand migration and consolidation processing, or export by VTV or Management Class.	NOMIGRAT, if not specified, migration, etc., is not disabled	do not disable	CONFIG HOST

Usage Notes

- Specifying NOMIGRAT also causes NORECLAM to be set; for more information, see "Hosts Disabled from Reclamation" on page 42.
- MGMTclas IMMEDmig KEEP and IMMEDmig DELETE are mutually exclusive with CONFIG HOST NOMIGRAT. If you specify both, the IMMEDmig value overrides NOMIGRAT (for only those VTVs with the IMMEDmig value), and VTCS does not issue a message about this override.

Recall VTVs with Read Data Checks

TABLE 2-7 Recall VTVs with Read Data Checks

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies whether VTCS recalls VTVs with read data checks.	YES - Recall VTVs with Read Data Checks. NO - Do not recall VTVs with Read Data Checks.	YES	CONFIG GLOBAL RECALWER CONsolid GLOBAL RECALWER EXPORT GLOBAL RECALWER MVCDRAIN GLOBAL RECALWER RECALLG GLOBAL RECALWER

Note – During MVC reclaims, VTCS will never recall VTVs with read data checks, regardless of the RECALWER setting on the CONFIG GLOBAL statement.

MVC Space Reclamation Policies

The following sections describe these MVC reclamation policies...and some of these take some Deep Thought, so take your time, and remember, it's usually a good idea to supplement automatic reclamation with demand reclamation as described in ...

- "MVC Fragmented Space Threshold - Determines MVC Eligibility for Reclamation" on page 38. It makes sense that you only want to go for the low-hanging fruit when you do reclamation, because reclamation costs you resources that you could be otherwise using for migrates and recalls. This is the dial you can use to specify how fragmented an MVC must be to make it a reclaim candidate.

  Note that this value only dictates when an MVC becomes a reclaim candidate. It does not **start** automatic reclamation; see the next two bullets.

- "Free MVCs Threshold - Starts Automatic Space Reclamation" on page 39 and "Eligible/Total MVCs Threshold - Starts Automatic Space Reclamation" on page 40.

  Yes, folks...there are **two** different triggers that start automatic reclamation. More fine tuning, more granularity. Read the fine print, and you'll see that these triggers supplement rather than compete with each other. If either you run low on Free MVCs or your ratio of eligible to total MVCs gets to a bad number, that's a dangerous situation, and it starts automatic reclamation.

- "Maximum MVCs Processed Per Reclaim" on page 41. Here's where you have to put on your thinking cap. VTCS reclaims MVCs one at a time...serially, that is. You can, however, specify the maximum number you want to reclaim in one run, either automatic or demand. More fine tuning...you can say that when reclamation kicks in, run it to reclaim this number of MVCs, because that's the magic number that will get me out of the ditch.
- "Maximum MVCs Concurrently Processed for Reclamation and Drain" on page 42. Okay, this is a test...what's the difference between this and maximum MVCs processed per reclaim, especially since you can only reclaim one MVC at a time? It turns out that reclaim and drain are separate but related processes that can be processing multiple MVCs, and you get to say how many.
- "Hosts Disabled from Reclamation" on page 42. Again, I can't think of a real world instance where you'd want to do this. If, for whatever reason, you don't want a host to initiate reclamation, you can explicitly turn it off. The default is not to disable any hosts, so if this isn't an issue, don't worry about it.
- "MVC Retain Interval" on page 43. Is this a VTSS policy or an MVC policy? I'm going to call it an MVC policy just because of the title. The idea is pretty simple: if you think you're going to write more data to an MVC once it's mounted and initially written to, you can specify a value that'll make it hang around for a while...

Note – Reclamation turns fragmented MVC space (space that contains non-current VTVs) into usable space (writable MVC space). MVC reports and Display MVCpool show the percentages of MVC space that is fragmented, used (space that contains current VTVs), available, and usable. **Note that** usable space may be zero even if there is still space physically available. For example, if the maximum VTVs per MVC is exceeded, then usable space is reported as 0%. You set maximum VTVs per MVC as described in "Maximum VTVs per MVC" on page 35. Similarly, if a data check error has been reported against an MVC, VTCS will not use this MVC for output and usable space is reported as 0%.

MVC Fragmented Space Threshold - Determines MVC Eligibility for Reclamation

TABLE 2-8 MVC Fragmented Space Threshold

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies the fragmented space threshold (as a percentage) that determines when an MVC is eligible for demand or automatic reclamation.	4 - 98	40	CONFIG RECLAIM THRESHLD RECLAIM THRESHLD

Usage Notes

- If fragmented space on an MVC exceeds the value specified on THRESHLD, VTCS makes the MVC eligible for reclamation. Regardless of the percentage of fragmented space on an MVC versus this value, however, VTCS also considers where fragmented space occurs. For example, if the first fragmented space is near the end of the MVC, VTCS may process the MVC before an MVC with more total fragmented space.
- You can use Display MVCpool to display the MVCs eligible for reclamation in your MVC pool, as well as information about MVC status and space.

Free MVCs Threshold - Starts Automatic Space Reclamation

TABLE 2-9 Free MVCs Threshold

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies the minimum number of free MVCs. If the actual number drops below this value, automatic reclamation starts.	0 - 255	40	CONFIG GLOBAL MVCFREE

Usage Notes

- A free MVC has 100% usable space and does not contain any migrated VTVs.
- VTCS checks the MVCFREE value for each ACS. VTCS issues message SLS6616I and starts an automatic space reclamation if *both* of the following occurs:
  - Free MVCs is equal to or less than the value specified on CONFIG MVCFREE.
  - There is at least one eligible MVC as defined by the CONFIG RECLAIM THRESHLD parameter; for more information, see "Eligible/Total MVCs Threshold - Starts Automatic Space Reclamation" on page 40.
- If you set MVCFREE=0, VTCS actually uses the default value (40).
- StorageTek **strongly recommends** that you ensure that your MVC pool always has *at least* one eligible MVC for each MVC media type.

  Otherwise, you may need to change the CONFIG GLOBAL MVCFREE value, add more MVCs to the pool, or both. You can use Display to display the number of free MVCs in your MVC pool.

Eligible/Total MVCs Threshold - Starts Automatic Space Reclamation

TABLE 2-10 Eligible/Total MVCs Threshold

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies a percentage value that represents the ratio of reclaim candidates to total MVCs, which triggers automatic space reclamation as described in "Usage Notes" on page 40	1 - 98	35	CONFIG RECLAIM START

Usage Notes

- CONFIG RECLAIM START specifies a percentage value, which is equal to:

  (*Reclaim Candidates*/*Reclaim Candidates + Free MVCs*) * 100

  Where:

  Reclaim Candidates

  is the number of Reclaim Candidates determined by the CONFIG RECLAIM THRESHLD parameter. For more information, see "Eligible/Total MVCs Threshold - Starts Automatic Space Reclamation" on page 40.

  Reclaim Candidates + Free MVCs

  equals the number of Reclaim Candidates *plus* the number of free MVCs. A free MVC:

  - Has 100% usable space and does not contain any migrated VTVs.
  - Is defined as described in "Define Available MVCs with CONFIG" on page 21 and "Define the MVC Pool" on page 21.
  - Is writeable.
  - Is resident in the ACS.
- For each ACS (not globally for all ACSs), VTCS issues message SLS6616I and starts an automatic space reclamation if *both* of the following occurs:
  - The actual value of (*Reclaim Candidates*/*Reclaim Candidates + Free MVCs*) * 100 exceeds the value specified on CONFIG RECLAIM START parameter.
  - The number of eligible MVCs exceeds the value specified on the MAXMVC parameter; for more information, see "Maximum MVCs Processed Per Reclaim" on page 41.

Note – The only exception to the above two conditions occurs if an SLS6699 message indicates a critical shortage of free MVCs, in which case automatic reclamation will start anyway.

- The following are general guidelines for specifying values for the START parameter:
  - A *low* value (for example, 5%), starts automatic space reclamation when there are *few* eligible MVCs compared to free MVCs *unless* you set the MAXMVC value high compared to the number of eligible MVCs.
  - A *high* value (for example, 95%), starts automatic space reclamation when there are *many* eligible MVCs compared to free MVCs unless you set the MAXMVC value *very* high and your MVC pool is *very* small.
- You can use Display MVCPOOL to display eligible and free MVCs.

Maximum MVCs Processed Per Reclaim

TABLE 2-11 Maximum MVCs Processed Per Reclaim

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies the maximum number of MVCs that will be processed in a single space reclamation run.	1 - 98	40	CONFIG RECLAIM MAXMVC RECLAIM MAXMVC

Usage Notes

- Automatic and demand space reclamation processes one MVC at a time. You can, however, use MAXMVC to control the **maximum** number of MVCs that will be processed in a single space reclamation run (automatic or demand).
- For automatic space reclamation to start via the CONFIG RECLAIM START parameter setting, the number of eligible MVCs (determined by the CONFIG RECLAIM THRESHLD parameter) must also exceed the MAXMVC value. For more information, see "Eligible/Total MVCs Threshold - Starts Automatic Space Reclamation" on page 40.
- The following are general guidelines for specifying values for the MAXMVC parameter:
  - A *low* value reclaims *fewer* MVCs in a single run, but may have *negligible* effect on migrations and recalls and may start automatic space reclamation *more* frequently; for more information, see "Eligible/Total MVCs Threshold - Starts Automatic Space Reclamation" on page 40.
  - A *high* value reclaims *more* MVCs in a single run, but may have *considerable* effect on migrations and recalls and may start automatic space reclamation *less* frequently; for more information, see "Eligible/Total MVCs Threshold - Starts Automatic Space Reclamation" on page 40.
- You can use Display MVCpool to display eligible and free MVCs.

Maximum MVCs Concurrently Processed for Reclamation and Drain

TABLE 2-12 Maximum MVCs Concurrently Processed for Reclamation and Drain

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies the maximum number of MVCs concurrently processed for reclamation and drain.	1 - 99	1	■ CONFIG RECLAIM CONMVC ■ MVCDRAIN CONMVC ■ RECLAIM CONMVC

Hosts Disabled from Reclamation

TABLE 2-13 Hosts Disabled from Reclamation

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies that a host cannot initiate automatic and demand reclamation.	NOMIRECLAM, if not specified, reclamation is not disabled	do not disable	CONFIG HOST NORECLAM

Usage Notes

- Specifying NOMIGRAT also causes NORECLAM to be set; for more information, see "Hosts Disabled from Migration, Consolidation and Export by VTV or Management Class" on page 36.
- Disabled hosts can still do demand MVC drains via MVCDRain.

MVC Retain Interval

TABLE 2-14 MVC Retain Interval

This policy does the following...	Valid values are...	The default is...	To set the policy, use...
Specifies how long VTCS will retain an MVC on an RTD in idle mode after a migration.	1 - 60 minutes	10	CONFIG VTSS RETAIN parameter

Usage Notes

- Retaining the MVC can reduce MVC mounts.
- When VTCS shuts down, VTCS dismounts all MVCs regardless of the MVC retain interval.

CHAPTER **3**

Preparing for Installation

Almost there...in the next chapter, we actually start installing software! But first, there are several items you need to get done in MSP to ensure a successful installation and configuration. So **before** doing the tasks described in Chapter 4 “Installing NCS and VTCS”, complete the preparation tasks described in the following sections:

Note – Most of the tasks in this Chapter require you to specify VSM system values that you determined in “Determining VSM Configuration Values” on page 9 and recorded in TABLE A-1 on page 99.

Defining A Security System User ID for HSC, SMC, and VTCS

Before writing to an MVC via the VTSS (without a standard DFP open), VTCS will issue a RACHECK against the TAPEVOL class to verify that VSM has update privileges for that MVC. Define a security system user ID, which is used in the RACROUTE and is associated with the HSC started task. Refer to your security system documentation for details on how to associate a security system user ID with the HSC started task.

Set up TAPEVOL profiles to protect against accidental overwrites of MVCs; for more information, see "Defining MVC Pool Volser Authority" on page 93.

Caution – Depending on the default settings of your security system, VSM may not be able to mount and to write to MVCs until you have defined a security system user ID for HSC and TAPEVOL profiles for the MVCs.

Configuring MSP Device Numbers and Esoterics

The following sections tell how to use the IOGRP facility to do the following:

- Assign MSP device numbers to VTDs and shared RTDs.
- Associate VTD MSP device numbers and esoterics.

You determined these values in "Determining VSM Configuration Values" on page 9 and recorded them in TABLE A-1 on page 99. See your Fujitsu documentation for more information on the IOGRP facility.

Assigning MSP Device Numbers to VTDs

Use the IOGRP facility to assign MSP 3490E device numbers to your VSM system's VTDs. You determined these device numbers in "VTD Unit Addresses" on page 11. For more information about assigning these device numbers, see *Virtual Storage Manager Planning, Implementation, and Usage Guide*.

Associating VTD MSP Device Numbers and Esoterics

If you use esoteric substitution to allocate VTDs as described in "VSM Esoterics and Esoteric Substitution" on page 12, use the IOGRP facility to associate each esoteric name with the MSP device numbers for the VTDs that you have chosen for that esoteric.

Assigning MSP Device Numbers to RTDs

Use the IOGRP facility to assign MSP device numbers to these RTDs.

Tip – You must use the same unit addresses you determined for these transports for LIBGEN updates as described in "RTD Definitions" on page 19.

Setting the MSP Missing Interrupt Handler (MIH) Value

The VTSS's internal error recovery procedures requires the MSP missing-interrupt handler (MIH) value to be 20 minutes. You set this value by modifying the MIH parameter in SYS1.IPLLIB member KHSDEV*xx*.

Note – Adjust applications running on your system that detect missing interrupts and that are independent of the system MIH setting to allow a five-minute MIH value.

Specifying the Region Size

StorageTek recommends that you run HSC/VTCS with a region size of **at least** 6 MB except if you are running utilities or commands that manipulate manifest files, in which case you need the maximum region size your system will allow.

CHAPTER 4

Installing VTCS Base

As you read through this chapter, you'll see that VTCS base installation is a series of standard SMP jobs, and therefore no big deal. There **are** some intricacies involved with VTCS installation, however, that you need to pay attention to, chiefly in the area of getting HSC/SMC in place and talking to VTCS. And one other item to consider...

Tip – Optionally, you can do all the tasks in "Reconfiguring HSC" on page 67 **before** you install VTCS, so if you want to arrange your work flow like that, go ahead and reconfigure HSC, then come back to this chapter and install the software.

And, as usual, there are a couple of "stop and think items," so **before** you install the software, complete the pre-installation tasks described in the following sections:

- "Ensuring that HSC and SMC Are Installed" on page 50
- "Reviewing Coexistence Requirements" on page 51
- "Verifying Base VTCS Base Tape" on page 52

Next, install HSC, HSC maintenance, and VTCS 6.2.0 as described in the following sections:

-

- "Unloading the SMP JCL Library" on page 55
- "Allocating VTCS Target and Distribution Library Data Sets and Required DDDEF Entries" on page 54
- "Applying the VTCS 6.2.0 FMID" on page 56
- "Accepting the VTCS 6.2.0 FMID" on page 57
- "Adding SWSLINK to the Authorized Program List" on page 60
- "Modifying the HSC Startup Procedure to include the VTCS 6.2.0 LINKLIB" on page 61

Ensuring that HSC and SMC Are Installed

Install HSC, SMC and all HSC/SMC maintenance before you install VTCS. For more information, see *NCS Installation Guide.*

StorageTek **requires** you to install SMC, which is required to perform allocation influencing and message interception on MSP.

Note – You must accept the HSC FMID (SOS@620 for HSC 6.2.0) and all HSC maintenance before installing VTCS 6.2.0.

Reviewing Coexistence Requirements

For more information, see "VTCS System Software Requirements" on page 5.

Note –

- The VSM Extended Format CDS **is required for VTCS 6.2.0. Also note that** after you convert the CDS to VSM Extended Format, you **cannot** run VTCS 4.0.0 or lower against the converted CDS. For more information, see "CDS VTCS Level" on page 25.
- Ensure that you install the Toleration PTFS (LF600M0 for VTCS 6.0 or LF61010 for VTCS 6.1). These PTFs prevent a Manifest File created on a G Level CDS from being processed on a system with a lower level CDS.

Verifying Base VTCS Base Tape

The installation materials consist of the VTCS 6.2 Base tape, which is a single standard label tape with a volume serial number of WS6200.

Note –

- Contact Sun StorageTek Software Support for information about additional PTFs that might be required before installing the NCS product components. See the *Requesting Help from Software Support* guide for information about contacting StorageTek for technical support and for requesting changes to software products.
- If you are using HSC or MVS/CSC, the SMC software **must** be installed.

VTCS Base Installation Tape Contents

The Base Tape contains the VTCS 6.2.0 FMID. TABLE 4-1 lists the files included on the VTCS 6.2.0 Base Tape.

TABLE 4-1 VTCS 6.2.0 Base Tape Contents

File	Data Set Name	Description
1	SMPMCS	SMP control statements
2	SWS@620.F1	SWS@620 JCLIN
3	SWS@620.F2	SWS@620 SAMPLIB members (automatically installed in the HSC SAMPLIB)
4	SWS@620.F3	SWS@620 MACLIB members (automatically installed in the HSC MACLIB)
5	SWS@620.F4	SWS@620 object modules

Note – The VTCS 6.2.0 installation automatically installs the following VTCS members in the HSC SAMPLIB:

SWSJCRDB

Sample CONFIG utility JCL

SWSJMVCR

Sample MVCRPT utility JCL

SWSJVTVR

Sample VTVRPT utility JCL

VTCS FMIDs

The VTCS 6.2.0 software is packaged in standard SMP format. The VTCS 6.2.0 installation tape includes the following VTCS FMID:

SWS@620

The SWS@620 function contains the VTCS load modules for VTCS 6.2.0 running with HSC 6.2.0.

Note – The SWS@620 FMID is a subsidiary HSC 6.2.0 FMID (SOS@620 for HSC 6.2.0) and you must apply the SWS@620 FMID to the same SMP zone as HSC. Products from other vendors should **not** be installed in this SMP PRJ.

Allocating VTCS Target and Distribution Library Data Sets and Required DDDEF Entries

If you **did not** previously allocate these data sets during NCS installation, you **must** allocate VTCS target and distribution data sets and define the appropriate DDDEF entries in the SMP PRJ, using the sample batch job provided in member NCSDDEF of your SMP JCL library.

Note – At this point, go to "Unloading the SMP JCL Library" on page 55:

Installing the VTCS Base

▼ Unloading the SMP JCL Library

To unload the files from tape, use the `SWS@620.F1` JCLIN file described in TABLE 4-1 on page 53 (JCL shown in FIGURE 4-1), then go to "Receiving the VTCS 6.2.0 FMID".

```
//jobname JOB your jobcard parameters
//UNLOAD  EXEC PGM=IEBCOPY
//INDD    DD DSN=SWS@620.F1,DISP=SHR,
//        UNIT=tape-unit,VOL=SER=WS6200,LABEL=(2,SL)
//OUTDD   DD DSN=your.SMP.jcllib,DISP=(NEW,CATLG),
//        UNIT=SYSALLDA,
//        SPACE=(TRK,(5,1,4)),
//        DCB=(RECFM=FB,LRECL=80,BLKSIZE=3120)
//SYSPRINT DD SYSOUT=*
//SYSIN   DD *
 C I=INDD,O=OUTDD
 E M=SWS@620
/*
```

FIGURE 4-1 JCL to Unload the VTCS SMP JCL Library from Tape

▼ Receiving the VTCS 6.2.0 FMID

Modify SAMPLIB member NCSRECV per the instructions in the prologue and run it to receive the VTCS 6.2.0 FMID. The receive must run with return code zero; otherwise, contact Sun StorageTek Software Support.

Applying the VTCS 6.2.0 FMID

Modify SAMPLIB member NCSAPPLY per the instructions in the prologue and run it to apply the VTCS 6.2.0 FMID. The apply must run with return code less than or equal to 4; otherwise, contact Sun StorageTek Software Support.

Note – Because the VTCS FMID is a subsidiary HSC FMID, SMP will also apply any VTCS PTFs called out by conditional COREQS in the HSC PTFs already applied to your system. If any of these PTFs have HOLDDATA, you will receive a JQP549 message for each, and the APPLY will fail. This is not an error condition. If you encounter this condition, please review the individual PTF cover letters, note any additional action(s) to be taken, and repeat the APPLY step with the following parameters:

```
APPLY S(SWS@620)
                  BYPASS(HOLDSYSTEM) .
```

Accepting the VTCS 6.2.0 FMID

Modify SAMPLIB member NCSACCPT per the instructions in the prologue and run it to accept the VTCS 6.2.0 FMID. The accept must run with return code less than or equal to 4; otherwise, contact Sun StorageTek Software Support.

Note – You *must* accept the HSC FMID and all HSC maintenance before installing VTCS 6.2.0. For more information, see “Ensuring that HSC and SMC Are Installed” on page 50.

Also note that because the VTCS FMID is a subsidiary HSC FMID, SMP will also accept any VTCS PTFs called out by conditional COREQS in the HSC PTFs already accepted on your system. If any of these PTFs have HOLDDATA, you will receive a JQP549 message for each, and the ACCEPT will fail. This is not an error condition. If you encounter this condition, please review the individual PTF cover letters, note any additional action(s) to be taken, and repeat the ACCEPT step with the following parameters:

```
ACCEPT S(SWS@620)

            BYPASS(HOLDSYSTEM) .
```

Applying the VTCS 6.2.0 Service

Use the example JCL in FIGURE 4-1 to apply the VTCS 6.2.0 service.

```
//APPTSOS EXEC PGM=JQPSMP10,
             // PARM='DATE=U',
             //SMPPRJ DD DISP=SHR,DSN=hsc.prj
             //SMPACS DD DISP=SHR,DSN=hsc.acds
             //SMPCDS DD DISP=SHR,DSN=hsc.cds
             //SMPCNTL DD *
              APPLY
              S(LF62000).
```

FIGURE 4-1 JCL Example: Applying the VTCS 6.2.0 service

Note – If any of the PTFs to be applied have HOLDDATA, you will receive a JQP302 message for each, and the APPLY will fail. This is not an error condition. If you encounter this condition, please review the individual PTF cover letters, note any additional action(s) to be taken, and repeat the APPLY step with the following parameters:

```
APPLY PTFS FORFMID(SWS@620)

BYPASS(HOLDSYSTEM) .
```

Accepting the VTCS 6.2.0 Service

Use the example JCL in FIGURE 4-3 to accept the VTCS 6.2.0 service.

```
//ACCTP EXEC PGM=JQPSMP10,
             // PARM='DATE=U',
             //SMPPRJ DD DISP=SHR,DSN=hsc.prj
             //SMPADCS DD DISP=SHR,DSN=hsc.acds
             //SMPCDS DD DISP=SHR,DSN=hsc.cds
             //SMPCNTL DD *
              ACCEPT
              S(LF62000).
```

FIGURE 4-2 JCL Example: Accepting the VTCS 6.2.0 service

Adding SWSLINK to the Authorized Program List

VTCS must run as an authorized program, which you do by adding the VTCS Link Library (SWSLINK) to the authorized program list on your system :

- Dynamically
- "Using KAAAPFxx to APF Authorize the SWSLINK"

Using KAAAPF***xx*** to APF Authorize the SWSLINK

To use the KAAAPF*xx* member of SYS1.IPLLIB to authorize the SWSLINK, add the following entry to that list with your HLQ and volser:

your`.SWSLINK` *volser*

Modifying the HSC Startup Procedure to include the VTCS 6.2.0 LINKLIB

Use the example JCL in FIGURE 4-3 as an example of how to modify the HSC startup procedure to start VTCS. Include the VTCS 6.2.0 LINKLIB (SWSLINK) in the STEPLIB **before** the HSC LINKLIB (SLSLINK).

```
//SLSO      PROC PROG=SLSBINIT
//IEFPROC   EXEC PGM=&PROG,TIME=1440,DPRTY=(7,5),
//          PARM='SSYS(SLSO) E(E086) F(23) M(00)'
//STEPLIB   DD DSN=hlq.SWSLINK,DISP=SHR
//          DD DSN=hlq.SLSLINK,DISP=SHR
```

FIGURE 4-3 JCL Example: Modifying the HSC started task to include the SWSLINK library

Installing VTCS 6.2 Maintenance

After installing VTCS 6.2 Base, you **must** install the current maintenance from the VTCS 6.2 Service Tape. For more information, see "Installing VTCS Maintenance" on page 63.

CHAPTER 5

Installing VTCS Maintenance

After installing VTCS 6.2 Base as described in "Installing VTCS Base" on page 49, you **must** install the current maintenance from the VTCS 6.2 Service Tape as described in the following sections:

Verifying Service Tape

The VTCS 6.2 Service Tape contains VTCS PTFs since the Base Tape was created.

Note –

- Contact Sun StorageTek Software Support as described in "Customer Support" on page xiv for information about additional PTFs that might be required before installing VTCS maintenance.

VTCS Service Tape Contents

TABLE 5-1 lists the files included on the VTCS 6.2.0 service tape.

TABLE 5-1 VTCS 6.2.0 Service Tape Contents

File	Data Set Name	Description
1	SYSMODS	SYSMODS
2	CVR	PTF cover letters and JCL samples
3	SMM	Summary data
4	HOLDDATA	SMP HOLDDATA

Unloading the VTCS Service Tape

Sample JCL members for unloading VTCS maintenance from tape were unloaded from the VTCS base tape during the VTCS installation process. See "VTCS Base Installation Tape Contents" on page 53 for more information.

Receiving the VTCS 6.2 Maintenance

To receive the VTCS 6.2 maintenance, modify and run one of the following SAMPLIB members per the instructions in the prologue:

- Use MAINTRCF to SMP RECEIVE maintenance by specific FMID.
- Use MAINTRCS to SMP RECEIVE maintenance by specific SYSMOD.

The receive must run with return code zero; otherwise, contact Sun StorageTek Software Support.

Note –

- When installing VTCS, you **must** SMP receive all maintenance from the corrective service tape before performing an SMP APPLY and ACCEPT for the HSC and VTCS base functions because of the ifreq and coreq relationship between HSC and VTCS.

Applying the VTCS 6.2 Maintenance

To apply the VTCS 6.2 maintenance, modify and run one of the following SAMPLIB members per the instructions in the prologue:

- Use MAINTAPF to SMP APPLY maintenance by specific FMID.
- Use MAINTAPS to SMP APPLY maintenance by specific SYSMOD.

The apply must run with return code zero; otherwise, contact Sun StorageTek Software Support.

Note – You can modify the sample members to do an APPLY CHECK, then modify again to do an APPLY.

Accepting the VTCS 6.2 Maintenance

To accept the VTCS 6.2 maintenance, modify and run one of the following SAMPLIB members per the instructions in the prologue:

- Use MAINTACF to SMP ACCEPT maintenance by specific FMID.
- Use MAINTACS to SMP ACCEPT maintenance by specific SYSMOD.

The accept must run with return code zero; otherwise, contact Sun StorageTek Software Support.

Note – You can modify the sample members to do an ACCEPT CHECK, then modify again to an ACCEPT.

CHAPTER 6

Reconfiguring HSC

Okay, the NCS/VTCS software is installed, and now things get interesting. Because, as you've probably guessed, **before** you configure VSM, you must do some or all of the HSC reconfiguration tasks described in the following sections.

The "some or all" you already determined by reading through the notes in TABLE 1-1 on page 1. **That is,** if you are upgrading from a previous release of VTCS, you may not need to do all the tasks in this chapter. For example, if you are not adding RTDs to your configuration, you do not need to update the HSC LIBGEN.

In addition, as noted in Chapter 4, "Installing VTCS Base"...

Tip – ...you can do all the tasks in "Reconfiguring HSC" **before** you install VTCS. Most of the tasks in this Chapter require you to specify VSM system values that you recorded in TABLE A-1 on page 99.

Your task list for reconfiguring NCS is as follows:

Creating or Updating the HSC LIBGEN

If your system's RTDs are new transports, you must update the HSC LIBGEN by adding a SLIDRIVS macro to define the device addresses you determined in "RTD Definitions" on page 19. Similarly, if you have made other hardware changes (for example, adding or removing LSMs), you must update the related LIBGEN macros as described in Step 2, below. If you are converting the CDS to VSM Extended Format as described in "CDS VTCS Level" on page 25, you must create a new CDS. For more information, see *HSC System Programmer's Guide for MSP*.

To update the HSC LIBGEN to define new transports that are RTDs:

1. **Run the HSC Database Decompile (LIBGEN) Utility to create LIBGEN macro statements from your existing CDS.**

   Do *not* edit the original LIBGEN, because if the SET Utility was used to change the library configuration stored in the CDS, the original LIBGEN no longer matches the CDS. For more information about the Database Decompile Utility, see *HSC System Programmer's Guide for MSP*.

2. **After you run the HSC Database Decompile Utility, add a SLIDRIVS macro to define the RTD device addresses.**

   You may also need to update related LIBGEN macros, such as the SLIACS, SLILSM and SLIDLIST macros. For more information about the LIBGEN macros, see *HSC Configuration Guide for MSP*.

Note – You can specify that Nearline transports can only be used as RTDs on the SLIACS macro as shown below:

```
SLIACS VSMONLY=YES,ACSDRV=(esoteric0,...,esoteric15),LSM=(....)
```

As shown in this example, in the HSC SLIACS macro:

- The VSMONLY=YES parameter specifies that the RTDs in the ACS are attached only to a VSM system for one or more of the HOSTs connected to this ACS. VSMONLY=NO is the default.
- The ACSDRV parameter specifies the esoteric name of each host that refers to the transports attached to this ACS. A comma is a placeholder for any esoteric name not specified **except** when VSMONLY=YES is specified. In this case, the esoteric "placeholder" is ignored (set to blanks), which then "dedicates" the ACS to VSM use. If VSMONLY=NO, then the esoteric of the first host system is substituted when an esoteric is omitted for a host.

Also note that you can use the HSC SET ACS utility to you specify that Nearline transports can only be used as RTDs as follows:

- The ACSDRV parameter specifies the esoteric name of the host that refers to the transports attached to this ACS. A () specifies that the esoteric for the specified host and ACS is set to blank only when VSMONLY(YES) is specified on the SET ACS utility, which then "dedicates" the ACS to VSM use. If VSMONLY(NO), then the esoteric of the first host system is substituted when an esoteric is omitted for a host.

- The VSMONLY parameter is added. VSMONLY(YES) specifies that the RTDs in the ACS are attached only to a VSM if the ACSDRV parameter specifies () for the esoteric for this host. VSMONLY=NO is the default.

3. **After you update the LIBGEN macros, reassemble and link–edit the LIBGEN file.**

   For more information, see “LIBGEN Process Verification” in *HSC Configuration Guide for MSP.*

Verifying the LIBGEN

After you assemble and link edit the LIBGEN file, run the SLIVERFY program to verify the LIBGEN. For more information, see “Verifying the Library Generation” *HSC Configuration Guide.*

Caution – Before you run SLIVERFY, if your system’s RTDs are new transports that you will share with MSP, you must install them and define their MSP unit addresses via the IOGRP facility as described in “Configuring MSP Device Numbers and Esoterics” on page 47.

Formatting the New CDS

In "HSC CDS DASD Space" on page 28, you determined the size of the CDS to support your VSM system. If you require a larger CDS, you must format a new CDS to this size by using the HSC SLICREAT macro. For more information on the HSC SLICREAT macro, see *HSC Configuration Guide.*

Note that:

- Before converting the CDS to VSM Extended Format as described in "Configuring VTCS" on page 73, you need to allocate a new data set for the VSM Extended Format CDS.
- If you change the CDS data set name, make sure to update the name in the HSC started task and in any other started tasks or batch jobs (such as ExPR and ExLM) that reference this data set.
- As described in "CDS Locations" on page 6VSM **does not** support copies of the CDS at multiple sites.
- For more information on using SLICREAT to format the new CDS, see *HSC System Programmer's Guide*. Typically, you run SLICREAT with the highest level of HSC that you will run after converting the CDS format.

Creating VOLATTR Statements for VTVs

As described in "VTV Definitions" on page 17, to define VTVs, you must create:

- CONFIG VTVVOL statements as shown in Step 5 on page 77.
- HSC VOLATTR statements to define VTVs to HSC, for example:

```
VOLATTR SERIAL (905000-999999) MEDIA(VIRTUAL)
VOLATTR SERIAL (C00000-C25000) MEDIA(VIRTUAL)
VOLATTR SERIAL (RMM000-RMM020) MEDIA(VIRTUAL)
```

Defining MVCs to HSC

As described in "MVC Definitions" on page 20, to define MVCs, you must create:

- CONFIG MVCVOL statements as shown in Step 5 on page 77.
- HSC VOLATTR statements to define MVCs to HSC. For example, to define MVCs `N25980-N25989` as T9840A/T9840B volumes and MVCs `N3500-N3599` as T9840C volumes, create the following VOLATTR statements:

```
VOLATTR SERIAL(N25980-N25989) MEDIA(STK1R) RECTECH(STK1RAB)
VOLATTR SERIAL(N3500-N3599) MEDIA(STK1R) RECTECH(STK1RC)
```

- HSC MVCPool statements, which specify the pool of MVCs available for migration and consolidation requests. For example, to define a single MVC Pool for the above volsers:

1. **Create the following MVCPool statements:**

```
MVCPOOL VOLSER(N25980-N25989)
MVCPOOL VOLSER(N3500-N3599)
```

2. **Run the VT MVCDEF command to activate the updated data set, for example:**

```
VT MVCDEF DSN(VSM.MVCPOOL)
```

CHAPTER 7

Configuring VTCS

All the warming up is done, and it's now time for the main part of the show, which is configuring VTCS, which you do using the VTCS CONFIG utility...so now would be a good time to open up your *VTCS Command and Utility Reference*.

Much of the CONFIG deck is devoted to what you would expect...defining to VTCS the essential virtual/hardware parts of the VSM solution...VTSSs, VTVs, VTDs, RTDs, and MVCs. What you **also** have the option of doing is setting non-default operating values, which we discussed in Chapter 2, "Planning VTCS Operating Policies"...and if you did your homework, you have the values recorded in TABLE A-1 on page 99.

This chapter has two major sections:

- "Building a Simple CONFIG Deck" on page 75 is basically a procedure where we build an example plain-vanilla CONFIG deck step by step. To lead you through this, we'll do it in ordered fashion, building the CONFIG deck as we go, as described in TABLE 7-1.
- "Special Cases: A Gallery of Advanced Uses of CONFIG" on page 79 is...well, what *he* said. There are variations of the CONFIG deck beyond the plain vanilla model, such as the one where you disable a host from initiating migrations, and this is the place to go if you're looking for that kind of information.

TABLE 7-1 VTCS Configuration Tasks

Step	Notes	Planning Information
Step 1 on page 75	Are you doing an upgrade install? Then you want to run DECOM to get a true picture of your current configuration. You can then update the DECOM listing and resubmit it to CONFIG to update your configuration. Typically, you run DECOM with the highest level of the VTCS (6.0 or 6.1) that supports the CDS 'from' level. First time install? Skip on down to Step 2 on page 75.	
Step 2 on page 75	The actual CDS level specification is pretty easy, but deciding which level takes some Deep Thought, so please study carefully the planning section before you begin coding...	..."CDS VTCS Level" on page 25
Step 3 on page 76	This is where you specify global operating policies, such as the number of free MVCs...if you want to. Remember, you can always take the defaults, and tune things up later...	"Planning VTCS Operating Policies" on page 29

TABLE 7-1 VTCS Configuration Tasks

Step	Notes	Planning Information
Step 4 on page 76	Moving right along to the MVC reclamation policies...	"MVC Space Reclamation Policies" on page 37
Step 5 on page 77	...followed by VTV and MVC volsers...	■ "VTV Definitions" on page 17 ■ "MVC Definitions" on page 20
Step 6 on page 78	...and, to complete the hardware definitions, CONFIG statements for the system's VTSSs, the RTDs attached to the VTSSs, and the VTDs in each VTSS.	■ "VTSS Names" on page 10 ■ "RTD Definitions" on page 19 ■ "VTD Unit Addresses" on page 11 ■ "VSM Esoterics and Esoteric Substitution" on page 12

Building a Simple CONFIG Deck

▼ To build a simple CONFIG deck:

1. **Run the VTCS DECOM Utility...**

   ...if you're doing an upgrade install. Otherwise, skip to Step 2.

   FIGURE 7-1 shows example JCL to run the DECOM utility with output to flat file CFG22202.

```
//DECOM EXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//CFG22202 DD DSN=FEDB.VSMLMULT.CFG22202,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 DECOM FLATDD(CFG22202)
```

FIGURE 7-1 Example JCL for the DECOM utility

2. **Start the CONFIG deck by specifying the CDS Level.**

   FIGURE 7-2 shows CONFIG JCL example to specify CDS level G.

```
//CREATECF EXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//CFG22202 DD DSN=FEDB.VSMLMULT.CFG22202,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG CDSLEVEL(V62ABOVE)
```

FIGURE 7-2 CONFIG Example: CDSLEVEL(V62ABOVE) to Specify Level G

Note – In FIGURE 7-2, per VTCS NCO support, we do not have to specify RESET. RESET is **not** required when going from F to G level, but all hosts accessing the CDS must be at VTCS/NCS 6.2 during the CDS level change. See *VTCS Command and Utility Reference* for details about when RESET is required.

---

3. **Specify global values.**

   FIGURE 7-3 shows our example CONFIG deck all spruced up with global values.

```
//CREATECF EXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//CFG22202 DD DSN=FEDB.VSMLMULT.CFG22202,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSINDD   *
 CONFIG RESET CDSLEVEL(V62ABOVE)
 GLOBAL MAXVTV=65000 MVCFREE=60 VTVATTR=SCRATCH RECALWER=YES
VTVPAGE=LARGE
```

FIGURE 7-3 CONFIG example: Specifying Global Values

Tip – If a Lock Structure is already defined to VTCS, you can use DECOM, Display CONFIG, and Display LOCKS to display information about the Lock Structure.

---

4. **Specify reclamation policy values.**

   FIGURE 7-4 shows our example CONFIG deck, now sporting reclamation policy values.

```
//CREATECF EXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//CFG22202 DD DSN=FEDB.VSMLMULT.CFG22202,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG RESET CDSLEVEL(V62ABOVE)
 GLOBAL MAXVTV=65000 MVCFREE=60 VTVATTR=SCRATCH RECALWER=YES
VTVPAGE=LARGE
 RECLAIM THRESHLD=70 MAXMVC=30 START=40 CONMVC=5
```

FIGURE 7-4 CONFIG example: Specifying Reclamation Values

5. Specify VTV and MVC volsers.

FIGURE 7-5 shows our example CONFIG deck with the addition of VTV and MVC volsers. Note that the VTVs are defined in scratch status so we won't have to explicitly scratch them with HSC SLUADMIN.

```
//CREATECF EXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//CFG22202 DD DSN=FEDB.VSMLMULT.CFG22202,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG RESET CDSLEVEL(V62ABOVE)
 GLOBAL MAXVTV=65000 MVCFREE=60 VTVATTR=SCRATCH RECALWER=YES
 LOCKSTR=STK_VTCS_LOCKS VTVPAGE=LARGE
 RECLAIM THRESHLD=70 MAXMVC=30 START=40 CONMVC=5
 VTVVOL LOW=905000 HIGH=999999 SCRATCH
 VTVVOL LOW=C00000 HIGH=C25000 SCRATCH
 VTVVOL LOW=RMM000 HIGH=RMM020 SCRATCH
 MVCVOL LOW=N25980 HIGH=N25989
 MVCVOL LOW=N35000 HIGH=N3599
```

FIGURE 7-5 CONFIG example: Specifying VTV and MVC Volsers

6. Define VTSSs, RTDs, and VTDs.

FIGURE 7-6 shows our example CONFIG deck that next defines our VTSSs, the RTDs attached to each VTSS (both VSM4s), and the VTDs in each VTSS. **Note that** the RTD and VTD definitions immediately follow the VTSS statement.

```
//CREATECF EXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//CFG22202 DD DSN=FEDB.VSMLMULT.CFG22202,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG RESET CDSLEVEL(V62ABOVE)
 GLOBAL MAXVTV=65000 MVCFREE=60 VTVATTR=SCRATCH RECALWER=YES
 LOCKSTR=STK_VTCS_LOCKS VTVPAGE=LARGE
 RECLAIM THRESHLD=70 MAXMVC=30 START=40 CONMVC=5
 VTVVOL LOW=905000 HIGH=999999 SCRATCH
 VTVVOL LOW=C00000 HIGH=C25000 SCRATCH
 VTVVOL LOW=RMM000 HIGH=RMM020 SCRATCH
 MVCVOL LOW=N25980 HIGH=N25989
 MVCVOL LOW=N35000 HIGH=N3599
 VTSS NAME=VSM41 LOW=70 HIGH=80 MAXMIG=8 MINMIG=4 RETAIN=5
 RTD  NAME=PR11A00 DEVNO=1A00 CHANIF=0C
 RTD  NAME=PR11A01 DEVNO=1A01 CHANIF=0D
 RTD  NAME=PR11A02 DEVNO=1A02 CHANIF=0K
 RTD  NAME=PR11A03 DEVNO=1A03 CHANIF=0L
 RTD  NAME=PR12A08 DEVNO=2A08 CHANIF=1C
 RTD  NAME=PR12A09 DEVNO=2A09 CHANIF=1D
 RTD  NAME=PR12A0A DEVNO=2A0A CHANIF=1K
 RTD  NAME=PR12A0B DEVNO=2A0B CHANIF=1L
 VTD LOW=9900 HIGH=99FF
 VTSS NAME=VSM42 LOW=70 HIGH=80 MAXMIG=8 MINMIG=4 RETAIN=5
 RTD  NAME=PR23A00 DEVNO=3A00 CHANIF=0C
 RTD  NAME=PR23A01 DEVNO=3A01 CHANIF=0D
 RTD  NAME=PR23A02 DEVNO=3A02 CHANIF=0K
 RTD  NAME=PR23A03 DEVNO=3A03 CHANIF=0L
 RTD  NAME=PR24A08 DEVNO=4A08 CHANIF=1C
 RTD  NAME=PR24A09 DEVNO=4A09 CHANIF=1D
 RTD  NAME=PR24A0A DEVNO=4A0A CHANIF=1K
 RTD  NAME=PR24A0B DEVNO=4A0B CHANIF=1L
 VTD LOW=9900 HIGH=99FF
```

FIGURE 7-6 CONFIG example: Defining VTSSs

Special Cases: A Gallery of Advanced Uses of CONFIG

Welcome to Star Wars, the movie...in this section, you're going to learn everything you ever wanted to know about wringing every last bit of functionality out of the CONFIG utility. Note that in many of these examples, you're changing the configuration, which is something you typically do when you're doing an upgrade install: upgrade the hardware configuration, run DECOM, then update the CONFIG deck to match the hardware changes at a release boundary.

Note that when you're doing something like adding RTDs, there's more to it than just plugging in the hardware and updating the CONFIG deck...you need to do all the good stuff we discussed back in "RTD Definitions" on page 19.

CONFIG Example: All Hosts Access VTDs in One VTSS, Only Selected Hosts Access VTDs in Second VTSS

FIGURE 7-7 shows example CONFIG JCL to define a VSM configuration as follows:

- The VTD statement specifies default VTD addresses 8900 - 893F for VTSS1. All hosts have access to these VTDs by their default addresses.
- No default VTD addresses are specified for VTSS2. The VTD statements that immediately follow the HOST statements for MSP1 and MSP2 specify that only these hosts can access the VTDs in VTSS2 by the addresses 9900 - 993F. HOST statement MSP3 is a placeholder; this host cannot access the VTDs in VTSS2, and is disabled from initiating migrates and reclaims.

```
//UPDATECFGEXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//CFG22202 DD DSN=FEDB.VSMLMULT.CFG22202,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG CDSLEVEL(V62ABOVE)
 GLOBAL MAXVTV=65000 MVCFREE=60 VTVATTR=SCRATCH RECALWER=YES
 LOCKSTR=STK_VTCS_LOCKS VTVPAGE=LARGE
 RECLAIM THRESHLD=70 MAXMVC=30 START=40 CONMVC=5
 VTVVOL LOW=905000 HIGH=999999 SCRATCH
 VTVVOL LOW=C00000 HIGH=C25000 SCRATCH
 VTVVOL LOW=RMM000 HIGH=RMM020 SCRATCH
 MVCVOL LOW=N25980 HIGH=N25989
 MVCVOL LOW=N35000 HIGH=N35999
 VTSSNAME=VTSS1  LOW=70 HIGH=80  MAXMIG=3  RETAIN=5
 RTDNAME=VT128800 DEVNO=8800 CHANIF=0A
 RTDNAME=VTS18801 DEVNO=8801 CHANIF=0I
 RTDNAME=VTS18802 DEVNO=8802 CHANIF=1A
 RTDNAME=VTS18803 DEVNO=8803 CHANIF=1I
 VTDLOW=8900 HIGH=893F
 VTSSNAME=VTSS2  LOW=70 HIGH=80  MAXMIG=3  RETAIN=5
 RTDNAME=VTS28804 DEVNO=8804 CHANIF=0A
 RTDNAME=VTS28805 DEVNO=8805 CHANIF=0I
 RTDNAME=VTS28806 DEVNO=8806 CHANIF=1A
 RTDNAME=VTS28807 DEVNO=8807 CHANIF=1I
 HOST   NAME=MSP1
 VTD    LOW=9900 HIGH=993F
 HOST   NAME=MSP2
 VTD    LOW=9900 HIGH=993F
 HOST   NAME=MSP3 NOMIGRAT NORECLAM
```

FIGURE 7-7 CONFIG example: All hosts access VTDs in one VTSS, selected hosts access VTDs in second VTSS

CONFIG Example: Update Configuration to Add RTDs

FIGURE 7-8 shows example JCL to run CONFIG to add RTDs VTS18811 and VTS18813 (connected to VTSS1) to the configuration shown in FIGURE 7-7 on page 80. Because of NCO, you can add the RTDs dynamically (no RESET required), by simply adding new definitions for RTDs VTS18811 and VTS18813.

```
//UPDATECFGEXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//CFG22202 DD DSN=FEDB.VSMLMULT.CFG22202,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG CDSLEVEL(V62ABOVE)
 GLOBAL MAXVTV=65000 MVCFREE=60 VTVATTR=SCRATCH RECALWER=YES
 LOCKSTR=STK_VTCS_LOCKS VTVPAGE=LARGE
 RECLAIM THRESHLD=70 MAXMVC=30 START=40 CONMVC=5
 VTVVOL LOW=905000 HIGH=999999 SCRATCH
 VTVVOL LOW=C00000 HIGH=C25000 SCRATCH
 VTVVOL LOW=RMM000 HIGH=RMM020 SCRATCH
 MVCVOL LOW=N25980 HIGH=N25989
 MVCVOL LOW=N35000 HIGH=N35999
 VTSSNAME=VTSS1  LOW=70 HIGH=80  MAXMIG=3  RETAIN=5
 RTDNAME=VTS18800 DEVNO=8800 CHANIF=0A
 RTDNAME=VTS18801 DEVNO=8801 CHANIF=0I
 RTDNAME=VTS18802 DEVNO=8802 CHANIF=1A
 RTDNAME=VTS18803 DEVNO=8803 CHANIF=1I
 RTDNAME=VTS18811 DEVNO=8811 CHANIF=0E
 RTDNAME=VTS18813 DEVNO=8813 CHANIF=1E
 VTDLOW=8900 HIGH=893F
 VTSSNAME=VTSS2  LOW=70 HIGH=80  MAXMIG=3  RETAIN=5
 RTDNAME=VTS28804 DEVNO=8804 CHANIF=0A
 RTDNAME=VTS28805 DEVNO=8805 CHANIF=0I
 RTDNAME=VTS28806 DEVNO=8806 CHANIF=1A
 RTDNAME=VTS28807 DEVNO=8807 CHANIF=1I
 HOST   NAME=MSP1
 VTD    LOW=9900 HIGH=993F
 HOST   NAME=MSP2
 VTD    LOW=9900 HIGH=993F
 HOST   NAME=MSP3
```

FIGURE 7-8 CONFIG example: updating configuration to add RTDs

CONFIG Example: Update Configuration to Add MVCs and VTVs and Change AMTs

FIGURE 7-9 shows example JCL to run CONFIG to modify the configuration shown in FIGURE 7-8 on page 81 by:

- Adding VTVs C25001 to C50000 as scratch.
- Adding MVCs N45000 to N45999.
- Changing the LAMT to 50 and the HAMT to 85 on both VTSS1 and VTSS2.

```
//UPDATECFGEXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//CFG22202 DD DSN=FEDB.VSMLMULT.CFG22202,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG CDSLEVEL(V62ABOVE)
 GLOBAL MAXVTV=65000 MVCFREE=60 VTVATTR=SCRATCH RECALWER=YES
 LOCKSTR=STK_VTCS_LOCKS VTVPAGE=LARGE
 RECLAIM THRESHLD=70 MAXMVC=30 START=40 CONMVC=5
 VTVVOL LOW=905000 HIGH=999999 SCRATCH
 VTVVOL LOW=C00000 HIGH=C25000 SCRATCH
 VTVVOL LOW=RMM000 HIGH=RMM020 SCRATCH
 VTVVOL LOW=C25001 HIGH=C50000 SCRATCH
 MVCVOL LOW=N25980 HIGH=N25989
 MVCVOL LOW=N35000 HIGH=N35999
 MVCVOL LOW=N45000 HIGH=N45999
 VTSSNAME=VTSS1  LOW=50 HIGH=85  MAXMIG=3  RETAIN=5
 RTDNAME=VTS18800 DEVNO=8800 CHANIF=0A
 RTDNAME=VTS18801 DEVNO=8801 CHANIF=0I
 RTDNAME=VTS18802 DEVNO=8802 CHANIF=1A
 RTDNAME=VTS18803 DEVNO=8803 CHANIF=1I
 RTDNAME=VTS18811 DEVNO=8811 CHANIF=0E
 RTDNAME=VTS18813 DEVNO=8813 CHANIF=1E
 VTDLOW=8900 HIGH=893F
 VTSSNAME=VTSS2  LOW=50 HIGH=85  MAXMIG=3  RETAIN=5
 RTDNAME=VTS28804 DEVNO=8804 CHANIF=0A
 RTDNAME=VTS28805 DEVNO=8805 CHANIF=0I
 RTDNAME=VTS28806 DEVNO=8806 CHANIF=1A
 RTDNAME=VTS28807 DEVNO=8807 CHANIF=1I
 HOST   NAME=MSP1
 VTD    LOW=9900 HIGH=993F
 HOST   NAME=MSP2
 VTD    LOW=9900 HIGH=993F
 HOST   NAME=MSP3
```

FIGURE 7-9 CONFIG example: updating configuration to add MVCs and VTVs and change AMTs

CONFIG Example: Denying Host Access to a Physically Removed VTSS

Here's an interesting one. You take a VTSS out of the mix...how do you let the hosts know it's not there any more. FIGURE 7-10 shows example JCL to run CONFIG to deny host access to VTSS2 that you physically removed from your configuration. In this example, you simply respecify the VTSS statement for VTSS2 with no parameters to deny host access to this VTSS.

```
//UPDATECFGEXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//CFG22202 DD DSN=FEDB.VSMLMULT.CFG22202,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG CDSLEVEL(V62ABOVE)
 GLOBAL MAXVTV=65000 MVCFREE=60 VTVATTR=SCRATCH RECALWER=YES
 LOCKSTR=STK_VTCS_LOCKS VTVPAGE=LARGE
 RECLAIM THRESHLD=70 MAXMVC=30 START=40 CONMVC=5
 VTSSNAME=VTSS1  LOW=70 HIGH=80  MAXMIG=3  RETAIN=5
 RTDNAME=VTS18800 DEVNO=8800 CHANIF=0A
 RTDNAME=VTS18801 DEVNO=8801 CHANIF=0I
 RTDNAME=VTS18802 DEVNO=8802 CHANIF=1A
 RTDNAME=VTS18803 DEVNO=8803 CHANIF=1I
 RTDNAME=VTS18811 DEVNO=8811 CHANIF=0E
 RTDNAME=VTS18813 DEVNO=8813 CHANIF=1E
 VTDLOW=8900 HIGH=893F
 VTSSNAME=VTSS2
```

FIGURE 7-10 CONFIG example: updating configuration to deny host access to a physically removed VTSS

CHAPTER **8**

Completing the VSM Configuration

In the home stretch now...we've configured VTCS, now it's time to complete some other key tasks to round out a working VSM configuration, to whit:

- "Updating the HSC PARMLIB Member (SLSSYSxx)" on page 86
- "Adding SMF Parameters for VTCS to SYS1.PARMLIB" on page 87
- "Using the SMC Client/Server Feature" on page 88
- "Updating the Tape Management System" on page 92
- "Routing Data Sets to VSM" on page 95
- "Restarting NCS/VTCS" on page 97

Tip – Several tasks in this Chapter require you to specify VSM system values that you determined in "Determining VSM Configuration Values" on page 9 and recorded in TABLE A-1 on page 99.

Updating the HSC PARMLIB Member (SLSSYSxx)

You can specify the VT MVCDEF command as a statement in the HSC PARMLIB. FIGURE 8-1 shows an example of TREQDEF, VT MVCDEF, and MGMTDEF commands specified as statements in the HSC PARMLIB member.

```
TREQDEF DSN(SMC.TAPEREQ)
VT MVCDEF DSN(VSM.MVCPOOL)
MGMTDEF DSN(HSC.PARMS)
COMMP METH LMU
FEAT VSM(ADVMGMT)
```

FIGURE 8-1 Example: Updating the HSC PARMLIB Member for VSM

In FIGURE 8-1:

SMC.TAPEREQ

is the data set that contains your system's TAPEREQ statements (including TAPEREQ statements for VTVs).

VSM.MVCPOOL

is the data set that contains your system's MVCPool statements.

HSC.PARMS

is the data set that contains your system's MGMTclas and STORclas statements.

COMMP METH LMU

specifies that LMU is the communications method. StorageTek recommends that you specify either LMU or VTAM, not CDS to allow even sharing of resources in a multi-host environment.

FEAT VSM(ADVMGMT)

enables the Advanced Management Feature.

Adding SMF Parameters for VTCS to SYS1.PARMLIB

HSC can produce SMF record subtypes for VTCS events. To produce these record subtypes, you must add a statement to your SMF parameters in SYS1.PARMLIB member SMFPRMxx, and a statement to your hsc.PARMLIB member SLSSYSxx to specify the following:

- HSC subsystem for which records are produced
- Recording interval in seconds
- SMF record subtypes. The record subtypes must be specified as a list (*subtype1*, *subtype2,...subtypen*), as a range (*subtype1-subtypen*), or as a combination *(subtype1*, *subtype2-subtypen*). A range must be specified using a dash; a colon is invalid for a range.

Tip – If you use ExPR for VSM reporting, StorageTek recommends that you specify that your system produces the HSC SMF record subtypes 1 through 8 and 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 25, 26, 27, 28, and 29 as shown in FIGURE 8-2.

FIGURE 8-2 and FIGURE 8-3 show example statements that produce record subtypes 1 through 8 and 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 25, 26, 27, 28, and 29 at 1500 second intervals for HSC subsystem SLS0.

```
SUBSYS(SLS0,INTERVAL(001500),TYPE(255))
```

FIGURE 8-2 SYS1.PARMLIB member SMFPRMxx example for VTCS SMF records

```
OPTION(SUBtype(1-8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 25, 26, 27, 28, 29)))
```

FIGURE 8-3 SYS1.PARMLIB member SMFPRMxx example for VTCS SMF records

Using the SMC Client/Server Feature

SMC provides a client/server feature that 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 MVS syslog files.
- **Communicate with multiple HSC/VTCS TapePlex systems** representing physically different hardware configurations.

For example, in FIGURE 8-4 on page 89, client MSPA is running SMC only, but is connected to two servers running HSC/VTCS and HTTP server.

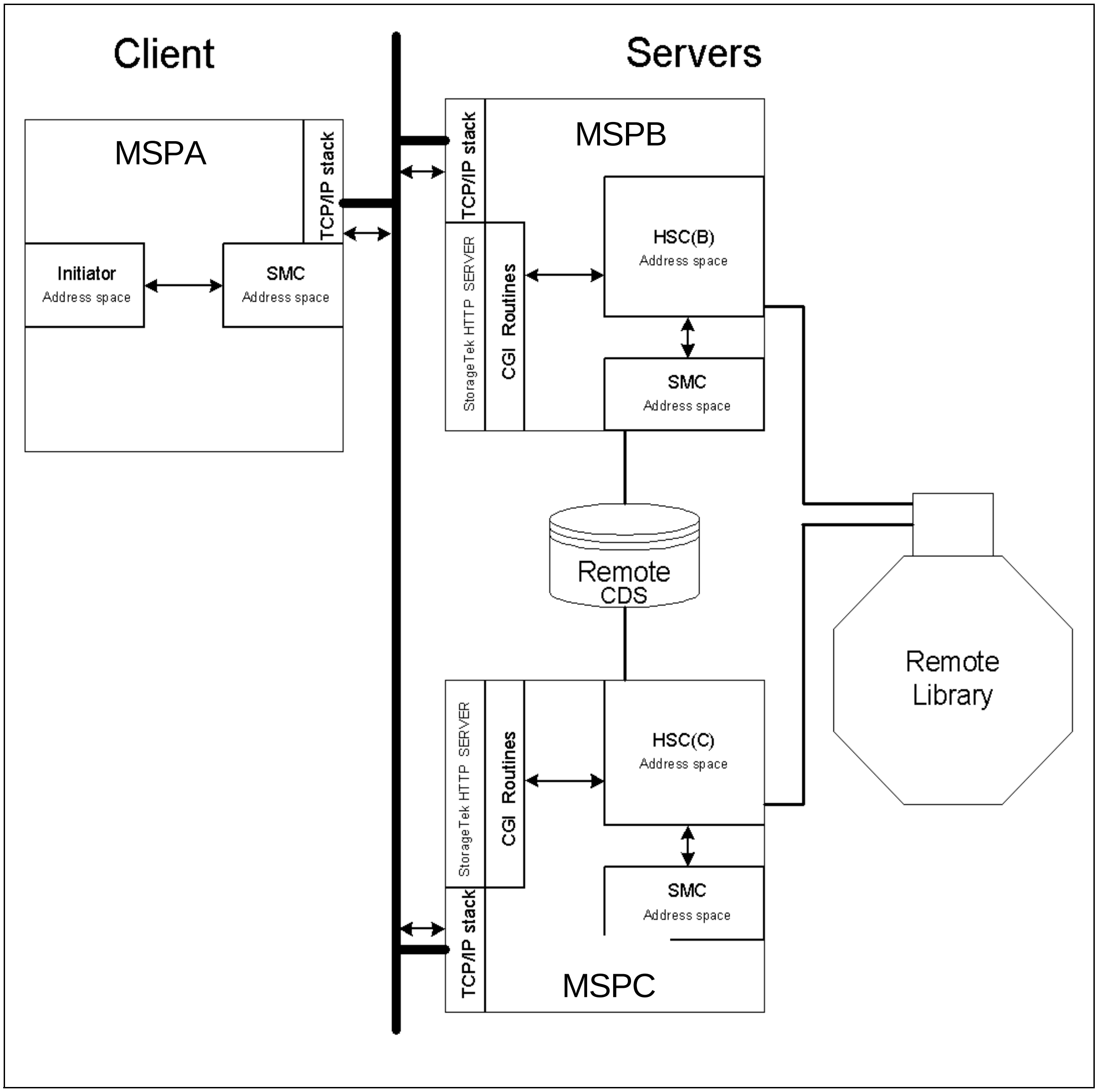

FIGURE 8-4 SMC Configuration: One Client, Two Servers

To make the client/server connections shown In FIGURE 8-4, MSPA a combination of the SMC TAPEPLEX and SERVer commands, for example:

```
TAPEPLEX NAME(SHRLIB)
SERVER NAME(REMPATH1) TAPEPLEX(SHRLIB) HOST(MSPB)
SERVER NAME(REMPATH2) TAPEPLEX(SHRLIB) HOST(MSPC)
```

The TAPEPLEX command lets the client assign a name to the *TapePlex*, or actual hardware configuration: the VTSSs, ACSs, real and virtual drives and volumes defined by the shared remote CDS. The SERVER commands, which point to the TapePlex name, complete the connection by specifying the paths to the HTTP server on the server hosts running the HSC/VTCS.

For full details on implementing SMC client/server, see the *SMC Configuration and Administration Guide*. In the next two sections, you'll see a high-level view of what it takes to convert to a client/server model. But first, a couple of words about client/server that are specific to VTCS:

- Ensure that both the VTCS CONFIG and the MSP IORSF on the hosts where you plan to run HSC define **all** VTDs. VTDs do not need to be online to the server host, but the server host must have a CHPID to all VTSSs accessed by client systems for communication with the VTSS.

Back to the conversion procedures. "Converting HSC/SMC on Multiple LPARs to SMC Client/Server" on page 91 is just what it sounds like. You have both HSC and SMC installed on multiple LPARs, and you want to move to the advantages of client/server.

Converting HSC/SMC on Multiple LPARs to SMC Client/Server

▼ To convert from HSC/SMC on multiple LPARs to SMC client/server:

1. **Choose one of your server hosts currently running HSC/SMC, and bring up the HTTP server on it.**

2. **Choose a "pilot" client host to define TAPEPLEX and SERVER statements for a Primary Server.**

   Define HSC on the pilot client host as the local subsystem for the TapePlex. For example:

   ```
   TAPEPLEX NAME(SHRLIB) LOCSUB(HSC0)
   SERVER NAME(REMPATH1) TAPEPLEX(SHRLIB) HOST(MVSA) PORT(8888)
   ```

3. **Start SMC on the client host, then disable the local subsystem and attempt to communicate with the Primary Server:**

   ```
   TAPEPLEX NAME(SHRLIB) LOCDIS
   RESYNC
   ```

   The RESYNC command output should show that the client is successfully communicating with the remote TapePlex.

4. **Next, start the HTTP server on a second HSC server host.**

5. **Define the second server as a backup:**

   ```
   SERVER NAME(REMPATH2) TAPEPLEX(SHRLIB) HOST(MVSB) PORT(8888)
   ```

6. **Disable the Primary Server and attempt to communicate with the Backup Server:**

   ```
   SERVER NAME(REMPATH1) DISABLE
   RESYNC
   ```

   The RESYNC command output should show that the client is successfully communicating with the remote TapePlex.

7. **Re-enable the first server and switch back to it:**

   ```
   SERVER NAME(REMPATH1) ENABLE
   RESYNC RESTART
   ```

8. **Repeat** Step 1 **through** Step 7 **on additional client hosts until you reach your desired final configuration.**

Updating the Tape Management System

To update your tape management system (such as CA-1 and CA-Dynam/TLMS), do the following:

- Add volser ranges for VTVs to your tape management system. Ensure that you do *not* assign vault codes to VTVs.
- Access to the MVCs via an RTD bypasses the MVS intercepts put in place by the tape management system so that it does *not* record within its database any access to the MVCs by VSM and does *not* automatically provide protection against inadvertent overwrites of non-expired data on MVCs. Therefore, if you choose to define MVCs to the tape management system, StorageTek **strongly recommends** that you define them as non-scratch, non-expiring volumes.
- The tape management system requires an entry in the MVS Subsystem Name Table; this entry must precede the entry for HSC. For more information, see *HSC Configuration Guide.*

Note – If you are using AutoMedia for MVS, ensure that VTVs are defined as virtual volumes to direct AutoMedia to bypass DSN checking, which allows AutoMedia to recall, mount, and reuse non-resident scratch VTVs.

Defining VSM Security

The following sections tell how to define security for VSM:

- "Defining MVC Pool Volser Authority" on page 93
- "Defining VTCS Command Authority" on page 94

Defining MVC Pool Volser Authority

When VSM needs to mount an MVC and to write to an MVC, a SAF query is issued to verify that the HSC user (see "Defining A Security System User ID for HSC, SMC, and VTCS" on page 46) has UPDATE authority for the MVC. The SAF query is issued on behalf of HSC and passed to the system security product (such as RACF, CA-ACF2, or CA-Top Secret).

VSM requires UPDATE authority for the volsers in the MVC pool. All other users should have an access of NONE for these volsers. Similarly, VSM should not have UPDATE authority for any volsers that are not in the MVC pool. See the documentation for your security product for procedures to add the appropriate TAPEVOL security for VSM. TABLE 8-1 summarizes these definitions.

TABLE 8-1 Security Class, Resource Class, and Access Values for MVC Pool Volser Authority

Class	Resource Name	Recommended User Access Levels
TAPEVOL	MVC Pool Volume Serials	UPDATE - allows VSM to write on MVC

FIGURE 8-5 shows an example of a RACF profile and permissions commands to give the user ID VSM8HSC update access to MVC volser CVC024.

```
*********************************************************************************
* Define a profile in the TAPEVOL class for MVC CVC024 *
*********************************************************************************
RDEFINE TAPEVOL CVC024 UACC(NONE)
*********************************************************************************
************ Allow user ID VSM8HSC update access to MVC CVC024 *
*********************************************************************************
**********PERMIT CVC024 CLASS(TAPEVOL) ACCESS(UPDATE) ID(VSM8HSC)
*********************************************************************************
```

FIGURE 8-5 Example RACF MVC volser access file

Caution – Note the following:

- To ensure that MVCs are not accidentally overwritten, for each MVC volser, you must update your TAPEVOL security as described above and your tape management system. For more information, see "Updating the Tape Management System" on page 92.
- You must also run the HSC UNSCratch Utility to unscratch any current scratch cartridges in the MVC range. For more information, see *HSC System Programmer's Guide for MVS*.
- Depending on the default settings of your security system, VSM may not be able to mount and to write to MVCs until you have defined a security system user ID for HSC and TAPEVOL profiles for the MVCs.
- If you add new ranges of MVCs to your VSM system, remember to update the TAPEVOL profiles to include the new ranges.

Defining VTCS Command Authority

If HSC user exit SLSUX15 sets a return code of UX15CHKA, the exit issues a command authorization request to the system security product. FIGURE 8-6 shows an example of RACF profile and permissions commands to give user SAM15 access to all VTCS commands (those with a VT command prefix). Note that you can only give a user access to *all* VTCS commands; you cannot give access to individual VTCS commands. For more information, see *HSC System Programmer's Guide for MVS*.

```
*******************************************************************************
* Define a profile in the OPERCMDS class for all VTCS commands *
*******************************************************************************
RDEFINE OPERCMDS subsysname.VT UACC (NONE)
*******************************************************************************
************ Allow user SAM15 update access to all VTCS commands
*******************************************************************************
**********PERMIT subsysname.VT CLASS(OPERCMDS) ID(SAM15) ACCESS (UPDATE)
*******************************************************************************
```

FIGURE 8-6 Example RACF VTCS command authorization file

Routing Data Sets to VSM

You recorded your VSM candidate data sets in TABLE A-1 on page 99. To route these data sets to VSM, use any of the techniques described in the following sections:

- "SMC TAPEREQ Statements" on page 96
- "HSC User Exits" on page 96

Note – In addition, you can also change your JCL to direct data sets to VSM although StorageTek does not recommend this method.

Caution – StorageTek strongly recommends that you create VTVs as Standard Label (SL) tapes, otherwise unpredictable results can occur.
Also note that VSM does not provide readonly protection for VTVs. That is, even if MVS requests a mount READONLY of a VTV, VSM mounts the VTV as READ/WRITE.

SMC TAPEREQ Statements

To route data sets to VSM, you can create an SMC TAPEREQ statement. To route data sets to VSM with TAPEREQ statements, do one of the following:

- Specify Virtual on the MEDia, MODel, or RECtech parameter. If you specify Virtual, VSM selects an available VTD in your system and routes the job to that VTD.

  In a multi-VTSS environment, therefore, specifying Virtual does *not* direct the VTD allocation to a specific VTSS, but lets the allocation occur in any VTSS in the configuration.

- Specify an esoteric that represents VTDs on the ESOTeric parameter. You recorded your VSM esoterics in TABLE A-1 on page 99.

  For more information on defining and using VSM esoterics for TAPEREQ statements, see "VSM Esoterics and Esoteric Substitution" on page 12.

- Specify a scratch subpool that contains virtual volumes.

Caution – Multiple TAPEREQ statements that specify the same or overlapping selection criteria (such as jobname, stepname, or data set) can cause undesirable results (such as assignment of MEDia Virtual *and* an esoteric).

HSC User Exits

To route data sets to VSM with HSC User Exits, do one of the following:

- Use return code UX02VIRT (32) in register 15 in HSC User Exit SLSUX02, which you use to control transport allocation for scratch mounts. To satisfy a scratch mount request, return code UX02VIRT causes VSM to select an available VTD in your system and routes the job to a VTV mounted on that VTD.
- Use esoteric substitution in any of the User Exits that support esoteric substitution. For example, to direct scratch allocation requests to a VTD, specify an esoteric that represents VTDs in the UX02ESO field of SLSUX02.

  For more information on defining and using VSM esoterics for HSC User Exits, see "VSM Esoterics and Esoteric Substitution" on page 12.

For more information about HSC User Exits, see *HSC System Programmer's Guide for MVS*.

Restarting NCS/VTCS

Ensure that you modified the HSC startup procedure as described in "Modifying the HSC Startup Procedure to include the VTCS 6.2.0 LINKLIB" on page 61. HSC initialization automatically starts VTCS, and HSC termination automatically terminates VTCS.

To complete the NCS reconfiguration, start one or more of the following on all hosts that are using the new CDS data sets:

- SMC, for more information, see *SMC Configuration and Administration Guide*.

APPENDIX **A**

VSM Configuration Record

TABLE A-1 lists the installation and configuration values you determined. It also provides a record of your site's VSM configuration, which can help you and StorageTek service troubleshoot problems with your VSM system.

TABLE A-1 VSM Configuration Record

Configuration Value	Planning Information	Your Site's Selection
VTSS names	"VTSS Names" on page 10	
VTD unit addresses	"VTD Unit Addresses" on page 11	
VSM esoteric names	"VSM Esoterics and Esoteric Substitution" on page 12	
VTV volsers (all)	"VTV Definitions" on page 17	
VTV volsers (scratch pool ranges)		
RTD unit addresses	"RTD Definitions" on page 19	
MVC volsers - VOLATTR statements and CONFIG	"MVC Definitions" on page 20	
MVC volsers - MVCPool statements		
CDS VTCS Level	"CDS VTCS Level" on page 25	
HSC CDS DASD size	"HSC CDS DASD Space" on page 28	
Tape management system DASD size	"Tape Management System DASD Space" on page 28	
VSM candidate data sets	"VSM Candidate Data Sets" on page 28	
HSC COMMpath METHod value	"HSC COMMPath METHod Value" on page 28	

TABLE A-1 VSM Configuration Record

	VTSS Policies	
AMT settings	"AMT Settings" on page 31	
VTV Page Size	"VTV Page Size" on page 32	
Maximum and minimum concurrent automatic migration, immediate migration, and migrate-to-threshold tasks (CONFIG MAXMIG/MINMIG)	"Maximum and Minimum Concurrent Migration Tasks" on page 34	
	VTV Policies	
Maximum VTVs per MVC (CONFIG MAXMVC)	"Maximum VTVs per MVC" on page 35	
Hosts disabled from migration, consolidation, and export by VTV or Management Class (CONFIG NOMIGRAT)	"Hosts Disabled from Reclamation" on page 42	
Recall VTVs with Read Data Checks	"Recall VTVs with Read Data Checks" on page 36	
	MVC Space Reclamation Policies	
MVC fragmented space threshold (CONFIG THRESHld)	"MVC Fragmented Space Threshold - Determines MVC Eligibility for Reclamation" on page 38	
Free MVCs threshold (CONFIG MVCFREE)	"Free MVCs Threshold - Starts Automatic Space Reclamation" on page 39	
Eligible/Total MVCs threshold (CONFIG START)	"Eligible/Total MVCs Threshold - Starts Automatic Space Reclamation" on page 40	
Maximum MVCs processed per reclaim (CONFIG MAXMVC)	"Maximum MVCs Processed Per Reclaim" on page 41	
Maximum MVCs Concurrently Processed for Reclamation and Drain	"Maximum MVCs Processed Per Reclaim" on page 41	
Hosts disabled from reclamation (CONFIG NORECLAM)	"Hosts Disabled from Reclamation" on page 42	
MVC retain interval	"MVC Retain Interval" on page 43	

APPENDIX **B**

VSM4 ESCON Configuration

The newest generation VTSS is the VSM4, which provides the following advantages over its predecessors:

- Enhanced connectivity options.
- Greater throughput.
- Greater VTSS capacity.
- 4x the number of VTDs and 3x the maximum number of VTVs per VTSS.
- Improved reliability and serviceability.

TABLE B-1 summarizes the VSM3 to VSM4 ESCON enhancements that you see from a software and system configuration perspective.

TABLE B-1 VSM3 to VSM4 Comparison: Software and System Configuration ESCON Enhancements

Product Feature	VSM3	VSM4
ESCON Interfaces	16 **total** where: ■ 2 to 14 can be host channels ■ 2 to 8 can be Nearlink/CLINK connections	32 **total** where: ■ 2 to 28 can be host channels ■ 2 to 16 can be Nearlink/CLINK connections **Note**: VSM4s are shipped with 16 ports enabled.With the 16 ports enabled option, **only** the top port on each CIP is enabled (Port 0 or Port 2). 32 ports enabled is an **optional, separately priced feature** that is activated via microcode diskette. On a VSM4 with 32 ports enabled, each ICE3 ESCON interface card contains two pairs of ESCON ports. Each pair is controlled by its own Channel Interface Processor (CIP). Each CIP switches between the two ports, so that only one port can transfer data at a time.
Maximum Logical Paths	128	16 per port for the 16 port standard configuration = 256 logical paths 16 per port for the 32 port optional configuration= 512 logical paths **Note**: VSM4 provides a theoretical maximum of 512 logical paths per VTSS, but you cannot allocate all 512 logical paths for host-to-VTSS connections.
VTDs per VTSS	64	256
Maximum resident VTVs per VTSS	100,000	300,000

VSM4 with 32 Ports

For the 32 port option, the 8 ICE3 cards have four ESCON ports per card as shown in FIGURE B-1.

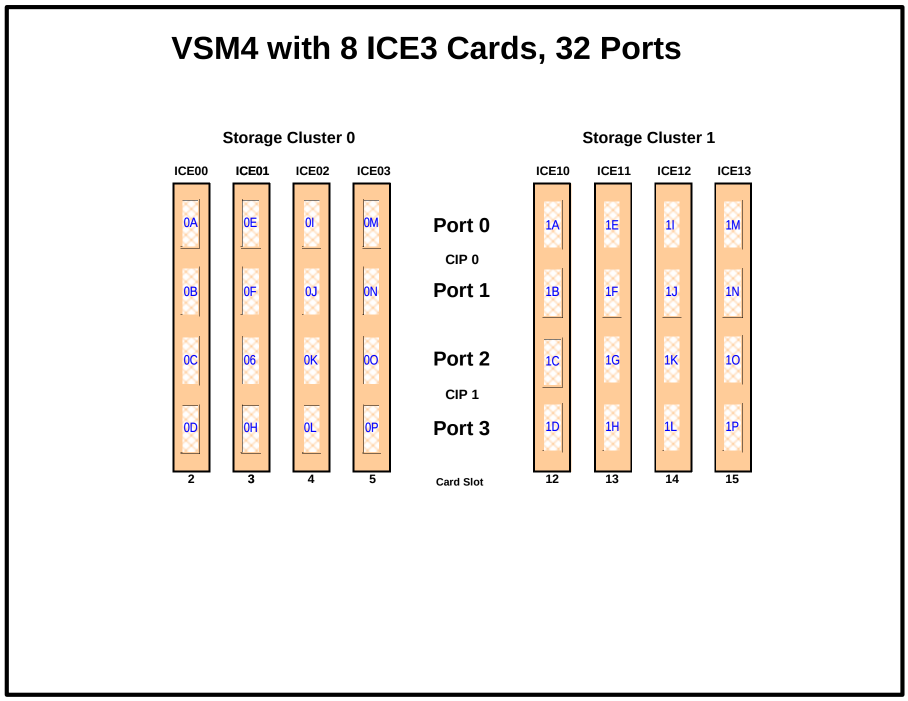

FIGURE B-1 VSM4 with 32 Ports

Note – In FIGURE B-1 and all the other figures in this appendix, the ports are shown with their channel interface identifiers for **enabled** ports (32 in FIGURE B-1). These channel interface identifiers are the values that are required for the CHANIF values that you code for the CONFIG utility. Each value is two characters in length and has a value from 0A to 1P. The first digit is the VTSS cluster ID (valid values are 0 or 1). The second digit is the group or adapter ID (valid values are A to P).

In FIGURE B-1, note the following:

- Each ICE3 card contains two pairs of ESCON ports. Each pair is controlled by its own Channel Interface Processor (CIP). Each CIP switches between the two ports, so that **only one port** can transfer data at a time.
- For a VSM4, each CIP can operate with only *one* of two “personalities”, which is set at the VTSS LOP:

- *Host Mode*. In Host Mode, either or both ESCON ports can connect to host CPU channels, including via ESCON Director(s) or channel extenders. Ports of a CIP in Host mode **cannot** connect to RTDs or to Secondary VTSSs via CLINKS. Note, however, that Secondary VTSSs must have an ESCON port in Host Mode to connect via a CLINK *from* an ESCON port in Nearlink Mode in a Primary VTSS.

  Also note that you can have two physical paths from the same LPAR to the same CIP, as long as the two physical paths address different (not overlapping) logical control units. For example, a single host LPAR can address logical control units 0-7 on one CIP port, and 8-F on the other CIP port of the same CIP.

- *Nearlink Mode*. In Nearlink Mode, either or both ESCON ports can connect to an RTD or via a CLINK to a Secondary VTSS. Ports of a CIP in Nearlink mode **cannot** connect to host CPU channels.You can set a **maximum** of 8 CIPs to Nearlink Mode, and here's the important fine print: only **one** Nearlink port per CIP is active at one time. What are Best Practices for optimizing port operations? See TABLE B-2...

TABLE B-2 Optimizing VSM4 Port Operations

Configuration - Two Ports on a CIP	Best Practices
Two CLINKs	**Don't use**....because only one port can be active at a time. If you're doing Clustered VTSS, you want all CLINK connections to be active all the time.
CLINK and RTD	**An advantage** in Degraded Cluster Mode. You normally have fewer RTDs on the Primary VTSS because the Secondary is doing most of the migrations. If you have an offline RTD on the same CIP as an active CLINK, if the Secondary fails you can vary the CLINK offline and bring the RTD online to handle more workload on the Primary. **Note that** while the CLINK is active, the RTD is unavailable and is reported as suspended via DISPLAY RTD.
Two RTDs	**An advantage** for the following: **Optimize use of local and remote RTDs**. During busy shifts, use only the local RTD on the CIP. During quiet periods, switch to the remote RTD for deep archive and DR work. **Optimize use of different drive technologies**. As described in the previous bullet, use a T9840 as a local RTD, then switch to a T9940 for deep archive. You can also use this feature to migrate from older drive technology (such as 9490) to newer technology (such as 9840). Use Management and Storage Classes to read in data from older media, then switch to the newer technology drive to place data on new media. This technique effectively gives you greater physical connectivity to different drive technologies without incurring the overhead of full time, real time ESCON connections to each drive type. **Note that** Because of the “only one active” rule, if an RTD on one port is migrating or recalling a VTV, the RTD on the second port cannot be accessed until the operation on the first port completes (the RTD on the second port is in “suspend” mode, as shown by the D RTD command/utility). Best Practices suggests, therefore, that RTDs that **must** be active simultaneously should connect to different CIPs. One more piece of fine print: If you have two RTDs on a CIP, you can't share them between VTSSs.

- On a VSM4 with 32 ports enabled, you have a theoretical maximum of 512 logical paths on the VSM4. However, you must have some RTD connections so you cannot allocate all 512 logical paths for host-to-VTSS connections. What’s the minimum number of RTDs? Well, it's like this: (1) CONFIG will not allow fewer than 2 RTDS per VTSS. (2) CONFIG cannot check device type, but StorageTek strongly recommends at least two RTDS of each device type in each ACS to which the VTSS is attached....otherwise, you can seriously compromise error recovery, and also impact the efficiency of space reclamation. If you had only two RTDs, Best Practices would suggest that you connect them to different ICE3 cards...and once you've done that, you've effectively used up 4 Nearlink ports due to the "CIP personality" nature of the ICE3 card. Therefore, in an 8 ICE card configuration, this leaves 28 available ports for host-to-VTSS ESCON channel connections, which equals a maximum of 16 x 28 or 448 logical paths. For more information, see "Logical Paths for VSM 4 with 32 Ports" on page 120.

- A host logical path is the communication path between a host and all of the 256 VTDs within the VSM4. TABLE B-3 summarizes the configuration options and maximum host logical paths for a VSM4 with 32 enabled ports.

TABLE B-3 VSM4 Configuration Options - 32 Ports

Host CIPs	Maximum Host Connections	Nearlink CIPs	Max Nearlink Connections	Maximum Host Logical Paths
8	16	8	16	256
9	18	7	14	288
10	20	6	12	320
11	22	5	10	352
12	24	4	8	384
14	28	2	4	448

- In IORSF:
  - From a single MSP host, you can only define 8 channels (CHPIDs) running to a single control unit (single VSM4). **Also note that** ICE3 cards **cannot** have 2 paths from the same LPAR connected to two ports with a common CIP.
  - You use the CTRLR statement to define each VSM4 as 16 F6473K images.
  - You use the DEVICE statement to define the 16 VTDs that are associated with each F6473K image.

VSM4 Configuration Examples - 32 Ports

For VSM4s with 32 ports, let’s look at two examples of port configurations:

- “VSM4 Configuration Example: 16 Host Ports, 16 RTD Ports” on page 107
- ““VSM 4 Configuration Example: 20 Host Ports, 12 RTD Ports” on page 109

For a VSM4 host gen example, see “IOCP Example for Single MSP Host Connected to a VSM4 Via ESCON Directors” on page 118.

VSM4 Configuration Example: 16 Host Ports, 16 RTD Ports

FIGURE B-2 shows CONFIG channel interface identifiers of 16 for hosts, 16 for RTDs for a VSM4.

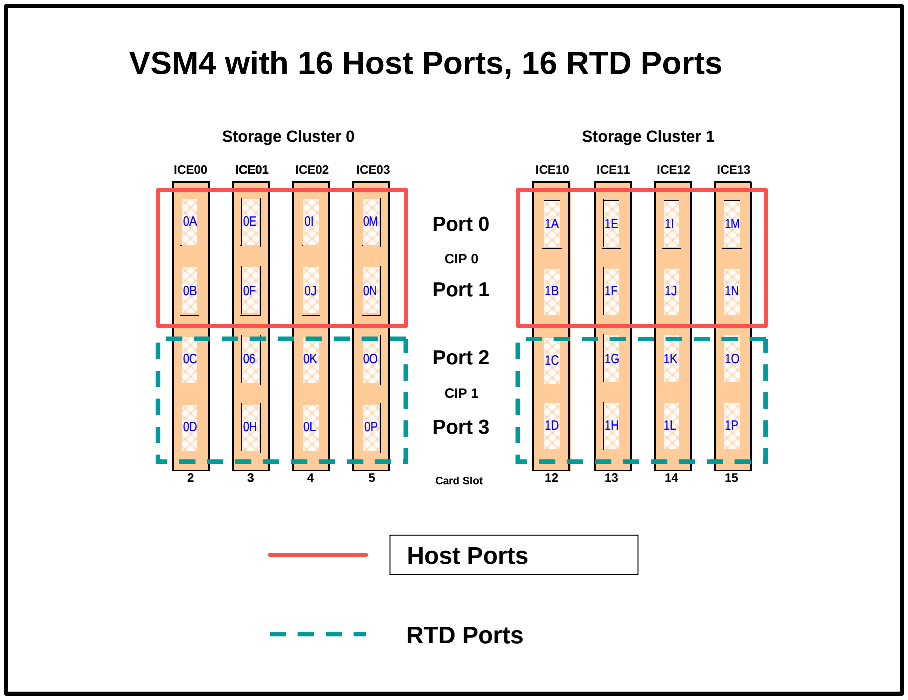

FIGURE B-2 VSM4 with 16 Host Ports, 16 RTD Ports

CONFIG Example for VSM4 with 16 Host Ports, 16 RTD Ports

FIGURE B-3 shows example CONFIG JCL to define the VSM4 configuration shown in FIGURE B-2 on page 107.

```
//CREATECF EXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG
 GLOBALMAXVTV=32000MVCFREE=40
 RECLAIMTHRESHLD=70MAXMVC=40  START=35
 VTVVOL LOW=905000 HIGH=999999 SCRATCH
 VTVVOL LOW=C00000 HIGH=C25000 SCRATCH
 VTVVOL LOW=RMM000 HIGH=RMM020 SCRATCH
 MVCVOL LOW=N25980 HIGH=N25989
 MVCVOL LOW=N35000 HIGH=N35999
 VTSS NAME=VSM401 LOW=70 HIGH=80 MAXMIG=8 RETAIN=5
 RTD  NAME=VSM42A00 DEVNO=2A00 CHANIF=0C
 RTD  NAME=VSM42A01 DEVNO=2A01 CHANIF=0D
 RTD  NAME=VSM42A02 DEVNO=2A02 CHANIF=0G
 RTD  NAME=VSM42A03 DEVNO=2A03 CHANIF=0H
 RTD  NAME=VSM42A04 DEVNO=2A04 CHANIF=0K
 RTD  NAME=VSM42A05 DEVNO=2A05 CHANIF=0L
 RTD  NAME=VSM42A06 DEVNO=2A06 CHANIF=0O
 RTD  NAME=VSM42A07 DEVNO=2A07 CHANIF=0P
 RTD  NAME=VSM42A08 DEVNO=2A08 CHANIF=1C
 RTD  NAME=VSM42A09 DEVNO=2A09 CHANIF=1D
 RTD  NAME=VSM42A0A DEVNO=2A0A CHANIF=1G
 RTD  NAME=VSM42A0B DEVNO=2A0B CHANIF=1H
 RTD  NAME=VSM42A0C DEVNO=2A0C CHANIF=1K
 RTD  NAME=VSM42A0D DEVNO=2A0D CHANIF=1L
 RTD  NAME=VSM42A0E DEVNO=2A0E CHANIF=1O
 RTD  NAME=VSM42A0F DEVNO=2A0F CHANIF=1P
 VTD LOW=9900 HIGH=99FF
```

FIGURE B-3 CONFIG example: VSM4 with 16 Host Ports, 16 RTD Ports

VSM 4 Configuration Example: 20 Host Ports, 12 RTD Ports

FIGURE B-4 shows port assignments of 20 for hosts, 12 for RTDs for a VSM4.

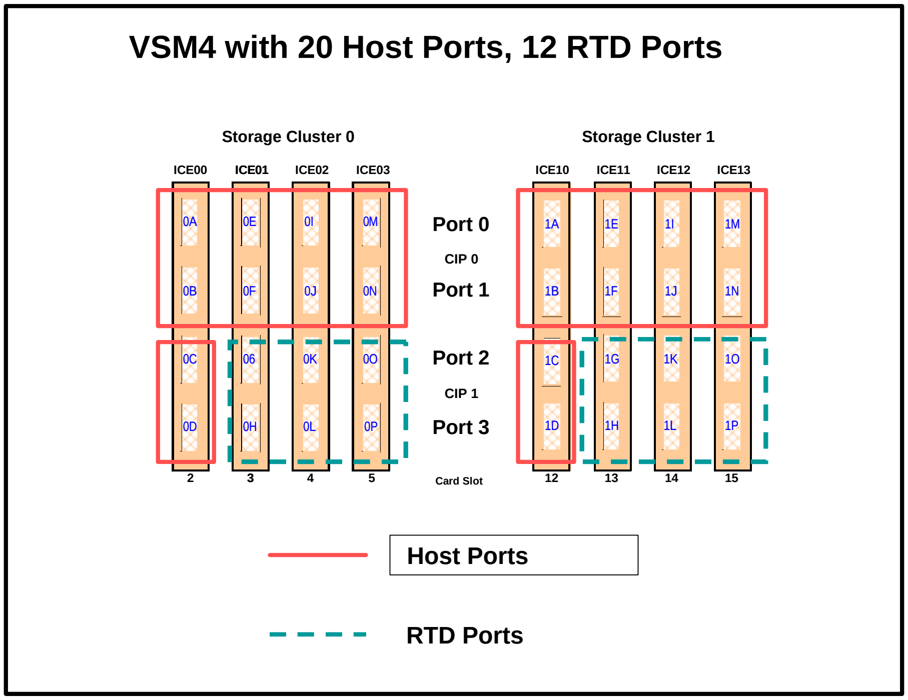

FIGURE B-4 VSM4 with 20 Host Ports, 12 RTD Ports

CONFIG Example for VSM4 with 20 Host Ports, 12 RTD Ports

FIGURE B-5 shows example CONFIG JCL to define the VSM4 configuration shown in FIGURE B-4 on page 109.

```
//CREATECF EXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG
 GLOBALMAXVTV=32000 MVCFREE=40
 RECLAIMTHRESHLD=70 MAXMVC=40  START=35
 VTVVOL LOW=905000 HIGH=999999 SCRATCH
 VTVVOL LOW=C00000 HIGH=C25000 SCRATCH
 VTVVOL LOW=RMM000 HIGH=RMM020 SCRATCH
 MVCVOL LOW=N25980 HIGH=N25989
 MVCVOL LOW=N35000 HIGH=N35999
 VTSS NAME=VSM401 LOW=70 HIGH=80 MAXMIG=6 RETAIN=5
 RTD  NAME=VSM42A00 DEVNO=2A00 CHANIF=0G
 RTD  NAME=VSM42A01 DEVNO=2A01 CHANIF=0H
 RTD  NAME=VSM42A02 DEVNO=2A02 CHANIF=0K
 RTD  NAME=VSM42A03 DEVNO=2A03 CHANIF=0L
 RTD  NAME=VSM42A04 DEVNO=2A04 CHANIF=0O
 RTD  NAME=VSM42A05 DEVNO=2A05 CHANIF=0P
 RTD  NAME=VSM42A06 DEVNO=2A06 CHANIF=1G
 RTD  NAME=VSM42A07 DEVNO=2A07 CHANIF=1H
 RTD  NAME=VSM42A08 DEVNO=2A08 CHANIF=1K
 RTD  NAME=VSM42A09 DEVNO=2A09 CHANIF=1L
 RTD  NAME=VSM42A0A DEVNO=2A0A CHANIF=1O
 RTD  NAME=VSM42A0B DEVNO=2A0B CHANIF=1P
 VTD LOW=9900 HIGH=99FF
```

FIGURE B-5 CONFIG example: VSM4 with 20 Host Ports, 12 RTD Ports

VSM4 with 16 Ports

For the 16 port option, the 8 ICE3 cards have two ESCON ports per card as shown in FIGURE B-6.

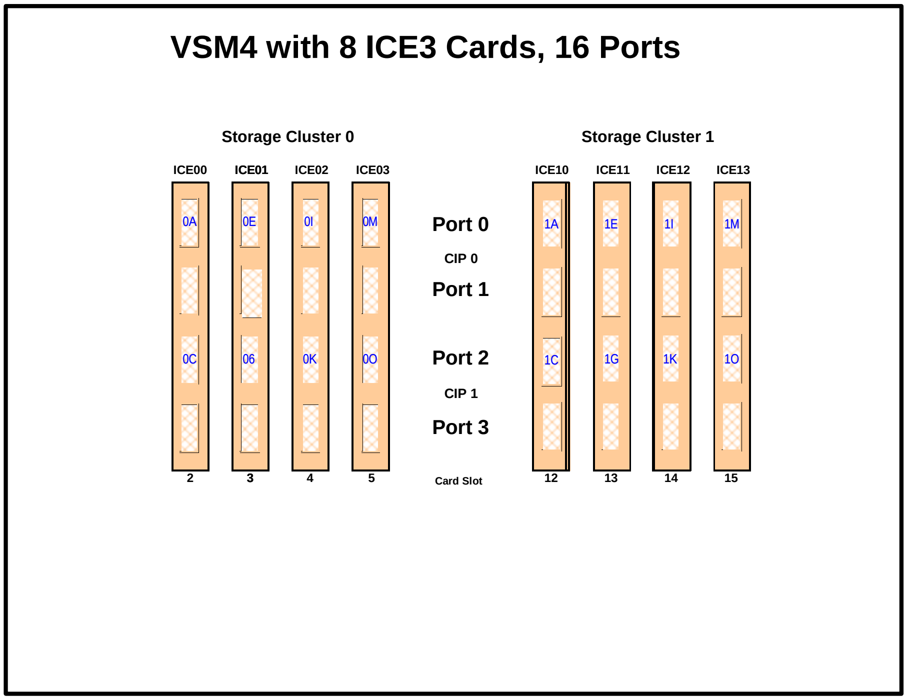

FIGURE B-6 VSM4 with 16 Ports

Note – In FIGURE B-6 and all the other figures in this appendix, the ports are shown with their channel interface identifiers for **enabled** ports (16 in FIGURE B-6). These channel interface identifiers are the values that are required for the CHANIF values that you code for the CONFIG utility. Each value is two characters in length and has a value from 0A to 1P. The first digit is the VTSS cluster ID (valid values are 0 or 1). The second digit is the group or adapter ID (valid values are A to P).

In FIGURE B-6, note the following:

- Each ICE3 card has two CIPs with **a single port enabled** on each CIP. As with the 32 port option, each CIP can operate with only *one* of two “personalities”, which is set at the VTSS LOP:
  - *Host Mode*. In Host Mode, the single ESCON port can connect to host CPU channels, including via ESCON Director(s) or channel extenders. Ports of a CIP in Host mode **cannot** connect to RTDs or to Secondary VTSSs via CLINKS. Note, however, that Secondary VTSSs must have an ESCON port in Host Mode to connect via a CLINK *from* an ESCON port in Nearlink Mode in a Primary VTSS.

- *Nearlink Mode*. In Nearlink Mode, the single ESCON port can connect to an RTD or via a CLINK to a Secondary VTSS. Ports of a CIP in Nearlink mode **cannot** connect to host CPU channels.

  You can set a **maximum** of 8 CIPs to Nearlink Mode. Therefore, in a 16 port configuration, the single port on a CIP can be either a CLINK or an RTD connection.

- On a VSM4 with 16 ports enabled, you have a **theoretical** maximum of 256 logical paths on the VSM4. However, you must have *some* RTD connections so you cannot allocate *all* 256 logical paths for host-to-VTSS connections. What's the **minimum** number of RTDs? Well, it's like this: (1) CONFIG will not allow fewer than 2 RTDS per VTSS. (2) CONFIG cannot check device type, but StorageTek s**trongly recommends** at least two RTDS of each device type in each ACS to which the VTSS is attached....otherwise, you can seriously compromise error recovery and also impact the efficiency of space reclamation. If you had only two RTDs, Best Practices would suggest that you connect them to different ICE3 cards...and once you've done that, you've effectively used up 4 Nearlink ports. Therefore, in an 8 ICE card 16 port configuration, this leaves 12 available ports for host-to-VTSS ESCON channel connections, which equals a **maximum** of 16 x 12 or 192 logical paths. For more information, see "Logical Paths for VSM 4 with 32 Ports" on page 120.
- A host logical path is the communication path between a host and all of the 256 VTDs within the VSM4. TABLE B-4 summarizes the configuration options and maximum host logical paths for a VSM4 with 16 enabled ports.

TABLE B-4 VSM4 Configuration Options - 16 Ports

Host CIPs	Maximum Host Connections	Nearlink CIPs	Max Nearlink Connections	Maximum Host Logical Paths
8	8	8	8	128
9	9	7	7	144
10	10	6	6	160
11	11	5	5	176
12	12	4	4	192
14	14	2	2	224

- In IORSF:
  - From a single MSP host, you can only define 8 channels (CHPIDs) running to a single control unit (single VSM4). **Also note that** ICE3 cards **cannot** have 2 paths from the same LPAR connected to two ports with a common CIP.
  - You use the CTRLR statement to define each VSM4 as 16 F6473K images.
  - You use the DEVICE statement to define the 16 VTDs that are associated with each F6473K image.

VSM4 Configuration Examples - 16 Ports

For VSM4s with 16 ports, let's look at two examples of port configurations:

- "VSM4 Configuration Example: 8 Host Ports, 8 RTD Ports" on page 114
- "VSM 4 Configuration Example: 10 Host Ports, 6 RTD Ports" on page 116

For a VSM4 host gen example, see"IOCP Example for Single MSP Host Connected to a VSM4 Via ESCON Directors" on page 118.

VSM4 Configuration Example: 8 Host Ports, 8 RTD Ports

FIGURE B-7 shows CONFIG channel interface identifiers of 8 for hosts, 8 for RTDs for an 8 ICE3 card VSM4 with 16 ports.

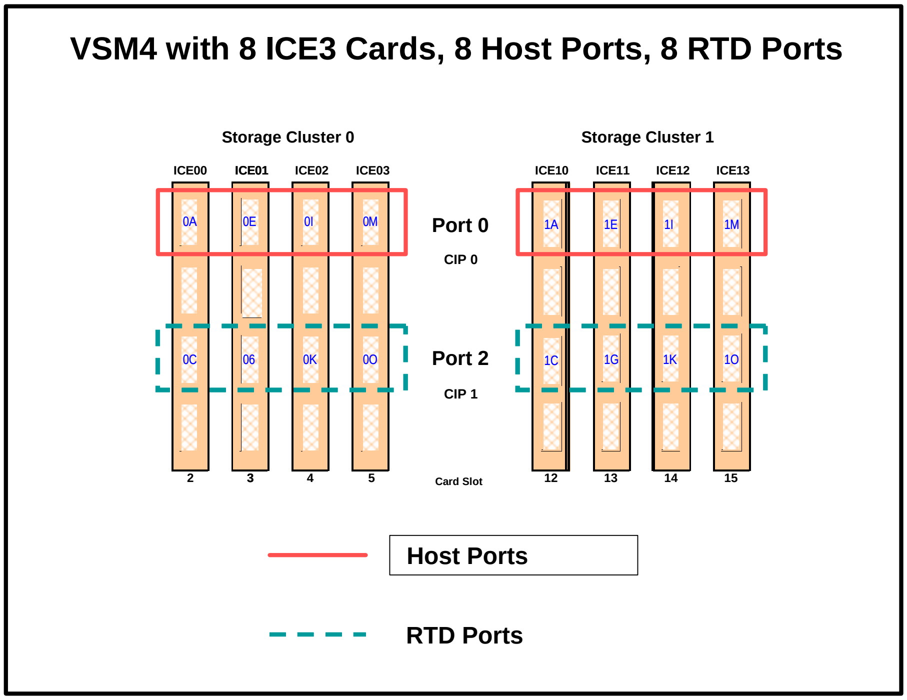

FIGURE B-7 VSM4 with 8 Host Ports, 8 RTD Ports

CONFIG Example for VSM4 with 8 Host Ports, 8 RTD Ports

FIGURE B-8 shows example CONFIG JCL to define the VSM4 configuration shown in FIGURE B-7 on page 114.

```
//CREATECF EXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG
 GLOBALMAXVTV=32000MVCFREE=40
 RECLAIMTHRESHLD=70MAXMVC=40  START=35
 VTVVOL LOW=905000 HIGH=999999 SCRATCH
 VTVVOL LOW=C00000 HIGH=C25000 SCRATCH
 VTVVOL LOW=RMM000 HIGH=RMM020 SCRATCH
 MVCVOL LOW=N25980 HIGH=N25989
 MVCVOL LOW=N35000 HIGH=N35999
 VTSS NAME=VSM401 LOW=70 HIGH=80 MAXMIG=8 RETAIN=5
 RTD  NAME=VSM42A00 DEVNO=2A00 CHANIF=0C
 RTD  NAME=VSM42A02 DEVNO=2A02 CHANIF=0G
 RTD  NAME=VSM42A04 DEVNO=2A04 CHANIF=0K
 RTD  NAME=VSM42A06 DEVNO=2A06 CHANIF=0O
 RTD  NAME=VSM42A08 DEVNO=2A08 CHANIF=1C
 RTD  NAME=VSM42A0A DEVNO=2A0A CHANIF=1G
 RTD  NAME=VSM42A0C DEVNO=2A0C CHANIF=1K
 RTD  NAME=VSM42A0E DEVNO=2A0E CHANIF=1O
 VTD LOW=9900 HIGH=99FF
```

FIGURE B-8 CONFIG example: VSM4 with 8 Host Ports, 8 RTD Ports

VSM 4 Configuration Example: 10 Host Ports, 6 RTD Ports

FIGURE B-9 shows port assignments of 10 for hosts, 6 for RTDs for a VSM4 with 16 ports.

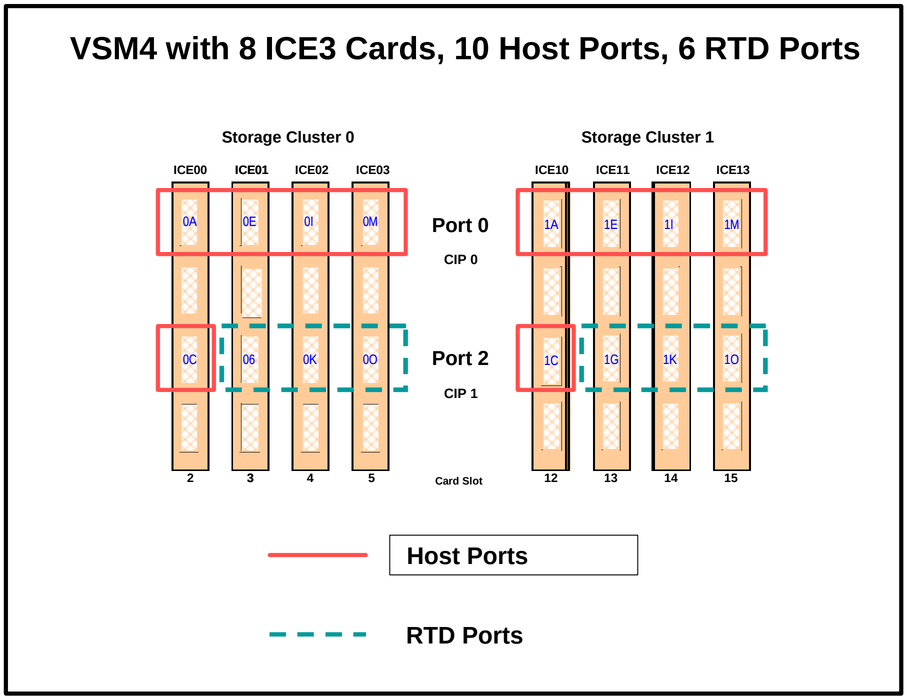

FIGURE B-9 VSM4 with 10 Host Ports, 6 RTD Ports

CONFIG Example for VSM4 with 10 Host Ports, 6 RTD Ports

FIGURE B-10 shows example CONFIG JCL to define the VSM4 configuration shown in FIGURE B-9 on page 116.

```
//CREATECF EXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG
 GLOBALMAXVTV=32000MVCFREE=40
 RECLAIMTHRESHLD=70MAXMVC=40  START=35
 VTVVOL LOW=905000 HIGH=999999 SCRATCH
 VTVVOL LOW=C00000 HIGH=C25000 SCRATCH
 VTVVOL LOW=RMM000 HIGH=RMM020 SCRATCH
 MVCVOL LOW=N25980 HIGH=N25989
 MVCVOL LOW=N35000 HIGH=N35999
 VTSS NAME=VSM401 LOW=70 HIGH=80 MAXMIG=8 RETAIN=5
 RTD  NAME=VSM42A02 DEVNO=2A02 CHANIF=0G
 RTD  NAME=VSM42A04 DEVNO=2A04 CHANIF=0K
 RTD  NAME=VSM42A06 DEVNO=2A06 CHANIF=0O
 RTD  NAME=VSM42A0A DEVNO=2A0A CHANIF=1G
 RTD  NAME=VSM42A0C DEVNO=2A0C CHANIF=1K
 RTD  NAME=VSM42A0E DEVNO=2A0E CHANIF=1O
 VTD LOW=9900 HIGH=99FF
```

FIGURE B-10 CONFIG example: VSM4 with 10 Host Ports, 6 RTD Ports

IOCP Example for Single MSP Host Connected to a VSM4 Via ESCON Directors

FIGURE B-11 shows a configuration diagram for a single MSP host connected to a VSM4 via ESCON Directors, and FIGURE B-12 on page 119 shows example IOCP statements for this configuration. **Note that**:

- From MSPA, you define 8 CHPIDs, with each path switched in the ESCON Director, for a total of 8 channels running to the VSM4.
- You code 16 CTRLR statements to define the VSM4 as 16 F6473K images.
- You code DEVICE statement to define the 16 VTDs that are associated with each F6473K image.

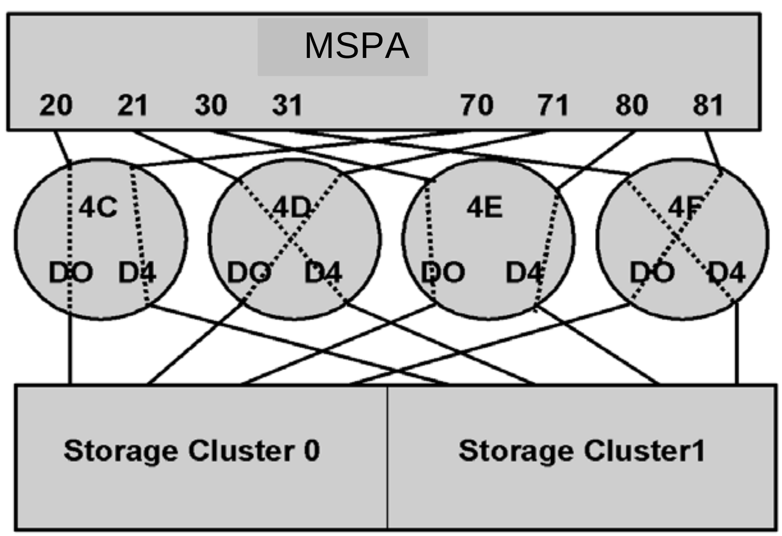

FIGURE B-11 Configuration Diagram: Single MSP Host Connected to a VSM4 via ESCON Directors

```
CHANNEL   CHPID(0A-0D),TYPE(BMC),INTF(OCLINK),OCLS(01)
CHANNEL   CHPID(24-27),TYPE(BMC),INTF(OCLINK),OCLS(02)
.
.
CTRLR     CTRLNUM(D00),NAME(F1751),CHPID(0A),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B0),CULOGADR(0)
CTRLR     CTRLNUM(D01),NAME(F1751),CHPID(0B),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B1),CULOGADR(0)
.
.
CTRLR     CTRLNUM(D10),NAME(F1751),CHPID(0A),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B0),CULOGADR(1)
CTRLR     CTRLNUM(D11),NAME(F1751),CHPID(0B),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B1),CULOGADR(1)
.
.CTRLR     CTRLNUM(D20),NAME(F1751),CHPID(0A),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B0),CULOGADR(2)
CTRLR     CTRLNUM(D21),NAME(F1751),CHPID(0B),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B1),CULOGADR(2)
.
.
CTRLR     CTRLNUM(D30),NAME(F1751),CHPID(0A),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B0),CULOGADR(3)
CTRLR     CTRLNUM(D31),NAME(F1751),CHPID(0B),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B1),CULOGADR(3)
.
.
DEVICE    DEVNUM(D00-D0F),NAME(F6473K),FEATURE(DPR,STCHK),
          CTRLNUM(D00,D01,D02,D03,D04,D05,D06,D07),UNITADDR(00)
DEVICE    DEVNUM(D10-D1F),NAME(F6473K),FEATURE(DPR,STCHK),
          CTRLNUM(D10,D11,D12,D13,D14,D15,D16,D17),UNITADDR(00)
DEVICE    DEVNUM(D20-D2F),NAME(F6473K),FEATURE(DPR,STCHK),
          CTRLNUM(D20,D21,D22,D23,D24,D25,D26,D27),UNITADDR(00)
DEVICE    DEVNUM(D30-D3F),NAME(F6473K),FEATURE(DPR,STCHK),
          CTRLNUM(D30,D31,D32,D33,D34,D35,D36,D37),UNITADDR(00)
```

FIGURE B-12 IOSRF Example: Single MSP Host Connected to a VSM4 via ESCON Directors

Logical Paths for VSM 4 with 32 Ports

A VSM4 with 32 ports has 4x the number of logical paths available to VSM2s and VSM3s. Does this mean that a VSM4 has enough logical paths for connectivity, redundancy, and throughput for *all* attached hosts? Even with 16 RTDs and 31 hosts attached, the answer is “yes” as shown in FIGURE B-13.

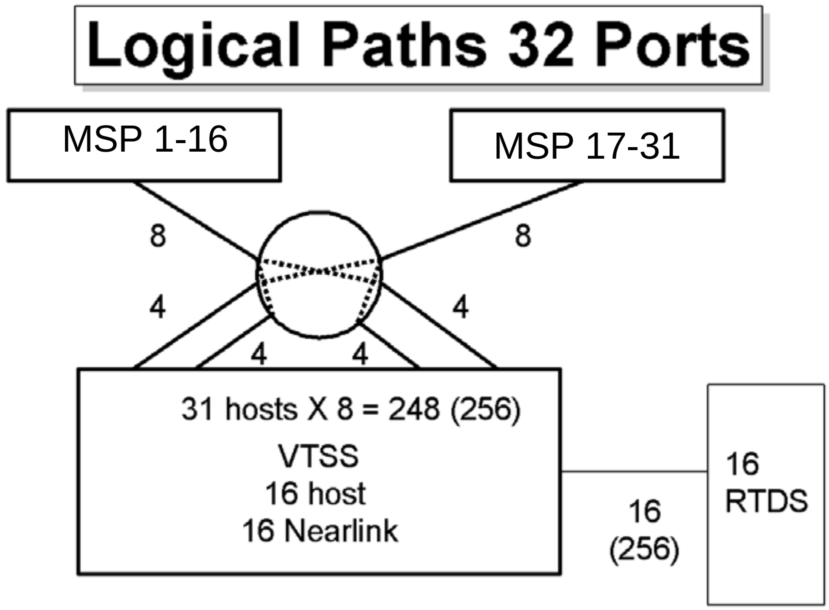

FIGURE B-13 Logical Paths for VSM 4 with 32 Ports, 31 Hosts, 16 RTDs

In FIGURE B-13:

- The 16 RTDs consume 16 x 16 or 256 logical paths.
- The **maximum** logical paths we allocated for a VSM2/3 was 4 to a host requiring maximum throughput (which also satisfied the redundancy/connectivity requirements). Therefore, if we allocated **double** that number, or 8 logical paths, for each of the 31 hosts in this configuration, we only consume 248, or 8 less than the logical paths remaining for host connections.

Therefore, logical path allocation isn’t an issue, as it was with VSM2s and VSM3s.

APPENDIX **C**

VSM4 FICON Back-End Configuration

The VSM4 FICON Back-End connectivity feature adds value to the existing ESCON front-end connectivity. TABLE C-1 summarizes the supported card configurations for VSM4 ESCON Front-End plus FICON Back-End connectivity.

TABLE C-1 Supported Card Configurations for VSM4 FICON Back-End Connectivity

VCF Cards	FICON Ports	ICE Cards	ESCON Ports	Total Ports	Total Logical Paths (16 per ICE Port, 64 per VCF Port)
2	4	6	24	28	640
4	8	4	16	24	768
6	12	2	8	20	896
8	16	0	0	16	1024

VSM4 FICON VCF Card Options

VSM4 supports the following FICON VCF card options:

- FIGURE C-1 shows a VSM4 with 6 ICE cards, 2 VCF cards.
- FIGURE C-2 on page 123 shows a VSM4 with 4 ICE cards, 4 VCF cards.
- FIGURE C-3 on page 124 shows a VSM4 with 2 ICE cards, 6 VCF cards.
- FIGURE C-4 on page 125 shows a VSM4 with 8 VCF cards.

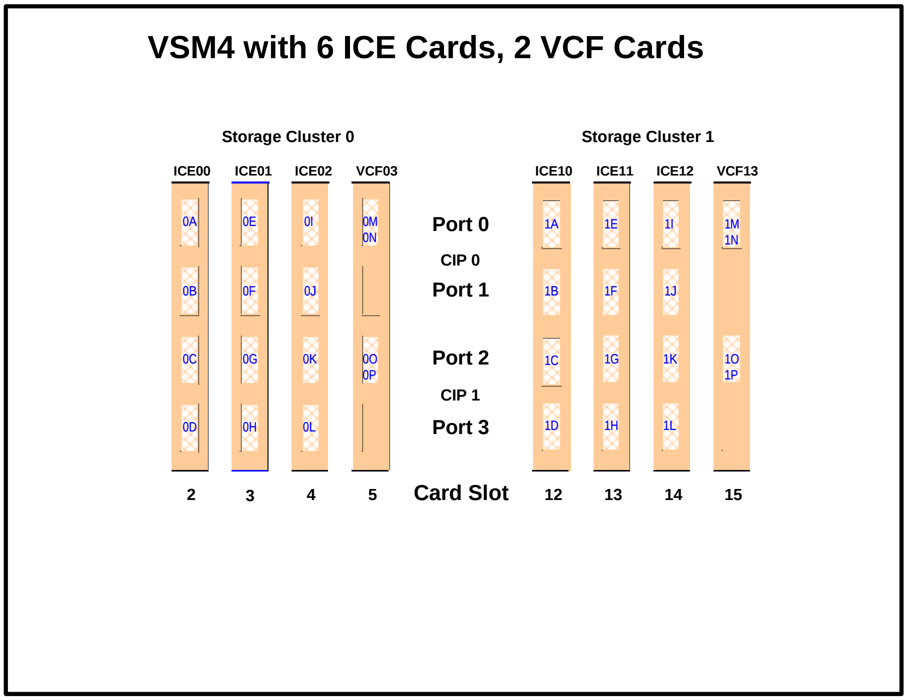

FIGURE C-1 VSM4 with 6 ICE cards, 2 VCF cards

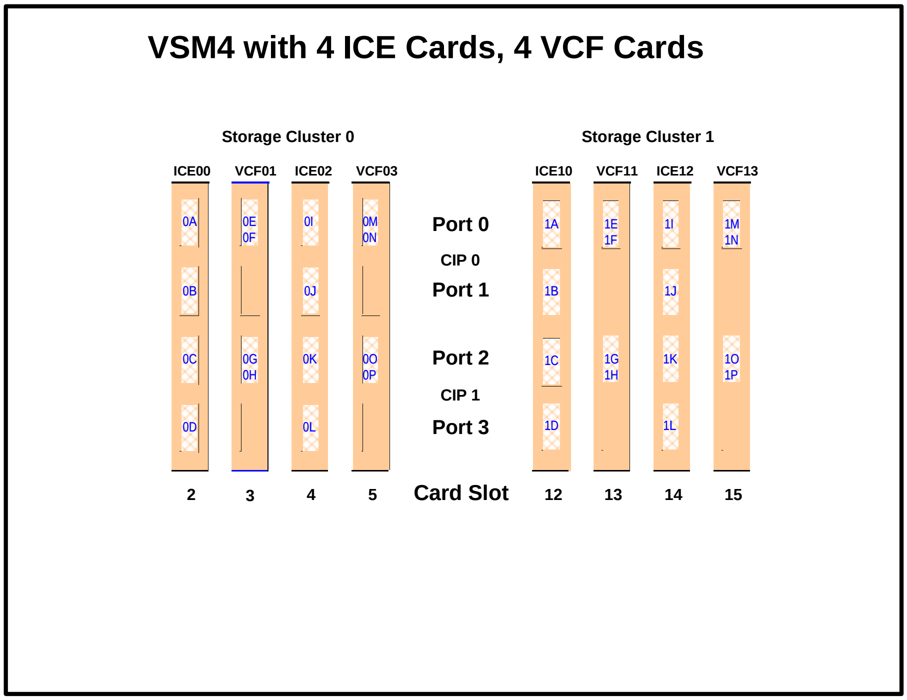

FIGURE C-2 VSM4 with 4 ICE cards, 4 VCF cards

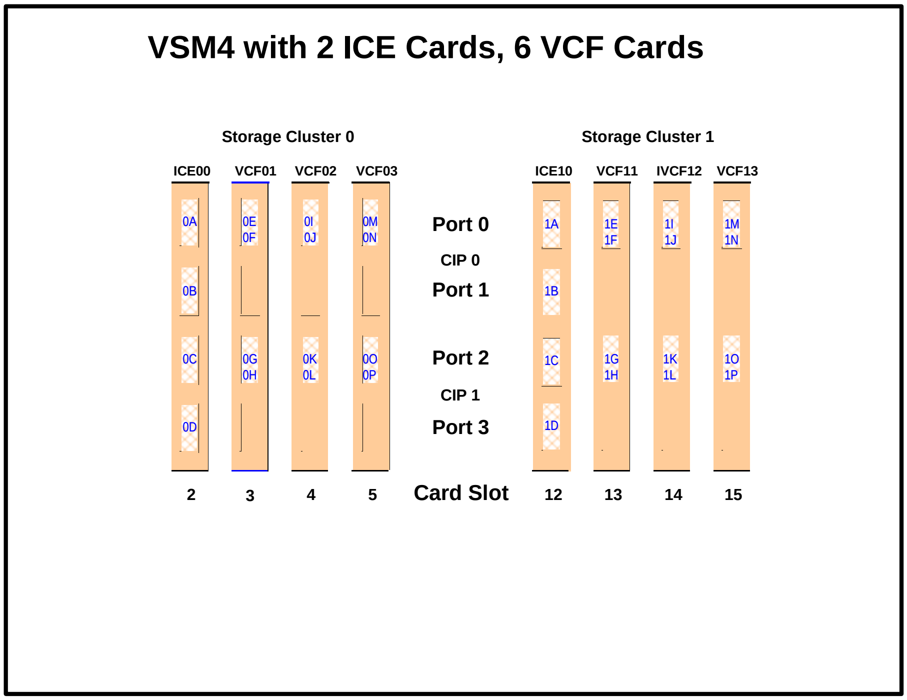

FIGURE C-3 VSM4 with 2 ICE cards, 6 VCF cards

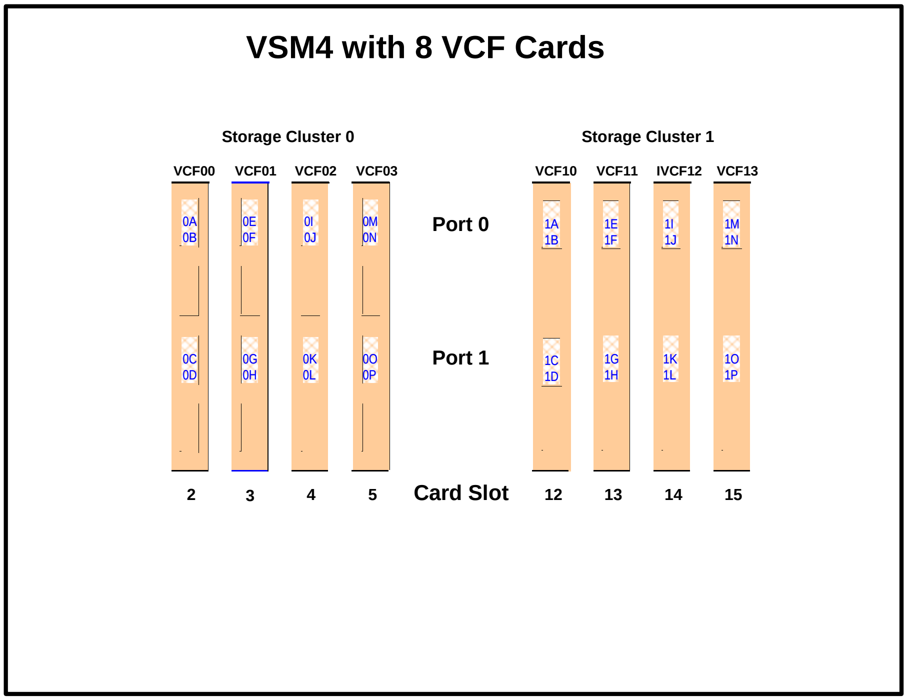

FIGURE C-4 VSM4 with 8 VCF cards

Note –

- In Figure FIGURE C-1 on page 122 through FIGURE C-4 on page 125, the VCF cards must go in:
  - Slots 5 and 15 in a two-VCF card configuration
  - Slots 3, 5, 13, and 15 in a four-VCF card configuration.
  - Slots 3, 4, 5, 13, 14, and 15 in a six-VCF card configuration.
  - All slots in an eight-VCF card configuration.
- FICON ports are controlled by a FICON Interface processor (FIP), ESCON ports are controlled by a CIP. Regardless of the card configuration, there can be only a total of 8 Nearlink FIPs and/or CIPs.
- All FICON ports can be configured as either a Host port or Nearlink (RTD/CLINK origination) port. All ESCON ports continue to be configurable as host or Nearlink ports in pairs on a per CIP basis.
- The ports are shown with their channel interface identifiers where **all ports are enabled**. These channel interface identifiers are the values that are required for the CHANIF values that you code for the CONFIG utility. Each value is two characters in length and has a value from 0A to 1O. The first digit is the VTSS cluster ID (valid values are 0 or 1). The second digit is the group or adapter ID (valid values are A to P).

  Each FICON port can attach to two RTDs, or two CLINKs, or an RTD/CLINK combination via a FICON director or supported switch (in FICON mode). **Note that**, as shown in these figures, **for RTDs only**, each FICON port has two CHANIF values **only if** the port is connected to a FICON director which is then connected to two RTDs. Nearlink RTD connections that are paired via a FICON switch or director on the same port dynamically alternate between both RTDs for atomic operations such as mount, migrate VTV, recall VTV, etc.
- **Each ICE card** contains two pairs of ESCON ports. Each pair is controlled by its own Channel Interface Processor (CIP). Each CIP switches between the two ports, so that **only one port** can transfer data at a time, which emulates a FICON port attached to a director attached to RTDs.
- Each host FICON channel supports 64 logical paths (times 16 logical units). However, in IOSF:
  - From a single MSP host, you can only define 8 channels (CHPIDs) running to a single control unit (single VSM4).
  - You use the CTRLR statement to define each VSM4 as 16 F6473K control unit images.
  - You use the DEVICE statement to define the 16 VTDs that are associated with each F6473K control unit image.

- For a VSM4, each ESCON CIP or FICON FIP can operate with only *one* of two "personalities", which is set at the VTSS LOP:
  - *Host Mode*. In Host Mode, ports can connect to the host CPU channels, including via Director(s) or channel extenders. A port in Host Mode can also serve as a CLINK terminator.

    Also note that for ESCON ports, you can have two physical paths from the same LPAR to the same CIP, as long as the two physical paths address different (not overlapping) logical control units. For example, a single host LPAR can address logical control units 0-7 on one CIP port, and 8-F on the other CIP port of the same CIP.
  - *Nearlink Mode*. In Nearlink Mode, ports can connect to an RTD. A port in Nearlink Mode can also serve as a CLINK originator.
  - **For clustering**, you need an originator port in Nearlink mode on one VTSS connected via a CLINK to a terminator port in Host mode on the other VTSS.

    For example, FIGURE C-5 shows 2 CLINK ports on each VTSS configured for Uni-Directional Clustering. On the Primary VTSS (VTSS1), the CLINK CIPs/FIPs are configured in **Nearlink Mode**, while on the Secondary VTSS (VTSS2), the CIPs/FIPs are configured in **Host Mode**.

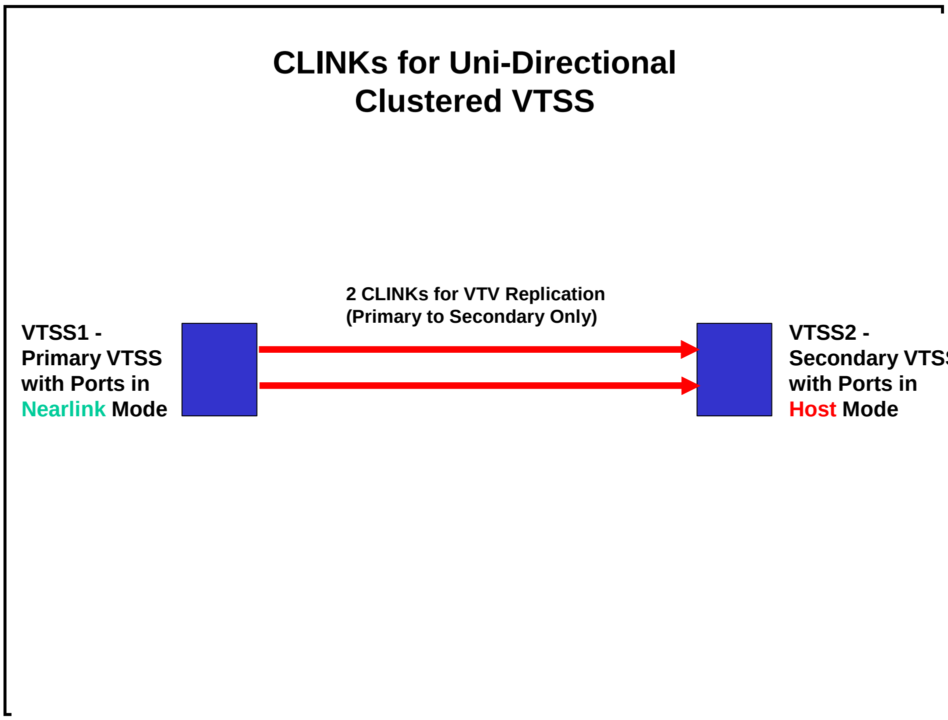

FIGURE C-5 CLINKs for Uni-Directional Clustered VTSS

FIGURE C-6 shows 2 CLINK ports on each VTSS configured for Bi-Directional Clustering. **Each** Peer VTSS (VSMPR1 and VSMPR2), must have **both** of the following:

- **One** CLINK CIP/FIP configured in **Nearlink Mode** for replicating to the Peer.
- **One** CLINK CIP/FIP configured in **Host Mode** for receiving replicated VTVs from the Peer.

Bi-Directional Clustering, therefore, requires pairs of Uni-Directional CLINKs with the CIPs/FIPSs configured so that the data flows in **opposite directions** on the CLINKs.

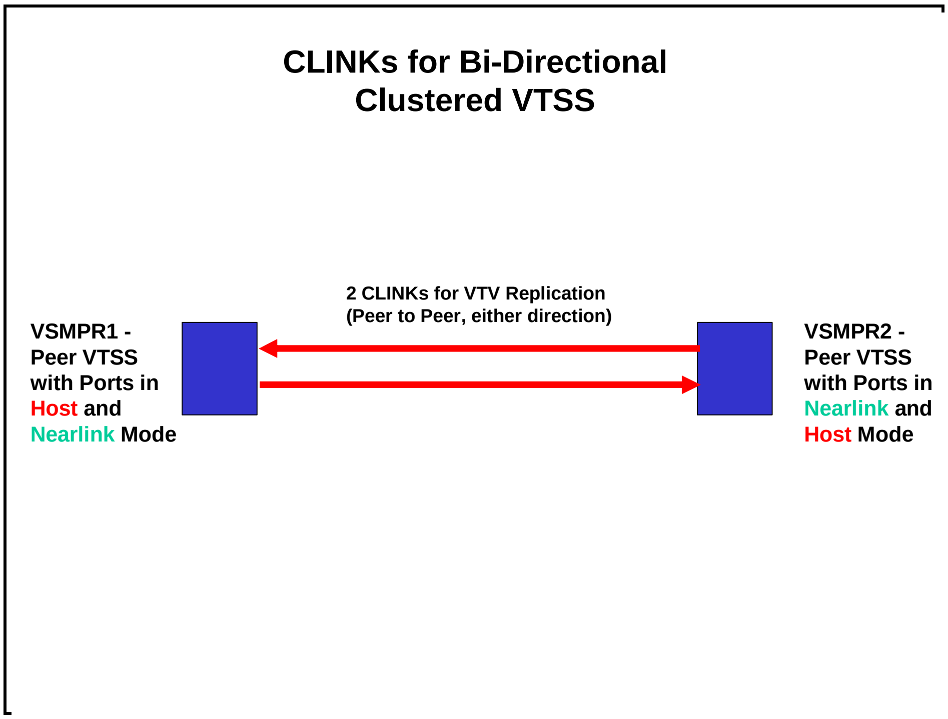

FIGURE C-6 CLINKs for Bi-Directional Clustered VTSS

In both FICON and ESCON, what are Best Practices for optimizing port operations? See TABLE C-2...

TABLE C-2 Optimizing VSM4 FICON/ESCON Port Operations

Configuration - Two ESCON Ports on a CIP (ICE) or FICON port attached to a FICON Director (VCF)	Best Practices
Two CLINKs	**Don’t use**....because only one port can be active at a time. If you're doing Clustered VTSS, you want all CLINK connections to be active all the time.
CLINK and RTD	**An advantage** in Degraded Cluster Mode. You normally have fewer RTDs on the Primary VTSS because the Secondary is doing most of the migrations. If you have an offline RTD on the same CIP as an active CLINK, if the Secondary fails you can vary the CLINK offline and bring the RTD online to handle more workload on the Primary.
Two RTDs	**An advantage** for the following: ■ **Optimize use of local and remote RTDs**. During busy shifts, use only the local RTD on the CIP. During quiet periods, switch to the remote RTD for deep archive and DR work. ■ **Optimize use of different drive technologies**. As described in the previous bullet, use a T9840 as a local RTD, then switch to a T9940 for deep archive. You can also use this feature to migrate from older drive technology (such as 9490) to newer technology (such as 9840). Use Management and Storage Classes to read in data from older media, then switch to the newer technology drive to place data on new media. This technique effectively gives you greater physical connectivity to different drive technologies without incurring the overhead of full time, real time ESCON connections to each drive type. **Note that** Because of the “only one active” rule, if an RTD on one port is migrating or recalling a VTV, the RTD on the second port cannot be accessed until the operation on the first port completes (the RTD on the second port is in “suspend” mode, as shown by the D RTD command/utility). Best Practices suggests, therefore, that RTDs that **must** be active simultaneously should connect to different CIPs.

VSM4 FICON Back-End Configuration Examples

For VSM4s with both ESCON Front-End and FICON Back-End connectivity, let's look at an example of VCF card configurations and implementation in "VSM4 Configuration Example: 6 ICE3 Cards, 2 VCF Cards" on page 131.

For a VSM4 host gen example, see "IOSRF Example for Single MSP Host Connected to a VSM4 Via ESCON Directors" on page 133.

VSM4 Configuration Example: 6 ICE3 Cards, 2 VCF Cards

FIGURE C-7 shows CONFIG channel interface identifiers for a VSM4 with 6 ICE3 cards, 2 VCF cards. In this configuration, we've allocated 24 ICE3 card ports to hosts and 4 VCF ports to RTDs. The RTD ports are all connected to FICON directors, each of which is attached to 2 RTDs, so the CHANIF identifiers for both RTDs are shown on each port. This allows Back-End connection to 8 RTDs, although, as with ESCON, only one RTD per port/Director can be active at a time.

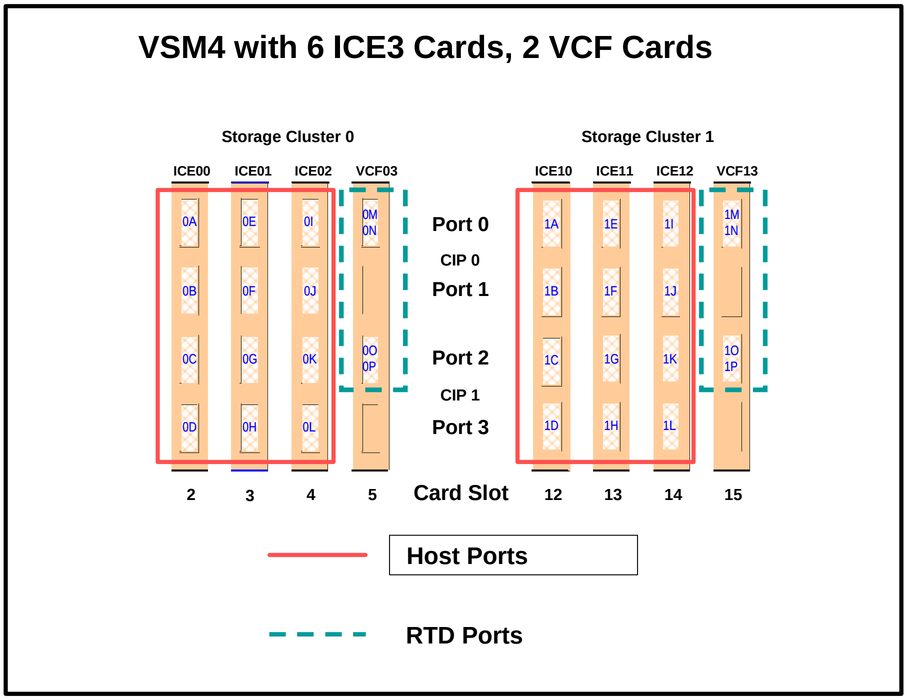

FIGURE C-7 VSM4 with 6 ICE3 Cards, 2 VCF Cards

CONFIG Example for VSM4 with 16 Host Ports, 6 RTD Ports

FIGURE C-8 shows example CONFIG JCL to define the VSM4 configuration shown in FIGURE C-7 on page 131.

```
//CREATECFGEXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIBDD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTLDD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBYDD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//SLSPRINTDD   SYSOUT=*
//SLSINDD   *
 CONFIG
 GLOBALMAXVTV=32000MVCFREE=40
 RECLAIMTHRESHLD=70MAXMVC=40  START=35
 VTVVOL LOW=905000 HIGH=999999 SCRATCH
 VTVVOL LOW=C00000 HIGH=C25000 SCRATCH
 VTVVOL LOW=RMM000 HIGH=RMM020 SCRATCH
 MVCVOL LOW=N25980 HIGH=N25989
 MVCVOL LOW=N35000 HIGH=N35999
 VTSS NAME=VSM401 LOW=70 HIGH=80 MAXMIG=6 RETAIN=5
 RTD  NAME=VSM42A01 DEVNO=2A01 CHANIF=0M
 RTD  NAME=VSM42A03 DEVNO=2A03 CHANIF=0N
 RTD  NAME=VSM42A05 DEVNO=2A05 CHANIF=0O
 RTD  NAME=VSM42A06 DEVNO=2A06 CHANIF=0P
 RTD  NAME=VSM42A07 DEVNO=2A07 CHANIF=1M
 RTD  NAME=VSM42A09 DEVNO=2A09 CHANIF=1N
 RTD  NAME=VSM42A0B DEVNO=2A0B CHANIF=1O
 RTD  NAME=VSM42A0C DEVNO=2A0C CHANIF=0P
 VTD LOW=9900 HIGH=99FF
```

FIGURE C-8 CONFIG example: VSM4 with 6 ICE3 cards, 2 VCF cards

IOSRF Example for Single MSP Host Connected to a VSM4 Via ESCON Directors

FIGURE C-9 shows a configuration diagram for a single MSP host connected to a VSM4 via ESCON Directors, andFIGURE C-10 on page 134 shows example IOSRF statements for this configuration. **Note that**:

- From MSPA, you define 8 CHPIDs, with each path switched in the ESCON Director, for a total of 8 channels running to the VSM4.
- You code 16 CTRLR statements to define the VSM4 as 16 F6473K images.
- You code DEVICE statement to define the 16 VTDs that are associated with each F6473K image.

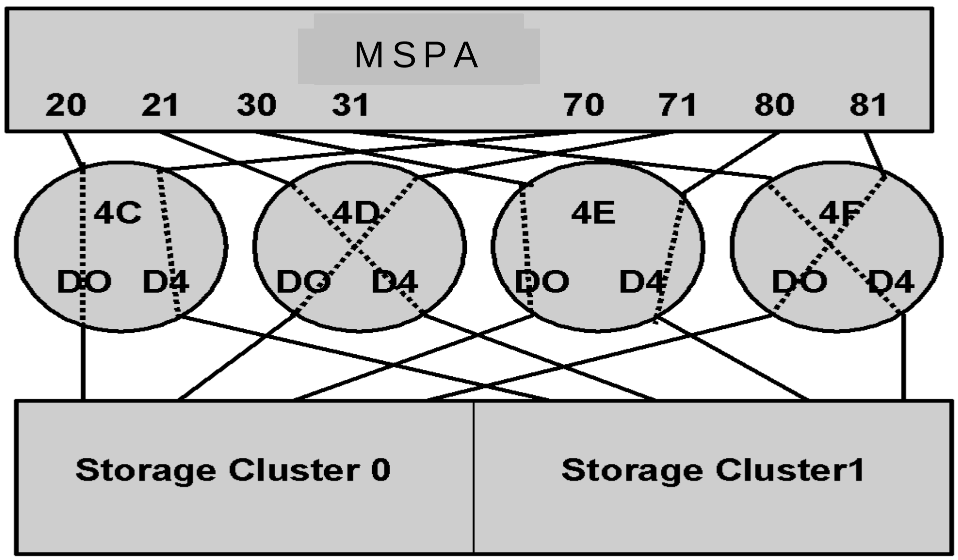

FIGURE C-9 Configuration Diagram: Single MSP Host Connected to a VSM4 via ESCON Directors

```
CHANNEL   CHPID(0A-0D),TYPE(BMC),INTF(OCLINK),OCLS(01)
CHANNEL   CHPID(24-27),TYPE(BMC),INTF(OCLINK),OCLS(02)
.
.
CTRLR     CTRLNUM(D00),NAME(F1751),CHPID(0A),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B0),CULOGADR(0)
CTRLR     CTRLNUM(D01),NAME(F1751),CHPID(0B),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B1),CULOGADR(0)
.
.
CTRLR     CTRLNUM(D10),NAME(F1751),CHPID(0A),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B0),CULOGADR(1)
CTRLR     CTRLNUM(D11),NAME(F1751),CHPID(0B),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B1),CULOGADR(1)
.
.CTRLR     CTRLNUM(D20),NAME(F1751),CHPID(0A),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B0),CULOGADR(2)
CTRLR     CTRLNUM(D21),NAME(F1751),CHPID(0B),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B1),CULOGADR(2)
.
.
CTRLR     CTRLNUM(D30),NAME(F1751),CHPID(0A),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B0),CULOGADR(3)
CTRLR     CTRLNUM(D31),NAME(F1751),CHPID(0B),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B1),CULOGADR(3)
.
.
DEVICE    DEVNUM(D00-D0F),NAME(F6473K),FEATURE(DPR,STCHK),
          CTRLNUM(D00,D01,D02,D03,D04,D05,D06,D07),UNITADDR(00)
DEVICE    DEVNUM(D10-D1F),NAME(F6473K),FEATURE(DPR,STCHK),
          CTRLNUM(D10,D11,D12,D13,D14,D15,D16,D17),UNITADDR(00)
DEVICE    DEVNUM(D20-D2F),NAME(F6473K),FEATURE(DPR,STCHK),
          CTRLNUM(D20,D21,D22,D23,D24,D25,D26,D27),UNITADDR(00)
DEVICE    DEVNUM(D30-D3F),NAME(F6473K),FEATURE(DPR,STCHK),
          CTRLNUM(D30,D31,D32,D33,D34,D35,D36,D37),UNITADDR(00)
```

FIGURE C-10 IOSRF Example: Single MSP Host Connected to a VSM4 via ESCON Directors

APPENDIX **D**

VSM5 Configuration

The VSM5, provides greater capacity and throughput than the VSM4, while retaining its advantages over the VSM3. TABLE D-1 summarizes the VSM5 features.

TABLE D-1 VSM5 Features

Feature	Description
Host/Nearlink Interfaces	Up to 16 (FICON only)
RTDs supported	Up to 16 via FICON directors (in 3490-emulation mode only), can be a mixture of the following: 9840B, 9840C, 9940B, T10000.
LSMs supported	9740, 9360, 4410, 9310, SL8500
Host Software	NCS/VTCS 6.0 and above
Maximum VTDs per VTSS	256
Maximum VTVs per VTSS	297,000

VSM5 FICON VCF Card Options

VSM5 is available **only** with VCF (FICON) cards in the following configurations:

- FIGURE D-1 shows a VSM5 with 8 VCF cards.
- FIGURE D-2 on page 137 shows a VSM5 with 6 VCF cards, 2 empty card slots.
- FIGURE D-3 on page 138 shows a VSM5 with 4 VCF cards, 4 empty card slots.

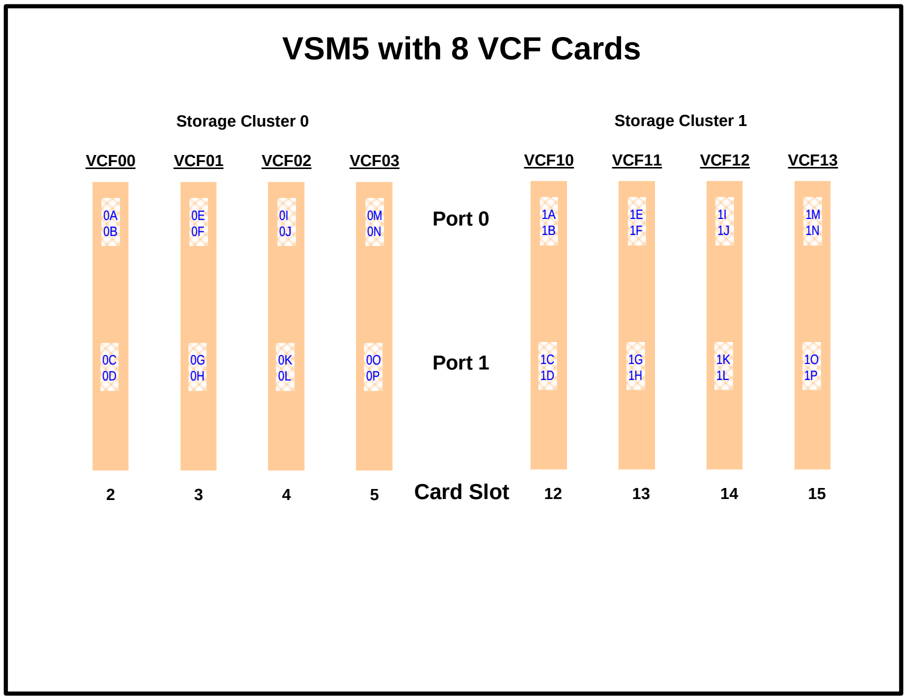

FIGURE D-1 VSM5 with 8 VCF cards

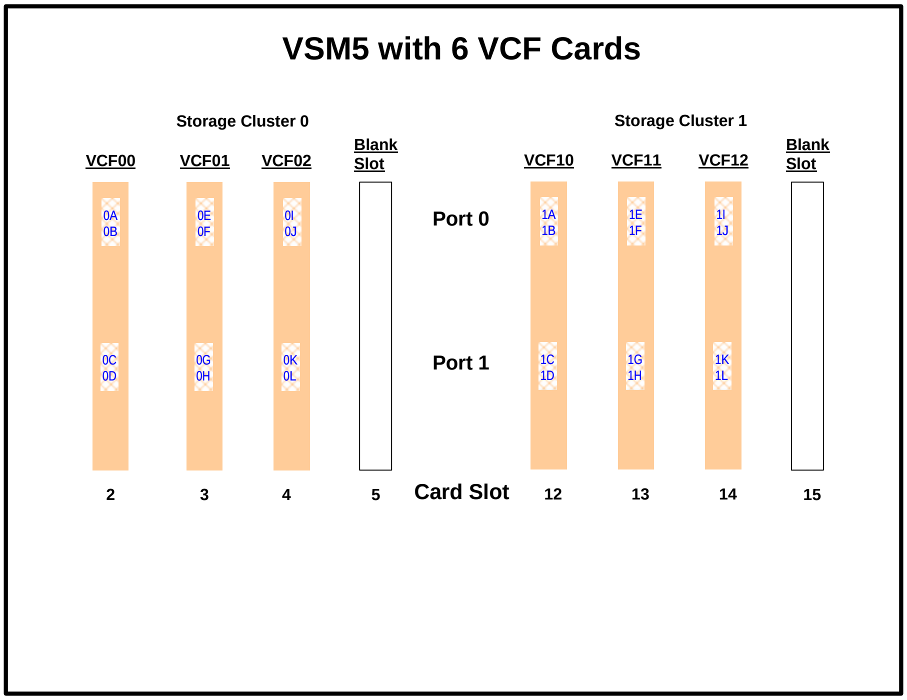

FIGURE D-2 VSM5 with 6 VCF cards, 2 empty card slots

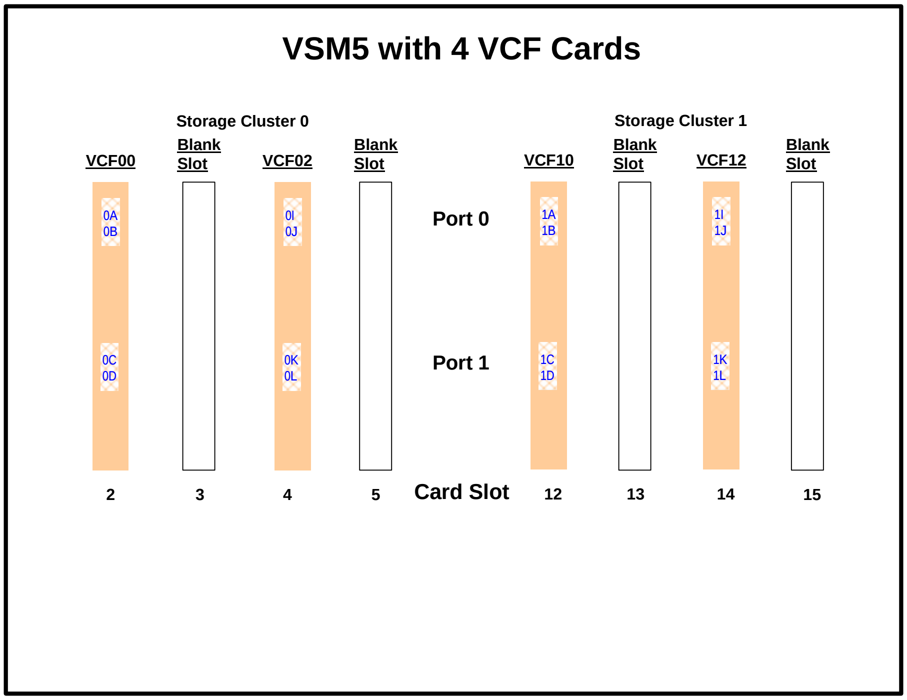

FIGURE D-3 VSM5 with 4 VCF cards, 4 empty card slots

Note –

- In FIGURE D-1 on page 136 through FIGURE D-3 on page 138, the VCF cards must go in:
  - All slots in an eight-VCF card configuration.
  - Slots 2, 3, 4, 13, 14, and 15 in a six-VCF card configuration.
  - Slots 2, 4, 14, and 15 in a four-VCF card configuration.
- FICON ports are controlled by a FICON Interface processor (FIP) and there can be only a total of 14 Nearlink FIPs.
- All FICON ports can be configured as either a Host port or Nearlink (RTD/CLINK origination) port.
- In FIGURE D-1 on page 136 through FIGURE D-3 on page 138, the ports are shown with their channel interface identifiers where **all ports are enabled**. These channel interface identifiers are the values that are required for the CHANIF values that you code for the CONFIG utility. Each value is two characters in length and has a value from 0A to 1O. The first digit is the VTSS cluster ID (valid values are 0 or 1). The second digit is the group or adapter ID (valid values are A to P).

  Each FICON port can attach to two RTDs, or two CLINKs, or an RTD/CLINK combination via a FICON director or supported switch (in FICON mode). **Note that**, as shown in these figures, **for RTDs only**, each FICON port has two CHANIF values **only if** the port is connected to a FICON director which is then connected to two RTDs. Nearlink RTD connections that are paired via a FICON switch or director on the same port dynamically alternate between both RTDs for atomic operations such as mount, migrate VTV, recall VTV, etc.

- Each host FICON channel supports 64 logical paths (times 16 logical units). However, in HCD:
  - From a single MSP host, you can only define 8 channels (CHPIDs) running to a single control unit (single VSM5).
  - You use the CTRLR statement to define each VSM5 as 16 F6473K control unit images.
  - You use the DEVICE statement to define the 16 VTDs that are associated with each F6473K control unit image.
- For a VSM5, each FIP can operate with only *one* of two “personalities”, which is set at the VTSS DOP:
  - *Host Mode*. In Host Mode, ports can connect to the host CPU channels, including via Director(s) or channel extenders. A port in Host Mode can also serve as a CLINK terminator.
  - *Nearlink Mode*. In Nearlink Mode, ports can connect to an RTD. A port in Nearlink Mode can also serve as a CLINK originator.
  - **For clustering**, you need an originator port in Nearlink mode on one VTSS connected via a CLINK to a terminator port in Host mode on the other VTSS.

    For example, FIGURE D-4 shows 2 CLINK ports on each VTSS configured for Uni-Directional Clustering. On the Primary VTSS (VTSS1), the CLINK FIPs are configured in **Nearlink Mode**, while on the Secondary VTSS (VTSS2), the FIPs are configured in **Host Mode**.

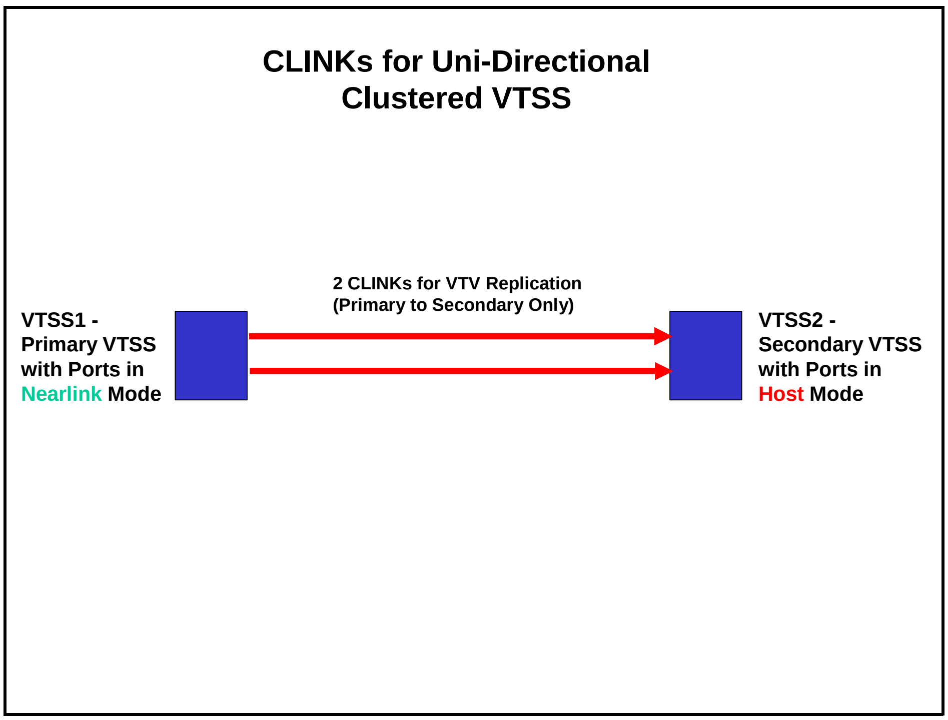

FIGURE D-4 CLINKs for Uni-Directional Clustered VTSS

FIGURE D-5 shows 2 CLINK ports on each VTSS configured for Bi-Directional Clustering. **Each** Peer VTSS (VSMPR1 and VSMPR2), must have **both** of the following:

- **One** CLINK FIP configured in **Nearlink Mode** for replicating to the Peer.
- **One** CLINK FIP configured in **Host Mode** for receiving replicated VTVs from the Peer.

Bi-Directional Clustering, therefore, requires pairs of Uni-Directional CLINKs with the FIPSs configured so that the data flows in **opposite directions** on the CLINKs.

CLINKs for Bi-Directional Clustered VTSS

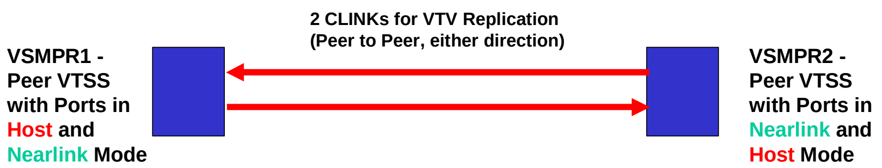

FIGURE D-5 CLINKs for Bi-Directional Clustered VTSS

For FICON, what are Best Practices for optimizing port operations? See TABLE D-2...

TABLE D-2 Optimizing VSM5 FICON Port Operations

Configuration - FICON port attached to a FICON Director	Best Practices
Two CLINKs	**Don't use**....because only one port can be active at a time. If you're doing Clustered VTSS, you want all CLINK connections to be active all the time.
CLINK and RTD	**An advantage** in Degraded Cluster Mode. You normally have fewer RTDs on the Primary VTSS because the Secondary is doing most of the migrations. If you have an offline RTD on the same FIP as an active CLINK, if the Secondary fails you can vary the CLINK offline and bring the RTD online to handle more workload on the Primary. **Note that** while the CLINK is active, the RTD is unavailable and is reported as suspended via DISPLAY RTD.
Two RTDs	**An advantage** for the following: **Optimize use of local and remote RTDs**. During busy shifts, use only the local RTD on the FIP. During quiet periods, switch to the remote RTD for deep archive and DR work. **Optimize use of different drive technologies**. As described in the previous bullet, use a T9840 as a local RTD, then switch to a T9940 for deep archive. You can also use this feature to migrate from older drive technology (such as 9490) to newer technology (such as 9840). Use Management and Storage Classes to read in data from older media, then switch to the newer technology drive to place data on new media. This technique effectively gives you greater physical connectivity to different drive technologies without incurring the overhead of full time, real time FICON connections to each drive type. **Note that** Because of the "only one active" rule, if an RTD on one port is migrating or recalling a VTV, the RTD on the second port cannot be accessed until the operation on the first port completes (the RTD on the second port is in "suspend" mode, as shown by the D RTD command/utility). Best Practices suggests, therefore, that RTDs that **must** be active simultaneously should connect to different FIPs.

VSM5 FICON Front-End and Back-End Configuration Examples

For VSM5s, let's look at two examples of VCF card configurations and implementation:

- "VSM5 Configuration Example: 8 VCF Cards, FICON Directors, 16 RTDs" on page 143
- "VSM5 Configuration Example: 8 VCF Cards, 4 CLINKs, FICON Directors for 8 RTDs" on page 145

For a VSM5 host gen example, see "IOCP Example for Single MSP Host Connected to a VSM5 Via FICON Directors" on page 148.

VSM5 Configuration Example: 8 VCF Cards, FICON Directors, 16 RTDs

FIGURE D-6 shows CONFIG channel interface identifiers for a VSM5 with 8 VCF cards. In this configuration, we've allocated 8 ports to RTDs and 8 ports to host connections. The RTD ports are all connected to FICON directors, each of which is attached to 2 RTDs, so the CHANIF identifiers for both RTDs are shown on each port. This allows Back-End connection to 16 RTDs, although only one RTD per port/Director can be active at a time.

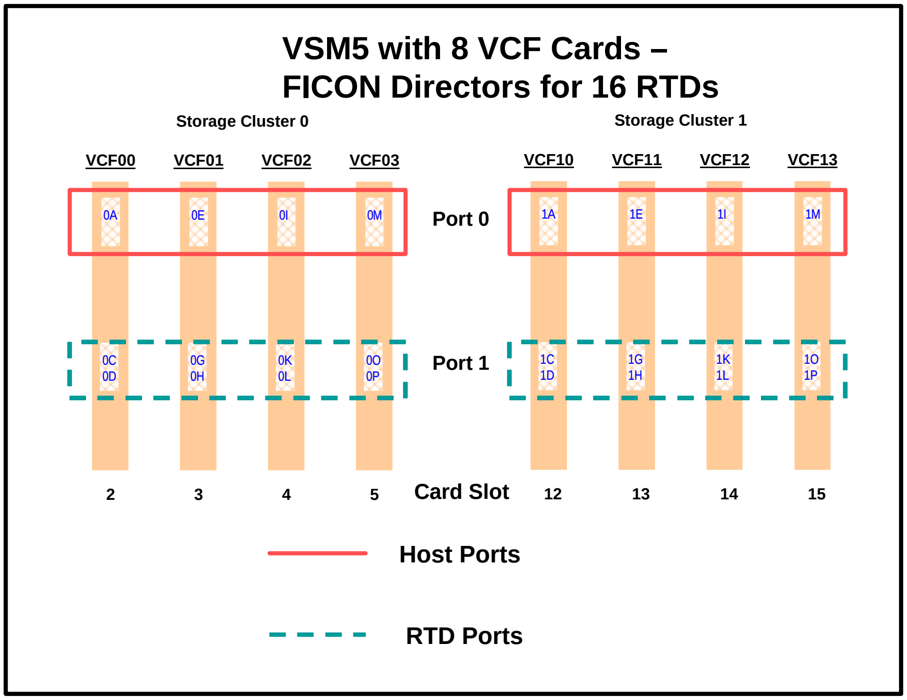

FIGURE D-6 VSM5 with 8 VCF Cards, FICON Directors for 16 RTDs

CONFIG Example for VSM5 FICON with 8 VCF Cards, FICON Directors, 16 RTDs

FIGURE D-7 shows example CONFIG JCL to define the VSM5 configuration shown in FIGURE D-6 on page 143.

```
//CREATECF EXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG
 GLOBALMAXVTV=32000 MVCFREE=40
 RECLAIMTHRESHLD=70 MAXMVC=40  START=35
 VTVVOL LOW=905000 HIGH=999999 SCRATCH
 VTVVOL LOW=C00000 HIGH=C25000 SCRATCH
 VTVVOL LOW=RMM000 HIGH=RMM020 SCRATCH
 MVCVOL LOW=N25980 HIGH=N25989
 MVCVOL LOW=N35000 HIGH=N35999
 VTSS NAME=VSM501 LOW=70 HIGH=80 MAXMIG=8 RETAIN=5
 RTD  NAME=VSM52A00 DEVNO=2A00 CHANIF=0C
 RTD  NAME=VSM52A01 DEVNO=2A01 CHANIF=0D
 RTD  NAME=VSM52A02 DEVNO=2A02 CHANIF=0G
 RTD  NAME=VSM52A03 DEVNO=2A03 CHANIF=0H
 RTD  NAME=VSM52A04 DEVNO=2A04 CHANIF=0K
 RTD  NAME=VSM52A05 DEVNO=2A05 CHANIF=0L
 RTD  NAME=VSM52A06 DEVNO=2A06 CHANIF=0O
 RTD  NAME=VSM52A07 DEVNO=2A07 CHANIF=0P
 RTD  NAME=VSM52A08 DEVNO=2A08 CHANIF=1C
 RTD  NAME=VSM52A09 DEVNO=2A09 CHANIF=1D
 RTD  NAME=VSM52A0A DEVNO=2A0A CHANIF=1G
 RTD  NAME=VSM52A0B DEVNO=2A0B CHANIF=1H
 RTD  NAME=VSM52A0C DEVNO=2A0C CHANIF=1K
 RTD  NAME=VSM52A0D DEVNO=2A0D CHANIF=1L
 RTD  NAME=VSM52A0E DEVNO=2A0E CHANIF=1O
 RTD  NAME=VSM52A0F DEVNO=2A0F CHANIF=1P
 VTD LOW=9900 HIGH=99FF
```

FIGURE D-7 CONFIG example: VSM5 with 8 VCF cards, FICON Directors, 16 RTDs

VSM5 Configuration Example: 8 VCF Cards, 4 CLINKs, FICON Directors for 8 RTDs

FIGURE D-8 shows CONFIG channel interface identifiers for a VSM5 with 8 VCF cards. In this configuration, we've allocated:

- 8 Host ports.
- 4 ports for RTDs. The RTD ports are all connected to FICON directors, each of which is attached to RTDs, so the CHANIF identifiers for both RTDs are shown on each port. This allows Back-End connection to 8 RTDs, although only one RTD per port/Director can be active at a time.
- 4 ports for CLINK connections to form a Bi-Directional VTSS Cluster, and 8 ports to host connections. To form the clustered VTSS, we'll have two VSM5s (VSMPR1 and VSMPR2) configured identically as shown in FIGURE D-6. As shown in FIGURE D-5 on page 140, Bi-Directional Clustering requires pairs of Uni-Directional CLINKs with the FIPSs configured so that the data flows in **opposite directions** on the CLINKs. To make that happen, let's make 0G and 1G the sending (Nearlink Mode) ports on both VTSSs and 0O and 1O the receiving (Host Mode) on both VTSSs.

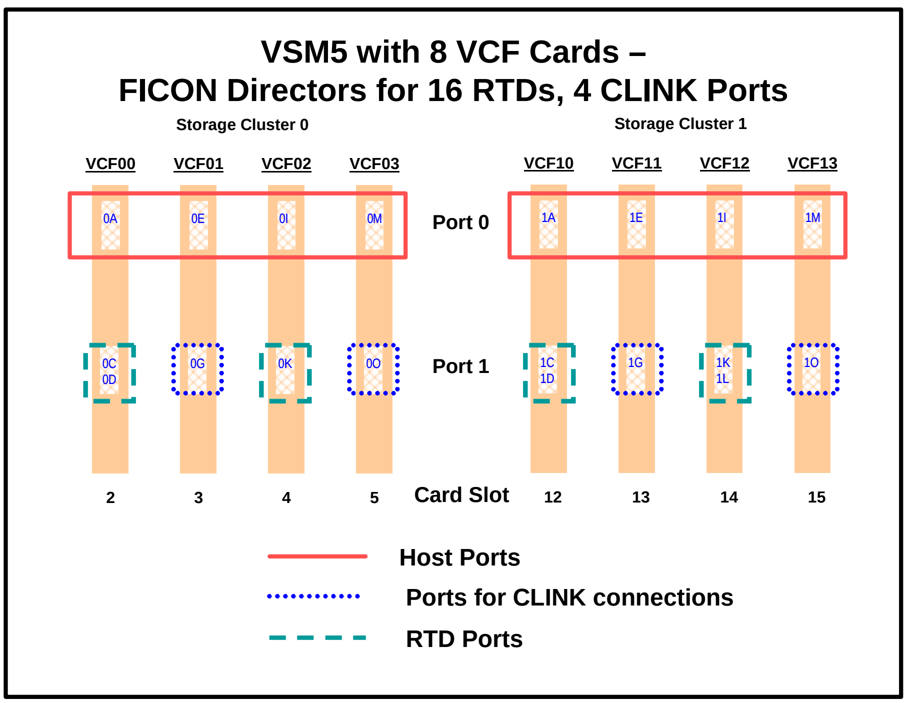

FIGURE D-8 VSM5 with 8 VCF Cards, 8 Host Ports, FICON Directors for 8 RTDs, 4 CLINK Ports

CONFIG Example for Bi-Directional Clustered VSM5 FICON Back-End

FIGURE D-9 shows example CONFIG JCL to define a Bi-Directional Cluster of two VSM5s (VSMPR1 and VSMPR2) with identical VCF card configurations shown in Figure FIGURE D-8 on page 145.

Caution – Bi-Directional Clustering **requires** VTCS 6.1! You **cannot** configure a Bi-Directional Cluster at releases lower than VTCS 6.1! **Also note** that the Clustered VTSSs require the Advanced Management Feature.

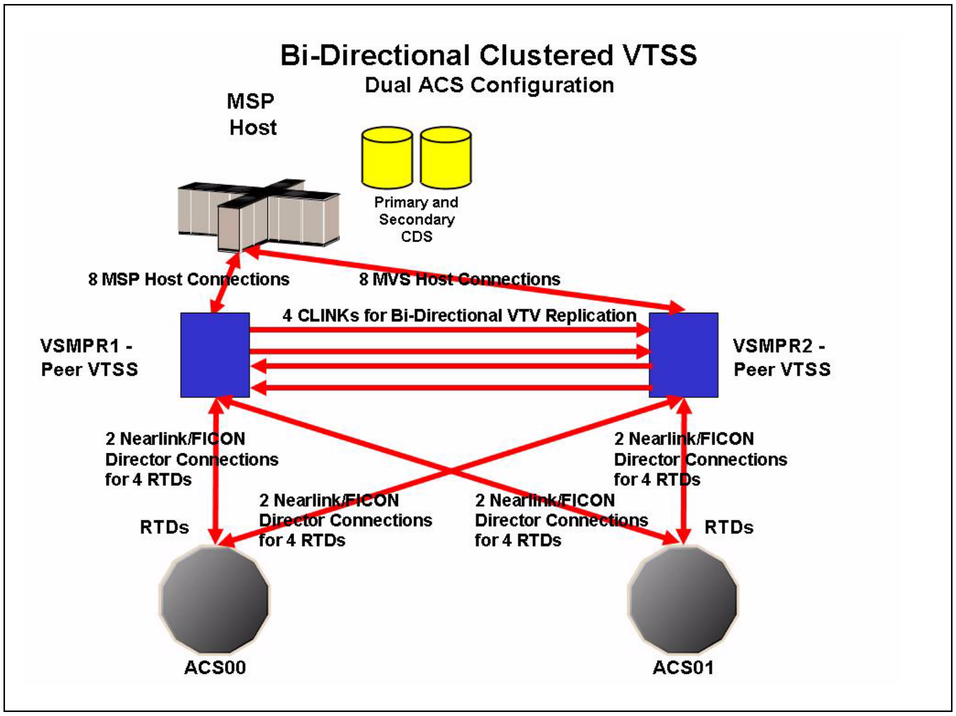

FIGURE D-9 Dual ACS Bi-Directional Clustered VTSS Configuration

FIGURE D-10 on page 147 shows example CONFIG JCL to define a Bi-Directional Cluster of two VSM5s (VSMPR1 and VSMPR2) as shown in FIGURE D-8 on page 145. **Note that**:

- The CLUSTER statement defines the Cluster as consisting of VSMPR1 and VSMPR2.

- There are CLINK statements using the sending (Nearlink Mode) ports of **both VTSSs** to enable the Cluster as Bi-Directional. As described, the Nearlink ports are 0G and 1G on both VTSSs.

```
//CREATECF EXEC PGM=SWSADMIN,PARM='MIXED'
//STEPLIB DD DSN=hlq.SLSLINK,DISP=SHR
//SLSCNTL DD DSN=FEDB.VSMLMULT.DBASEPRM,DISP=SHR
//SLSCNTL2 DD DSN=FEDB.VSMLMULT.DBASESEC,DISP=SHR
//SLSSTBY DD DSN=FEDB.VSMLMULT.DBASETBY,DISP=SHR
//SLSPRINT DD   SYSOUT=*
//SLSIN DD   *
 CONFIG RESET CDSLEVEL(V61ABOVE)
 GLOBALMAXVTV=32000MVCFREE=40
 RECLAIMTHRESHLD=70MAXMVC=40  START=35
 VTVVOL LOW=905000 HIGH=999999 SCRATCH
 VTVVOL LOW=C00000 HIGH=C25000 SCRATCH
 VTVVOL LOW=RMM000 HIGH=RMM020 SCRATCH
 MVCVOL LOW=N25980 HIGH=N25989
 MVCVOL LOW=N35000 HIGH=N35999
 VTSS NAME=VSMPR1 LOW=70 HIGH=80 MAXMIG=8 MINMIG=4 RETAIN=5
 RTD  NAME=PR11A00 DEVNO=1A00 CHANIF=0C
 RTD  NAME=PR11A01 DEVNO=1A01 CHANIF=0D
 RTD  NAME=PR11A02 DEVNO=1A02 CHANIF=0K
 RTD  NAME=PR11A03 DEVNO=1A03 CHANIF=0L
 RTD  NAME=PR12A08 DEVNO=2A08 CHANIF=1C
 RTD  NAME=PR12A09 DEVNO=2A09 CHANIF=1D
 RTD  NAME=PR12A0A DEVNO=2A0A CHANIF=1K
 RTD  NAME=PR12A0B DEVNO=2A0B CHANIF=1L
 VTD LOW=9900 HIGH=99FF
 VTSS NAME=VSMPR2 LOW=70 HIGH=80 MAXMIG=8 MINMIG=4 RETAIN=5
 RTD  NAME=PR23A00 DEVNO=3A00 CHANIF=0C
 RTD  NAME=PR23A01 DEVNO=3A01 CHANIF=0D
 RTD  NAME=PR23A02 DEVNO=3A02 CHANIF=0K
 RTD  NAME=PR23A03 DEVNO=3A03 CHANIF=0L
 RTD  NAME=PR24A08 DEVNO=4A08 CHANIF=1C
 RTD  NAME=PR24A09 DEVNO=4A09 CHANIF=1D
 RTD  NAME=PR24A0A DEVNO=4A0A CHANIF=1K
 RTD  NAME=PR24A0B DEVNO=4A0B CHANIF=1L
 VTD LOW=9900 HIGH=99FF
 CLUSTER NAME=CLUSTER1 VTSSs(VSMPR1,VSMPR2)
 CLINK VTSS=VSMPR1 CHANIF=0G
 CLINK VTSS=VSMPR1 CHANIF=1G
 CLINK VTSS=VSMPR2 CHANIF=0G
 CLINK VTSS=VSMPR2 CHANIF=1G
```

FIGURE D-10 CONFIG example: Dual ACS Bi-Directional Clustered VTSS System, VSM5 FICON Back-End

IOCP Example for Single MSP Host Connected to a VSM5 Via FICON Directors

FIGURE D-11 shows a configuration diagram for a single MSP host connected to a VSM5 via FICON Directors, and FIGURE D-12 on page 149 shows example IOCP statements for this configuration. **Note that**:

- From MSPA, you define 8 CHPIDs, with each path switched in the FICON Director, for a total of 8 channels running to the VSM5.
- You code 16 CTRLR statements to define the VSM5 as 16 F6473K images.
- You code DEVICE statement to define the 16 VTDs that are associated with each F6473K image.
- If ESCON and FICON channels are configured to the same logical control unit, MSP issues message CBDG489I, which indicates that mixing ESCON and FICON channel paths on a logical control unit should be used only for the migration from ESCON to native FICON, but should not be used permanently. This is a warning message only, and does not indicate an error.

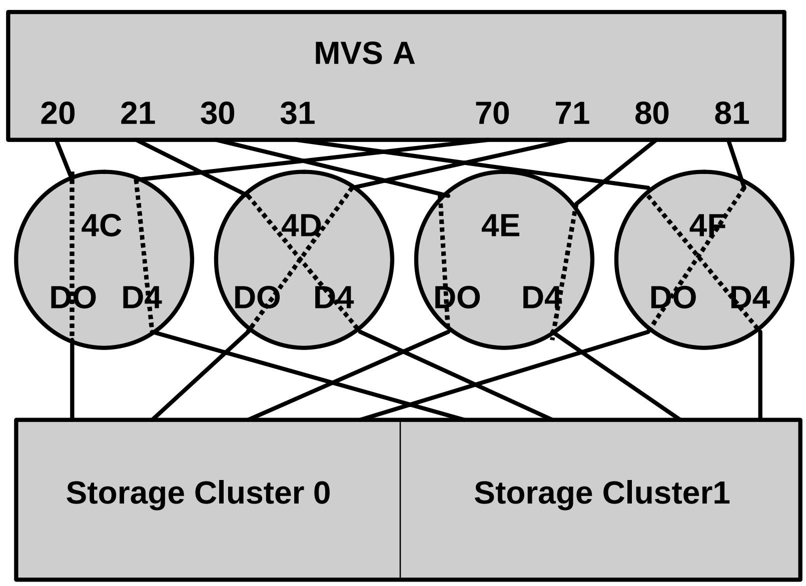

FIGURE D-11 Configuration Diagram: Single MSP Host Connected to a VSM5 via FICON Directors

```
CHANNEL   CHPID(0A-0D),TYPE(BMC),INTF(OCLINK),OCLS(01)
CHANNEL   CHPID(24-27),TYPE(BMC),INTF(OCLINK),OCLS(02)
.
.
CTRLR     CTRLNUM(D00),NAME(F1751),CHPID(0A),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B0),CULOGADR(0)
CTRLR     CTRLNUM(D01),NAME(F1751),CHPID(0B),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B1),CULOGADR(0)
.
.
CTRLR     CTRLNUM(D10),NAME(F1751),CHPID(0A),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B0),CULOGADR(1)
CTRLR     CTRLNUM(D11),NAME(F1751),CHPID(0B),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B1),CULOGADR(1)
.
.CTRLR     CTRLNUM(D20),NAME(F1751),CHPID(0A),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B0),CULOGADR(2)
CTRLR     CTRLNUM(D21),NAME(F1751),CHPID(0B),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B1),CULOGADR(2)
.
.
CTRLR     CTRLNUM(D30),NAME(F1751),CHPID(0A),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B0),CULOGADR(3)
CTRLR     CTRLNUM(D31),NAME(F1751),CHPID(0B),UNITADDR(00-0F),
          FEATURE(DSF,SUP),LINKADDR(B1),CULOGADR(3)
.
.
DEVICE    DEVNUM(D00-D0F),NAME(F6473K),FEATURE(DPR,STCHK),
          CTRLNUM(D00,D01,D02,D03,D04,D05,D06,D07),UNITADDR(00)
DEVICE    DEVNUM(D10-D1F),NAME(F6473K),FEATURE(DPR,STCHK),
          CTRLNUM(D10,D11,D12,D13,D14,D15,D16,D17),UNITADDR(00)
DEVICE    DEVNUM(D20-D2F),NAME(F6473K),FEATURE(DPR,STCHK),
          CTRLNUM(D20,D21,D22,D23,D24,D25,D26,D27),UNITADDR(00)
DEVICE    DEVNUM(D30-D3F),NAME(F6473K),FEATURE(DPR,STCHK),
          CTRLNUM(D30,D31,D32,D33,D34,D35,D36,D37),UNITADDR(00)
```

FIGURE D-12 IOCP Example: Single MSP Host Connected to a VSM5 via FICON Directors

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Tip – Unlike ESCON, FICON supports multiple active I/Os per channel. If the number of active VTDs is less than the number of channels configured to the VTSS, the I/Os to those VTDs may not be evenly spread across all the channels. As the number of active VTDs increases to be greater than the number of channels configured to the VTSS, the channel subsystem will spread the I/Os across all the channels. If it is desired to spread the I/Os across all of the channels even when only a few VTDs are active, it is necessary to use the preferred path feature to force the channel subsystem to spread the I/Os across the channels. The preferred path feature is specified via the PATH= parameter on the DEVICE statement. When you specify preferred path on the DEVICE statement, the channel subsystem always tries the preferred path first. If it is busy or unavailable, the channel subsystem next tries the channel path following the preferred path in the rotation order, and so on.

FIGURE D-12 on page 149 (repeated in FIGURE D-13) shows DEVICE statements for STRING1 **without** using preferred pathing.

```
STRING1  DEVICE ADDRESS=(0500,16),
              CUNUMBER=(001),
        UNIT=F6473K,
UNITADD=00,STADET=Y
```

FIGURE D-13 DEVICE Statements for STRING 1 without Preferred Pathing

FigureFIGURE D-14 shows DEVICE statements for STRING1 **using** preferred pathing. If you're using preferred pathing, you need to use these kind of DEVICE statements for **all** paths, such as STRING2 through STRING16 in FIGURE D-12 on page 149.

```
STRING10 DEVICE ADDRESS=(0500,2),
CUNUMBER=(001),
UNIT=F6473K,
UNITADD=00,STADET=Y,
PATH=20

STRING12 DEVICE ADDRESS=(0502,2),
CUNUMBER=(001),
UNIT=F6473K,
UNITADD=00,STADET=Y,
PATH=21

STRING14 DEVICE ADDRESS=(0504,2),
CUNUMBER=(001),
UNIT=F6473K,
UNITADD=00,STADET=Y,
PATH=30

STRING16 DEVICE ADDRESS=(0506,2),
CUNUMBER=(001),
UNIT=F6473K,
UNITADD=00,STADET=Y,
PATH=31

STRING18 DEVICE ADDRESS=(0508,2),
CUNUMBER=(001),
UNIT=F6473K,
UNITADD=00,STADET=Y,
PATH=70

STRING1A DEVICE ADDRESS=(050A,2),
CUNUMBER=(001),
UNIT=F6473K,
UNITADD=00,STADET=Y,
PATH=71

STRING1C DEVICE ADDRESS=(050C,2),
CUNUMBER=(001),
UNIT=F6473K,
UNITADD=00,STADET=Y,
PATH=80

STRING1E DEVICE ADDRESS=(050E,2),
CUNUMBER=(001),
UNIT=F6473K,
UNITADD=00,STADET=Y,
PATH=81
```

FIGURE D-14 DEVICE Statements for STRING 1 Using Preferred Pathing

Glossary

A

access method A technique for moving data between processor storage and input/output devices.

ACS *See* Automated Cartridge System.

ACSid A method used to identify an ACS. An ACSid is the result of defining the SLIALIST macro during the library generation (LIBGEN) process. The first ACS listed in this macro acquires a hexadecimal identifier of 00, the second ACS listed acquires a hexadecimal identifier of 01, and so forth, until all ACSs are identified.

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.

AMT automatic migration threshold.

APF Authorized Program Facility.

APPL VTAM APPLID definition for the HSC.

archiving The storage of backup files and associated journals, usually for a given period of time.

audit A VSM audit (which is not the same as an HSC audit) reconstructs VTV and MVC information.

Automated Cartridge System (ACS) The library subsystem consisting of one or two LMUs, and from 1 to 16 attached LSMs.

automated library *See* library.

automatic mode A relationship between an LSM and all attached hosts. LSMs operating in automatic mode handle cartridges without operator intervention. This is the normal operating mode of an LSM that has been modified online.

automatic migration Migrating VTVs to MVCs that is automatically initiated and controlled by VSM.

automatic migration threshold (AMT) AMT values are 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.

automatic recall Recalling VTVs to the VTSS that is automatically initiated and controlled by VSM.

automatic reclaim Reclaiming MVC space that is automatically initiated and controlled by VSM.

B

back-end capacity The capacity of the VTSS disk buffer, in bytes, as defined in disk arrays excluding space for system overhead.

block A collection of contiguous records recorded as a unit. Blocks are separated by interblock gaps, and each block may contain one or more records.

buffer A routine or storage used to compensate for a difference in rate of data flow, or time of occurrence of events, when transferring data from one device to another.

C

CA–1 (TMS) Computer Associates Tape Management System. Third–party software by Computer Associates International, Inc.

CAP *See* Cartridge Access Port.

capacity *See* media capacity.

CAPid A CAPid uniquely defines the location of a CAP by the LSM on which it resides. A CAPid is of the form *AAL:CC* where *AA* is the ACSid, *L* is the LSM number, and *CC* is the CAP number. Some commands and utilities permit an abbreviated CAPid format of *AAL*.

cartridge The plastic housing around the tape. It is approximately 4 inches (100 mm) by 5 inches (125 mm) by 1 inch (25 mm). The tape is threaded automatically when loaded in a transport. A plastic leader block is attached to the tape for automatic threading. The spine of the cartridge contains a Tri–Optic label listing the VOLSER (tape volume identifier).

Cartridge Access Port (CAP) An assembly which allows an operator to enter/eject cartridges during automated operations. The CAP is located on the access door of an LSM. (*see also,* standard CAP, enhanced CAP, WolfCreek CAP, WolfCreek optional CAP.)

Cartridge Scratch Loader An optional feature for the Cartridge Drive. It allows the automatic loading of premounted tape cartridges or the manual loading of single tape cartridges.

cartridge system tape The basic tape cartridge media that is used with 4480, 4490, or 9490 Cartridge Subsystems. They are visually identified by a one–color cartridge case.

CAW *See* Channel Address Word.

CDRM Cross Domain Resource Manager definition (if not using existing CDRMs).

CDRSC Cross Domain Resource definition.

CDS *See* control data set.

CE Channel End.

cell A storage slot in the LSM that is used to store a tape cartridge.

Central Support Remote Center (CSRC) *See* Remote Diagnostics Center.

CFT Customer field test.

channel A device that connects the host and main storage with the input and output control units.

Channel Address Word (CAW) An area in storage that specifies the location in main storage at which a channel program begins.

channel command A command received by a CU from a channel.

Channel Status Word (CSW) An area in storage that provides information about the termination of input/output operations.

check Detection of an error condition.

CI Converter/Interpreter (JES3).

Clink (cluster link). The path between a primary VTSS and secondary VTSS in a cluster. The Clink path is used to copy replicate VTVs from the primary to the secondary.

Cluster. Two VTSSs which are physically cabled together by Clink paths and are defined in CONFIG as a cluster. A cluster consists of a primary and a secondary VTSS. VTVs with the replicate attribute attached will be copied from the primary to the secondary as soon as possible after dismount time.

connected mode A relationship between a host and an ACS. In this mode, the host and an ACS are capable of communicating (at least one station to this ACS is online).

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

control data set allocation map A CDS subfile that marks individual blocks as used or free.

control data set data blocks CDS blocks that contain information about the library and its configuration or environment.

control data set directory A part of the CDS that maps its subdivision into subfiles.

control data set pointer blocks CDS blocks that contain pointers to map data blocks belonging to a subfile.

control data set recovery area A portion of the CDS reserved for maintaining integrity for updates that affect multiple CDS blocks.

control data set subfile A portion of the CDS consisting of Data Blocks and Pointer Blocks containing related information.

Control Unit (CU) A microprocessor–based unit situated logically between a host channel (or channels) and from two to sixteen tape transports. It functions to translate channel commands into tape transport commands, send transport status to the channel(s), and pass data between the channel(s) and transport(s).

conventional Nearline transport An HSC–controlled transport that is not defined to VSM as an RTD.

cross–host recovery The ability for one host to perform recovery for another host that has failed.

CSE Customer Service Engineer.

CSI Consolidated System Inventory.

CSL Cartridge Scratch Loader.

CSRC Central Support Remote Center (*See* Remote Diagnostics Center)

CSW Channel Status Word.

CU *See* Control Unit.

D

DAE Dump Analysis Elimination.

DASD Direct access storage device.

data Any representations such as characters or analog quantities to which meaning is, or might be, assigned.

data class A collection of allocation and space attributes, defined by the storage administrator, that are used to create a data set.

data compaction An algorithmic data–reduction technique that encodes data from the host and stores it in less space than unencoded data. The original data is recovered by an inverse process call decompaction.

data–compaction ratio The number of host data bytes divided by the number of encoded bytes. It is variable depending on the characteristics of the data being processed. The more random the data stream, the lower the opportunity to achieve compaction.

Data Control Block (DCB) A control block used by access routines in storing and retrieving data.

data set The major unit of data storage and retrieval, consisting of a collection of data in one of several prescribed arrangements and described by control information to which the system has access.

data streaming A continuous stream of data being transmitted in character or binary–digit form, using a specified format.

DBU disk buffer utilization.

DCB Data Control Block.

demand allocation An MVS term meaning that a user has requested a specific unit.

demand migration Migrating VTVs to MVCs that an administrator does with the MIGRATE command or utility.

demand recall Recalling VTVs to the VTSS that an administrator does with the RECALL command or utility.

demand reclaim Reclaiming MVC space that an administrator does with the RECLAIM command or utility.

device number A four–digit hexadecimal number that uniquely identifies a device attached to a processor.

device separation The HSC function which *forces* the MVS device selection process to choose either a nonlibrary transport or a transport in a particular ACS, based on the location of the volume (specific requests) or the given subpool rules in effect (nonspecific request).

DFP Data Facility Product. A program that isolates applications from storage devices, storage management, and storage device hierarchy management.

DFSMS Refers to an environment running MVS/ESA SP and DFSMS/MVS, DFSORT, and RACF. This environment helps automate and centralize the management of storage through a combination of hardware, software, and policies.

DFSMS ACS routine A sequence of instructions for having the system assign data class, storage class, management class, and storage group for a data set.

directed allocation The HSC function of *influencing* MVS's selection of library transports. For a specific request, the HSC influences MVS to choose a transport requiring the fewest number of pass–thrus; for a nonspecific (scratch) request, HSC's influencing is based on the given subpool rules in effect.

disconnected mode A relationship between a host and an ACS. In this mode, the host and an ACS are not capable of communicating (there are no online stations to this ACS).

disk buffer utilization (DBU). The ratio of used to total VTSS buffer capacity.

DOMed Pertaining to a console message that was previously highlighted during execution, but is now at normal intensity.

drain The deletion of data from an MVC. May be accompanied by a "virtual" eject to prevent the MVC from being reused.

drive loaded A condition of a tape drive in which a tape cartridge has been inserted in the drive, and the tape has been threaded to the beginning–of–tape position.

DSI Dynamic System Interchange (JES3).

dual LMU A hardware/u–software feature that provides a redundant LMU capability.

dual LMU HSC release 1.1.0 or later that automates a switchover to the standby LMU in a dual LMU configuration.

dump To write the contents of storage, or of a part of storage, usually from an internal storage to an external medium, for a specific purpose such as to allow other use of storage, as a safeguard against faults or errors, or in connection with debugging.

Dynamic Device Reconfiguration (DDR) A facility that allows a demountable volume to be moved, and repositioned if necessary, without abnormally terminating the job or repeating the initial program load procedure.

E

Ecart Cartridge system tape with a length of 1100 feet that can be used with 4490 cartridge drives. These tapes are visually identified by a two–tone colored case.

EDL *See* eligible device list.

eligible device list A group of tape drives that are available to satisfy an allocation request.

enhanced CAP An enhanced CAP contains two forty–cell magazine–style CAPs and a one–cell priority CAP (PCAP). Each forty–cell CAP holds four removable magazines of ten cells each. An LSM access door with an enhanced CAP contains no cell locations for storing cartridges. An enhanced CAP is ordered as Feature Number CC80. (*see also,* Cartridge Access Port (CAP), standard CAP, WolfCreek CAP, WolfCreek optional CAP.)

Effective Recording Density The number of user bytes per unit of length of the recording medium.

eject The LSM robot places a cartridge in a Cartridge Access Port (CAP) so the operator can remove it from the LSM.

ExPR Expert Performance Reporter.

Expert Performance Reporter Expert Performance Reporter collects performance data and generates reports about StorageTek Nearline ACSs and VTSS status and performance. It has an MVS component and a PC component.

Enhanced Capacity Cartridge System Tape Cartridge system tape with increased capacity that can be used with 4490 and 9490 Cartridge Drives. These tapes are visually identified by a two–tone colored case.

EOT End–of–Tape marker.

EPO Emergency Power Off.

ERDS Error Recording Data Set.

EREP Environmental Recording, Editing, Printing.

ERP Error recovery procedures.

error recovery procedures (ERP) Procedures designed to help isolate and, where possible, to recover from errors in equipment.

ExtendedStore Library One or more LSMs with no cartridge drives (CDs) that are attached by pass–thru ports to other LSMs (with CDs) in an ACS. These LSMs provide archive storage for cartridges containing less active data sets. Cartridges can be entered and ejected directly into and out of this LSM though either a standard CAP or an enhanced CAP.

F

file protected Pertaining to a tape volume from which data can be read only. Data cannot be written on or erased from the tape.

format The arrangement or layout of data on a data medium.

G

GB 1,073,741,824 bytes of storage.

GDG Generation Data Group. An MVS data set naming convention. Sequence numbers are appended to the basic data set name to track the generations created for that data set.

GTF Generalized Trace Facility. An MVS facility used to trace software functions and events.

H

HDA Head/disk assembly.

Host Software Component (HSC) That portion of the Automated Cartridge System which executes on host systems attached to an automated library. This component acts as the interface between the operating system and the rest of the automated library.

host system A data processing system that is used to prepare programs and the operating environments for use on another computer or controller.

HSC Host Software Component.

HSM Hierarchical Storage Manager.

HWS High Watermark Setup. Relates to chains set up for tape transport allocation in JES3.

I

ICRC See Improved Cartridge Recording Capability.

Improved Cartridge Recording Capability (ICRC) An improved data recording mode that, when enabled, can increase the effective cartridge data capacity and the effective data rate when invoked.

ID Identifier or identification.

IML *See* Initial Microprogram Load.

index a function performed by the cartridge loader that moves cartridges down the input or output stack one cartridge position. A loader can perform multiple consecutive indexes.

Initial Microprogram Load (IML) A process that activates a machine reset and loads system programs to prepare a computer system for operation. Processors having diagnostic programs activate these programs at IML execution. Devices running u–software reload the functional u–software usually from a floppy diskette at IML execution.

Initial Program Load (IPL) A process that activates a machine reset and loads system programs to prepare a computer system for operation. Processors having diagnostic programs activate these programs at IPL execution. Devices running u–software reload the functional u–software usually from a floppy diskette at IPL execution.

initial value A value assumed until explicitly changed. It must then be explicitly specified in another command to restore the initial value. An initial value for the HSC is the value in effect when the product is installed.

inline diagnostics Diagnostic routines that test subsystem components while operating on a time–sharing basis with the functional u–software in the subsystem component.

input stack The part of the cartridge loader where cartridges are premounted.

intervention required Manual action is needed.

ips Inches per second.

IVP Installation Verification Programs. A package of programs that is run by a user after the library is installed in order to verify that the library is functioning properly.

J

JCL See Job Control Language.

Job Control Language Problem–oriented language designed to express statements in a job that are used to identify the job or describe its requirements to an operating system.

journal The log associated with journaling. The log (stored in a data set) contains a record of completed work and changes to the control data set since the last backup was created.

journaling A technique for recovery that involves creating a backup control data set and maintaining a log of all changes (transactions) to that data set.

K

KB Kilobyte, thousand bytes, or 1024 bytes.

kb kilobit, or thousand bits (10^3 bits).

keyword parameter In command and utility syntax, operands that include keywords and their related values (*see* “positional parameter”). Values are concatenated to the keyword either by an equal sign, “KEYWORD=value,” or by parentheses, “KEYWORD(value).” Keyword parameters can be specified in any order. The HSC accepts (tolerates) multiple occurrences of a keyword. The value assigned to a keyword reflects the last occurrence of a keyword within a command.

L

LAN Local Area Network.

LCU *See* Library Control Unit.

LED *See* Light Emitting Diode.

LIBGEN The process of defining the configuration of the automated library to the host software.

library An installation of one or more ACSs, attached cartridge drives, volumes placed into the ACSs, host software that controls and manages the ACSs and associated volumes, and the library control data set that describes the state of the ACSs.

library control data set *See* control data set.

Library Control Unit (LCU) The portion of the LSM that controls the picking, mounting, dismounting, and replacing of cartridges.

Light Emitting Diode (LED) An electronic device used mainly as an indicator on status panels to show equipment on/off conditions.

LMU Library Management Unit. The portion of the ACS that manages from one to sixteen LSMs and communicates with the host CPU.

loader *See* Cartridge Scratch Loader.

load point The beginning of the recording area on magnetic tape.

Local Area Network (LAN) A computer network in which devices within the network can access each other for data transmission purposes. The LMU and attached LCUs are connected with a local area network.

logical ejection The process of removing a volume from the control data set without physically ejecting it from its LSM location.

LSM Library Storage Module. Provides the storage area for cartridges plus the robot necessary to move the cartridges. The term LSM often means the LCU and LSM combined.

LSMid An LSMid is composed of the ACSid concatenated with the LSM number.

LSM number A method used to identify an LSM. An LSM number is the result of defining the SLIACS macro LSM parameter during a LIBGEN. The first LSM listed in this parameter acquires the LSM number of 0 (hexadecimal), the second LSM listed acquires a hexadecimal number of 1, and so forth, until all LSMs are identified (maximum of sixteen or hexadecimal F).

M

machine initiated maintenance See ServiceTek.

magnetic recording A technique of storing data by selectively magnetizing portions of a magnetizable material.

magnetic tape A tape with a magnetizable surface layer on which data can be stored by magnetic recording.

magnetic tape drive A mechanism for moving magnetic tape and controlling it's movement.

maintenance facility Hardware contained in the CU and LMU that allows a CSE and the RDC to run diagnostics, retrieve status, and communicate with respective units through their control panels.

management class A collection of management attributes, assigned by the storage administrator, that are used to control the allocation and use of space by a data set. Note that SMS Management Classes are different from VSM Management Classes.

manual mode A relationship between an LSM and all attached hosts. LSMs operating in manual mode have been modified offline and require human assistance to perform cartridge operations.

master LMU The LMU currently controlling the functional work of the ACS in a dual LMU configuration.

MDS Main Device Scheduler (JES3).

media capacity The amount of data that can be contained on storage media and expressed in bytes of data.

micro–software *See* υ –software under Symbols.

migration The movement of VTVs from the VTSS to the RTD where the VTVs are stacked onto MVCs. See *automatic migration* and *demand migration*.

MIM Multi–Image Manager. Third–party software by CA Corporation.

mixed configurations Installations containing cartridge drives under ACS control and cartridge drives outside of library control. These configurations cause the Host Software Component to alter allocation to one or the other.

modem Modulator/demodulator. An electronic device that converts computer digital data to analog data for transmission over a telecommunications line (telephone line). At the receiving end, the modem performs the inverse function.

monitor A device that observes, records, and verifies selected system activities to determine significant departure from expected operation.

Multi-Volume Cartridge (MVC) A physical tape cartridge residing in an LSM that either contains migrated virtual tape volumes (VTVs) or is identified as a volume that can be selected for VTV stacking.

MVCPool Statement An HSC control statement that is contained in the definition data set specified by the VT MVCDEF command. An MVCPool statement specifies the MVCs that VTCS uses.

MVCDEF An HSC command that is used to load the definition data set that contains MVCPool statements.

N

O

output stack The part of the cartridge loader that receives and holds processed cartridges.

P

paired–CAP mode The two forty–cell CAPs in an enhanced CAP function in paired–CAP mode as a single eighty–cell CAP.

PARMLIB control statements Parameter library (PARMLIB) control statements allow you statically specify various operation parameters which take effect at HSC initialization. Identifying your system requirements and then specifying the appropriate control statements permits you to customize the HSC to your data center.

Pass–Thru Port (PTP) A mechanism that allows a cartridge to be passed from one LSM to another in a multiple LSM ACS.

physical end of tape A point on the tape beyond which the tape is not permitted to move.

positional parameter In command and utility syntax, operands that are identified by their position in the command string rather than by keywords (*see* "keyword parameter"). Positional parameters must be entered in the order shown in the syntax diagram.

POST *See* Program for Online System Testing.

PowderHorn A high–performance LSM (model number 9310) featuring a high–speed robot. The PowderHorn has a capacity of up to approximately 6000 cartridges.

Primary. One of two VTSSs in a cluster which is designated in CONFIG as the primary. During normal operations the primary services the host workload and copies replicate VTVs to the secondary.

Program for Online System Testing (POST) A program in a host computer that allows it to test an attached subsystem while the subsystem is online.

Program Temporary Fix A unit of corrective maintenance delivered to a customer to repair a defect in a product, or a means of packaging a Small Programming Enhancement (SPE).

Program Update Tape A tape containing a collection of PTFs. PUTs are shipped to customers on a regular basis under the conditions of the customer's maintenance license.

PTF *See* Program Temporary Fix.

PTP *See* pass–thru port.

PUT *See* Program Update Tape.

R

RACF See Resource Access Control Facility.

Real Tape Drive (RTD) The physical transport attached to the LSM. The transport has a data path to a VTSS and may optionally have a data path to MVS or to another VTSS.

RDC *See* Remote Diagnostic Center.

recall The movement of VTVs from the MVC back to the VTSS. May be automatic or on demand.

reclaim Refers to MVC space reclamation. For automatic and demand 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.

Reconciliation. An automatic process initiated when a cluster is reestablished after the primary or secondary has been offline. Reconciliation ensures that the contents of the primary and secondary are identical with respect to replicate VTVs.

Recording Density The number of bits in a single linear track measured per unit of length of the recording medium.

Remote Diagnostic Center (RDC) The Remote Diagnostic Center at StorageTek. RDC operators can access and test StorageTek systems and software, through telecommunications lines, from remote customer installations. Also referred to as the Central Support Remote Center (CSRC).

Replication. Copying a replicate VTV from the primary VTSS to the secondary VTSS in a cluster. When replication completes, there are two copies of the VTV, one in the primary and one in the secondary.

Replicate VTV. A VTV which has had the replicate attribute attached to it by a management class statement.

Resource Access Control Facility (RACF) Security software controlling access to data sets.

RTD *See* real tape drive.

S

SCP See System Control Program.

scratch tape subpool A defined subset of all scratch tapes. Subpools are composed of one or more ranges of VOLSERs with similar physical characteristics (type of volume {reel or cartridge}, reel size, length, physical location, etc.). Some installations may also subdivide their scratch pools by other characteristics, such as label type (AL, SL, NSL, NL). The purpose of subpooling is to ensure that certain data sets are built only within particular ranges of volumes (for whatever reason the user desires). If a volume which does not belong to the required subpool is mounted for a particular data set, it is dismounted and the mount reissued.

Secondary. One of two VTSSs in a cluster which is designated in CONFIG as the secondary. During normal operations the secondary receives copies of replicate VTVs, stores them, and makes a migration copy on an MVC as soon as possible.

secondary recording A technique for recovery involving maintaining both a control data set and a copy (secondary) of the control data set.

SER Software Enhancement Request.

ServiceTek (machine initiated maintenance) A unique feature of the ACS in which an expert system monitors conditions and performance of subsystems and requests operator attention before a potential problem impacts operations. Customers can set maintenance threshold levels.

servo A device that uses feedback from a sensing element to control mechanical motion.

Small Programming Enhancement (SPE) A supplement to a released program that can affect several products or components.

SMF System Management Facility. An MVS facility used to record system actions which affect system functionality.

SMP System Modification Program.

SMS System Managed Storage.

SPE Small Programming Enhancement.

standard CAP A standard CAP has a capacity of twenty–one cartridges (three rows of seven cells each). An LSM access door with a standard CAP contains cell locations for storing cartridges. (*see also,* Cartridge Access Port (CAP), enhanced CAP.)

standard LSM A model 4410 LSM which a has a storage capacity of up to approximately 6000 cartridges.

standby The status of a station that has been varied online but is connected to the standby LMU of a dual LMU ACS.

standby LMU The redundant LMU in a dual LMU configuration that is ready to take over in case of a master LMU failure or when the operator issues the SWitch command.

station A hardware path between the host computer and an LMU over which the HSC and LMU send control information.

storage class A named list of storage attributes that identify performance goals and availability requirements for a data set. Note that SMS Storage Classes are different from VSM Storage Classes.

storage group A collection of storage volumes and attributes defined by the storage administrator. Note that this is an SMS concept, not a VSM concept.

switchover The assumption of master LMU functionality by the standby LMU.

System Control Program The general term to describe a program which controls access to system resources, and allocates those resources among executing tasks.

system–managed storage Storage that is managed by the Storage Management Subsystem, which attempts to deliver required services for availability, performance, space, and security applications.

System Modification Program Extended An IBM–licensed program used to install software and software maintenance.

T

tape cartridge A container holding magnetic tape that can be processed without separating it from the container.

tape drive A device that is used for moving magnetic tape and includes the mechanisms for writing and reading data to and from the tape.

TAPEREQ An HSC control statement that is contained in the definition data set specified by the TREQDEF command. A TAPEREQ statement defines a specific tape request. It is divided into two parts, the input: job name, step name, program name, data set name, expiration date or retention period, and an indication for specific requests or nonspecific (scratch) requests; and the output: media type and recording technique capabilities. You can use TAPEREQ statements to direct data sets to VSM.

tape unit A device that contains tape drives and their associated power supplies and electronics.

Timberwolf (9740) LSM A high performance LSM that provides a storage capacity of up to 494 cartridges. Up to 10 drives (STD, 4490, 9490, 9490EE, 9840, and SD-3) can be configured. Timberwolf LSMs can only attach to other Timberwolfs.

TMS Tape Management System.

TP Tape–to–Print.

transaction A short series of actions with the control data set. These actions are usually related to a specific function (e.g., Mount, ENter).

transport An electromechanical device capable of threading tape from a cartridge, moving the tape across a read/write head, and writing data onto or reading data from the tape.

TREQDEF An HSC command that is used to load the definition data set that contains TAPEREQ control statements.

Tri–Optic label An external label attached to the spine of a cartridge that is both human and machine readable.

TT Tape–to–Tape.

U

UNITATTR An HSC control statement that is contained in the definition data set specified by the UNITDEF command. A UNITATTR statement defines to the HSC the transport's media type and recording technique capabilities. For VSM, the UNITATTR statements define the VTD addresses to VSM as virtual and associate them with a VTSS.

UNITDEF An HSC command that is used to load the definition data set that contains UNITATTR control statements.

utilities Utility programs. The programs that allow an operator to manage the resources of the library and to monitor overall library performance.

V

Virtual Storage Manager (VSM) 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 DASD buffer, and RTDs. The software includes VTCS, an HSC–based host software, and VTSS microcode.

Virtual Tape Control System (VTCS) The primary host code that controls activity and information about VTSSs, VTVs, RTDs, and MVCs.

Virtual Tape Drive (VTD) An emulation of a physical transport in the VTSS that looks like a physical tape transport to MVS. The data written to a VTD is really being written to DASD. The VTSS has 64 VTDs that do virtual mounts of VTVs.

Virtual Tape Storage Subsystem (VTSS) The DASD buffer containing virtual volumes (VTVs) and virtual drives (VTDs). The VTSS is a STK RAID 6 hardware device with microcode that enables transport emulation. The RAID device can read and write "tape" data from/to disk, and can read and write the data from/to an RTD.

Virtual Tape Volume (VTV) A portion of the DASD buffer that appears to the operating system as a real tape volume. Data is written to and read from the VTV, and the VTV can be migrated to and recalled from real tape.

virtual thumbwheel An HSC feature that allows read–only access to a volume that is not physically write–protected.

VOLATTR An HSC control statement that is contained in the definition data set specified by the VOLDEF command. A VOLATTR statement defines to the HSC the media type and recording technique of the specified volumes. For VSM, the VOLATTR statements define the volsers for volumes that will be used as MVCs.

VOLDEF An HSC command that is used to load the definition data set that contains VOLATTR control statements.

VOLSER A six–character alphanumeric label used to identify a tape volume.

volume A data carrier that is mounted or demounted as a unit. (*See* cartridge).

VSM *See* Virtual Storage Manager.

VTCS *See* Virtual Tape Control System.

VTD *See* virtual tape drive.

W

WolfCreek A smaller capacity high–performance LSM. WolfCreek LSMs are available in 500, 750, and 1000 cartridge capacities (model numbers 9360–050, 9360–075, and 9360–100 respectively). WolfCreek LSMs can be connected by pass–thru ports to 4410, 9310, or other WolfCreek LSMs.

WolfCreek CAP The standard WolfCreek CAP contains a 20–cell magazine–style CAP and a priority CAP (PCAP). (*see also,* Cartridge Access Port (CAP), Enhanced CAP, standard CAP, WolfCreek optional CAP.)

WolfCreek optional CAP The WolfCreek optional CAP contains a 30–cell magazine–style CAP which is added to the standard WolfCreek CAP. (*see also,* Cartridge Access Port (CAP), Enhanced CAP, standard CAP, WolfCreek CAP.)

Write Tape Mark (WTM) The operation performed to record a special magnetic mark on tape. The mark identifies a specific location on the tape.

WTM *See* Write Tape Mark.

WTO Write–to–Operator.

WTOR Write–to–Operator with reply.

Symbols

υ **-software.** Microprogram. A sequence of microinstructions used to perform preplanned functions and implement machine instructions.

Numerics

4410 LSM *See* standard LSM.

9310 LSM *See* Powderhorn LSM.

9360 LSM See Wolfcreek *LSM*.

9490 Cartridge Subsystem Cartridge tape transports that provide read/write capability for 36–track recording format and extended capacity tape and provide improved performance over the 4490 Cartridge Subsystem. 9490 transports can also read data recorded in 18–track format. The StorageTek 9490 Cartridge Subsystem offers better performance (faster data transfer rate, faster load/unload) than a 3490E device.

9490EE Cartridge Subsystem A high performance tape transport that provides read/write capability for Extended Enhanced (EEtape) cartridges. It is functionally equivalent to the IBM 3490E device.

9**740 LSM** See Timberwolf *LSM*.

9840 Cartridge Subsystem A high performance tape transport system for Enterprise and Open Systems environments that reads and writes 9840 cartridges. 9840s can be defined in 10-drive and 20-drive panel configurations. The 9840 can perform as a stand-alone subsystem with a cartridge scratch loader installed, or it can be attached to a StorageTek ACS.

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